SJB Architects

Brickworks Yarralumla
Uriarra Track View Study

Prepared for
DOMA

Issued
06.04.2020

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Version: 01
Prepared by: DM
Checked by: EW

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ABN 20 310 373 425
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Adam Haddow 7188 John Pradel 7004

Issued

Draft for review	06.04.2020

Uriarra Track

1

1.1 Location Map



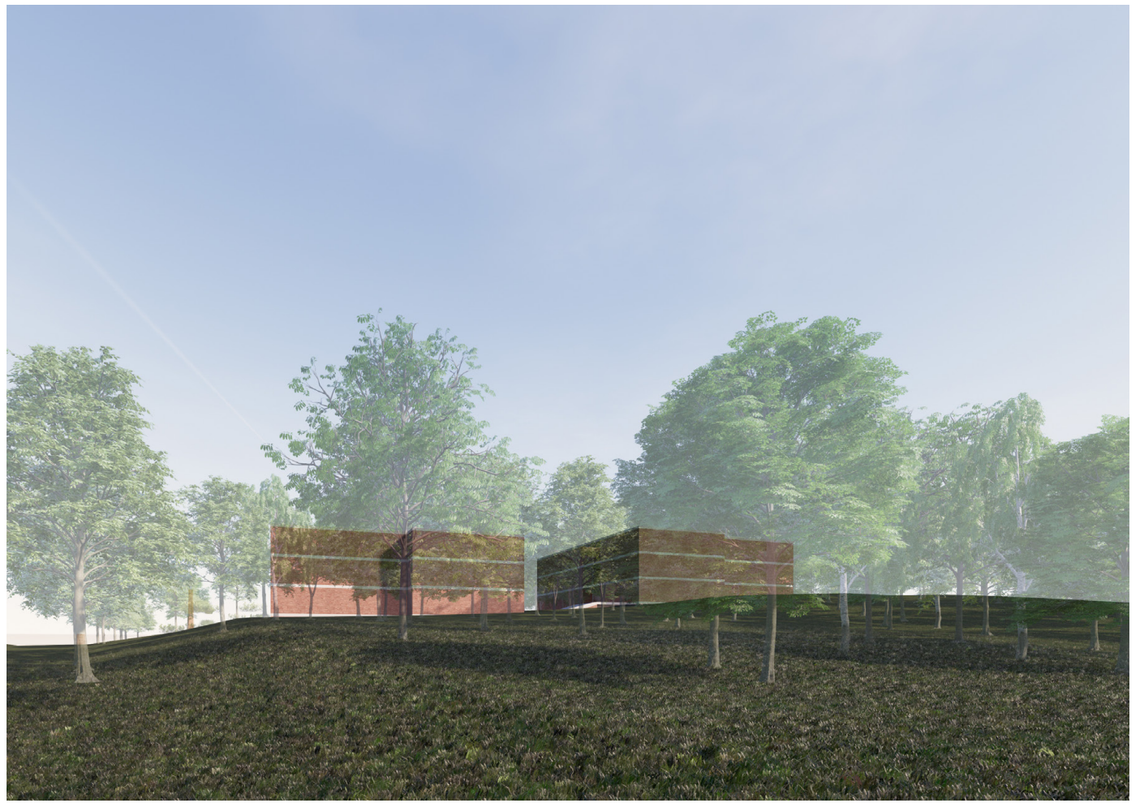
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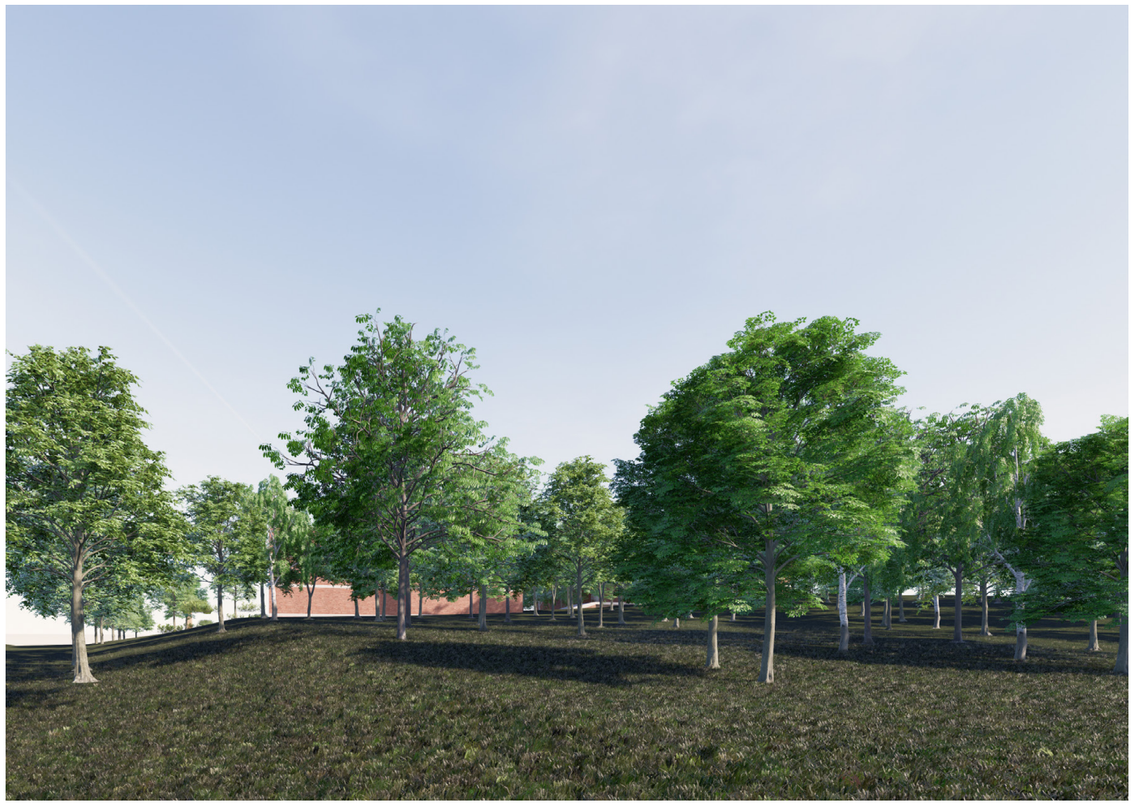




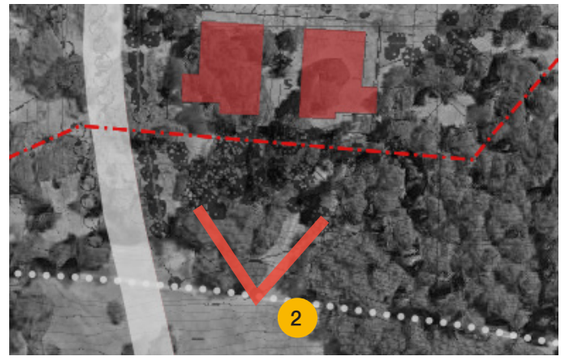
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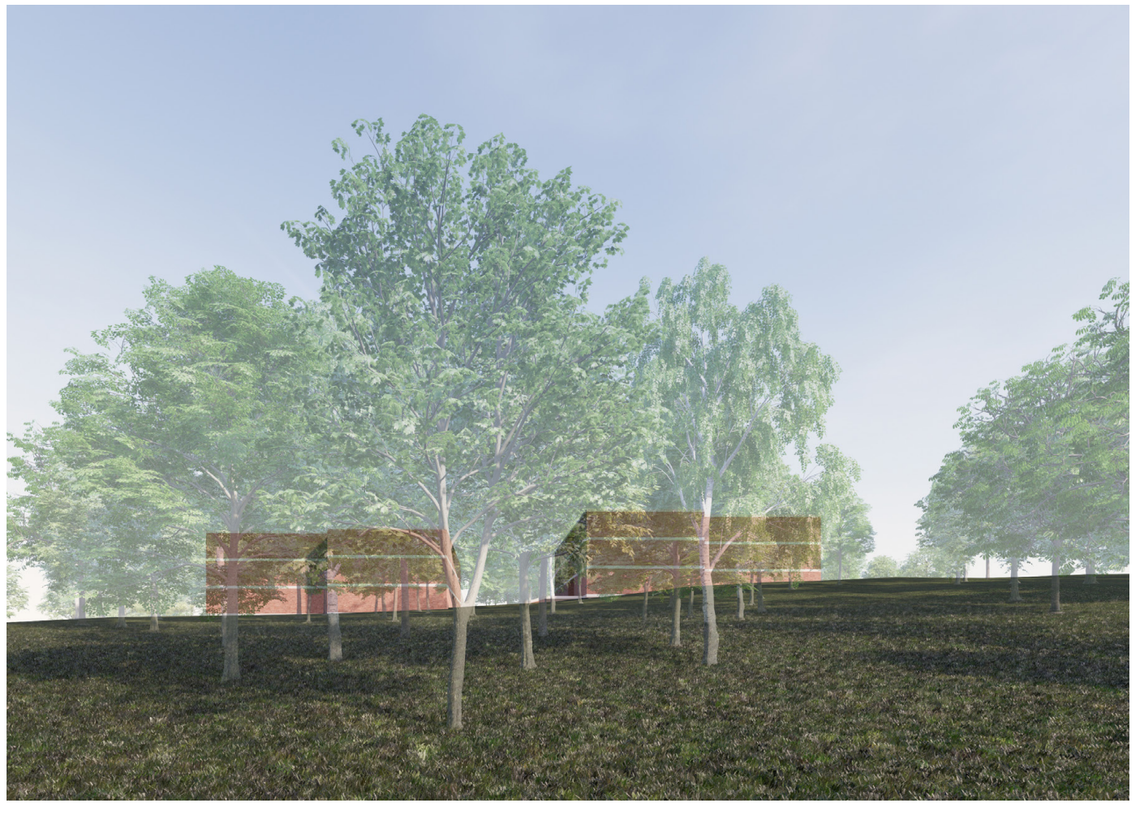






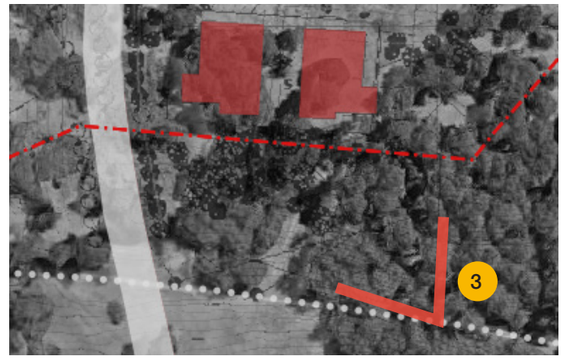
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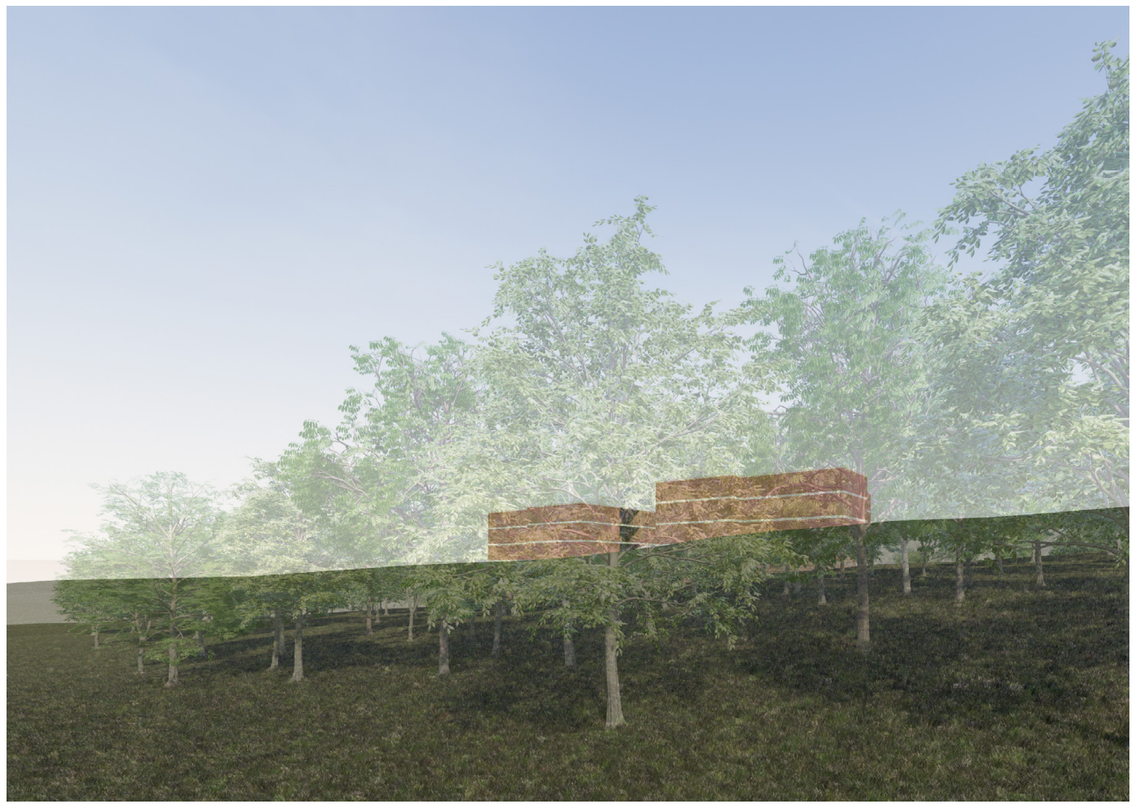


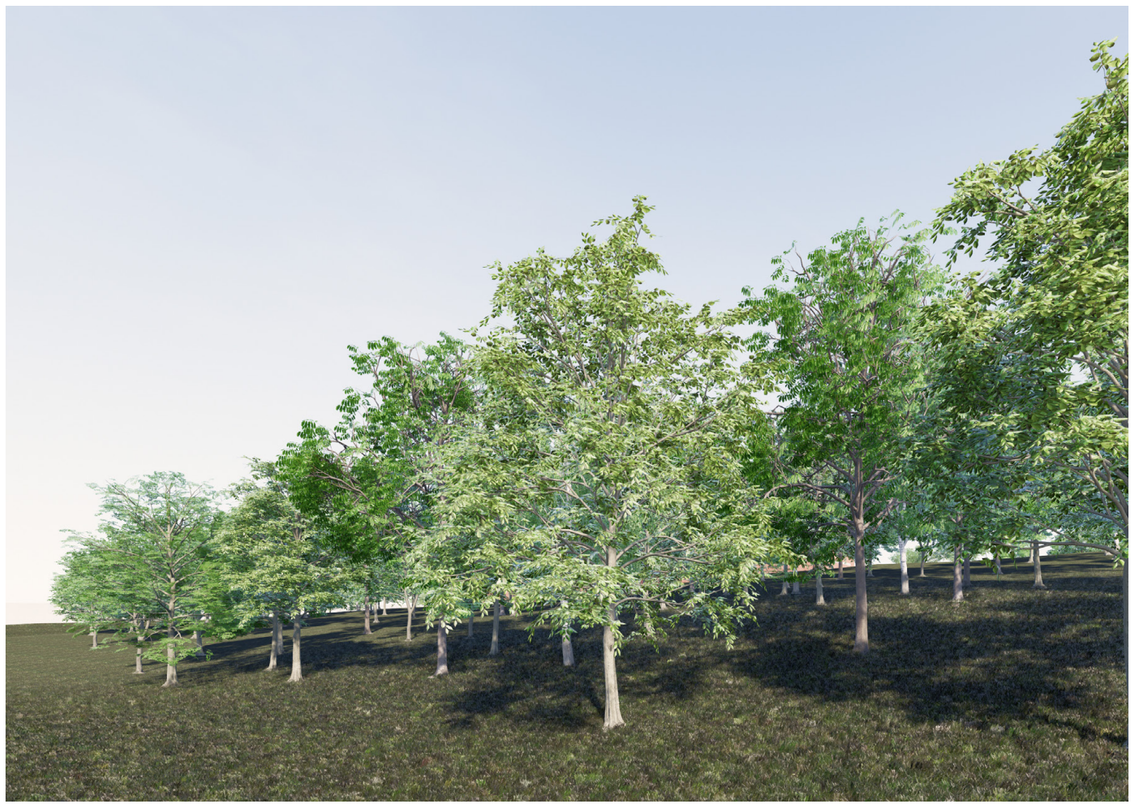




1.5 Building Q Massing | Location 3







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SELLICK CONSULTANTS PTY LTD
Waste Overview





Job Title: **Canberra Brickworks**

Job Location: **Blocks 1, 7 & 20 Section 102 Yarralumla, ACT**

Client: **Doma Group**

Reference #: **191148**

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Project Details

For the Attention of:	Alex Moulis
	Doma Group Unit 4/3 Sydney Avenue Barton ACT 2600
Project No:	191148
Sellick Consultants Reference:	Blocks 1, 7 & 20 Section 102 Yarralumla, ACT Canberra Brickworks

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Revision	Issue	Prepared By	Approved By	Date
A	Estate Development Plan	Ross Costello	Bernie Cusack	07/06/2021

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1.0 INTRODUCTION

Sellick Consultants Pty Ltd on behalf of Doma Group has prepared this Waste Management Report for the proposed estate and multi-unit developments on Blocks 1, 7 and 20 Section 102 Yarralumla. This report has been prepared in accordance with The Development Control Code for Best Practice Waste Management in the ACT 2019 (DCC 2019) where applicable. The purpose of this report is to present the proposed waste management strategy for the estate and future developments to TCCS to enable estate development plan (EDP) application endorsement of the proposal from a waste management perspective.

1.1 PROPOSED DEVELOPMENT

The proposed estate will consist of nine multi-unit residential precincts, commercial Heritage Core, 18 single dwelling residential blocks and two gazetted roads. A community title subdivision is to form part of the estate development plan in accordance with the attached subdivision plan in Appendix A.

1.1.1 RESIDENTIAL LAND USES

The development residential land uses consist of nine different multi-unit residential precincts and single unit residential blocks. The multi-unit residential precincts range from five units to 129 units, with a total of 362 units. The multi-unit precincts will have a centralised waste and recycling collection location within the community title for collection by the Territory Contractor. Transfer of residential waste from each precinct to the centralised waste location will be the responsibility of each precinct's building manager. The single dwelling blocks are proposed to have kerbside collection undertaken by the Territory Contractor. The yield for the development is broken down in Table 1 below.

Table 1 – Proposed Development Residential Yield

PRECINCT	NUMBER OF UNITS
PRECINCT 1	126
PRECINCT 2	22
PRECINCT 3	22
PRECINCT 4	44
PRECINCT 5	69
PRECINCT 6	32
PRECINCT 7	32
PRECINCT 8	10
PRECINCT 9	5
SINGLE DWELLING BLOCKS	18
SUBTOTAL	**380**

2.0 WASTE AND RECYCLING GENERATION RATES

The Development Control Code for Best Practice Waste Management in the ACT 2019 (DCC 2019) provides residential and commercial waste and recycling generation rates. The residential rates, indicated in Table 2 below, and commercial rates in DCC 2019 Table 5.1, have been applied to the proposed development.

Table 2 – Residences' Waste and Recycling Generation Rates

APARTMENT	WEEKLY WASTE GENERATION RATE (LITRES)	WEEKLY RECYCLING GENERATION RATE (LITRES)
1 BEDROOM	80	70
1 BEDROOM + STUDY	90	80
2 BEDROOMS	100	90
3 BEDROOMS	120	110
4 BEDROOMS	140	120

Generation for each precinct being collected at the centralised collection location is shown in Table 3 below.

Table 3 – Summary of Residential Waste and Recycling Generation and Collection

	WASTE	ALLOCATED BINS	COLLECTION FREQUENCY	RECYCLING	ALLOCATED BINS	COLLECTION FREQUENCY
PRECINCT 1	13.38m^3/ week	7x1.1m^3	Twice Weekly	12.12m^3/ week	6x1.1m^3	Twice Weekly
PRECINCT 2	3.08m^3/ week	3x1.1m^3	Weekly	2.64m^3/ week	3x1.1m^3	Weekly
PRECINCT 3	2.64m^3/ week	3x1.1m^3	Weekly	2.42m^3/ week	3x1.1m^3	Weekly
PRECINCT 4	4.66m^3/ week	3x1.1m^3	Twice Weekly	4.22m^3/ week	2x1.1m^3	Twice Weekly
PRECINCT 5	7.36m^3/ week	4X1.1m^3	Twice Weekly	6.67m^3/ week	4x1.1m^3	Twice Weekly
PRECINCT 6	3.42m^3/ week	4x1.1m^3	Weekly	3.10m^3/ week	3x1.1m^3	Weekly
PRECINCT 7	3.42m^3/ week	4x1.1m^3	Weekly	3.10m^3/ week	3x1.1m^3	Weekly
PRECINCT 8	1.20m^3/ week	2x1.1m^3	Weekly	1.10m^3/ week	1x1.1m^3	Weekly
PRECINCT 9	0.60m^3/ week	3x240L	Weekly	0.55m^3/ week	2x360L	Weekly
TOTAL	39.8m^3/ week	1x16m^3 RORO*	Weekly	35.9m^3/ week	1x16m^3 RORO*	Weekly

*RORO compactors are proposed to utilise 3:1 compaction.

As the total volume of waste exceeds 36.0m^3, under the DCC 2019 it is required to service the site using Roll-on Roll-off compactors (RORO). Due to the volume of recycling being just under the 36.0m^3 threshold, it is proposed to have recycling collected by RORO compactors also. This will provide greater collection efficiency for the Territory and greater amenity for the residents.

Refer to Appendix D for detailed breakdown of waste and recycling generation.

Table 4 -Summary of Commercial Waste and Recycling Generation and Collection

COMMERCIAL USE	WASTE	ALLOCATED BINS	COLLECTION FREQUENCY	RECYCLING	ALLOCATED BINS	COLLECTION FREQUENCY
FOOD AND BEVERAGE	53.59m³/ week	5x3m³	Five Times Weekly	10.96m³/ week	5x1.1m³	Five Times Weekly
OFFICE	2.25m³/ week			2.81m³/ week		
RETAIL	13.62m³/ week			13.62m³/ week		
TOTAL	**69.45m³/ week**			**27.39m³/ week**		

Commercial tenancies will have shared waste and recycling bins that will be collected by a private waste management contractor organised by the building manager.

3.0 WASTE AND RECYCLING OPERATIONS

Waste and recycling generated from multi-unit precincts is proposed to be transferred to a single centralised location. The building manager for each development will be responsible for waste transfer.

3.1 INTERNAL RESIDENTIAL WASTE MANAGEMENT

Each residential precinct is to be designed in accordance with the DCC 2019.

Waste for Precincts 1 to 9 is proposed to be managed by the precinct's designated building manager. Residents of each precinct will be responsible for transferring waste and recycling from their units to the designated communal collection point within their precinct.

Hoppers from each precinct will be taken from the waste enclosures within the precinct to the estate central waste collection location, adjacent to the heritage core, by the precinct's nominated site manager. This will be facilitated using a bin trailer provided to the estate by the developer, allowing multiple hoppers to be transported at a time, refer Figure 1 below for example. Two RORO compactors are proposed to be located at the central waste and recycling enclosure location, one each for waste and recycling. Hoppers transferred from the precincts will be emptied into the RORO compactors, using a mechanical bin lifter, before being returned to the designated enclosures within the precinct. Each precinct will have sufficient float hoppers to ensure continuous waste servicing for residents during waste transfer periods.

Figure 1: Aluminium Trailer from SPACEPAC Solutions



Single dwelling residential blocks are proposed to take standard residential MGB's from their storage locations within the block to the designated kerb location on Road 3 for collection by the Territory designated contractor (refer site plan in Appendix A for road layouts). Each block is a maximum 75m away from the kerb location, with travel grades less than 1:10 for each dwelling.

3.2 SITE ACCESS

Road 1 within the estate will provide vehicle access to Precincts 1-8 as well as the Heritage Core and the central waste collection area. An access laneway (Road 5) within the proposed community shared space will provide access to the central waste collection area, where the RORO compactors reside. The collection area has been designed to allow waste collection and loading vehicles to do a three-point turn within the designated loading area, allowing vehicles to enter and exit the waste collection area in a forward direction. This has been allowed for front collection, rear collection (for commercial waste) and RORO compactor collection vehicles.

Road 3 provides vehicle access to Precinct 9 and the single dwelling residential blocks, providing verge space for kerbside collection for the single dwelling Blocks. Both ends of Road 3 have an 8.5m turning head in accordance with the Estate Development Code.

Refer to the subdivision plan in Appendix A for the road layout of the estate.

3.3 TERRITORY COLLECTION OPERATIONS

Territory collection operations will consist of two different collection requirements, combined collection for multi-unit precincts and kerbside collection for single dwelling residential blocks.

Collection for the multi-unit residential precincts will consist of the collection of one 16m^3 waste RORO and one 16m^3 recycling RORO, each proposed to be collected weekly. Collection will occur within the central waste area within community shared space, adjacent to the Heritage Core. The proposed collection location for the RORO compactors has been designed to ensure it is offline from the commercial access to Heritage Core.

Collection for the single dwelling residential blocks is proposed to be by standard kerbside collection by the Territory's designated contractor off the proposed Road 3.

Territory collection operations are proposed as deemed to satisfy under the DCC 2019, with the use of RORO compactors to be presented to TCCS prior to development application for pre-development application approval.

3.4 COMMERCIAL COLLECTION OPERATIONS

Commercial waste and recycling storage for the Heritage Core precinct is proposed to be in the centralised waste storage location, adjacent to the RORO compactor collection location. The storage enclosure is sized to house hoppers for combined waste and recycling streams.

Waste and recycling from the commercial tenancies is to be transported from each tenancy to the waste and recycling storage enclosure by the tenants. Collection of waste and recycling from the commercial storage enclosure is proposed to be by a designated private waste collection contractor.

4.0 CONCLUSION

The proposed development's waste and recycling management process has been undertaken in accordance with the relevant parts of the Development Control Code for Best Practice Waste Management in the ACT 2019, with sections required for pre-approval by ACT NoWaste outlined.

The waste and recycling management process for the development is recommended for Pre-Development Application endorsement by TCCS.

APPENDIX A

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F	EDP SUBMISSION	08.06.2021	RT
E	EIS SUBMISSION	07.05.2021	RT
D	90% EDP FOR INFORMATION	22.03.2021	RT
C	BOUNDARIES AND ROAD AL-04 REVISED	20.12.2019	DA
B	DOMA GROUP COMMENTS ADDRESSED	18.12.2019	DA
A	ESTATE DEVELOPMENT PLAN - 30%	16.12.2019	DA

LANE-POOLE PLACE
BENTHAM STREET
SCHOMBURGK STREET
WOOLLS STREET
DENMAN STREET
MAXWELL STREET
BLAKELY ROW
DUNROSSIL DRIVE
DUDLEY STREET
ROAD 01
ROAD 02
ROAD 03
ROAD 05
PRECINCT 1
PRECINCT 2
PRECINCT 3
PRECINCT 4
PRECINCT 5
PRECINCT 6
PRECINCT 7
PRECINCT 8
PRECINCT 9
HERITAGE CORE
QUARRY PARK
THE REMNANTS
PUBLIC CAR PARKING (UNDER) (200 SPACES)
INNER ASSET PROTECTION ZONE
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T13
T14
T15
T16
T17
T18

LEGEND

- HOLDING LEASE BOUNDARY
- PROPOSED BLOCK BOUNDARY
- EXISTING TREE TO BE REMOVED
- EXISTING TREE TO RETAINED
- 580.0 PROPOSED CONTOUR
- 580.0 EXISTING CONTOUR
- MULTI UNIT- APARTMENT TYPOLOGY
- MULTI UNIT - TERRACE TYPOLOGY
- COMMUNITY TITLE ROAD / DRIVEWAY
- SINGLE DWELLING LOTS
- PUBLIC OPEN SPACE
- PUBLIC ROAD
- HERITAGE PRECINCT
- SHARED PATHS
- POND

Scales

0 20 30 40 50m

1:1000 @ A1

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DOMAGROUP

Original Size	A1	Drawn By DA	Drafting Check DCA
Date Plotted	8-Jun-21	Designed By AE	Design Check BC
Coordinate System	STROMLO GRID	Approved BC	Approved Date 16/12/2019
Height Datum	AHD	Approved Signature	

Project Name and Location

THE CANBERRA BRICKWORKS

BLOCKS 1,7 & 20 SECTION 102

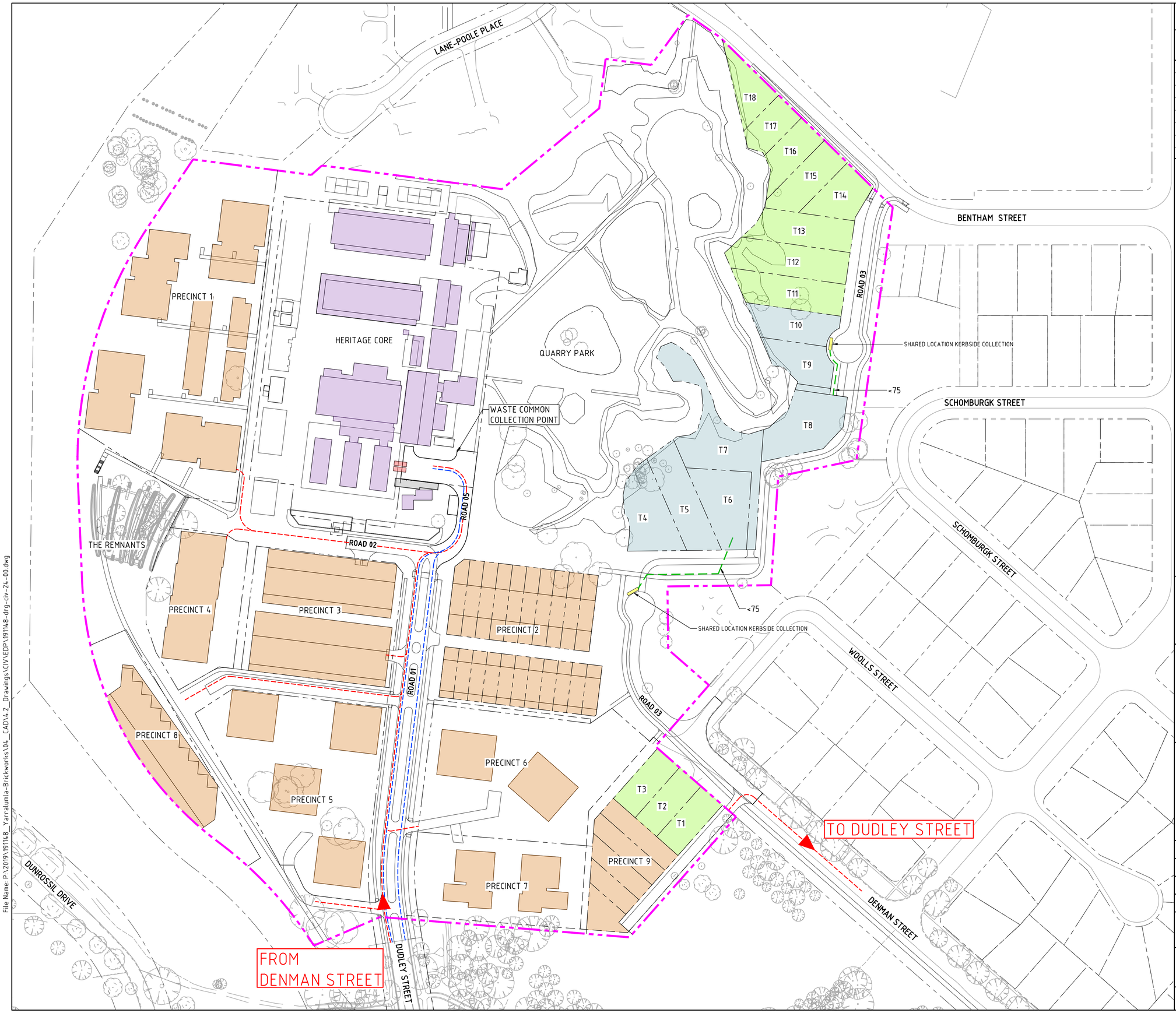
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CONCEPT EDP - ESTATE DEVELOPMENT PLAN

Project Number	Type	Discipline	Drg No.	Sub-No.	Rev
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APPENDIX B



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- 580.0 PROPOSED CONTOUR
- 580.0 EXISTING CONTOUR

- KERBSIDE COLLECTION
- SHARED LOCATION KERBSIDE COLLECTION
- MULTI-UNIT COMMON COLLECTION
- COMMERCIAL COMMON COLLECTION
- ROLL ON - ROLL OFF COLLECTION
- COMMERCIAL COMMON COLLECTION POINT
- SHARED LOCATION KERBSIDE COLLECTION POINT

- BUILDING MANAGERS MOVEMENTS
- TERRITORY COLLECTION MOVEMENTS

Scales

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1:1000 @ A1

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Height Datum	AHD	Approved Signature	

Project Name and Location

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BLOCKS 1,7 & 20 SECTION 102

Drawing Title

CONCEPT EDP - WASTE COLLECTION PLAN

Project Number	Type	Discipline	Drg No.	Sub-No.	Rev
191148	DRG	CIV	24	00	F

APPENDIX C

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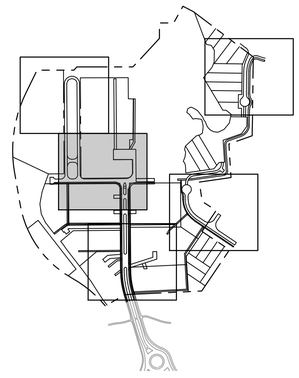
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- EXISTING TREE TO RETAINED
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- 580.0 EXISTING CONTOUR



KEY PLAN

Scales

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1:250 @ A1

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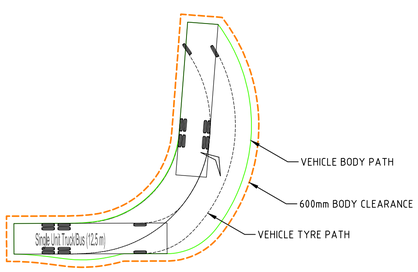
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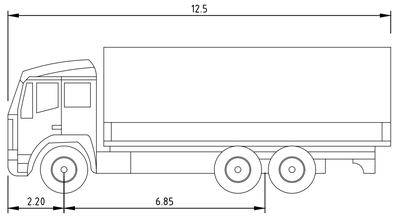
BLOCKS 1,7 & 20 SECTION 102

Drawing Title

CONCEPT EDP - ROADS DETAIL PLAN SHEET 1

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191148	DRG	CIV	18	01	F





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APPENDIX D

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	Precinct 1		Precinct 2		Precinct 3		Precinct 4		Precinct 5		Precinct 6		Precinct 7		Precinct 8		Precinct 9		
	Beds	Total	Beds	Total	Beds	Total	Beds	Total	Beds	Total	Beds	Total	Beds	Total	Beds	Total	Beds	Total	
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	1+	0	1+	0	1+	0	1+	0	1+	0	1+	0	1+	0	1+	0	1+	0	
Number of Units per Waste Chute	2	85	2	0	2	0	2	29	2	44	2	19	2	19	2	0	2	0	
	3	40	3	0	3	22	3	14	3	24	3	12	3	12	3	10	3	5	
	4	0	4	22	4	0	4	0	4	0	4	0	4	0	4	0	4	0	
	Total	126	Total	22	Total	22	Total	44	Total	69	Total	32	Total	32	Total	10	Total	5	362

	Precinct 1		Precinct 2		Precinct 3		Precinct 4		Precinct 5		Precinct 6		Precinct 7		Precinct 8		Precinct 9	
	Waste	Recycling	Waste	Recycling	Waste	Recycling	Waste	Recycling	Waste	Recycling	Waste	Recycling	Waste	Recycling	Waste	Recycling	Waste	Recycling
Daily Generation (m^3/d)	1.91	1.73	0.44	0.38	0.38	0.35	0.67	0.60	1.05	0.95	0.49	0.44	0.49	0.44	0.17	0.16	0.09	0.08
Weekly Generation (m^3/w)	13.38	12.12	3.08	2.64	2.64	2.42	4.66	4.22	7.36	6.67	3.42	3.1	3.42	3.1	1.2	1.1	0.6	0.55
Waste container size	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.24	0.36
# of bins @ chute	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Compaction ratio (n:1)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Frequency of Bin Changes (Days)	0.58	0.64	2.50	2.92	2.92	3.18	1.65	1.82	1.05	1.15	2.25	2.48	2.25	2.48	6.42	7.00	2.80	4.58
Collections / week	2	2	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1
Bins collected / collection	7	6	3	3	3	3	3	2	4	4	4	3	4	3	2	1	3	2
Weekly Capacity (m3)	15.4	13.2	3.3	3.3	3.3	3.3	6.6	4.4	8.8	8.8	4.4	3.3	4.4	3.3	2.2	1.1	0.72	0.72

Total Waste bins/ collection	33	Twice Weekly
Total Recycling Bins/ collection	27	Twice Weekly
Total Waste Generation (m3)	39.8	
Total Recycling Generation (m3)	35.9	
Total Waste Capacity (m3)	49.12	
Total Recycling Capacity (m3)	41.42	
Total Units	362	

APPENDIX E

www.sellickconsultants.com.au • sellick@sellickconsultants.com.au

SPACEPAC SOLUTIONS
www.SPACEPAC.com.au

EMOVEIT
www.EMOVEIT.com.au

PO Box 1468 Auburn St. Wollongong NSW 2500
Phone: 1300 763 444 ABN 98 002 454 462
Email: sales@spacepac.com.au

Replaces all previous versions

Effective 20th December 2018

SPACEPAC ALUMINIUM TRAILERS

Ideal for foodbins, wastebins, and general use. made to order - Custom sizes available .



Engineer designed, lightweight yet extremely robust and easily cleaned

Suitable for:

- Insulated food trolleys (eg: Versigen, Cambro, Rubbermaid, Carlisle)
- 820/120/240/660/1100 ltr Plastic Council wheelie bins
- General use for transport of goods
- Hospitals, Aged care, residential and commercial applications



Size:

2/4/6/8 bin, also custom sizes to suit your application.
Designed Speeds: 5km to 20km/hr maximum
Not for highway use. Unless with "Blueslip" option





All prices/specifications subject to change without notice.

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SPACEPAC ALUMINIUM TRAILERS

FEATURES

Heavy Gauge Aluminium construction fully welded

- Inline 700 mm models will fit through standard doorways.
- Engineer designed, lightweight yet extremely robust and easily cleaned.
- Can be pushed by one person or towed with Spacepac / Emoveit Battery Electric Tugs

Non Slip - Rear Ramp

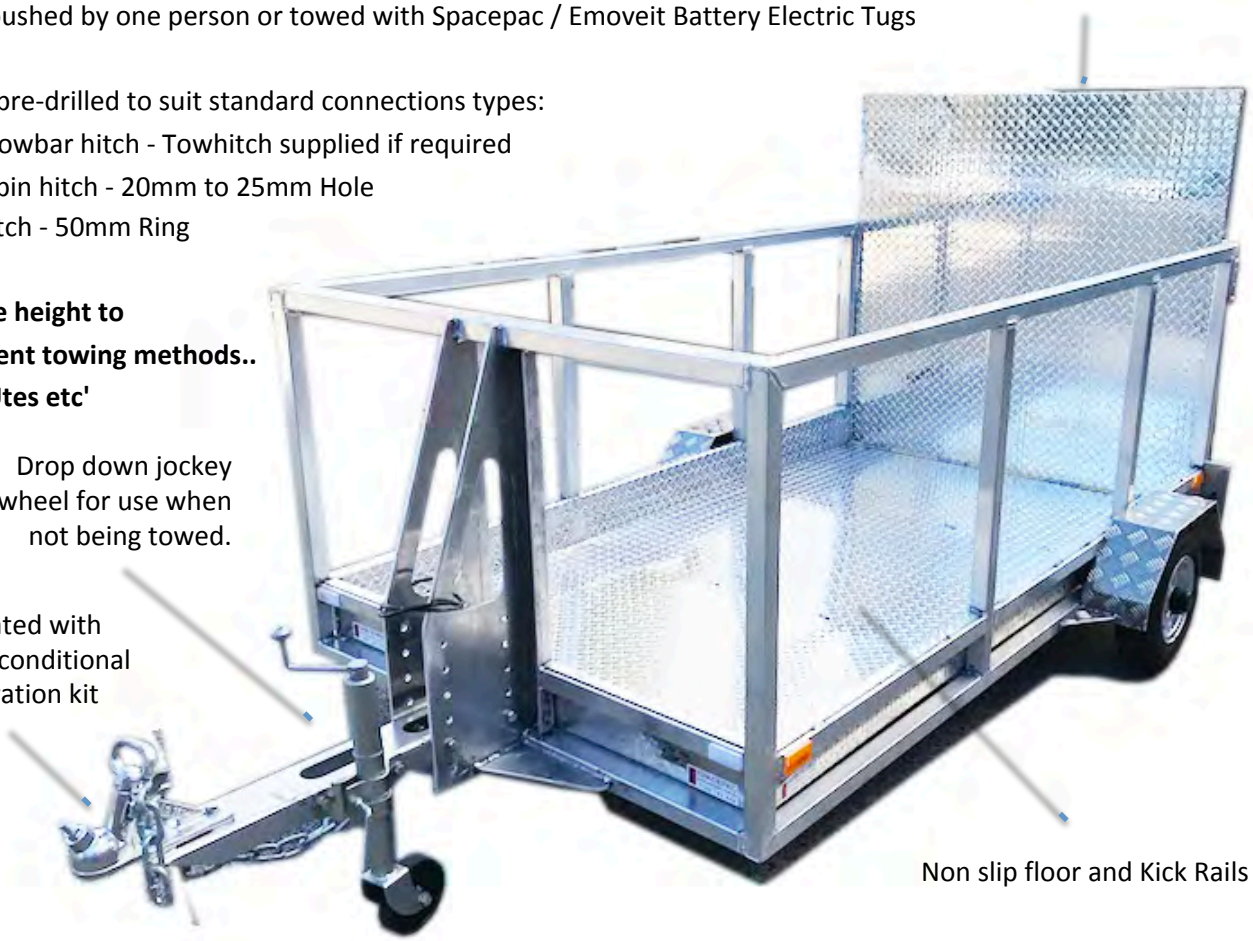
Draw-bar pre-drilled to suit standard connections types:

- 50 mm towbar hitch - Towhitch supplied if required
- Drop-in pin hitch - 20mm to 25mm Hole
- Pintle hitch - 50mm Ring

Adjustable height to suit different towing methods.. ie: Tugs, Utes etc'

Drop down jockey wheel for use when not being towed.

Illustrated with optional conditional registration kit



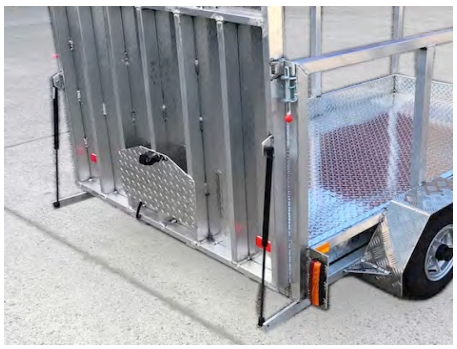
Non slip floor and Kick Rails



Adjustable height heavy duty draw-bar pre-drilled to suit standard connection types: 50 mm towbar hitch Or Drop -in pin hitch.



8 Inch Alloy Wheels with Holden precision bearings & Highway grade 6 ply tires designed to resist side loads on ramp. Complete with Wheel Guards for protection and road safety.



1200mm Rear Ramp complete with high quality gas struts & positive locking

All prices/specifications subject to change without notice.

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Effective 20th December 2018

SPACEPAC ALUMINIUM TRAILERS

OPTIONS



Divider plus twin ramp for moving food trolleys



Conditional registration kit including Tail & Brake lights, Indicators, Reflectors & Number plate light.

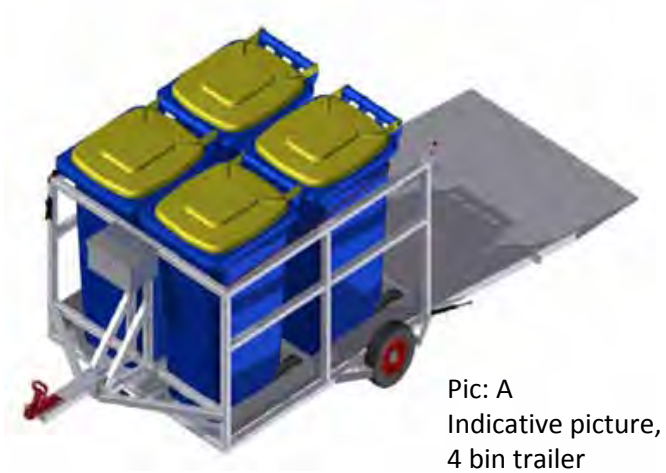


Optional Divider with twin ramp & Reverse camera with 7 inch screen mounted on the vehicle's dashboard.

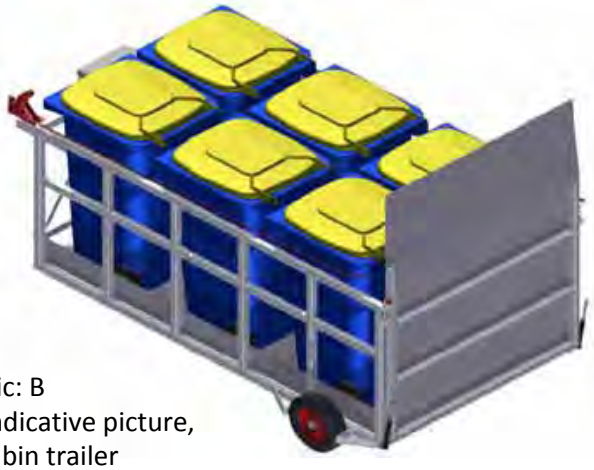


Pedestrian Model with optional infill panels & pedal lock

DESIGN SUGGETIONS:



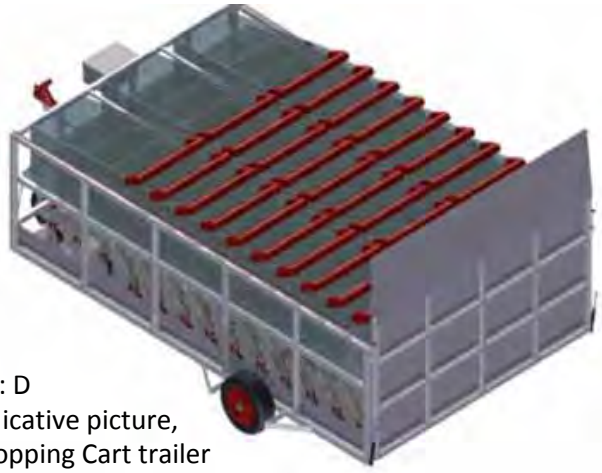
Pic: A
Indicative picture,
4 bin trailer



Pic: B
Indicative picture,
6 bin trailer



Pic: C
Indicative picture,
8 bin trailer



Pic: D
Indicative picture,
Shopping Cart trailer

All prices/specifications subject to change without notice.

EN

PÖTTINGER
Entsorgungstechnik

MULTIPRESS
MP 1.9/1.4/1.0



falconic
KEEP AN EYE ON EFFICIENCY

NEW!

OPTIMUM PRESS TECHNOLOGY in contemporary design

- → + 20% more filling weight
- → Reduction of transport costs
- → Universal deployment
- → Paint quality as in the car industry
- → Silent hydraulic pump
- → Optimum safety for operator
- → Communication with machine
- → Online configuration of machine and location
- → Optimum management of your container pool

ECONOMIC SUCCESS

depends on several factors

Improved capacity – up to 20% more fill volume

due to the newly developed press geometry. Tapered press bottom, curved press plate, high quality piston guiding and improved press geometry ensure an effective retention system. Up to 20% higher compaction!

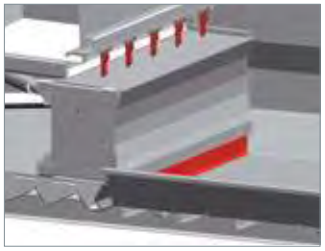


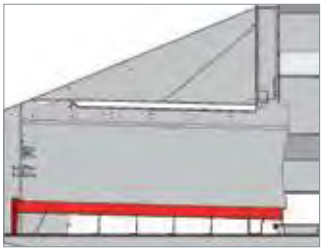
Large filling opening

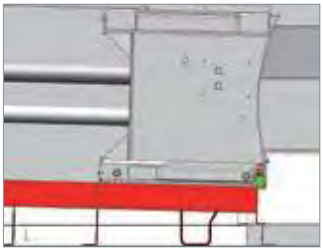
The double build-up prevention by means of retaining tines and a 152 mm high trash holder in combination with the immersion depth of the compressing ram of 334 mm keeps the pressing area free and permanently available.

Type MP 1.4:
1050 x 1860 mm
→ 1,4 m³ / stroke

Type MP 1.9:
1450 x 1860 mm
→ 1,9 m³ / stroke







MULTIPRESS
MP 1.9/1.4/1.0

Universal deployment and variable equipment that is easy to retrofit

Regardless of whether ground, ramp or building loading – additional equipment can be bolted on for quick and easy adaptation to any disposal location.





Tipping device

Preparation provided as standard - no welding needed for retrofitting. Optionally hydraulic comb lift.



Operation

Phase adapter and connection for remote control are supplied as standard.



Side-hung or top-hung rear door

The back wall is easily converted from a side-hung door to a top-hung door. Standard 8-point locking system for leak tight seal.
The hook on the back can be used for hoisting it on to the lorry.



SAFETY
is top priority

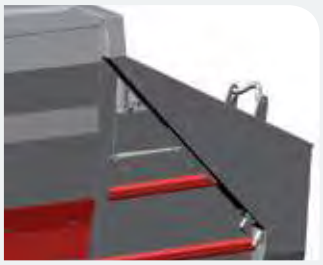




Safety unlocking device with door catch system

The operator is always outside of the danger area when opening the door. Through a special door catch system, people who are not in the field of vision remain, protected.

OPTIONAL:
Bulky waste model – reinforced construction for bulky waste





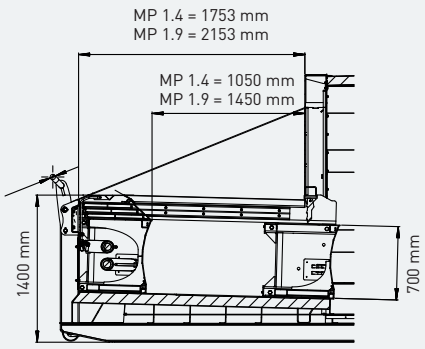
The following components are reinforced on this model:

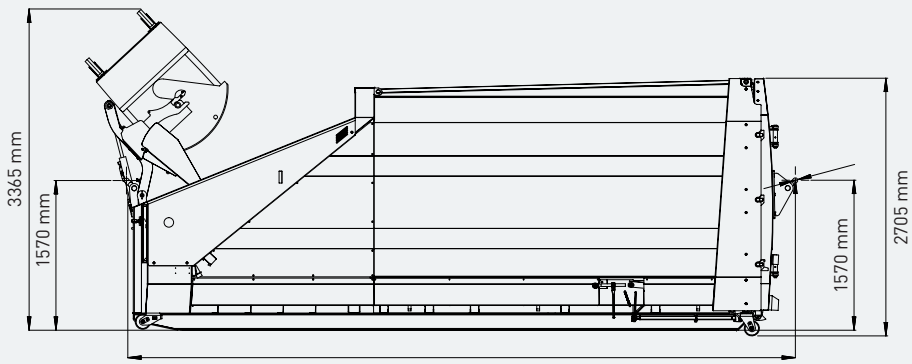
- → Piston guide, piston and yoke
- → Side walls of the container
- → Floor cleaner on the piston head as standard

HYDRAULICS und ELEKTRICS

Easy to access and clearly laid out. Accident prevention as no climbing aids are required. Easy to service thanks to ergonomic working position.







MP 1.4 16 m³ = 5850 / 18 m³ = 6250 / 20 m³ = 6650 / 22 m³ = 7050 / 24 m³ = 7450
MP 1.9 16 m³ = 6250 / 18 m³ = 6650 / 20 m³ = 7050 / 22 m³ = 7450 / 24 m³ = 7850

MULTIPRESS
MP 1.9/1.4/1.0

Building-feeding

Taylormade solutions for the space-saving filling
of your PÖTTINGER machines from inside of a building.

By their innovative design, the individually adapted length of the chutes and different filling possibilities they can be perfectly integrated in modern architecture.





Tipping devices

For the decentralised
collection of waste in
DIN standard containers.

Tipping devices can be either attached to a press container or are available as stationary or mobile solutions. Thus, waste can be collected during operation in 80 to 1100 litre DIN standard containers and then filled into the press by means of the tipping device.





Quiet-running pump

The Pöttinger MULTIPRESS containers are equipped with a quiet-running pump as standard. At idle, the machine noise level is under 59 dBA.



MULTIPRESS
MP 1.4 - 1.9

Optimum press technology in contemprary design



01 | Modular construction - all parts screwable
02 | Hood over intake opening - comfortable operation
03 | Foldaway front hook
04 | Connector with 16 poles for additional operation panel
05 | Automatic phase changing
06 | Stability
07 | Combined poliamide rolls
08 | Gliders for piston (inside)
09 | Inclined press floor (inside)
10 | Concave front plate ROC 401 (inside)
11 | Sealings at maintenance door, hood and rear door
12 | Sand blasting RA 2,5 / powder coating primer plus top coat at least 120µ
13 | Rear door convertible top hanged / side hanged
14 | Rear hook for transporting the machine
15 | Ratchet spanner for rear door in safe position
16 | Door catch system
17 | Hour counter
18 | Low noise gear pump standard f-59dbA

Technical Data 1.4	MP 16-1.4	MP 18-1.4	MP 20-1.4	MP 22-1.4	MP 24-1.4
Volume Container	16 m³	18 m³	20 m³	22 m³	24 m³
Length (without hook)	5650 mm	6050 mm	6450 mm	6850 mm	7250 mm
Length (with hook)	5850 mm	6250 mm	6650 mm	7050 mm	7450 mm
Width x height	2460 x 2704 mm	2460 x 2704 mm	2460 x 2704 mm	2460 x 2704 mm	2460 x 2704 mm
Filling height	1400 mm	1400 mm	1400 mm	1400 mm	1400 mm
Volume per stroke	1,4 m³	1,4 m³	1,4 m³	1,4 m³	1,4 m³
Height of press ram	700 mm	700 mm	700 mm	700 mm	700 mm
Press opening W x H	1860 x 1050 mm	1860 x 1050 mm	1860 x 1050 mm	1860 x 1050 mm	1860 x 1050 mm
Filling opening W x H	1860 x 1753 mm	1860 x 1753 mm	1860 x 1753 mm	1860 x 1753 mm	1860 x 1753 mm
Compaction force	340 kN	340 kN	340 kN	340 kN	340 kN
Pressing cycle	40 sec.	40 sec.	40 sec.	40 sec.	40 sec.
Motor	5,5 kW	5,5 kW	5,5 kW	5,5 kW	5,5 kW
Fuse slow	16 A	16 A	16 A	16 A	16 A
Electric connection	400 V, 50 Hz	400 V, 50 Hz	400 V, 50 Hz	400 V, 50 Hz	400 V, 50 Hz
Unladen weight	4797 kg	4947 kg	5097 kg	5247 kg	5397 kg
Container conical	conical à 100 mm	conical à 100 mm	conical à 100 mm	conical à 100 mm	conical à 100 mm



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The essential tool
for an efficient work
organisation.



Technical Data 1.9	MP 16-1.9	MP 18-1.9	MP 20-1.9	MP 22-1.9	MP 24-1.9
Volume Container	16 m³	18 m³	20 m³	22 m³	24 m³
Length (without hook)	6050 mm	6450 mm	6850 mm	7250 mm	7650 mm
Length (with hook)	6250 mm	6650 mm	7050 mm	7450 mm	7850 mm
Width x height	2460 x 2704 mm	2460 x 2704 mm	2460 x 2704 mm	2460 x 2704 mm	2460 x 2704 mm
Filling height	1400 mm	1400 mm	1400 mm	1400 mm	1400 mm
Volume per stroke	1,9 m³	1,9 m³	1,9 m³	1,9 m³	1,9 m³
Height of press ram	700 mm	700 mm	700 mm	700 mm	700 mm
Press opening W x H	1860 x 1450 mm	1860 x 1450 mm	1860 x 1450 mm	1860 x 1450 mm	1860 x 1450 mm
Filling opening W x H	1860 x 2153 mm	1860 x 2153 mm	1860 x 2153 mm	1860 x 2153 mm	1860 x 2153 mm
Compaction force	340 kN	340 kN	340 kN	340 kN	340 kN
Pressing cycle	40 sec.	40 sec.	40 sec.	40 sec.	40 sec.
Motor	5,5 kW	5,5 kW	5,5 kW	5,5 kW	5,5 kW
Fuse slow	16 A	16 A	16 A	16 A	16 A
Electric connection	400 V, 50 Hz	400 V, 50 Hz	400 V, 50 Hz	400 V, 50 Hz	400 V, 50 Hz
Unladen weight	5060 kg	5210 kg	5360 kg	5510 kg	5660 kg
Container conical	conical à 100 mm	conical à 100 mm	conical à 100 mm	conical à 100 mm	conical à 100 mm

MULTIPRESS 1.0

MULTIPRESS 1.0 **Skip**

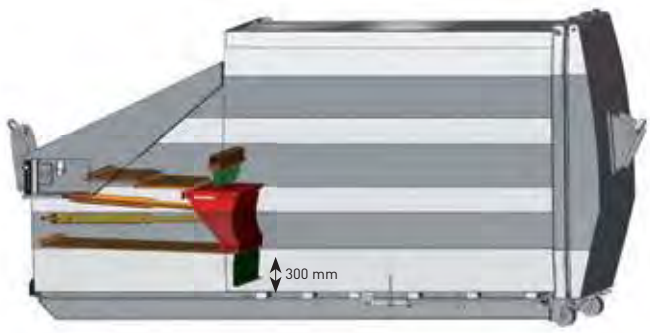
If there is limited space available
or if being used with skip vehicles



Due to the container volumes from 8 to 12 m³ and the width of 2 m, the **MULTIPRESS 1.0** suits to narrow surrounding areas.
The press technology contains all advantages of the big brother and characterizes due to its efficiency, high compaction ratio and durability.

Skip	MP 8-1.0	MP 10-1.0	MP 12-1.0
Volume Container	8 m³	10 m³	12 m³
Length (without hook)	4200	4700	5200
Length (with hook)	–	–	–
Width x height	1950 x 2400 mm	1950 x 2400 mm	1950 x 2400 mm
Filling height	1270 mm	1270 mm	1270 mm
Volume per stroke	1 m³	1 m³	1 m³
Height of press ram	550 mm	550 mm	550 mm
Press opening W x H	1000 x 1450 mm	1000 x 1450 mm	1000 x 1450 mm
Filling opening W x H	1580 x 1450 mm	1580 x 1450 mm	1580 x 1450 mm
Compaction force	300 kN	300 kN	300 kN
Pressing cycle	24 sec.	24 sec.	24 sec.
Motor	5,5 kW	5,5 kW	5,5 kW
Fuse slow	16 A	16 A	16 A
Electric connection	400 V, 50 Hz	400 V, 50 Hz	400 V, 50 Hz
Unladen weight	3250 kg	3450 kg	3650 kg
Container conical	conical à 80 mm	conical à 80 mm	conical à 80 mm

MULTIPRESS 1.0



MULTIPRESS 1.0
Roll-off container

Special version as wet waste press

Mixed waste and also waste with a high moisture content can be ideally compressed. The sloping pressing floor and the special high level difference (300 mm Trashholder) between the pressing floor and the container floor guarantee that the equipment remains clean.
In addition, the **MULTIPRESS 1.0 roll-off container** is also available as an underground garage model.



Roll-off container	MP 10-1.0	MP 12-1.0	MP 14-1.0	MP 16-1.0
Volume Container	10 m³	12 m³	14 m³	16 m³
Length (without hook)	4960	5460	5960	6460
Length (with hook)	5200	5700	6200	6700
Width x height	1950 x 2440 mm	1950 x 2440 mm	1950 x 2440 mm	1950 x 2440 mm
Filling height	1270 mm	1270 mm	1270 mm	1270 mm
Volume per stroke	1 m³	1 m³	1 m³	1 m³
Height of press ram	550 mm	550 mm	550 mm	550 mm
Press opening W x H	1000 x 1450 mm	1000 x 1450 mm	1000 x 1450 mm	1000 x 1450 mm
Filling opening W x H	1580 x 1450 mm	1580 x 1450 mm	1580 x 1450 mm	1580 x 1450 mm
Compaction force	300 kN	300 kN	300 kN	300 kN
Pressing cycle	24 sec.	24 sec.	24 sec.	24 sec.
Motor	5,5 kW	5,5 kW	5,5 kW	5,5 kW
Fuse slow	16 A	16 A	16 A	16 A
Electric connection	400 V, 50 Hz	400 V, 50 Hz	400 V, 50 Hz	400 V, 50 Hz
Unladen weight	3390 kg	3550 kg	3720 kg	3880 kg
Container conical	conical à 80 mm	conical à 80 mm	conical à 80 mm	conical à 80 mm

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KEEP AN EYE ON EFFICIENCY



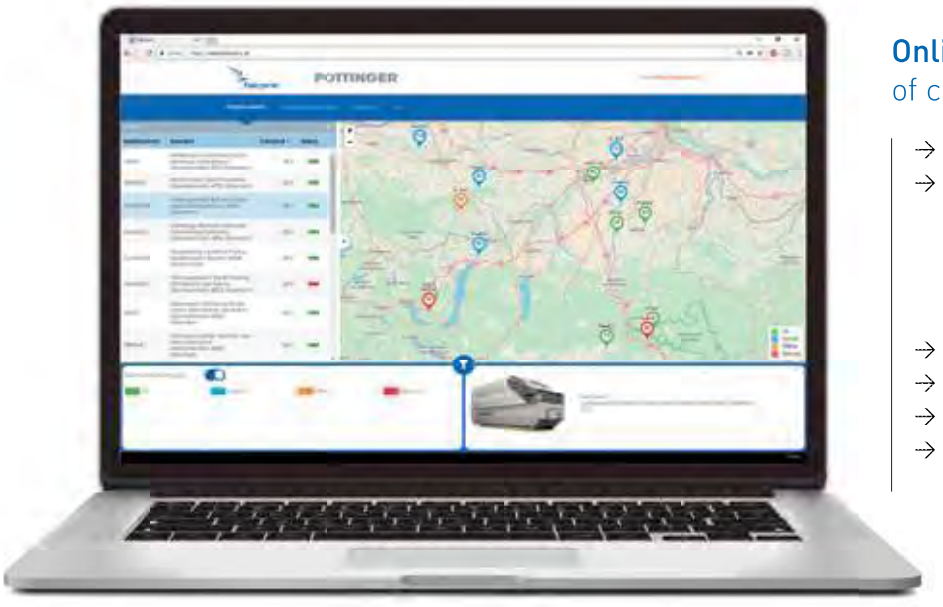
NEW!

OPTIMIZE YOUR LOGISTICS

with **falconic**, the control module for your press container.

falconic offers everything you need to work more efficiently in our digital world:

- → GPS Tracking and visualization of container location
- → **Online configuration of machines and installation sites**
- → **Automatic adoption of site specific parameters when changing the containers** (e.g. type of material, amount of press strokes...)
- → Running statistic of all machine related data (e.g. amount of emptyings, starting sequences, error messages etc.)
- → Information about machine equipment
- → Connection to already existing scheduling and invoicing programs possible
- → Data transfer from container to Web interface
- → Automatic adaption of the rotating direction of the motor

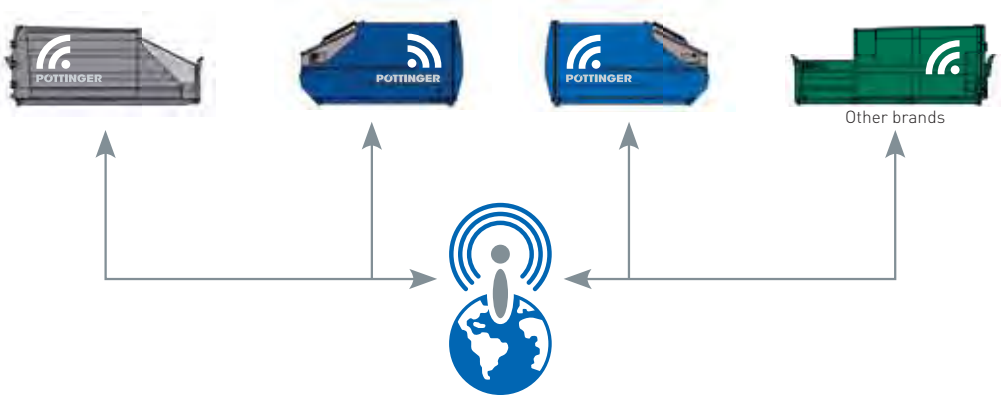


Online-adjustment
of containers and location sites:

- → Pre-full and full announcement 50 – 100%
- → Personalized container status announcements (Email/SMS) to
  - Technical/Service department
  - Scheduling department
  - Client (machine location)
- → Predictive service
- → Amount of strokes at pressing cycle
- → Position of press ram
- → Adjustment of press related to type of material



falconic
The mode of operation



GPRS
Data transfer worldwide

Data base / server

Connection to existing scheduling and invoicing programs

falconic saves:

- → LOGISTIC COSTS
- → SCHEDULING COSTS
- → MAINTENANCE COSTS

Client / scheduler



Optimized emptying intervals

Predictivice service

Trouble-shooting by telephone

falconic RETROFIT - possible for all Pöttinger machines and machines from other manufacturers

PÖTTINGER
Entsorgungstechnik

THE 7 QUALITY MARKS



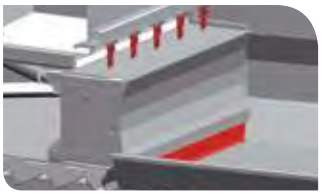
POWDER COATING



STABLE EXECUTION + 200%



LOAD TESTS



OPTIMUM MATERIAL GLOW,
GEOMETRIE OF THE PRESS



INNOVATVE DESIGN



TEXTILE COVERINGS
WITH CAMO DESIGN



FALCONIC -
KEEP AN EYE ON EFFICIENCY

Technical modifications, mistakes or misprints reserved. 0418

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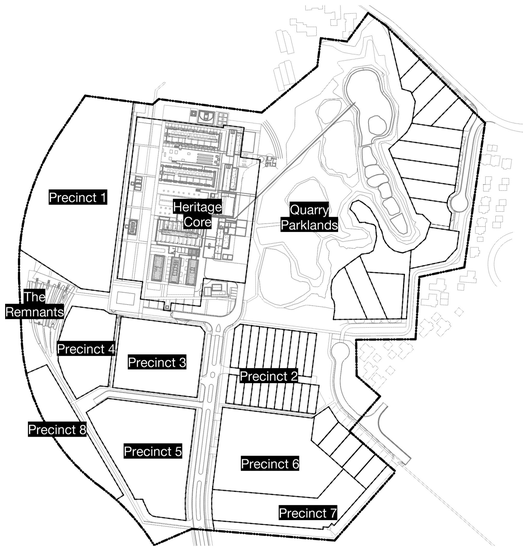
E: **sellick@sellickconsultants.com.au**
www. sellickconsultants.com.au











Program

1	Brickworks Way	11	Basketball Half-Court (Private)
2	Public Carpark Vehicle Entry	12	Table Tennis (Private)
3	Public Carpark Pedestrian Entry	13	Pool (Private)
4	Entry Garden	14	Orchard (Private)
5	Cafe Frontage	15	Water Feature Concourse
6	Welness Centre Frontage	16	Water Pump Pole
7	Concierge	17	Viewing Deck
8	Brickyard	18	Drop-Off Area
9	Kitchen Garden	19	Service Road
10	Tennis Court (Private)		

General
- Site Boundary
- Precinct & Lot Boundary

Preparation + Groundworks
- Proposed Contour Line
- Existing Contour Line
- FL 580.0 Proposed Finished Level
- EL 580.0 Existing Finished Level
- FFL 580.00 Finished Floor Level
- Proposed Fall

Walls + Edges
- Existing Concrete Channel Drain
- Existing Brick Wall
- Existing Concrete Wall
- Insitu Concrete Edge
- Brick Wall
- Brick Wall
- Steel Edge / Wall

Pavements
- Asphaltic Concrete
- Brick (white colour)
- Brick (brown colour)
- Decomposed Granite
- Crushed Bricks
- Insitu Concrete
- Reinforced Grass
- Stone Setts

Architecture and Site Structures
- Heritage Building / Chimney Stack
- Proposed Building
- Architecture Catwalk
- Structure Below

Rails + Fencing
- Fence
- Access gate

Water Elements
- Water Feature Concourse
- Pond
- Reflection Pool
- Sediment basin
- Wetland

Furniture + Fittings
- Proposed Seating
- Proposed Bollards
- Proposed Table Set
- Proposed Long Table Set

Planting
- Lawn
- Native Grass Mix 01
- Native Grass Mix 02
- Native Grass Mix 03
- Garden Mix 01
- Garden Mix 02
- Garden Mix 03
- Garden Mix 04
- Garden Mix 05
- Vegetable Gardens / Rooftop

Trees
- Proposed Tree
- Existing Tree to Retain
- Existing Tree to Retain

MCGREGOR COXALL

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Project Team
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Sixdegrees
CUMULUS
Sellick Consultants

Project Name
YARRALUMLA BRICKWORKS

Project No.
0619SYD

Address
Yarralumla ACT 2600

Key Plan

Issue Log

Rev	Revision Description	By / Checked	Date
D	Draft Issue for EDP	MF/MK	13/05/2021
E	Final Draft EDP	MK/JM	2/06/2021
F	Final Draft EDP	MK/JM	10/06/2021
G	Final EDP	YC/MK	5/11/2021

Scale
1 : 1000 @ A1

North

All dimensions are in millimetres unless otherwise noted.
Do not scale from this drawing.

Phase
Schematic Design

Sheet Title
Landscape Master Plan

Sheet No.
LD-EDP-101

Rev
G



SUPPLEMENTARY

BUSHFIRE ASSESSMENT REPORT

YARRALUMLA BRICKWORKS PRECINCT

BLOCK 1, BLOCK 7 & BLOCK 764, SECTION 102 YARRALUMLA,

AUSTRALIAN CAPITAL TERRITORY

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SUPPLEMENTARY

BUSHFIRE ASSESSMENT REPORT

YARRALUMLA BRICKWORKS PRECINCT

BLOCK 1, BLOCK 7 & BLOCK 764, SECTION 102

YARRALUMLA,

AUSTRALIAN CAPITAL TERRITORY

Assessment Number	Document	Preparation Date	Issue Date	Directors Approval
B203479 - 3	Final	17.04.2020	04.08.2021	*G.L.Swain*

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FOREWORD

Australian Bushfire Protection Planners Pty Limited was commissioned by the *Land Development Agency [LDA]* in 2014 to prepare a Bushfire Risk Assessment (Reference B142415 dated 29.01.2016) that determined the level of bushfire risk and the protection measures required to mitigate the risk to the proposed development within the Yarralumla Brickworks, Block 1, Block 7 and Block 764 Section 102 Yarralumla, ACT.

The 2016 report provided recommendations on the provision of measures required to be implemented to mitigate the potential bushfire risk to future residential development on the site. These measures included:

- The management of the vegetation within Block 1, Section 127 to the west of the development precinct;

- The provision of a 10 and 30 metre wide Inner Asset Protection Zone (IAPZ) against the retained vegetation on Block 3 Section 94 to the southeast of the development precinct; and

- The provision of a 30 metre wide Inner Asset Protection Zone to the southwest of the development precinct – unless the adjacent land outside the Lease Boundary was managed as an Outer Asset Protection Zone (OAPZ).

Australian Bushfire Protection Planners Pty Limited was commissioned by BLOC to prepare an updated Bushfire Risk Assessment Report (Reference B203479 – dated 03.09.2020) to determine the level of bushfire risk to the future residential development within the Yarralumla Brickworks precinct, Block 1, Block 7 and Block 764, Section 102 Yarralumla, ACT.

The Bushfire Risk Assessment prepared for BLOC reviewed the report undertaken in 2016 and undertook and assessment of the risk to the proposed residential development, including the determination of the Asset Interface Classification using the methodology in the ACT Bushfire Management Standards.

This methodology confirmed the 2016 report's recommendation on the widths of the Asset Protection Zones to the southeast and southwest and the need for the management of the vegetation within Block 1, Section 127, to the west and southwest of the proposed residential development.

The 2020 report was subsequently referred to the ACT Emergency Services Agency (ESA). The review undertaken by ESA identified the following matters required by ACTF&R to be resolved:

Bushfire Assessment Report:
ACTF&R has reviewed bushfire assessment report **B203479** - prepared by **Australian Bushfire Protection Planners Pty Ltd** and request further information.

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1. ACTF&R notes the Bushfire Risk Assessment Report references AS3959-2009. This standard has been superseded by AS3959-2018 and is required to be used for any future development within the Yarralumla Brickworks precinct as well as inform this EDP.

2. ACTF&R is concerned with the construction standards to buildings on Blocks T1 – T6 and Buildings N, P, Q, R and S. The construction standard has been assessed to comply with BAL 12.5. ACTF&R considers this BAL assessment to be insufficient given the proximity to the identified unmanaged vegetation on Block 3 Section 94. Field observations of slope and vegetation undertaken during inspection on 05/08/2020 do not support this BAL assessment. Analysis of AS3959-2018 also indicates this BAL assessment to be insufficient using method 1.

3. ACTF&R notes the vegetation classification of woodland to the SE of the development. Field observations conducted on the 05/08/2020 does not support this assessment.

4. ACTF&R notes the report presents the BOP along Dunrossil Drive as developed by the National Capital Authority on page 16. This plan indicates works up to Autumn 2018.

5. ACTF&R notes the report indicates Block 1 Section 127 has been added to the ESA Bushfire Operations Plan which has been highlighted as incorrect by the ACTRFS.

6. ACTF&R notes the report has used the Asset Interface Classification System within the ACT Bushfire Management Standards to establish a 10m IAPZ to the south and south east of the development adjoining Blocks T1 – T6 and Buildings P and Q. It should be noted this IAPZ along with the recommendation of BAL 12.5 construction standards is not supported as discussed in point 2 above.

ACTF&R requests further detailed clarification on the APZ and BAL assessment for the construction standards for Blocks T1 – T6 and Buildings N, P, Q, R and S, using AS3959-2018.

ACTF&R requires further information on the BOP for Dunrossil Drive before support can be provided for the management of the land as an OAPZ.

ACTF&R requires any APZ or other land management identified on adjoining land be confirmed, in writing, with the detail on the ongoing management, to what standard the land will be managed to and to whom this responsibility will rest.

These matters were addressed in a response prepared in October 2020 with subsequent site meetings and discussions held between BLOC and ESA.

Following a meeting between Deed Management; Parks & Conservation ACT Fire & Rescue; ACT Rural Fire Service; Statutory Planning and Suburban Land Agency a resolution was reached on the provision of bushfire protection measures to be established to the southeast of Precinct 7 and Precinct 9 of the approved Master Plan for the Brickworks Site.

These measures are based on the provision (and management) of an Outer Asset Protection Zone (OAPZ) on the land immediately adjoining the south-eastern boundary of the site – refer to Figure 1 – Extract from the ACTMapi Bushfire Operations Plan (BOP) and Figure 4 – Extract from the ACTMapi Regional Management Zones Plan on Page 5.

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Figure 1 – Extract ACTMapi Bushfire Operations Plan (BOP)

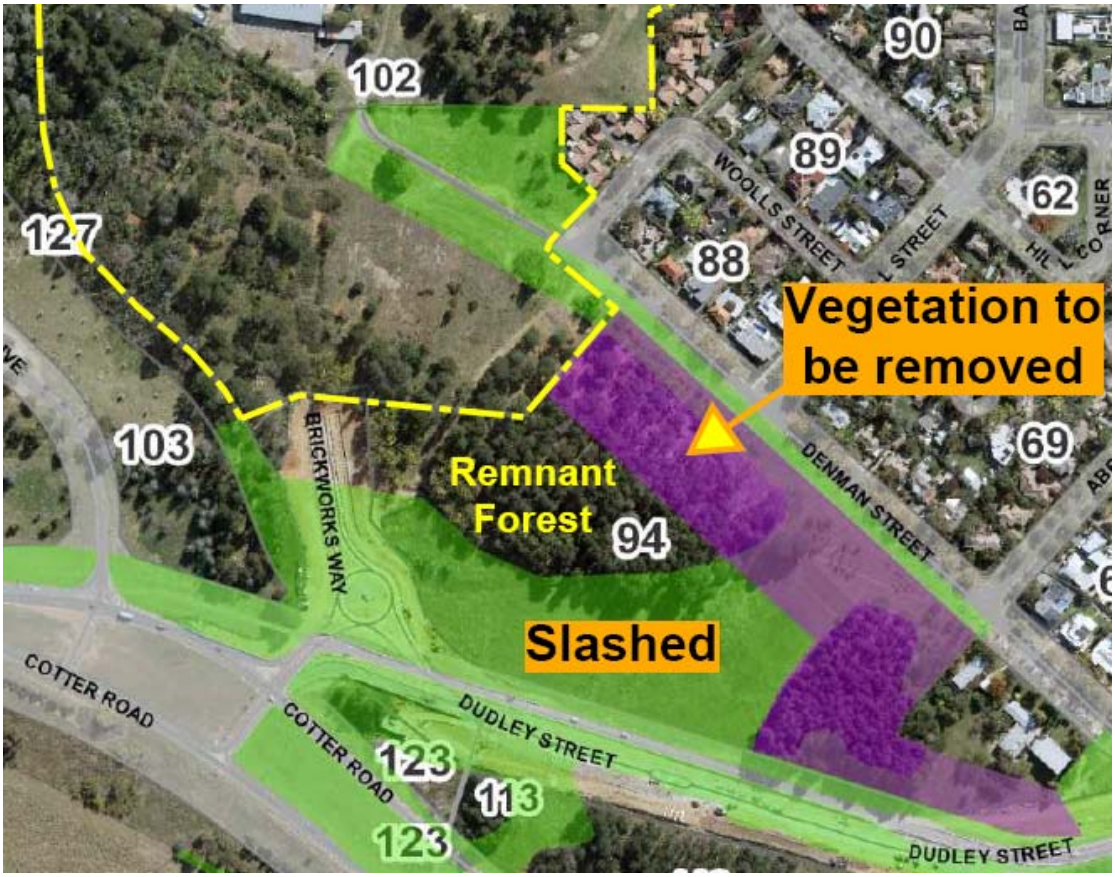
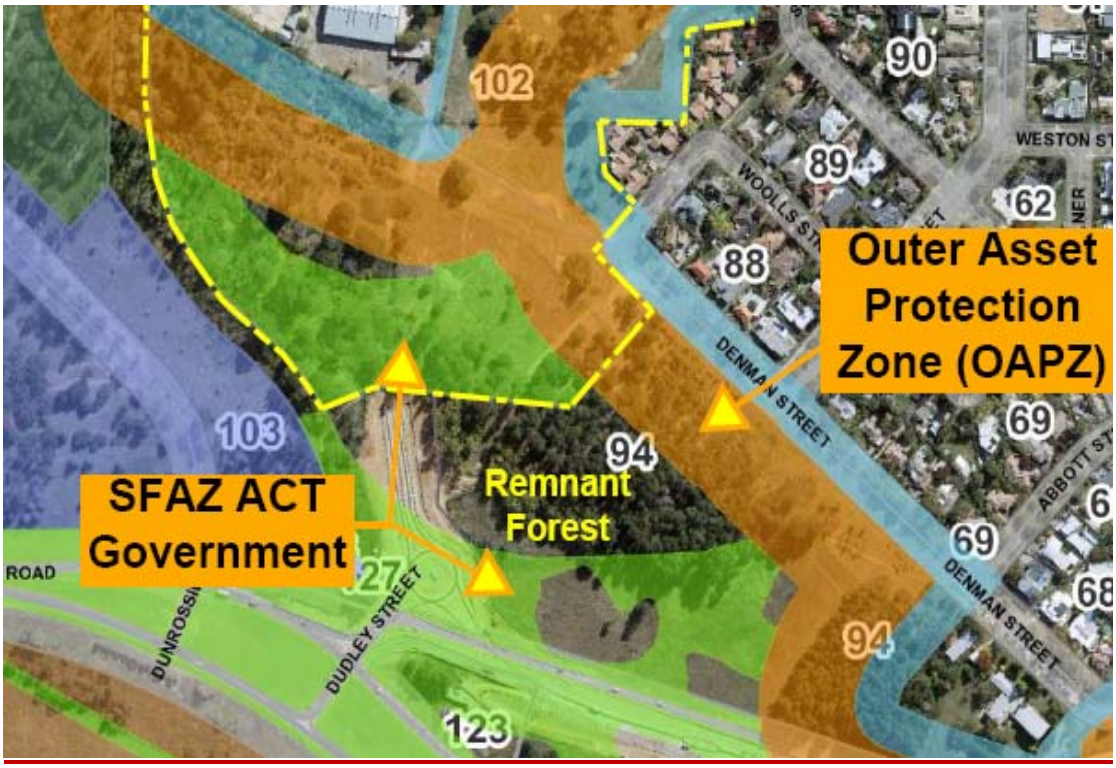


Figure 2 – Extract ACTMapi Regional Management Zones (RMZs) Map



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The ESA have advised that the small area of vegetation that remains to the southeast of the Brickworks Site, following the establishment and management of the Outer Asset Protection along the south-western side of Denman Street, can be assessed as 'remnant forest' for the purpose of determining the width of Inner Asset Protection Zone to the building erected on Precinct 7 and Precinct 9 and also determination of the required level of bushfire construction to the proposed buildings.

A.S. 3959 – 2018 – *'Construction of Buildings in Bushfire Prone Areas'* provides the methodology for determining the width of the Asset Protection Zone and construction standards to the buildings in Precinct 7 and Precinct 9, based on the following parameters:

- Fire Danger Index for the area: 100;
- Vegetation Classification: Remnant Forest (as defined by RFS/ACT F&R) reclassified as low hazard 'rainforest';
- Effective slope under the low hazard vegetation – level.

From Table 2.4 of A.S. 3959 – 2018, to achieve a Bushfire Attack Level (BAL) of 29, the required width of Asset Protection Zone is 11 metres.

Figure 3 on Page 7 provides a diagrammatic layout of the Asset Protection Zone measured from the south-eastern boundary of Precinct 9 and the southern boundary of Precinct 7.

The Asset Protection Zone shall be maintained to the standards of an Inner Asset Protection Zone (IAPZ) in accordance with the ACT Bushfire Management Standards.

The bushfire construction standards to the elevations of the buildings which are exposed to the hazard (remnant forest vegetation) shall comply with Section 3 and Section 7 (BAL 29) with the elevations not exposed to the hazard constructed to comply with Section 3 and Section 6 (BAL 19) of A.S. 3959 – 2018 – *'Construction of Buildings in Bushfire Prone Areas'.*

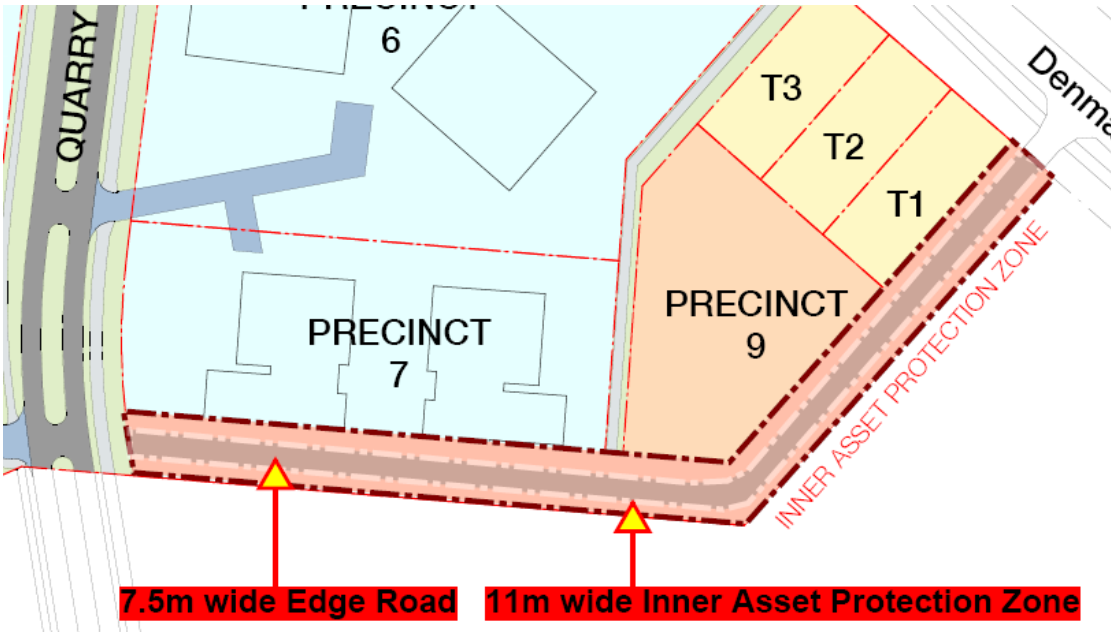
The ESA have also advised that there is required to be provided an edge (perimeter) road between the hazard and the buildings in Precinct 7 and Precinct 9 and that the perimeter road shall have a width of 7.5 metres, kerb to kerb and constructed in accordance with the performance criteria of Table 10 of the ACT Strategic Bushfire Management Plan.

These performance criteria include:

- Curves shall have an inner radius of 6 metres and an outer radius of 12 metres;
- Minimum vertical clearance height of 4.2 metres above the road;
- Hydrants shall be provided and located clear of parking bays.

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Figure 3 – Diagrammatic layout of Asset Protection Zone to Precinct 7 and Precinct 9



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5 March 2021
Our ref: JM/C11596

Doma Group
via email: alex@domagroup.com.au

Attention: Mr Alex Moulis

CANBERRA BRICKWORKS REDEVELOPMENT - BLOCKS 1, 7, & 20, SECTION 102, YARRALUMLA
BACKFILLING OF OLD QUARRY AREA

GEOLOGICAL FOSSIL STUDY

1 INTRODUCTION

At the request of Doma Group, ACT Geotechnical Engineers Pty Ltd carried out a geological fossil study in the old quarry area of the Canberra Brickworks, in Yarralumla, ACT.

It is understood that the old Canberra Brickworks are being redeveloped into a residential development. As part of this redevelopment, some areas of the old quarry area are being backfilled to turn it into a parkland. This will involve up to 6m of fill being placed to return the surface levels to their pre-quarry levels. As this will bury some of the exposed quarry faces, the client has requested a geological study of these quarry faces be carried out to establish if any fossils are present in these quarry faces, and if so, what is their quality and significance. A copy of the earthworks plan, showing the areas and depths of the proposed filling, is presented in Figure 4. The aim of the geological study was to:

i) Inspect the quarry and infill area to look for fossil remnants and other geological features of significance within the proposed infill zone.
ii) Review existing geological information.
iii) Provide a statement of significance of the area and the geology.
iv) If fossils or significant features are noted, provide mitigation measures.
v) Provide advice on buffer zone for works in close proximity to known listed features – especially formation Feature C where the works are close to the feature zone.

"Geological Monuments in the ACT" by the Geological Society of Australia documents the Yarralumla Brickpits as being a site of scientific value, and notes that at a location within the brickpits (designated as Feature 12C), there are "abundant fossils preserved as molds on a bedding plane. The main types are barchiopods with rarer trilobites, corals, and a simple crinoid belonging to the genus Pisocrinus. Most fossils have been distorted by the pervasive cleavage". It notes that other areas within the brickpits show good examples of anticlinal folding. An extract from this document is attached.

2 SITE DESCRIPTION

The old Canberra Brickworks site is located on Block 1, Section 102, in Yarralumla, ACT. The eastern portion of the site was used as the quarry, where shale rock was excavated to provide the raw material for bricksproduction, while the western portion of the site included the buildings and kilns used to make the bricks. A recent aerial photo of the site is presented in Figure 1, which shows the present site layout, as well as the two proposed fill areas (designated as Fill Area1 and Fill Area 2).

The natural topography of the eastern side of the site comprised a knoll, that was excavated by up to 10m depth to source rock for brick production. The quarry is an irregular shape, as seams of better brick-making rock were sought. The quarry faces are generally near vertical, but appear to have weathered over time, with some soil and rock wedges that have fallen from the face and are now at the toe of

the batter faces. There are trees along the top edges of the quarry faces, and some of the rock faces have become over-grown with vegetation. It is understood that rock was excavated from the quarry between 1913 and the mid-1930's.

3 GEOLOGY

The 1:100,000 Canberra Geology Map indicates the area to be underlain by Silurian age Yarralumla Formation bedrock, which includes siltstone, sandstone, mudstone, limestone, and tuffaceous sediments. A description of the Yarralumla Formation from "BMR Bulletin 233 - Geology of the Canberra 1:100,00 Sheet Area" is provided in the following section.

The Yarralumla Formation occurs in two main outcrop belts; one extends from Red Hill ridge to Lake Burley Griffin and the other from Woden Valley towards the Molonglo River. There has been some lateral displacement of the two belts by faulting. The sigmoidal outcrop pattern indicates deformation along north-northwest trending fold axes.

The shallow-water marine transgression represented by the Yarralumla Formation is indicated by limestone and fine clastic sediments containing a shelly fauna of brachiopods, trilobites and corals. Local current-bedded quartz sandstone, probably derived from adjacent volcanic terrain, suggests deltaic environments were temporarily established at the basin margin. The overall marine environment indicates a temporary waning of volcanic activity at the end of the Wenlockian. However, the coeval deposition of some volcaniclastic sediments suggests sporadic volcanism at centres marginal to the site of marine deposition.

The Yarralumla Formation formation consists of a sequence of calcareous and tuffaceous mudstone and siltstone with minor interbeds of limestone and quartz sandstone. Airfall tuff and a few rhyodacitic units were also deposited coevally with the marine sequence.

At the Canberra Brickworks locality, well-bedded, olive-green calcareous mudstone and siltstone with minor tuffaceous sandstone and dark-grey cherty limestone are exposed. The bedding is denoted by major partings, sometimes accentuated by fossiliferous horizons, spaced up to a few metres apart or on a smaller scale as laminations and graded tuffaceous units up to 2 cm thick. The sequence is folded into open symmetrical anticlines with a shallow plunge southwards. A spaced, almost vertical cleavage is axial planar to the folds and also forms a well defined lineation where it intersects the bedding. It is reported that fossils such as brachiopod fauna, favositid and heliolitid tabulate corals and the microcrinoid, Pisocrinus, have been identified. Fossils are distorted and flattened in the plane of the cleavage and along bedding plane partings.

Around the northern side of Red Hill ridge, the assemblage has been locally contact-metamorphosed to calc-silicate hornfels and marble, and is well exposed in an abandoned quarry southeast of the Red Hill Kiosk.

Also, fresh, laminated olive-green mudstone and siltstone containing graded beds of tuff up to 5 cm thick are well exposed in a disused brickpit at Deakin Oval. At this locality two anticlines show a widely spaced axial plane cleavage which intersects and disrupts the bedding. A prominent lineation defines a southward plunge to the folds.

4 INVESTIGATION METHODS

The field investigation was carried out on 22 February 2021, by Mr Dennis Dyer, a senior engineering geologist with over 50 years experience, with assistance from Mr Jeremy Murray, a Chartered senior geotechnical engineer with over 20 years experience. Copies of their respective CV's are attached.

The fieldwork comprised a walk-over of the site to assess the general geological conditions, as well as a close inspection and geological mapping of the exposed quarry faces in the areas of proposed infilling.

The geological mapping included logging of the defect sets (bedding, cleavage/foliation, and jointing), logging of the rock type and weathering, and a close visual inspection of any exposed bedding planes for the presence of fossils.

Detailed geological mapping of the exposed quarry faces was conducted at approximately 20m spacing along the quarry faces, designated as 1A to 8A for Fill Area 1, and 1B to 5B for Fill Area 2. Detailed geological mapping was also conducted at Feature 12C, where the presence of fossils has previously been reported. The locations of Fill Area 1, Fill Area 2, and Feature 12C are shown in Figure 1, while Figures 2 and 3 show the locations of geological mappings 1A to 8A and 1B to 5B. A copy of the earthworks plan, showing the areas and depths of the proposed filling, is presented in Figure 4.

Photos 1 to 16 are presented in Figures 5 to 20, which show some of the quarry faces that were mapped, as well as typical exposed bedding planes.

A desk-top study of available geology maps and literature was also conducted, with geological information relevant to this site reviewed. These sources included the "1:100,000 Canberra Geology Map", "BMR Bulletin 233 - Geology of the Canberra 1:100,00 Sheet Area", and "Geological Monuments in the ACT".

5 INVESTIGATION RESULTS

5.1 Geological Mapping

Fossils occur where animals or plants are deposited on sediment and covered and preserved by deposition of more sediment. Therefore, fossils are usually found on bedding planes within sedimentary bedrock. Despite a close examination of exposed bedding planes within the rock of the quarry faces, our geological inspection of 22 February 2021 did not find any fossils within Fill Areas 1 and 2.

The majority of the exposed quarry faces comprise weak to medium strong, highly weathered (HW) and moderately weathered (MW) mudstone bedrock that displays strongly developed foliation and hence is described as phyllitic mudstone in this report. The regional metamorphism that formed the anticlines and synclines exposed at this site has caused the micaceous minerals to recrystalise and align and thereby develop a phyllitic texture to the rock. There were some sections of extremely weak, extremely weathered (EW) rock, as well as some sections of stronger, moderately to slightly weathered (MW/SW) rock. The phyllitic mudstone is occasionally inter-bedded with sandstone, siltstone, and tuff.

The folding has resulted in the foliation/cleavage being a more prominent feature of the rock than the original bedding, and the bedding has been distorted by this pervasive foliation. If any fossils were present (we did not find any within Fill Areas 1 and 2), then this foliation would likely have either destroyed or distorted the fossils. In areas where the bedding planes are exposed, the bedding is folded, as in Photos 8, 10, 12, and 14. In addition, most bedding planes are weathered and clay infilled (Photo 15). Given this, fossils that may be present are likely to be of poor quality and low scientific value.

A possible crinoid stem fossil less than 1cm long was observed in weathered siltstone at Feature 12C, which is not within the proposed filling areas.

5.2 Fill Area 1

Results of the geological mapping of the exposed quarry faces in Fill Area 1 and Feature 12C are summarised in Table 1 below.

TABLE 1
Results of Geological Mapping - Area 1

Feature N0.	Description	Rock Profile	Defect Mapping	Presence of Fossils & Comments
1A	Start of cut, some dumped rock piles	N/A	N/A	No fossils found
2A	~1.5m high cut	HW to MW SILTSTONE, with some fine-grained SANDSTONE	Foliation - 63°/250° 5mm to 70mm spacing Bedding- 11°/165° - 30mm to 70mm spacing Joints - 90°/190° - 10mm to 20mm spacing	No fossils found. Photo 2
3A	~1.5m high cut	MW TUFF, with 20mm/70mm mudstone xenoliths	Foliation - 81°/085° 20mm to 90mm spacing Bedding- 16°/236° - 30mm to 300mm spacing Joints - 88°/189° - 10mm to 20mm spacing	No fossils found. Possible fault, with fracturing and weathering of the rock. Photo 3.
4A	~4m high cut	HW/MW PHYLLITIC MUDSTONE, with MW SANDSTONE seam from ~0.5m to 2m depth	Foliation - 87°/085° 50mm to 100mm spacing Bedding- 30°/180° - 40mm to 300mm spacing Joints - 60°/350° - ~100mm spacing	No fossils found. Photo 4.
5A	~4.5m high cut	HW to MW PHYLLITIC MUDSTONE, with thin beds of EW MUDSTONE	Foliation - 75°/080° 50mm to 100mm spacing Bedding- 20°/100° - 70mm to 300mm spacing Joints - 76°/163° - ~100mm spacing	No fossils found. Some evidence of normal faulting - ~100mm of displacement. Photo 5.
6A	~2.5m high cut	MW PHYLLITIC MUDSTONE	Foliation - 79°/069° 80mm to 500mm spacing Bedding- 09°/229° - 30mm to 300mm spacing Joints - 81°/355° - 70mm to 150mm spacing	No fossils found. Photo 7.
7A	~4m high cut	~3m of overburden fill, then MW/SW PHYLLITIC MUDSTONE	Foliation - 73°/260° 80mm to 500mm spacing Bedding- 38°/235° - 30mm to 300mm spacing	No fossils found. The exposed bedding planes are masked by the foliation. Photo 8.
8A	~2.5m high cut	MW/SW PHYLLITIC MUDSTONE	Foliation - 88°/260° 80mm to 500mm spacing Bedding- 39°/247° - 30mm to 300mm spacing	No fossils found. The exposed bedding planes are masked by the foliation. Photos 9 and 10.
Feature 12C - Not in the proposed filling areas				
12C	~4m high cut	MW PHYLLITIC MUDSTONE	Foliation - 88°/260° 80mm to 500mm spacing Bedding- 35°/215° - 30mm to 300mm spacing	Possible crinoid stem fossil. Photo 1.

5.3 Fill Area 2

Results of the geological mapping of the exposed quarry faces in Fill Area 2 are summarised in Table 2 below.

TABLE 2
Results of Geological Mapping - Area 2

Feature No.	Description	Rock Profile	Defect Mapping	Presence of Fossils & Comments
1B	~4m high cut	HW/MW PHYLLITIC MUDSTONE	Foliation - 81°/102° 5mm to 70mm spacing Bedding- 42°/213° - 30mm to 70mm spacing Joints - 68°/146° - 10mm to 20mm spacing	No fossils found. The exposed bedding planes are masked by the foliation. Photos 11 and 12.
2B	~6m high cut	HW to HW/MW PHYLLITIC MUDSTONE	Foliation - 88°/062° 5mm to 70mm spacing Bedding- 42°/260° - 30mm to 70mm spacing	No fossils found. The exposed bedding planes are masked by the foliation. Bedding also infilled with clay. Photos 13, 14 and 15.
3B	~6m high cut	HW PHYLLITIC MUDSTONE, then SW PHYLLITIC MUDSTONE	Foliation - 88°/074° 20mm to 90mm spacing Bedding- 45°/245° - 30mm to 300mm spacing	No fossils found.
4B	~3m high cut	HW/MW PHYLLITIC MUDSTONE	Bedding - 22°/169° - 100mm to 200mm spacing Foliation - not clear due to disturbed nature and weathering	No fossils found.
5B	~3m high cut	HW/MW PHYLLITIC MUDSTONE	Very disturbed and weathered face. Several large boulders on face (from quarrying or wedge failures)	No fossils found. Photo 16.

5.4 Other Geological Issues

The brick pits have been excavated to provide raw material for brick production over a number of years and subsequently been left with little maintenance undertaken. This has resulted in much of the quarry excavation faces consisting of steep to sub-vertical rock cuts. This rock is highly fractured by bedding, jointing, and foliation, as well as having been weathered. Some areas of erosion and/or slumping are present, with some large boulders present at the toe of cut batter having apparently toppled from the face. There are areas where fractured rock os located on the steep faces, and is likely to fall at some point in the future. Given the apparent slope instability, it is recommended that a slope stability risk assessment be carried out to identify all rock fall hazards and provide risk mitigation measures.

6 CONCLUSIONS

6.1 Presence & Quality of Fossils

Fossils usually are preserved when plants or animals are deposited on sediment and covered by more sediment. In these circumstances, fossils are found on bedding planes within sedimentary bedrock. Despite a close examination of exposed bedding planes within the rock of the quarry faces, our geological inspection of 22 February 2021 did not find any fossils within Fill Areas 1 and 2.

The regional folding of the bedrock has resulted in some of the minerals being recrystallised to develop foliation/cleavage that on exposure appears more prominent than the original bedding. If any fossils were present (we did not find any within Fill Areas 1 and 2), then the development of the foliation would likely have destroyed or distorted the fossils. Here, where the bedding planes are exposed, the bedding dipsand weathering has occurred and the bedding planes are often clay infilled. Given this, any fossils that may be present are likely to have been degraded and of low scientific value.

Therefore, it is our assessment that there are no fossils of scientific value in the proposed Fill Areas 1 and 2, and henceis no geological reason to prevent the filling to occur.

However, at Feature 12C it is reported that there are "abundant fossils preserved as molds on a bedding plane. The main types are barchiopods with rarer trilobites, corals, and a simple crinoid belonging to the genus Pisocrinus". Therefore, it is recommended that the area around Feature 12C be preserved and protected from future development.

The "Geological Monuments in the ACT" by the Geological Society of Australia also documents the Yarralumla Brickpits as being a site of scientific value. In particular there are areas within the brickpits that show good examples of anticlinal folding, and it is recommended that these areas be preserved and protected from future development. These anticlinal folding features are outside the proposed Fill Areas 1 and 2.

5.2 Mitigation Measures

To protect Feature 12C from damage during the earthworks for Fill Areas 1 and 2, it is recommended that the area is fenced off and an exclusion zone established. There should be a minim 5m buffer around the perimeter of this feature.

As discussed in Section 5.4, it is advisable that a slope instability risk assessment be carried out to ensure that there are no risks from falling rocks within the old quarry areas.

Should you require any further information, please contact our office.

Yours faithfully
ACT Geotechnical Engineers Pty Ltd



Jeremy Murray
Director
Senior Geotechnical Engineer
FIEAust CPEng EngExec RPEQ NER APEC Engineer IntPE (Aust)



DOMA GROUP
CANBERRA BRICKWORKS – GEOLOGICAL FOSSIL STUDY
SITE LOCALITY & BRICKWORKS LAYOUT

ACT Geotechnical Engineers Pty Ltd	C11596	FIGURE 1



LEGEND

○ - Location of Geological & Fossil Mapping

DOMA GROUP
CANBERRA BRICKWORKS – GEOLOGICAL FOSSIL STUDY
AERIAL PHOTOGRAPH – FILL AREA 1

ACT Geotechnical Engineers Pty Ltd	C11596	FIGURE 2



LEGEND

○ - Location of Geological & Fossil Mapping

DOMA GROUP
CANBERRA BRICKWORKS – GEOLOGICAL FOSSIL STUDY
AERIAL PHOTOGRAPH – FILL AREA 2

ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 3**



DOMA GROUP
CANBERRA BRICKWORKS – GEOLOGICAL FOSSIL STUDY
EARTHWORKS PLAN

ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 4**

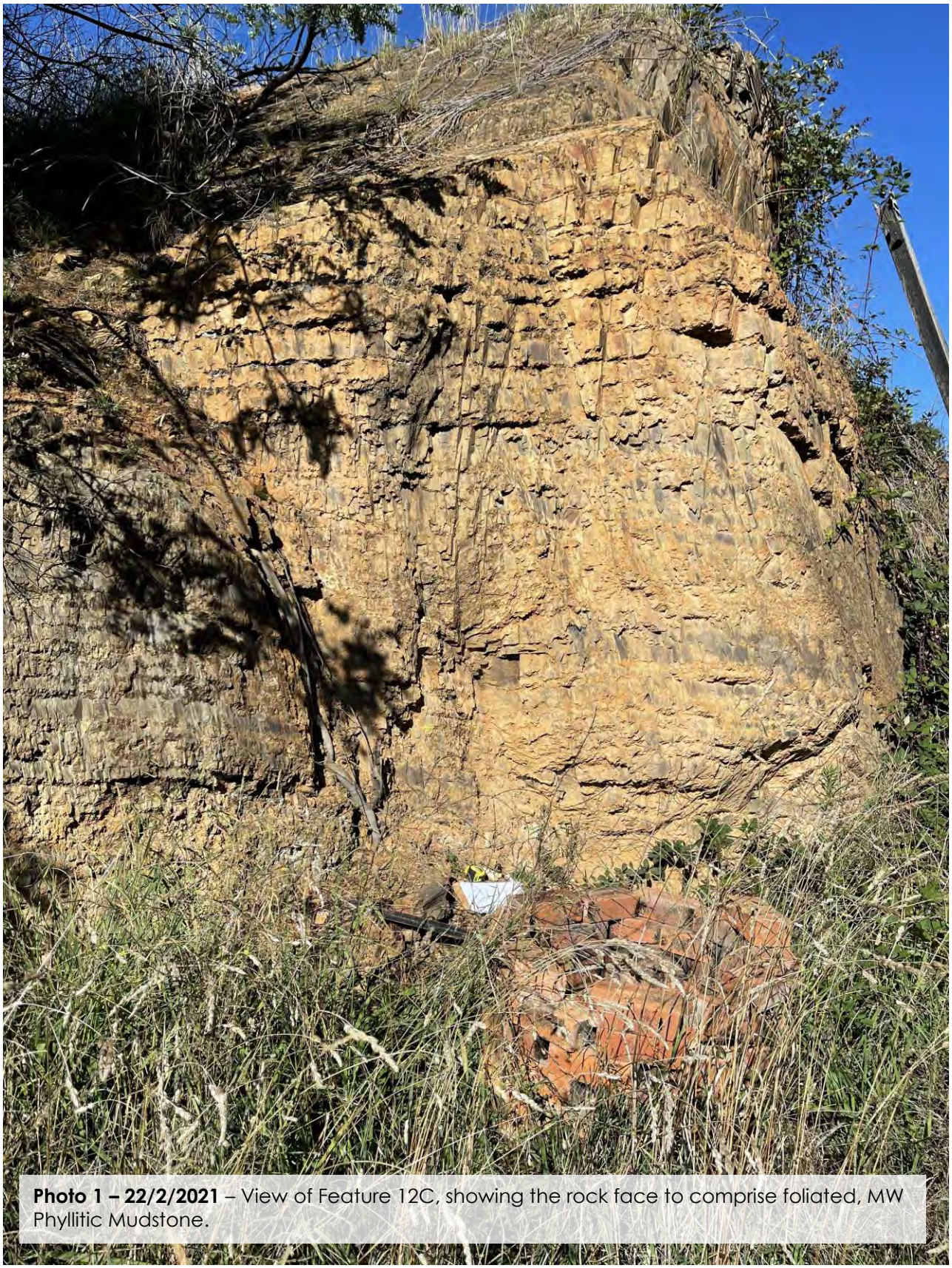


Photo 1 – 22/2/2021 – View of Feature 12C, showing the rock face to comprise foliated, MW Phyllitic Mudstone.

DOMA GROUP
CANBERRA BRICKWORKS – GEOLOGICAL FOSSIL STUDY
SITE PHOTO

ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 5**



Photo 2 – 22/2/2021 – View of Location 2A, showing the rock face to comprise foliated, HW to MW Siltstone.

DOMA GROUP
CANBERRA BRICKWORKS – GEOLOGICAL FOSSIL STUDY
SITE PHOTO

ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 6**



Photo 3 – 22/2/2021 – View of Location 3A, showing the rock face to comprise foliated, MW Tuff, with xenoliths of mudstone.

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ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 7**



Photo 4 – 22/2/2021 – View of Location 4A, showing the rock face to comprise foliated, HW to MW Phyllitic Mudstone, with some beds of Sandstone.

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Photo 5 – 22/2/2021 – View of Location 5A, showing the rock face to comprise foliated, HW to MW Phyllitic Mudstone, with some beds of Mudstone.

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ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 9**



Photo 6 – 22/2/2021 – View of Locations 4A and 5A, showing the rock face to comprise foliated, HW to MW Phyllitic Mudstone, with some beds of Sandstone & Mudstone.

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ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 10**

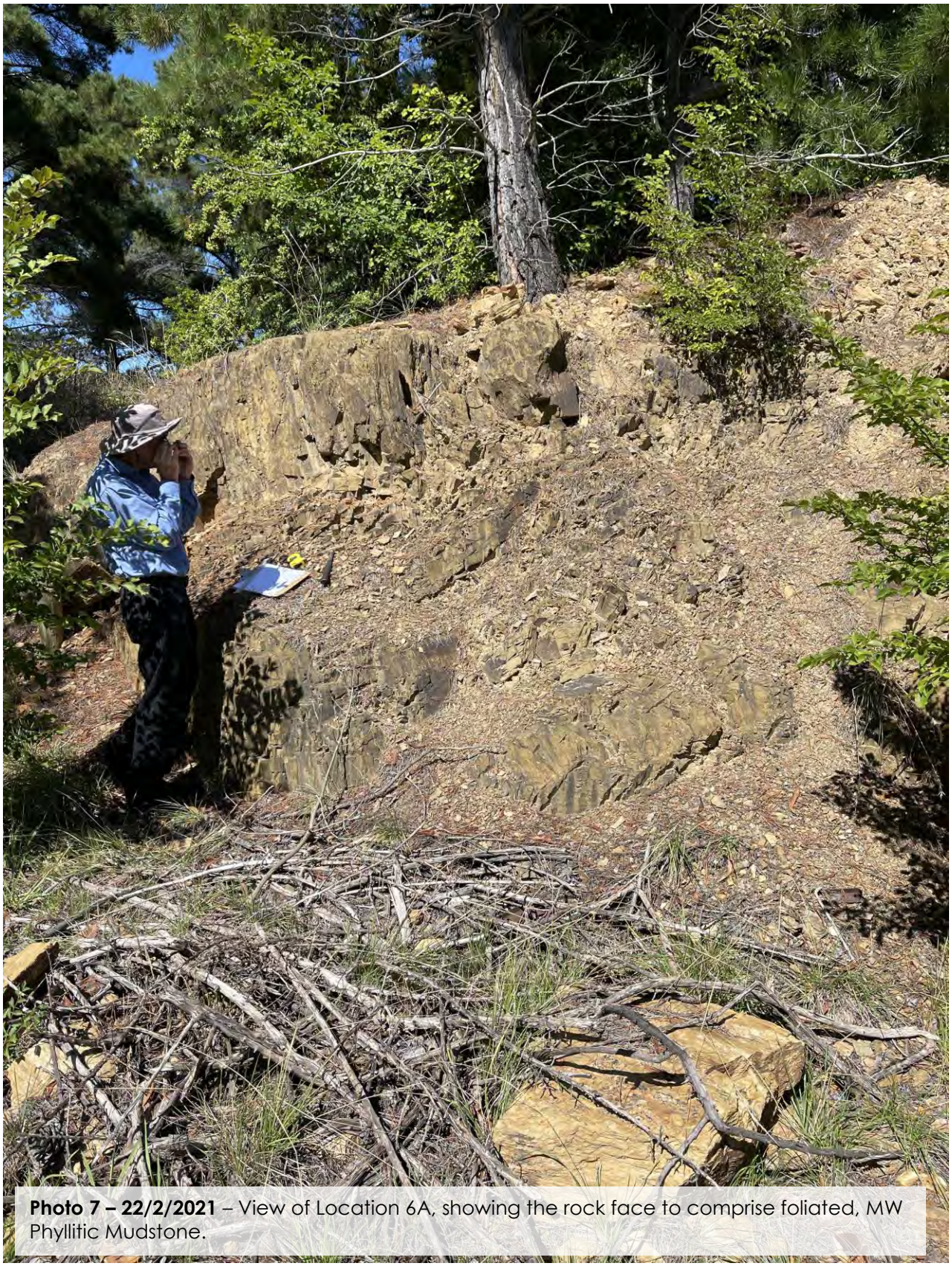


Photo 7 – 22/2/2021 – View of Location 6A, showing the rock face to comprise foliated, MW Phyllitic Mudstone.

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ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 11**



Photo 8 – 22/2/2021 – View of Location 7A, showing the exposed bedding plane on the foliated, MW/SW Phyllitic Mudstone. There are no signs of any fossils. The foliation has distorted the bedding planes considerably, and would likely have destroyed most fossils (if

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ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 12**



Photo 9 – 22/2/2021 – View of Location 8A, showing the rock face to comprise foliated, MW/SW Phyllitic Mudstone.

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ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 13**



Photo 10 – 22/2/2021 – View of Location 8A, showing the exposed bedding plane on the foliated, MW/SW Phyllitic Mudstone. There are no signs of any fossils. The foliation has distorted the bedding planes considerably, and would likely have destroyed most fossils (if present).

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ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 14**



Photo 11 – 22/2/2021 – View of Location 1B, showing the rock face to comprise foliated, HW/MW Phyllitic Mudstone.

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ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 15**



Photo 12 – 22/2/2021 – View of Location 1B, showing the exposed bedding plane on the foliated, HW/W Phyllitic Mudstone. There are no signs of any fossils. The foliation has distorted the bedding planes considerably, and would likely have destroyed most fossils (if present). The bedding is also extremely weathered, also limiting the quality of any fossils.

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Photo 13 – 22/2/2021 – View of Location 2B, showing the rock face to comprise foliated, HW/MW Phyllitic Mudstone.

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SITE PHOTO

ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 17**



Photo 14 – 22/2/2021 – View of Location 2B, showing the exposed bedding plane on the foliated, HW/W Phyllitic Mudstone. There are no signs of any fossils. The foliation has distorted the bedding planes considerably, and would likely have destroyed most fossils (if present). The bedding is also extremely weathered, also limiting the quality of any fossils.

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Photo 15 – 22/2/2021 – View of Location 2B, showing the rock face to comprise foliated, HW/MW Phyllitic Mudstone. The foliation has distorted the bedding planes considerably, and would likely have destroyed most fossils (if present). The bedding is also extremely weathered, also limiting the quality of any fossils.

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ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 19**



Photo 16 – 22/2/2021 – View of Location 5B, showing the rock face to comprise foliated, MW Phyllitic Mudstone.

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ACT Geotechnical Engineers Pty Ltd	**C11596**	**FIGURE 120**

YARRALUMLA BRICKPITS

ITEM: Type locality of the Yarralumla Formation.

LOCATION: In the disused quarries associated with the old Canberra Brickworks (fig. 67). A.C.T. 1:10 000 Planning Series, sheet 200-600, G.R. 9010 9057 A.M.G.

DESCRIPTION: The abandoned Brickworks in Yarralumla were closed down in the mid-1970's with quarrying having ceased some time before that. The quarries are the type locality of the Yarralumla Formation, a marine unit within the mostly volcanic mid-Silurian sequences of the Canberra region. The unit is formed of tuffaceous sandstone, siltstone, mudstone and minor limestone, and at this locality has been strongly folded and cleaved.

Four sites have been selected within the quarry area as being representative of the lithology and structure of the Yarralumla Formation at its type locality (see fig. 67). Sites A and D (fig. 69) show good examples of anticlinal folding within the Yarralumla Formation, and, like the Deakin Anticlines site, show the relationship between folding and cleavage. Site B (fig. 68) shows a good section typical of the lithology of the Yarralumla Formation, and should be regarded as the type section for the Formation. Site C contains abundant fossils preserved as molds on a bedding plane. The main types are brachiopods with rarer trilobites, corals and a simple crinoid belonging to the genus *Pisocrinus*. Most fossils have been distorted by the pervasive cleavage.

ACCESS: The locality is situated at the end of Denman Street, Yarralumla. Access is uncertain however; the old brickwork buildings are currently (early 1987) occupied by art and craft studio workshops, and access is easy to obtain, but the long term plans for the area by the Department of Territories is uncertain.

GEOLOGICAL VALUE: The site is of scientific value as the type locality of the Yarralumla Formation. It could also be of considerable educational value both to the schools and the general public if some interpretive programme was developed for the area.

STATE OF PRESERVATION: The area is in general in a good state of preservation, apart from some weed growth.

RECOMMENDATIONS: As an important scientific and educational locality the individual sites selected within the quarry area need to be preserved. Future development plans for the area should take account of their value, and a plan of management for the quarry area formulated.

Fig.67 Locality Map, Yarralumla Brickpits.

Dennis Dyer

Senior Engineering Geologist

QUALIFICATIONS

- B.Sc. (Hons), Sydney University, 1966, majoring in Geology, Mathematics and Physics, and specialising in Engineering & Economic Geology
- B.A. University of Canberra 1984, specialising in Teaching Geology

KEY SKILLS & FIELDS OF COMPETENCE

- Geotechnical Site Investigations
- Borehole Drilling and Logging
- Geological Mapping
- Geotechnical Engineering Report Writing
- Supervision & Certification of Controlled Fill (Level 1 & 2)
- Footing Certification
- Slope Stability Assessment

PROJECT EXPERIENCE

1993 - Present Consulting Engineering Geologist for ACT Geotechnical Engineers Pty Ltd. Provision of specialised geological expertise for small and major geotechnical engineering projects.

Projects included: Risk analyses for numerous lodges in Kosciusko National Park, rood stability investigations in the Snowy M'ts including for the Alpine Way, bridge investigations, hydro-geological studies in the ACT, rood studies, deep drilling investigations for high-rise buildings, geotechnical stability assessment of major quarries in NSW and ACT, construction overviews, suburban infrastructure development.

1988 - 1993 - Consulting Engineering Geologist for Peter J Burgess & Associates Pty Ltd. Consulting Geologist for Horizon Resources on Fiery Creek Exploration Lease.

1969 - 1982 - Electricity Commission of New South Wales. Geological work associated with structures (dams, tunnels, power stations, roods, railways) for the generation and transmission of electricity. Investigation of Coal Mines

1967 - 1969 - Snowy Mountains Hydro Electric Authority. Geological work associated with major engineering structures (dams, tunnels, power stations, roods) in the Snowy Mountains area, NSW and Victoria.

1966 - Study of stability and causes of landslides of Razorback Range, NSW (BSc Hons Thesis).

CAREER HISTORY

1993	-	Present	ACT Geotechnical Engineers	Senior Engineering Geologist
1982	-	2007	Canberra Institute of Technology	Senior Lecturer in Geology
1969	-	1982	Electricity Commission of New South Wales	Engineering Geologist
1967	-	1969	Snowy Mountains Hydro Electric Authority	Engineering Geologist

Jeremy Murray

Director, Senior Geotechnical Engineer

QUALIFICATIONS

- B.E. (Hons), University of New South Wales, 2000, Civil Engineering, majoring in Geotechnical Engineering.
- Masters in Engineering Science (MEngSc), University of New South Wales, 2013 – majoring in Geotechnical Engineering, including courses in Slope Stability & Stabilisation, Pavement Engineering & Analysis, Advanced Geomechanics, Geotechnical Models, Rock Engineering, Geotechnical Engineering of Dams, Advanced Foundation Engineering, and Environmental Management.

KEY SKILLS & FIELDS OF COMPETENCE

- Planning, conducting and reporting Geotechnical Site Investigations;
- Supervision of earthworks and substructure construction;
- Instrumentation installation and monitoring for settlement and groundwater;
- Slope stability and analysis, soil and groundwater contamination assessments;
- Highways, roads and bridges;
- Multi-storey commercial and residential buildings;
- Warehouses, schools and supermarkets;
- Residential subdivisions and site classifications;
- Quarries; and
- Earth and Rock Fill dams.

PROFESSIONAL AFFILIATIONS

Fellow of the Institute of Engineers Australia (FIEAust)

Chartered Professional Engineer (CPEng)

Engineering Executive (Eng Exec)

APEC Engineer in Australia

National Engineering Register

Registered Professional Engineer of Queensland

Registered Building Practitioner of Victoria

Member of the Australian Geomechanics Society

Chairman of the Canberra Sub-Group of the Australian Geomechanics Society

CAREER EXPERIENCE

Jeremy started his engineering career in 1999 as a graduate geotechnical engineer at ACT Geotechnical Engineers. The primary tasks and responsibilities including planning and conducting geotechnical investigations and subsequently analysing the field data and preparing geotechnical reports for the projects. These projects also required Jeremy to perform inspections and certifications during the construction phase. Such construction certifications included confirming bearing capacity for footings, assessment of excavations for stability, assessment of pavement subgrades, and cut and fill earthworks supervision. The types of projects included site classifications for new houses, medium density residential units, multi-storey office and commercial developments, warehouses and retail developments, residential subdivisions, new roads and highways, and bridges.

Jeremy was promoted to Senior Geotechnical Engineer within ACT Geotechnical Engineers, with an associated increase in responsibilities. Generally, this involved working on more critical and larger projects and projects with a where a higher technical ability was required. Examples include the HQJOC Defence Headquarters, high-rise apartment buildings, earthfill/rockfill dams, and forensic geotechnical investigations. For these projects, Jeremy had to coordinate all of the sub-contractors, as well as the engineering fieldwork team. Extra responsibilities in the senior engineering role included preparation of quotes/proposals and project procurement. This required identify the scope of works and then estimating costs.

In 2010 Jeremy became the Principal of ACT Geotechnical Engineers, and so having combined the responsibilities of Senior Geotechnical Engineer along with running the company. The role of Principal required Jeremy to take responsibility for all aspects of running the company, including managing staffing resources and levels, all aspects of business finance including accounting and book keeping, ensuring WHS, environmental, and QMS compliance across the company, fleet management, insurance and workers comp compliance, staff welfare, staff training and certification, testing and equipment procurement, business development, client liaison, and final review of all reports before issuing to clients.

In 2017, Jeremy started a new geotechnical engineering consultancy based in Sydney called Fortify Geotech (while still owning and running ACT Geotech). This provided the challenge of starting a business from scratch and required all the demands of establishing a new business. Added challenges including working in a new geographical area, needing to find new clients and contacts, and juggling the business and engineering sides of two separate engineering consulting firms.

Jeremy is a strong promoter of women in engineering, and currently employs 3 female engineers out of a total of 7 engineers. Jeremy also dedicates time to helping undergraduate engineering students gain work experience and industrial training, currently providing work experience for 3 undergraduate engineering students, with typically 1 or 2 every year. Jeremy also assists lecturers at UNSW Canberra, conducting guest lectures and field trips for civil engineering undergraduates in the areas of geotechnical investigations and engineering geology.

Jeremy is the Chairman of the Canberra Sub-Group of the Australian Geomechanics Society. This sub-group aims to promote geotechnical engineering in the Canberra region, as well as providing valuable technical information for geotechnical consultants in the area. This is mainly done by arranging 4 seminars per year, with a guest speaker presenting on interesting geotechnical topics or recent innovations.

PROJECT EXPERIENCE

Burrinjuck Dam Road Upgrade

Jeremy carried out construction supervision and certification of remediation works for the failed cut and fill batters along Burrinjuck Road following storm events of 2010. There were 13 features requiring remediation, that included fixing culverts, gabion supports, reno mattresses, fill reinstatement, and erosion protection.

Batemans Bay Coastal Zone Management Plan

Jeremy conducted geotechnical slope instability assessments as part of the Batemans Bay CZMP. The assessments were primarily along the headlands around Batemans Bay (nine headlands in total), where risks included falling boulders, rock slope failure, and erosion. The slope instability risk assessment is based on the landslide risk management concepts and guidelines of “Practice Note Guidelines for Landslide Risk Management 2007" issued by the Australian Geomechanics Journal Vol 42 March 2007.

Major Arterial Roads

Jeremy has conducted geotechnical investigations and provide expert geotechnical advice for many new arterial roads around Canberra and NSW including Conjola Mountain Realignment, Ellerton Drive Extension, Old Cooma Road Stage 2, several stages of Horse Park Drive, Flemington Road, Gungahlin Drive, and Athllon Drive. These investigations included on site investigation, laboratory testing of site soils, and then recommendations such as earthworks, subgrade preparation, CBR design, and drainage.

Residential Estate Subdivisions - ACT

Jeremy conducted geotechnical investigations for many large residential estate subdivisions in the ACT including for Crace, Horse Park Estate & Yerrabi Estate (Gungahlin), Franklin, Bonner, East O’Malley, Conder, Banks, and Gordon. These investigations comprised the excavation and logging of large numbers of test pits to provide advice a recommendations for site earthworks, road design, site classifications, and controlled fill.

ACT Major Road Pavement Rehabilitation

Gungahlin Drive, Anzac Parade, London Circuit, & Pialligo Avenue

Jeremy carried out road pavement investigations to establish existing pavement construction and cause of failure, and provided advice for pavement remediation. Included a visual assessment of the pavement condition in accordance with AUSTROADS “A guide to the visual assessment of pavement condition”, as well as drilling boreholes through the pavement, conducting DCP testing, and carrying out laboratory testing of pavement and subgrade materials.

Coombs Ponds

Jeremy conducted a geotechnical investigation and design of Coombs Ponds A and B. The investigation comprised test pits and boreholes, along with soil classification, permeability, and triaxial laboratory testing of on-site materials to determine the most suitable dam embankment type, and then design of the embankments including material properties, slope angles, filters, and instrumentation.

Residential Estates

Sunshine Bay, Long Beach, & Rosedale

Jeremy carried out a qualitative slope instability assessment of the site, based on the requirements on landslide risk management of the NSW Department of Infrastructure, Planning and Natural Resources, to establish whether the land was suitable for residential development

Denham Prospect & Molonglo Group Centre

Jeremy carried out a preliminary geotechnical assessment for the proposed residential estate of Denham Prospect and the Molonglo Group Centre. This assessment included a desk-top study and site geological assessment of existing road cutting, valleys/erosion gullies, and rock outcrops. The purpose of the assessment was to determine the geotechnical feasibility of developing this land, establishing general subsurface conditions for forward design of earthworks and roads, and identify geotechnical constraints to development.

Department of Defence – HQJOC & HMAS Albatross

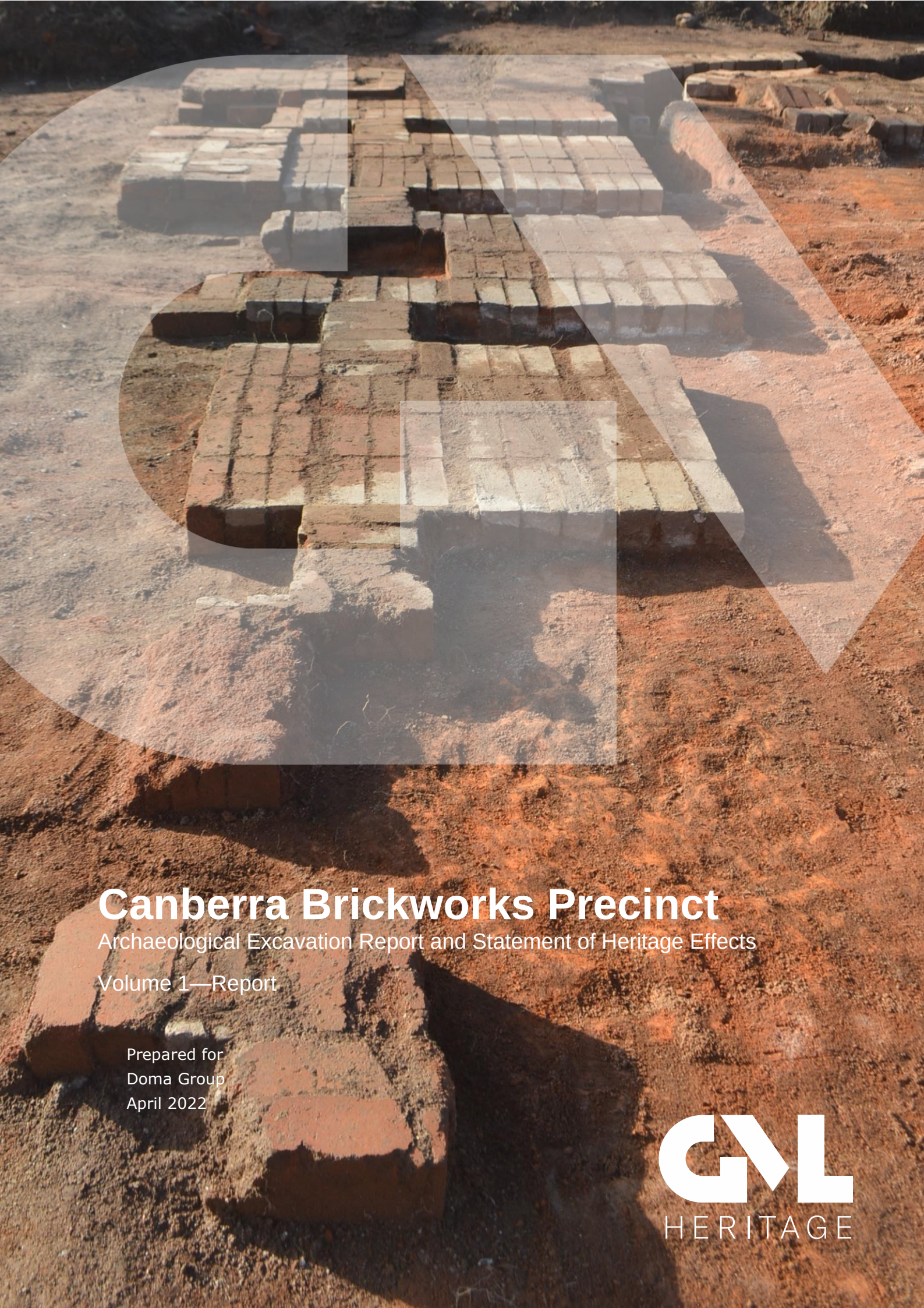
Jeremy carried out a geotechnical investigations and certifications during constructions for the Head Quarters Joint Operations Command (HQJOC) complex and the large upgrade to HMAS Albatross. This work included a geotechnical investigation and analysis for roads, large structures, aircraft runways, pavement rehabilitation, and fuel pipelines.

Apartment & Multi-Storey Developments

Jeremy has carried out geotechnical investigations and certifications during constructions for many large, multi-storey apartment developments, including projects in Braddon, Canberra City, Campbell, Kingston, Kingston Foreshore, Gungahlin, Belconnen, Greenway, and Acton. This work included a geotechnical investigation and analysis for deep basement excavations, retaining walls, footings, and groundwater control.

CAREER HISTORY

1999	-	2005	ACT Geotechnical Engineers	Geotechnical Engineer Geotechnical work associated with the investigation and construction of roads, mines, buildings, dams, bridges & quarries
2005	-	2010	ACT Geotechnical Engineers	Senior Geotechnical Engineer
2010	-	Present	ACT Geotechnical Engineers	Principal & Senior Geotechnical Engineer
2017	-	Present	Fortify Geotech	Principal & Senior Geotechnical Engineer



Canberra Brickworks Precinct

Archaeological Excavation Report and Statement of Heritage Effects

Volume 1—Report

Prepared for
Doma Group
April 2022

GML HERITAGE

Acknowledgement of Country

We respect and acknowledge the Ngunnawal and Ngambri people of the lands and waterways on which we live and work, their rich cultural heritage and their deep connection to Country, and we acknowledge their Elders past and present. We are committed to truth-telling and to engaging with Ngunawal and Ngambri people to support the protection of their culture and heritage. We strongly advocate social, cultural and political justice and support the Uluru Statement from the Heart.

GML HERITAGE

Report register

The following report register documents the development of this report, in accordance with GML's Quality Management System.

Job No.	Issue No.	Notes/Description	Issue Date
19-0443E	1	Draft Report	22 December 2021
19-0443E	2	Revised Draft Report	5 April 2022

Quality assurance

The report has been reviewed and approved for issue in accordance with the GML quality assurance policy and procedures.

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Executive summary

GML Heritage Pty Ltd (GML) was engaged by Doma Group (Doma) to undertake historical archaeological test excavations at the Canberra Brickworks Precinct (the Precinct or the Brickworks) in accordance with Excavation Permit Yarralumla-S102-B1, issued under Section 61F of the *Heritage Act 2004* (ACT).

The Precinct is a significant historic site with a distinctive industrial character. It has recognised heritage significance through its listing on the ACT Heritage Register as the 'Yarralumla Brickworks' and the associated 'Yarralumla Brickworks Railway Remnants'

A 2016 Archaeological Assessment (AA) identified 12 areas of archaeological potential across the Precinct. Eight of these areas were selected to be subject to archaeological test excavation based on: observable remnant surface features; degree of archaeological potential; and likely significance of any surviving archaeological deposits.

A total of 32 test trenches (TTs) were excavated during 2–19 March 2021. Five of these were then fully or partially reopened as part of two open area (OA) trenches excavated during 19 July–12 August 2021. A total of 225 contexts were recorded, 38 of which yielded artefacts.

The archaeological remnants identified in this investigation are only partially reflective of several distinct phases of operations. Widespread demolition often took place between these phases, and subsequent reinvigoration of the site often obscured the earlier activities.

Most notably, the archaeological investigations identified evidence for the 1913–c1916 'experimental plant'. This evidence comprised the remains of five early kilns, including the modification of two downdraught kilns into Scotch kilns. Although previously considered to be a temporary part of the Brickworks, the modification of these two kilns to continue operations show an active investment in the longevity of the experimental plant—this demonstrates the value the experimental kilns held, and the efforts expended to continue their operation.

The investigations also mapped the subsurface flues for the Staffordshire and Downdraught Kilns. Whilst the subsurface flues for the Hardy Patent Kilns 1 and 2 could not be accessed, the documenting of the Staffordshire and Downdraught Kilns flues provided valuable insight into the layout and conditions of these previously unexplored structures.

The Canberra Brickworks Precinct is significant as the first industrial manufacturing facility commissioned for and constructed in the ACT, developed specifically to facilitate the construction of the new capital city. It has a diverse range of heritage values, such as the role it has played in the course of the ACT's history, its aesthetic qualities, and the

connection it holds with both the local Yarralumla community and the wider Canberran population. These values are manifested in the intact industrial landscape and its archaeological remains.

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1 Introduction

1 Introduction

The Canberra Brickworks Precinct (the Precinct or the Brickworks) is a significant historic site with a distinctive industrial character. It has recognised heritage significance through its listing on the ACT Heritage Register as the 'Yarralumla Brickworks' and the associated 'Yarralumla Brickworks Railway Remnants' (Section 1.1.3).

Doma Group (Doma) engaged GML Heritage Pty Ltd (GML) to undertake historical archaeological test excavations at the Precinct across a number of identified areas of archaeological potential. The archaeological investigation of these areas is proposed to inform the design and management of the Precinct during the proposed redevelopment.

The archaeological works were undertaken in accordance with Excavation Permit Yarralumla-S102-B1, issued under Section 61F of the *Heritage Act 2004* (ACT) (see Section 3.1).

This report has been prepared to meet the post-excavation reporting requirements of the ACT Heritage Council (2015) *Cultural Heritage Reporting Policy*.

1.1 Site identification

1.1.1 Terminology

The Precinct is subject to two separate ACT Heritage Register listings (Section 1.1.3) and has been referred to historically by many names (eg the Old Canberra Brickworks, Yarralumla Brickworks, Westridge Brickworks, the Commonwealth Brickworks, and the Government Brickworks). For consistency, this assessment utilises the terminology outlined in the 2021 Conservation Management Plan (CMP) prepared by GML:

- **Canberra Brickworks Precinct**—The area comprising Blocks 1, 7, and 20, which is inclusive of the 'Yarralumla Brickworks' and 'Yarralumla Brickworks Railway Remnants' heritage citations.
- **Canberra Brickworks**—Referred to as the 'Yarralumla Brickworks' in the ACT Heritage Register citation.
- **Railway Remnants**—Referred to as the 'Yarralumla Brickworks Railway Remnants' in the ACT Heritage Register citation.

1.1.2 Location

The Precinct is in the suburb of Yarralumla, to the west of central Canberra (Figure 1.1). It occupies Blocks 1, 7, and 20, Section 102. The site is bordered to the north and east by

low-density residential development, to the west by the Royal Canberra Golf Course and Westbourne Woods, and to the south by open space. It comprises the heritage-listed sites and additional unlisted lands that were part of the ancillary operation of the Brickworks.



Figure 1.1 Location of the Canberra Brickworks Precinct (inclusive of the 'Yarralumla Brickworks' and 'Yarralumla Brickworks Railway Remnants'), in the broader context of Canberra. (Source: Google Earth with GML overlay, 2017)

1.1.3 Heritage status

ACT Heritage Register

The Heritage Act aims to represent and protect the rich natural and cultural heritage of the ACT. The legislation establishes a system for the recognition, registration and conservation of natural and cultural heritage places and objects, including Aboriginal places and objects.

As described previously, the 'Yarralumla Brickworks' and the 'Yarralumla Brickworks Railway Remnants' are included on the ACT Heritage Register (Appendix A).

Non-statutory listings

- Yarralumla Brickworks' is listed on the Australian Institute of Architects (AIA) ACT Chapter Register of Significant Twentieth Century Architecture (RSTCA), Item No. R063.

- ‘Canberra Brickworks’ was identified as a ‘Classified’ place by the National Trust of Australia (ACT) on 20 July 1981.

1.2 Authorship and acknowledgements

This report was prepared by Elise Jakeman (GML Consultant and Archaeologist) with input and review by Martin Rowney (GML Principal and Archaeologist). The excavations were undertaken by Martin Rowney, Elise Jakeman, Caitlin Harvey (GML Graduate Consultant), Lara Tooby (GML Subcontractor), and Georgia Reed (GML Subcontractor). Post-excavation analysis and processing was undertaken by Elise Jakeman, Caitlin Harvey, Anna Leeson (GML Consultant), and Therese McCarthy (GML Senior Consultant).

We gratefully acknowledge the assistance of the following individuals for their contribution to the preparation of this report:
- Rod and Joe, D Group Pty Ltd;
- Peter Fogarty, Soil and Land Conservation Consulting Pty Ltd, and Cath Fogarty, ceramicist;
- Guy Hazell, Archaeological Surveying, Photogrammetry, and Illustration;
- John O’Brien, Agon Environmental Pty Ltd;
- Steve Barnsley, MMB Consulting Surveyors Pty Ltd;
- Jeff Wullaert, Commence Communications Pty Ltd;
- Ann Gugler, local historian; and
- archivists at the National Archives of Australia (NAA), ACT Heritage Library and ACT Archives, and Canberra District Historical Society (CDHS).

1.3 Limitations

The Brickworks has previously been assessed as having no Aboriginal cultural values. As a result, this archaeological investigation has not addressed Aboriginal archaeological potential.

1.4 Relevant documentation

Several previous reports considering the archaeological potential and heritage significance of the Canberra Brickworks Precinct have been consulted in the preparation of this post-excavation report:

- GML Heritage, Canberra Brickworks Precinct—Conservation Management Plan, prepared for Doma, September 2021;

- Navin Officer Heritage Consultants, Archaeological Assessment Canberra Brickworks and Environs, draft report prepared for the Land Development Agency, September 2016;
- GML Heritage, Canberra Brickworks Quarry—Statement of Heritage Effects, draft report prepared for Doma, September 2021;
- Lovell Chen, Canberra Brickworks—Conservation Management Plan, prepared for the Land Development Agency, April 2010; and
- Lester Firth Associates, Old Canberra Brickworks—Conservation Plan, June 1986.

2 Historical context

2 Historical context

This section provides a summary of the historical development of the Canberra Brickworks Precinct, with particular emphasis on events and features that have been identified as having archaeological potential (see Section 3.2). It has been drawn largely from the history provided in the CMP, but supplemented where necessary.

A comprehensive history of the development of the site, its operations, and its contextual place within the historical landscape of Canberra is presented in the CMP.

2.1 Establishment of the Brickworks, 1911–1920

In 1910, King O'Malley announced Government plans for the construction of a brickworks to serve the Federal Capital.[1] Other industries considered essential for the inland city included a power station, a dam and a pumping station, which became the Kingston Powerhouse and the Cotter Dam.

The establishment of the Brickworks is outlined in meticulous detail in a number of letters between Andrew Christie, an engineer, and PT Owen, the Director General of Works over the course of 1911 to 1913. Dubbed the 'experimental plant', in July 1911, Christie intended that:

> The first portion of the works will consist of two Hoffman kilns and two open kilns for burning face bricks.[2]

Before construction could commence, the best source of raw materials for the production of bricks had to be located. Various experiments on shale in the region were carried out in early 1911. Two potential sites were investigated, one at the Duntroon Station and the other on Frederick Campbell's Yarralumla property. Samples from both sites were sent for testing at the Hoffman Brick Company in Melbourne, where batches of bricks were burnt and compared for colour and composition.[3] Reports concluded that samples from Yarralumla produced bricks of excellent quality, equal to the best commercially produced bricks for hardness and porosity, while those produced from the Duntroon sample produced bricks of a better colour, but the material was 'little in weight, its absorption is greater and it has not burnt too well'.[4] The Yarralumla site was selected on this basis and development of the began in 1913.[5]

The Queanbeyan Observer reported in February 1913 that:

> … an Australian-made brick-making machine … will be delivered on the site of the brick-works of the Federal Capital within three weeks. There will then be no delay in the

> manufacture of the first bricks, and it is anticipated that bricks for the making of the three open kilns will be turned out within a month … These kilns in turn will be used for the making of large quantities of bricks required in the construction of the new city.[6]

However, a letter from a Thomas Hill to the Director General of Works on 19 June 1913 indicated that the construction of the experimental plant had been delayed:

> … commencement was made on the 12th [instant] in the manufacture of green bricks for the first kiln, and fair progress is being maintained. The first kiln of bricks about 20,000 should be burnt in a few days.[7]

Once these first bricks had been fired and the second kiln constructed, the experimental plant grew rapidly. On 25 August 1913, Christie wrote:

> I beg to report that I visited the Brickworks at Federal Capital in 20th [instant] for the purpose of inspecting the bricks made in No 2 Kiln …
>
> I waited until next day to see No 3 Kiln opened. The bricks exposed appeared to be of good quality but were lighter in colour than No 2 Kiln …
>
> I had [a] test sample of shale bagged in my presence, of the same stuff as the bricks now being made for No 6 Kiln.[8]

Within the span of two months, the Brickworks had grown from a single kiln to at least six structures.

Beyond Christie's first suggestion that an equal number of Hoffman and open kilns would be constructed, it is unknown exactly what types of kilns were constructed or how many of each there were. The only known configuration of the experimental plant is shown on a 1916 contour survey of the Brickworks (Figure 2.5). Contemporary reports of the kilns were generally concerned with the quantity of brick being produced, with descriptions limited to 'open brick kilns'.[9] An article in *The Queanbeyan Observer* in September 1913 described these kilns as 'immense'[10], whilst a June 1917 Federal Capital Administration *Report of the Royal Commission* stated 'the bricks were burned in a Hoffman kiln'.[11]

Regardless, the experimental kilns were considered a success. In August 1913, Christie wrote:

> I found a considerable portion of the bricks were good quality common bricks and of good colour … I am perfectly satisfied that the rubbish stage has been passed and that the material now being quarried will make first class bricks and of good colour.[12]

As a result, further experiments could be undertaken. A memorandum from Owen to the Administrator of the Federal Territory in October 1913 reported:

> … the original proposal was to manufacture with the semi-dry process … The results from the semi-dry process have been satisfactory, but Mr Andrew Christie has, in the meantime, arranged for experimental brick making by the stiff plastic process, and that process has, on a small scale, produced bricks superior to the semi-dry …

Mr Christie has also arranged for experiments to be made in the moulding of special and fancy bricks with satisfactory results, but this factor enters into the considerations in respect to types of kilns …

I am glad to say that the work carried on up to the present in the … open kilns has proved satisfactory. There is now a stack of over a quarter of a million of good bricks which can be used in the permanent [Kingston] Power House now being erected, or elsewhere where demands may arise.[13]



Figure 2.1 A line of railway trucks carrying bricks from the Brickworks at the Kingston Powerhouse, c1927. (Source: NAA, A3560 7674)



Figure 2.2 The Kingston Powerhouse, c1926. (Source: NAA, A3560 150)

On 1 December 1913, Owen approved the construction of a single Staffordshire kiln, which was to form part of the next stage of the Brickworks. The selection of the Staffordshire design had been a rigorous process, with numerous other designs considered. Following the inspection of the Staffordshire kilns at the State Brickworks in Homebush, in July 1911 Christie wrote that the kiln design had:

… all drying, burning and cooling temperatures are under perfect control and high class goods of perfect colouring is the result. The kiln can also be for fancy and facing bricks, finials, pipes, etc., as well as ordinary bricks, the use of downdraught kilns is dispensed with and the cost of fuel materially reduced'.[14]



Figure 2.3 Staffordshire Kiln construction at the Brickworks, c1915. (Source: Canberra District Historical Society, ID15652)



Figure 2.4 View west over the Staffordshire Kiln, c1926. (Source: NAA, A3560 188)

Prior to the closure of the Brickworks from late 1916 until 1920, workers were predominantly accommodated in two camps of tents—one for married couples the other for single men—located on Banks Street, near the present Forestry School.[15] Table 2.1 lists the inhabitants of the 'Brickworks Campsite' for married men in 1915 and 1916. An additional dormitory block is shown on the site of the 'Old Kilns' on the 1916 survey plan (Figure 2.5).

Table 2.1 Occupants of the 'Brickworks Campsite' for married men. (Source: NAA A207, G1916/299)

Name	Block	Occupied from	Occupation
R Boag	1	27 August 1915	Main Sewer
Edward Moore	2	21 June 1915	Main Sewer
Peter Nightingale	4	29 March 2915	Brickworks, carpenter
Michael John Ware	5	24 August 1915	Brickworks, labourer
W Denley	6	22 April 1915	Unknown
W J McDermott	7	26 August 1915	Unknown
Lewis Pola	9	25 August 1915	Brickworks, labourer
Samuel Coad	10	31 March 1915	Brickworks, labourer
John Robert Lake		8 July 1915	Unknown
Thomas Ernest Enver		21 October 1915	Main Sewer, labourer
James Pearce	12	24 February 1916	Brickworks, labourer
Edward Skerry Snr	13	8 July 1915	Maintenance, Uriarra Road, labourer with horse and dray

Name	Block	Occupied from	Occupation
James 'Jas' Skerry	15	24 February 1916	Brickworks, carter
S Oldfield	16	16/4/15	Unknown
Joseph Lea	17	21 June 1915	Brickworks, engine driver
Everett P Eggleston	18	2 May 1915	Brickworks, bricklayer
William Handcock	20	13 April 1915	Brickworks, caretaker
M O'Malley	22	24 June 1915	Unknown
William C Boyd	23	20 October 1915	Main Sewer
Mitchell Curtin George Murrin	24	27 August 1915 24 February 1916	Unknown Main Sewer, miner
Arthur Henry Ingram Edward Quigg	25	8 July 1915 21 June 1915	Unknown Unknown
J C Cotterill	34	25 August 1915	Unknown
Williams Fields Percy William Stephenson	36	5 July 1915 24 February 1916	Brickworks, bricklayer Brickworks, labourer
Isaac Beveridge	37	24 February 1916	Main Sewer, miner
William Jacobs	41	24 August 1915	Main Sewer, labourer

The arrival of World War I led to a shift in government priorities and commitments and resulted in restrictions on the works program for Canberra. This shift, together with a coal strike, caused the first closure of the Canberra Brickworks in December 1916.

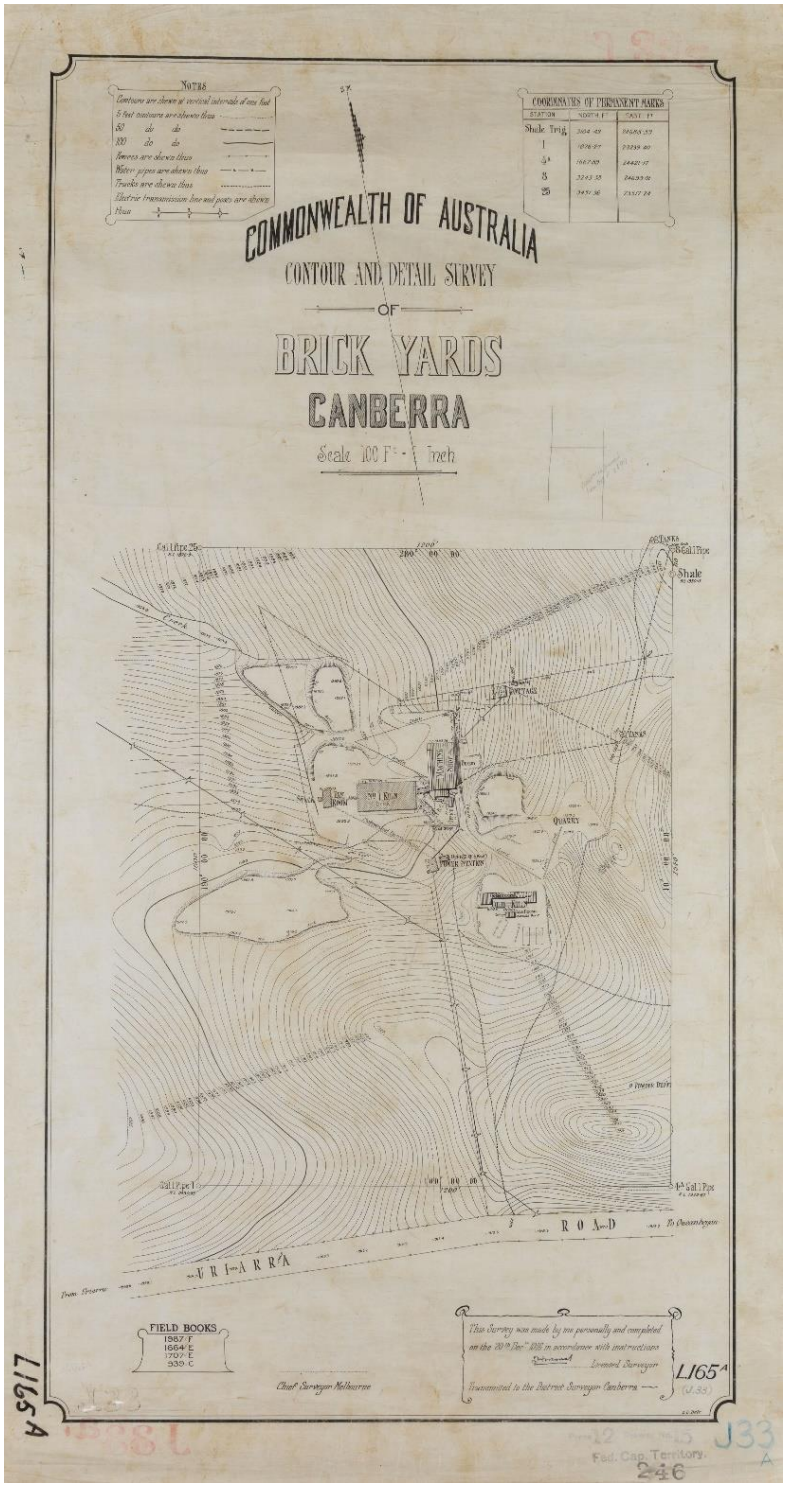


Figure 2.5 The 'Contour and Detail Survey, Canberra Brick Yards, 20 December 1916'. The 'Dormitories' and 'Bath House' are shown to the southeast of the site. Note that the 'Old Kilns' to the bottom right illustrates the footprints of four kilns—presumably two wholly or partially demolished kilns (indicated by the crossed lines) and two other kilns that may still have been standing. The two other kilns mentioned by Christie (totalling six kilns) are not depicted. (Source: NAA A6664, L165A)

2.2 Expansion phase, 1921–1942

With the end of World War I, the government proceeded with the construction of Canberra and formally reopened the Brickworks in 1921, which had undergone machinery repairs the previous year. In 1922, a tile-making plant was installed. By the end of 1923, five million bricks and 50,000 tiles had been produced at the plant by a workforce of 53.[16] The bricks produced at the Precinct in this period were generally regarded as being of a high quality.

Initially bricks were transported from the Brickworks to the construction sites in the emerging city centre by traction engine. However, the machines were only able to make two daily round trips. To accelerate the process, a light railway was constructed, leading from the southwest of the brickworks site, before aligning with the present Denman Street and heading east to the construction sites (Figure 2.1). The 'branch lines' of the light railway were removed prior to the opening of the Provisional Parliament Building in May 1927 and the remaining sections of the railway were removed in 1929. From the late 1920s, bricks were once again transported by road.



Figure 2.6 The quarry face and adjacent narrow gauge railway track, c1920 to 1930. (Source: NAA, A3560 3314)

The output of the Precinct in the mid 1920s was insufficient to cope with the demands of the national capital construction program. By 1927 a new Hardy Patent kiln (a variation of a Hoffman kiln) was completed and operational.[17] To aid in its construction, several clamp and Scotch kilns were in operation to the north of the Staffordshire Kiln (Figure 2.8).



Figure 2.7 The Hardy Patent Kiln 1 under construction, c1926. (Source: NAA, A3560 2111)



Figure 2.8 Scotch kilns (left) and a clamp kiln (right) were used to assist in making bricks for the Hardy Patent Kiln 1, c1926. (Sources: left, NAA, A3560 1968; right, NAA, A3560 1854)

The output of the two kilns was considered to be excellent, with approximately 2 per cent of green bricks and 15 per cent of tiles lost during the firing process.[18] The misfired bricks

were not allowed to go to waste. The clinker (over-burnt) and callow (under-burnt) bricks were often sold as suboptimal goods. Where the quality was too poor for sale, these bricks were kept aside. In 1929, a large proportion of this dump was collected and used as crushed material for road construction.[19]

The Depression curtailed production at the Brickworks and timber was used instead of the more expensive coal to operate the kilns. With significant reduction in demand, the Precinct closed for a second time in 1931 before reopening once again in 1935.

The range of products for building purposes manufactured at the Brickworks in the 1930s was enormous. A 1936 Stock Sheet of the Department of Interior lists all products and includes: 3 inch (76 millimetre) common bricks, 3 inch face bricks (red), 3 inch black bricks common, 2 inch (51 millimetre) paving bricks, 2 inch face bricks (red), 3 inch semi-glazed face bricks, 3 inch chocolate face bricks, 3 inch pavers, 2 inch common bricks, squints, ovolo double return bricks, special mould bricks, ovolo type 8, ovolo type 17, splay on end 3 inch, 3 inch splay on end flat double, angle bricks, Scotia, cornice, 3 inch bull nose bricks, plinth single return, double return, bull nose stops—single and double, vents, louvres, air bricks, kerbs, tiles—Marseilles, Roman, with apex, ridge, starters and stops, paving tiles, chimney pots, fluted bricks, and facing tiles.[20]

The reactivation of the Brickworks required accommodation to support the additional workers. In c1921–1922, seven timber tenements and a number of brick cottages were constructed adjacent to the Brickworks Camp. The next phase of residential development at the Brickworks began in February 1927, when a new single men's camp was constructed on the south side of Denman Street, close to the entrance to the site. New married quarters were located to the south of the Brickworks in the same year (Figure 2.10 and Figure 2.11).[21]

World War II diverted peace time activity to works associated with the war effort, and saw the closure of the Brickworks once again. In April 1942 staff were laid off and a caretaker manager was retained to issue bricks for essential works.



Figure 2.9 Workers at the Brickworks, c1924. (Source: The Canberra Page)



Figure 2.10 The married quarters camp (background), built to the southwest of the Brickworks in 1927. (Source: NAA)



Figure 2.11 Looking south past the Staffordshire Kiln (left), 1929. The mess hall building and the roofs of several of the sleeping quarters are visible in the background. (Source: NAA, A3560 5837)

2.3 Post World War II phase, 1944–1976

With the end of World War II in sight, the Canberra Brickworks reopened in September 1944, with limited production. From the late 1940s and into the 1950s, output was stepped up to provide material to address the postwar housing shortage, resulting in a major expansion and redevelopment of the Brickworks.

Among the first postwar construction projects was the replacement of the married quarters of the Brickworks Camp built during the 1920s, which had been removed by the army during World War II. The new 'Brickworks Hostel' was ready for occupation in 1945.[22] and was located on the site of the former married quarters.

In 1945 it was noted that the condition of the two 'dome kilns' had deteriorated. W J Lind, the Acting Secretary, wrote to the Director Works reporting that 'the main flues are collapsing and one has fully collapsed, whilst the floors are very bad'.[23] In 1955, Hardy Patent Kiln 1 was also substantially rebuilt and enlarged by two bays.

The development of Canberra received renewed attention with the creation of the National Capital Development Commission (NCDC) in 1958. The three existing kilns not producing enough bricks to meet the construction needs of Canberra, three new Downdraught Kilns were completed in c1960. In a continuation of the widespread upgrades, oil replaced coal as the fuel for firing the kilns, and modifications were made to the arched side openings (known as 'wickets') of the three continuous kilns (the Staffordshire and two Hardy patents) for the use of forklift trucks to set and remove bricks.[24]

From the late 1960s, however, the Precinct began to decline. In 1967 the ACT Health Services Branch inspected the Brickworks Hostel and reported that the buildings were in a state of disrepair. Late in 1970 it was reported that the hostel was to be demolished.[25]

By 1973 the Canberra Brickworks were considered to be in need of extensive modernisation and proposals were prepared by Commonwealth Brickworks Pty Ltd for upgrade works. These proposals were rejected by the NCDC on environmental grounds and a new brickworks site was released at Mitchell, north of Canberra. The *Canberra Times* cited the reasons for moving the brickworks as: the land being required for residential purposes; excessive use of neighbourhood roads by heavy traffic; and levels of air pollution incompatible with the amenity of residential development nearby.[26] The kilns were unloaded for the last time in August 1976. All usable material was moved to the new site and the remainder offered for sale. Bricks were first produced in the Mitchell plant in October 1976.

By the time of its closure it was estimated that some 600 million bricks had been produced at the Canberra Brickworks.[27]



Figure 2.12 An aerial photograph of the Brickworks in 1976, the year of its closure. The photograph shows the six extant kilns, the extrusion plant to the west, a number of sheds within the quarry, and a carpark at the entrance of the complex. (Source: ACT Heritage Library)

2.4 Post-closure phase, 1976–2017

In 1976 a local developer and businessman, Alan Marr (A R Marr Pty Ltd), put forward a proposal to develop the Brickworks as an integrated tourist, recreation, and retail centre with medium-density housing to the east and north of the site. Marr succeeded in having the land rezoned to accommodate his vision, and carried out maintenance and reconstruction works to the kilns. Landscaping of the quarry, involving land fill and the creation of the reflection lake, proceeded in 1978. The redeveloped Brickworks was opened to the public as a tourist attraction in July 1979. However, limited income opportunities and high capital costs forced Marr's business into provisional liquidation. In the early 1980s Marr was seriously injured in a fall at the site and later died of complications. The Commonwealth accepted the surrender of Marr's company's lease in 1984 and management of the site was transferred to caretaker Bruce McDonald. While many of Marr's tenants remained at the Brickworks, concerns about the safety of some of the buildings and potential redevelopment of the site led to the tenants being asked to leave and the caretaker role being abolished. A timber recycling business, Thor's Hammer, was granted an extended period to relocate due to the considerable amount of its timber stock.

The 1988 *Canberra Brickworks South Canberra Policy Plan* suggested a range of potential uses for the site, such as housing, commercial accommodation, and office and retail space. The government adopted the plan despite it being poorly received by the community. Hooker Projects submitted the preferred 'Expression Of Interest', which proposed a development that adapted the kilns and machine bays, and contained a sports precinct, museum, restaurant, hotel, and visitor attractions. A depressed economy led to Hookers being placed in provisional liquidation, and by 1992 their proposal was defunct. It was around this that time the Commonwealth handed the Brickworks site over to the ACT Government.

Further development proposals were investigated but none proceeded, and during this phase the Brickworks continued to accommodate a range of tenants, including artists, designers, and manufacturers. In 2001 the Brickworks was included on the ACT Heritage Register as the 'Yarralumla Brickworks'. In 2013 the remnants of the former 1920s narrow-gauge railway were individually listed as the 'Yarralumla Brickworks Railway Remnants'.

In September 2013 the ACT Government's Land Development Agency (LDA) (now the Suburban Land Agency) released the *Canberra Brickworks and Environs Planning and Development Strategy*, which sought to promote the adaptive re-use of the site and its surrounds with respect to its heritage significance. Following a revision of the strategy in 2015 the LDA called for development proposals, and in 2017 it was announced that the preferred tenderer was local Canberra developer Doma, which had submitted a proposal for a mixed-use residential, commercial, and retail development that utilised much of the historic Brickworks infrastructure.

2.5 Endnotes

1 Lester Firth Associates Pty Ltd, *Old Canberra Brickworks, Conservation Plan*, June 1986, Section 2.1.1, citing the *Queanbeyan Age*, 23 February 1910.

2 National Archives of Australia, A110, FC 1913/1055.

3 Lester Firth Associates (Section 2.1.1) state that 1,000 test bricks were fired at the Hoffman Brick Co., Melbourne.

4 National Archives of Australia, A110, FC1913/1055, in Ian Carnell, 'Canberra's Cornerstone', *Canberra Historical Journal*, No. 5, March 1990, cited by Lester Firth Associates, 1986, Section 2.2.1.

5 Gugler, A 1994, The builders of Canberra, 1909–1929. Part one, Temporary camps & settlements, CPN Publications, Canberra, p 77.

6 *The Queanbeyan Observer*, 'Local and General News', 18 February 1913, p 2, Trove, National Library of Australia <https://trove.nla.gov.au/newspaper/page/25410953>

7 National Archives of Australia, A6269, E1/30/92.

8 National Archives of Australia, A6269, E1/30/92.

[9] *Queanbeyan Age*, 'The Federal Capital', 16 June 1914, p 4, Trove, National Library of Australia <https://trove.nla.gov.au/newspaper/page/4324941>; *The Queanbeyan Observer*, 'Local and General News', 18 February 1913, p 2, Trove, National Library of Australia <https://trove.nla.gov.au/newspaper/page/25410953>

[10] *The Queanbeyan Observer*, 'Electrical Brick-making Plant', 23 September 1913, p 3, Trove, National Library of Australia <https://trove.nla.gov.au/newspaper/page/25411094>

[11] The Parliament of the Commonwealth of Australia, Federal Capital Commission, *Report of the Royal Commission, Part 5, Brick-works at Canberra*, 3 April 1917, No. 15—F.7954, p 3.

[12] National Archives of Australia, A6269, E1/30/92.

[13] National Archives of Australia, A199, FCW1914/723.

[15] Gugler, A 1994, The builders of Canberra, 1909–1929. Part one, Temporary camps & settlements, CPN Publications, Canberra, Chapters 2 and 3.

[16] Dates and figures in this paragraph are taken from Lester Firth and Associates, 1986, Section 2.1.2. Sources are not cited.

[17] Lester Firth and Associates, 1986, Section 2.1.2. Source uncited.

[18] National Archives of Australia, A6269, E1/30/92.

[19] National Archives of Australia, A6269, E1/30/92.

[20] Department of Interior, Stock Sheet, 1936, referenced in Lester Firth and Associates, 1986, Section 2.1.2.

[21] Dates and details in this paragraph are from Gugler, A 1994, *The builders of Canberra, 1909–1929. Part one, Temporary camps & settlements*, CPN Publications, Canberra, Chapters 2 and 3.

[22] National Archives of Australia, Series A431, cited in Lester Firth and Associates, 1986, Section 2.1.4.

[23] National Archives of Australia, Series A431, 1953/1328.

[24] Lester Firth and Associates, 1986, Section 2.1.4. Dates and precise details relating to these modifications are not included, and sources are not cited.

[25] Lester Firth and Associates, 1986, Section 2.1.4. Original sources uncited.

[26] *Canberra Times*, 18 June 1974, cited in Lester Firth and Associates, 1986, Section 2.1.4.

[27] Lester Firth and Associates, 1986, Section 2.1.4. Source uncited.

3 Investigation methodology

3 Investigation methodology

The following section provides the statutory context for the archaeological investigations and outlines the methods used.

3.1 Statutory approval

An Archaeological Research Design (ARD) and Excavation Permit application was submitted to the ACT Heritage Council in May 2020 under Section 61E of the Heritage Act. Following amendments to the application in September 2020 it was approved under Section 61F of the Heritage Act. An Archaeological Excavation Permit (Yarralumla-S102-B1) was granted on 20 October 2020 with the following conditions (Appendix B):

- all excavation and related activities are to be undertaken in accordance with the September 2020 ARD;
- a long term artefact management strategy is to be submitted to the ACT Heritage Council.

Two variations to the Permit were submitted to the ACT Heritage Council on 1 March 2021 and 21 June 2021. These concerned, respectively:

- Reducing the number of test trenches proposed to be excavated in BRW7, based on evidence gathered during the contamination and geotechnical investigations undertaken by Agon Environmental Pty Ltd during 16–18 and 25 February 2021.
- Expanding the test trenches in BRW8 to encompass an open area excavation and allow for the full exposure of the early kiln complex.

3.2 Description of investigations

The 2016 Archaeological Assessment (AA) prepared by Navin Officer Heritage Consultants Pty Ltd (NOHC) identified 12 areas of archaeological potential across the Precinct (Appendix D). Eight of these areas were selected to be subject to archaeological test excavation based on: observable remnant surface features; degree of archaeological potential; and likely significance of any surviving archaeological deposits. These were (Figure 3.1):

- Brickworks (BRW) 1—Building platform and concrete features;
- BRW2—Married quarters and Brickworks Hostel;
- BRW3—Area of postholes and other remains
- BRW7—Quarry;
- BRW8—Old kiln and dormitories;
- BRW10—Railway remnants;
- BRW11—Railway siding extension; and

- BRW12—Flues and subsurface workings.

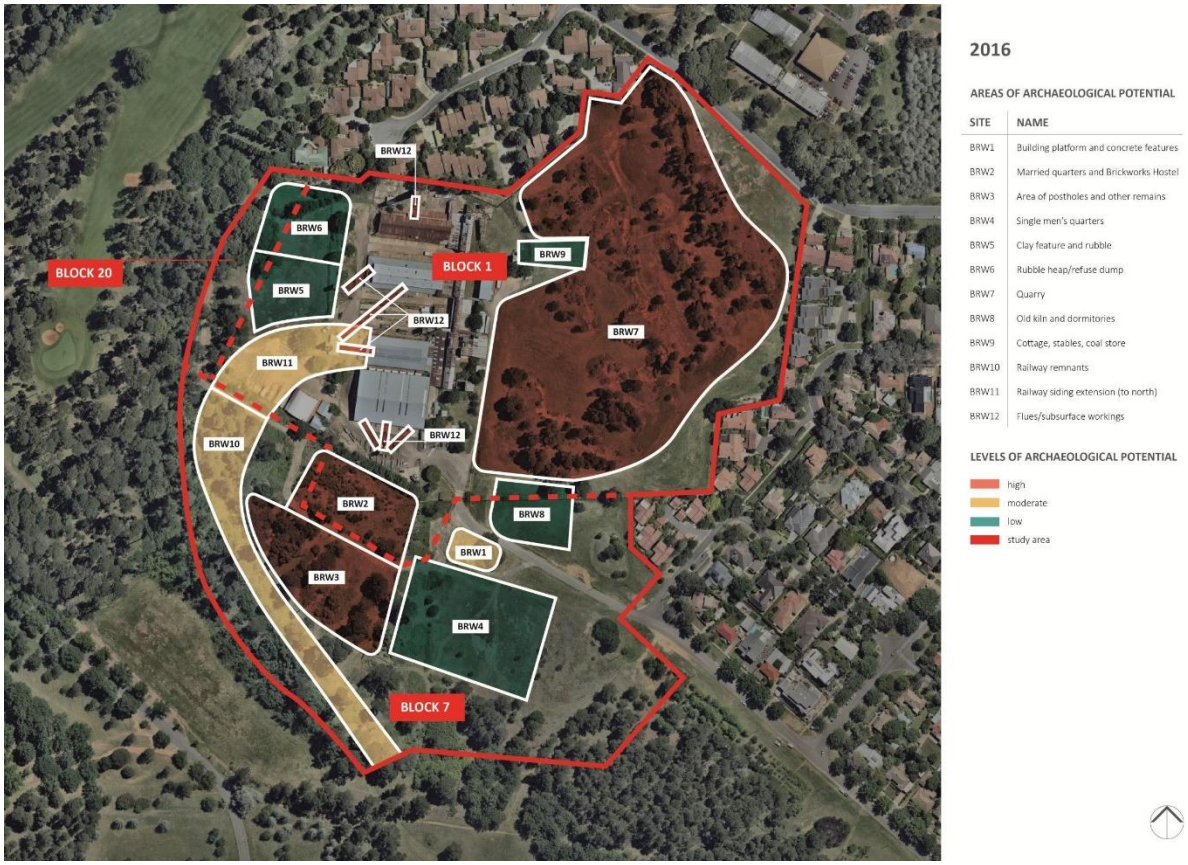


Figure 3.1 Areas of archaeological potential. (Source: NOHC, 2016)

Excavation and post-excavation tasks were undertaken in accordance with the detailed methodologies outlined in the approved ARD (Appendix C). These are summarised below.

- Excavation:
  - Archaeological material was recorded using the single context recording system and included context sheets, photographs, and measured drawings (included in Appendix).
  - Machine excavation (with a flat-edged bucket approximately 1.2 metres wide) was used to open all excavation areas, remove modern overburden, and reveal archaeological features and deposits. Once archaeological features and deposits were identified, manual excavation was employed to expose, investigate, and clean the in situ features.
  - Significant archaeology identified within the trenches was not removed during excavation. Where these features or deposits needed to be examined further, test pits and cross-sections were excavated to confirm the nature of the

archaeology, determine if any depositional phases were present, and verify archaeological significance. Where machine excavation was used to excavate sondages, a flat-edged bucket approximately 30 centimetres wide was used.
  - All artefacts recovered during the excavation were collected according to their context.
- Post-excavation:
  - All records made during the excavation were collated and digitised into a succinct database (Appendix F).
  - Artefacts were sorted into type—brick, glass, metal, ceramic, bone, organic, and other—for cataloguing, cleaning, and photographing. Emphasis was placed on cleaning and photographing diagnostic artefacts. The entire artefact assemblage was analysed to identify typologies and manufacture dates, and to provide context for the associated archaeological deposits.

4 Results

4 Results

The following section discusses the results from the archaeological investigations. It is split into two sections:

- The excavation, describing the archaeological features and deposits identified. This includes comparative analysis and synthesis for the structures identified in BRW2, 3, and 8.
- The artefacts recovered during the excavation, their provenance, and their interpretation.

4.1 Excavation and terminology

A total of 32 test trenches (TTs) were excavated during 2–19 March 2021. Five of these (all within BRW8) were then fully or partially reopened as part of two open area (OA) trenches excavated during 19 July–12 August 2021 (Figure 4.1). All context records, drawings, and photographs associated with the excavation units and contexts are provided in Appendix F. Context numbers referred to in the text below are signified in italics.

The following section uses the following terms to describe the orientation of laid brickwork in structures (Figure 4.1):

- Stretcher—The typical position for a laid brick. The brick is placed on its broadest surface with the long edge exposed on the wall face.
- Header—The opposite of the stretcher position. The brick is placed on its broadest surface with the short end exposed on the wall face.
- Shiner—The brick is placed on its long edge with its broadest surface exposed on the wall face.
- Rowlock—The opposite of the shiner position. The brick is placed on its long edge with the short end exposed on the wall face.
- Soldier—The brick is placed 'upright' on its short end with its long edge exposed on the wall face.
- Sailor—The opposite of the soldier position. The brick is placed 'upright' on its short end with its broadest surface exposed on the wall face.

A wall brick usually has a depression (called a frog) on one of the broadest sides. This reduces the amount of clay needed to form the brick and helps it bind to its neighbour when cemented on that side. The frog often incorporates a maker's or producer's mark. Bricks without frogs might have a mark stamped into the surface. Alternatively, some bricks are manufactured with perforations through the centre of the brick. These

perforations reduce the weight of the brick, promote even firing during production, and assist with the distribution of mortar. These have been referred to as 'air' bricks. The marks observed during the excavation are noted below and discussed in further depth in Section 4.2.1.

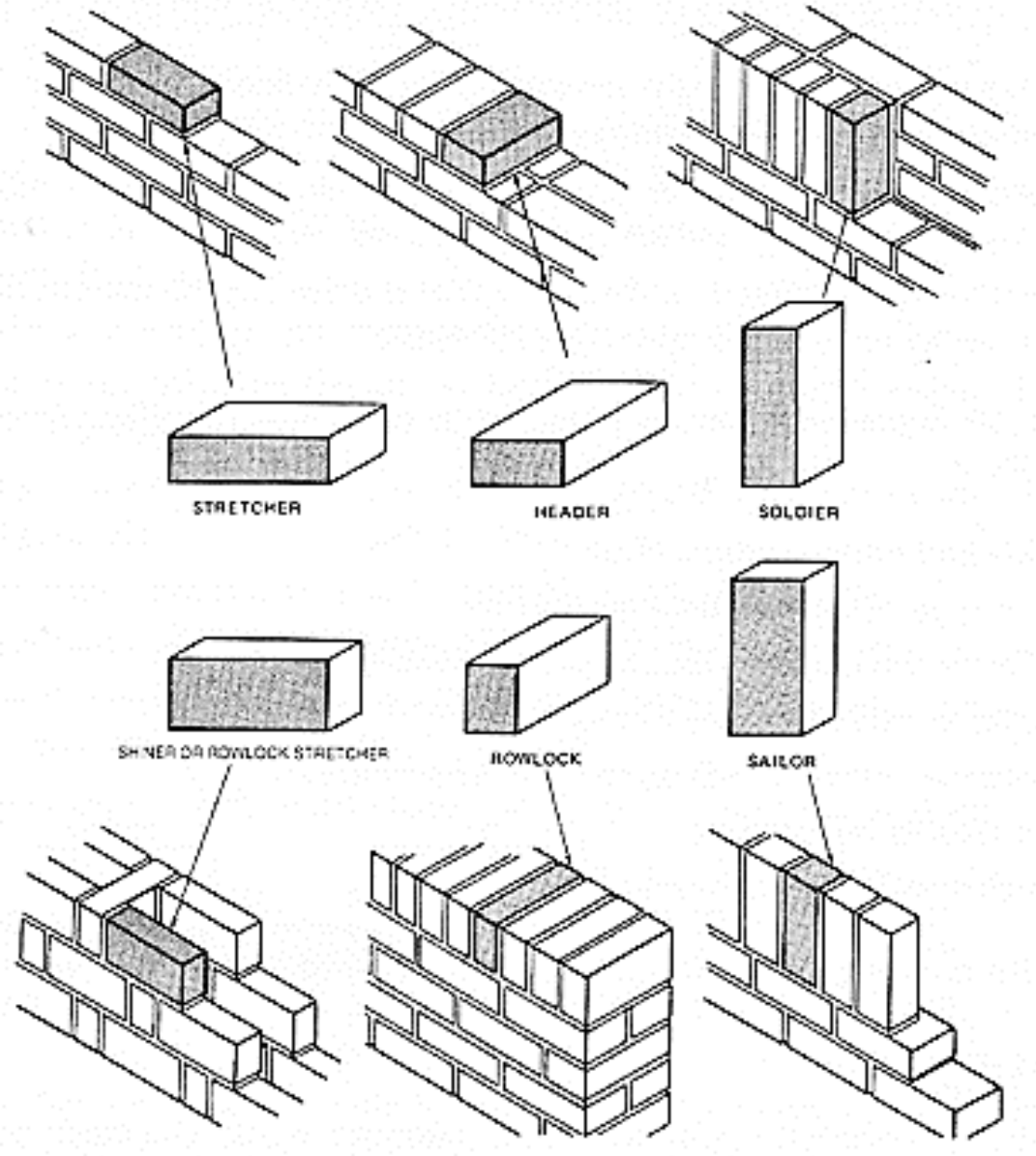


Figure 4.1 Typical orientations for laid bricks.

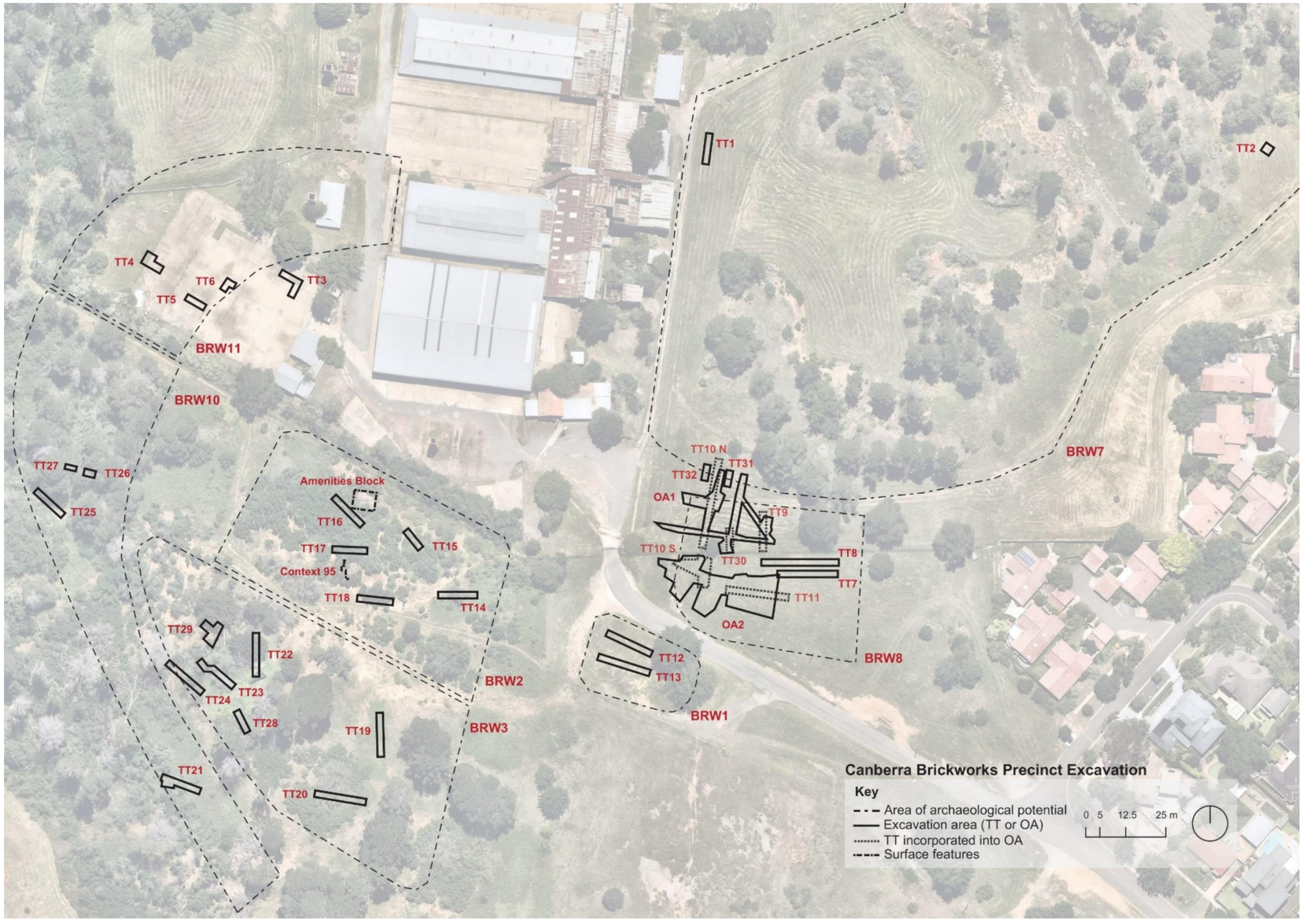


Figure 4.2 Layout of TTs and OAs excavated at the Canberra Brickworks Precinct. Note that BRW12 is not depicted; see Figure 4.3. (Source: Near Map 2020 with GML additions)

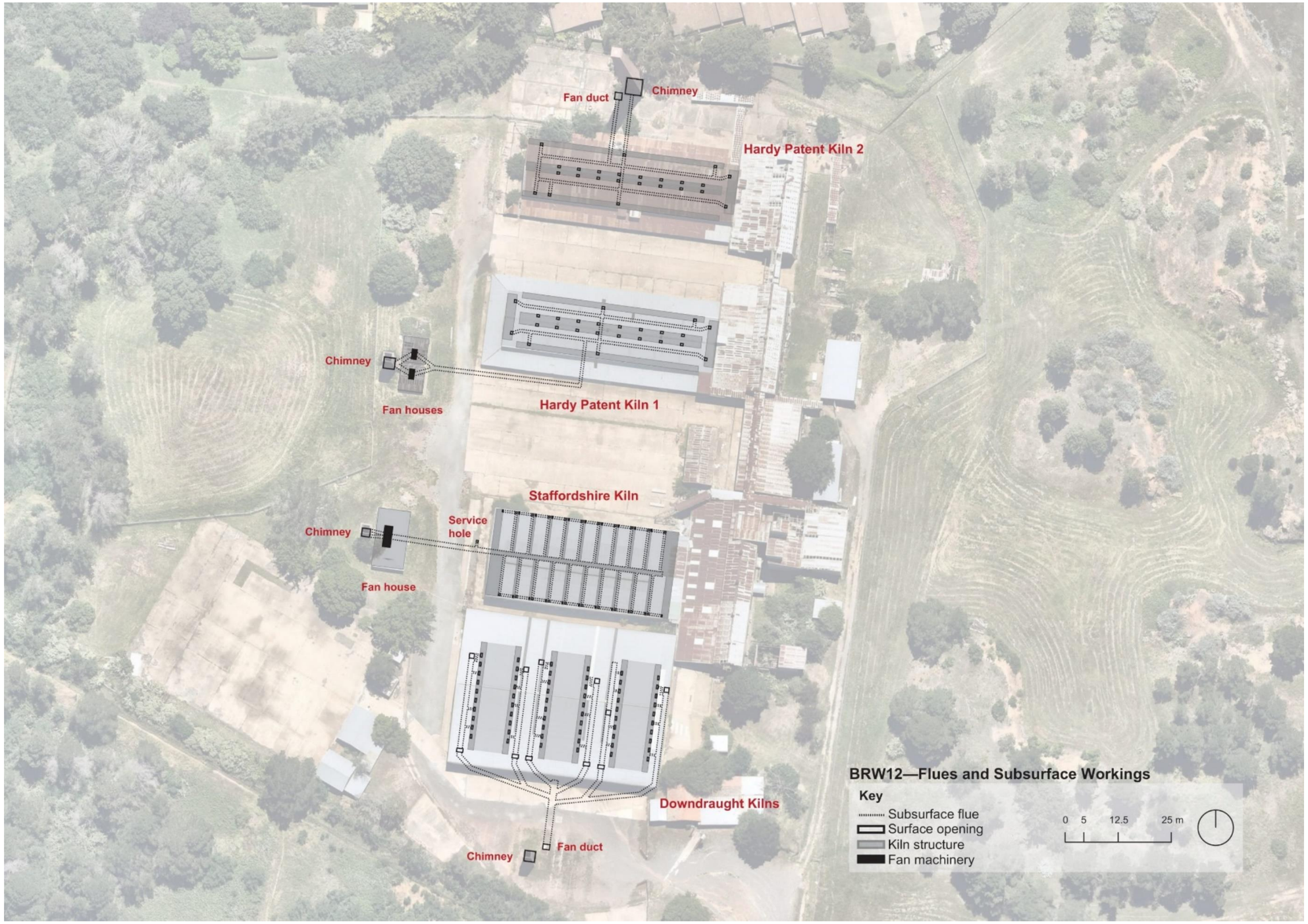


Figure 4.3 Layout of subsurface flues at the Canberra Brickworks Precinct. Note that the wickets in the long walls of both Hardy Patent Kilns have not been mapped due to successive alterations to the locations and use of the wickets. (Source: Near Map 2020 with GML additions)

4.1.1 BRW1—Building platform and concrete features

BRW1 consists of several surface features and potential subsurface features, including a square concrete feature and—at the time of recording—a visible line of grass dieback. The AA suggested that the feature had a function with water, either for storage or drainage. Aerial imagery showed that the area remained largely cleared without any structures, possibly with some intersection by roads during the twentieth century.[28]

Two TTs (12 and 13) were excavated in BRW1 (refer to Figure 4.6 and Figure 4.7). Both were oriented southeast–northwest and located adjacent to Denman Street opposite the main entrance to the Brickworks. Little ground cover was present at the time of excavation and the concrete feature was clearly visible.

The identified surface features were ephemeral pre-cast concrete remnants and were not associated with any further subsurface features, such as water storage or drainage infrastructure, or other structural purposes. Removal of the topsoil in TT12 identified a very compact crushed yellow granite gravel layer (*83*, similar to *35* and *41*), which is consistent with materials used in 1960s–1970s carparks in Canberra. Beneath the crushed gravel were several deposits (*82*, *85*, and *87*) containing ash, mixed shale, and brick rubble representative of background demolition and levelling events. These had been compacted into the natural soil surface. TT13 contained comparable deposits (*84*, *85*, and *86*). No artefacts were associated with any of these deposits.



Figure 4.4 TT12, ash (*82*) and crushed brick rubble (*87*) deposits, facing north.



Figure 4.5 TT13, crushed brick rubble (*85*) and clay (*86*) deposits, facing north.

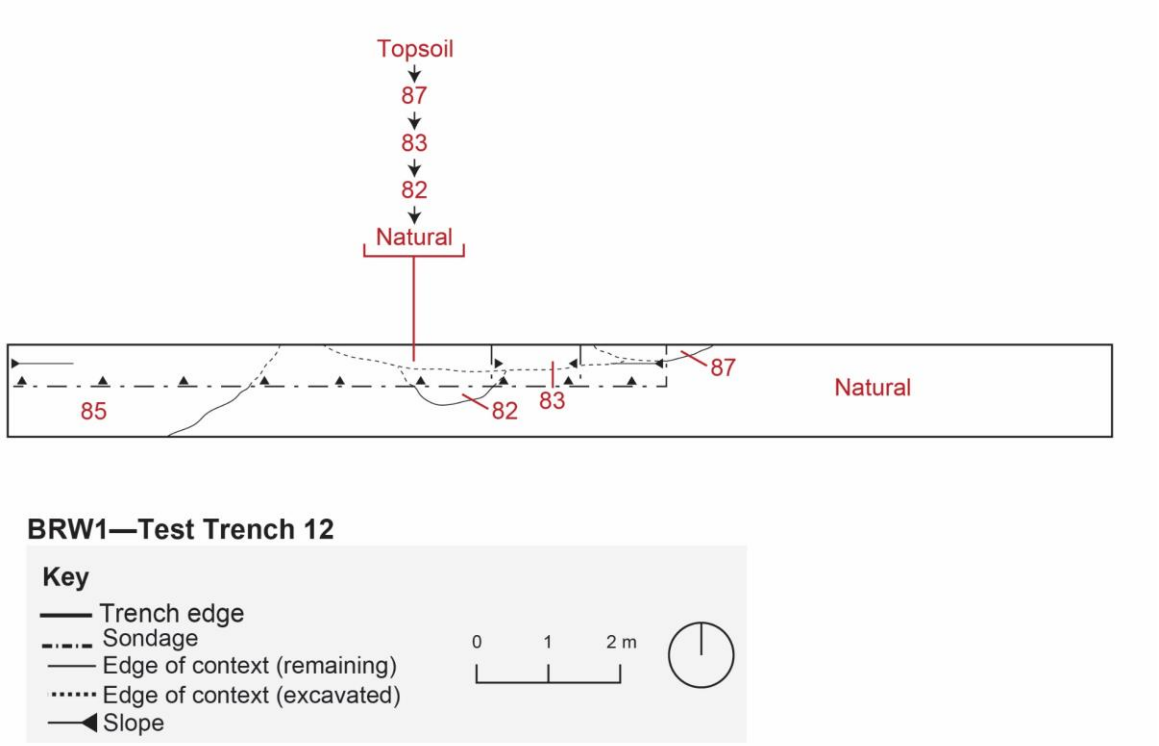


Figure 4.6 TT12.

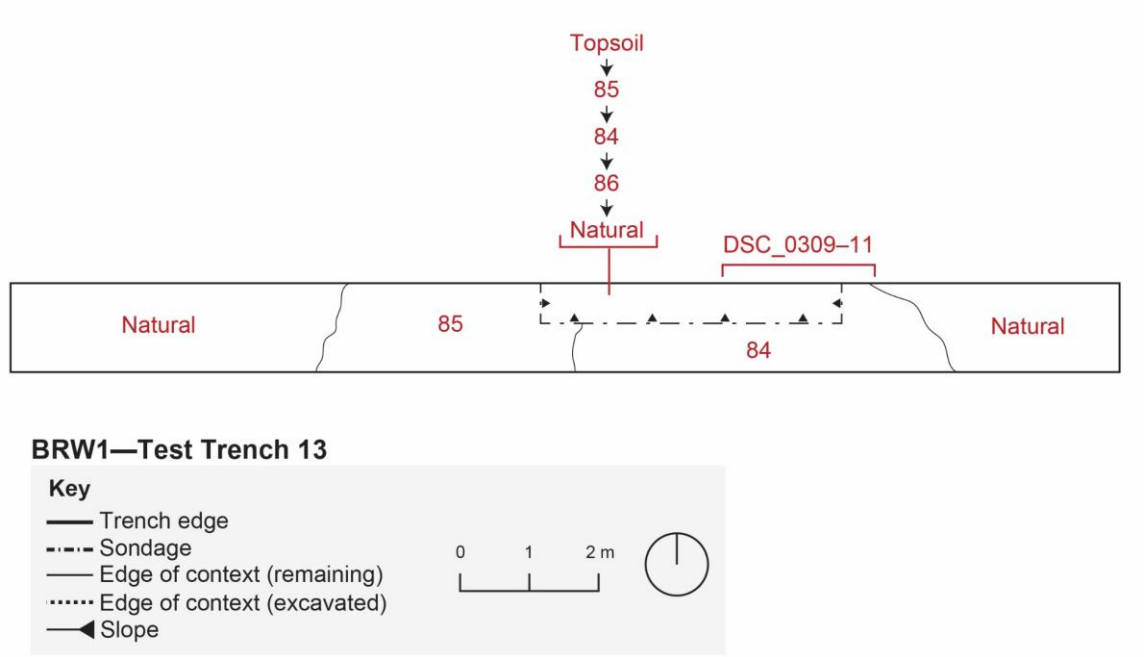


Figure 4.7 TT13.

4.1.2 BRW2—Married quarters and Brickworks Hostel and BRW3—Area of postholes and other remains

BRW2

BRW2 consists of the Brickworks accommodation village, which contained a complex of structural features, including several remnant coursed brick footings and brick mounds, a metal spoil heap, and a concrete slab.[29]

Five TTs (14, 15, 16, 17, and 18) were excavated in BRW2.

TT16 was adjacent to the pre-cast concrete slab for an amenities block. The area was covered by dense shrubbery. TT16 contained no identifiable deposits or features, only natural soil profiles. The pre-cast concrete slab for the amenities block contained plumbing apertures for toilet and shower facilities.

TT14 and 15 were on the eastern and northeastern extent of BRW2 within an area of dense shrubbery (refer to Figure 4.10 and Figure 4.11). Following the removal of the topsoil, ferrous waterpipes were identified in each TT. The pipe (*88*) in TT14 was aligned north–south, and was below a deposit of friable brownish grey sandy silt with brick rubble and charcoal inclusions (*90*) (Figure 4.8). This deposit was 0.25 metres deep and contained a considerable quantity of miscellaneous ferrous metal artefacts (Section 4.2). It had been deposited onto natural soil profiles. The water pipe (*92*) in TT15 was aligned northeast–southwest and was not associated with any further archaeological deposits, having been inserted through natural soil profiles (Figure 4.9).



Figure 4.8 The water pipe (*88*) and overlying rubble deposit (*90*) in TT14, looking north.



Figure 4.9 The water pipe (*92*) in TT15, looking northeast.

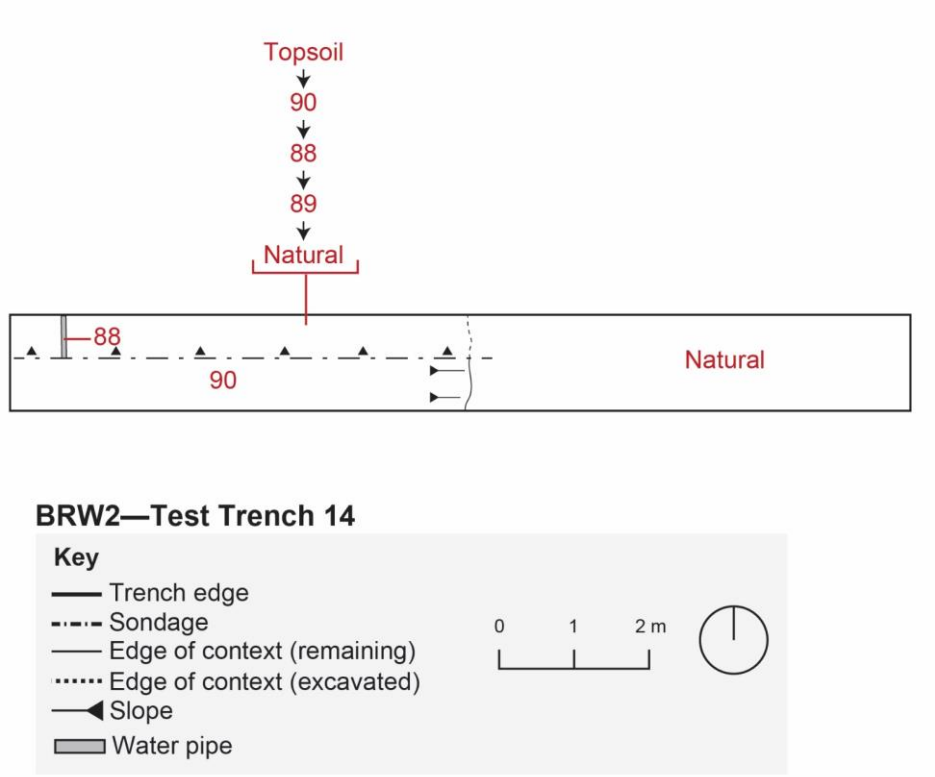


Figure 4.10 TT14.

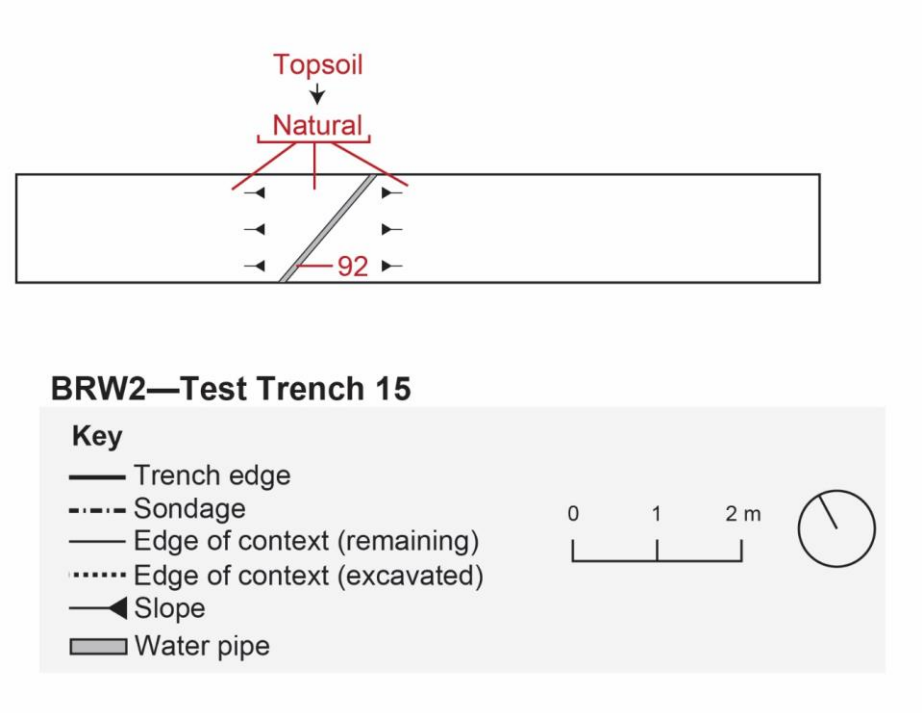


Figure 4.11 TT15.

TT17 was in the centre of BRW2 (refer to Figure 4.13). It was characterised by several drainage and plumbing features (*94*), including drains, a ferrous water pipe, and a possible grease or debris trap (Figure 4.12). Artefacts recovered from this area primarily comprised c1960s glass beer and soft-drink bottles (Section 4.2). The whole area had been extensively disturbed, and a considerable quantity of demolition debris and other waste materials was contained within the topsoil.



Figure 4.12 TT17, plumbing features (*94*), facing northwest.

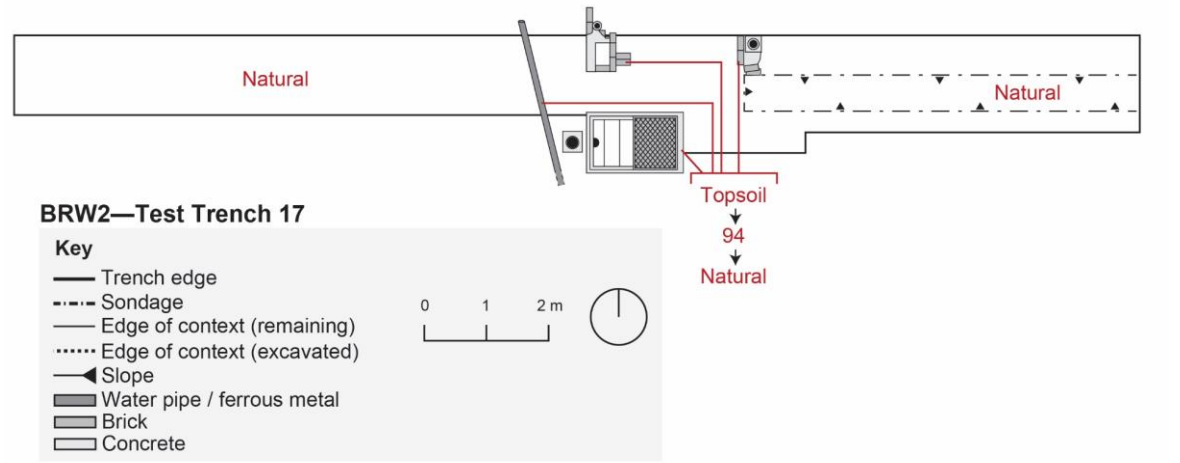


Figure 4.13 TT17.

TT18 was on the southern boundary of BRW2, adjacent to an informal vehicle track that provides external access around the Brickworks (refer to Figure 4.15). Due to the presence of the vehicle track, the immediate location of TT18 was largely clear of vegetation. Following the removal of the topsoil, several brick strip footings (*97* and *98*) and (originally) upright concrete stumps (*99*) were identified in TT18. These features were adjacent to an asphalt surface (*96*), all aligned east–west (Figure 4.14). The western-most footings (*97*) were constructed from bricks laid in stretcher bond—forming three sides of a rectangle—with amorphous cast-in-place concrete completing the fourth side. The concrete obscured the brick frogs (brick frogs are discussed in Section 4.2.1). A single line of brick strip footings (*98*) extended from the southeast corner of the western-most footings (*97*). This line of brick strip footings (*98*) had been constructed from bricks with frogs marked either 'CANBERRA C'WEALTH' or with no mark ('blank'), laid in shiner bond. The asphalt surface (*96*)—which had been significantly degraded—abutted both footings on the south. Five pre-cast concrete stumps with ferrous ant caps (*99*) were aligned linearly on the opposite side. Artefacts were predominantly collected from the topsoil in this area and reflected those found in TT17, with large quantities of glass beverage bottles, several tea cups and mugs, and animal (faunal) remains (Section 4.2).



Figure 4.14 TT18, brick strip footings (*97* [top left] and *98* [top right and bottom left]), asphalt surface (*96* [bottom left]), and (originally) upright concrete stumps (*99* [top right and bottom right]), facing various.

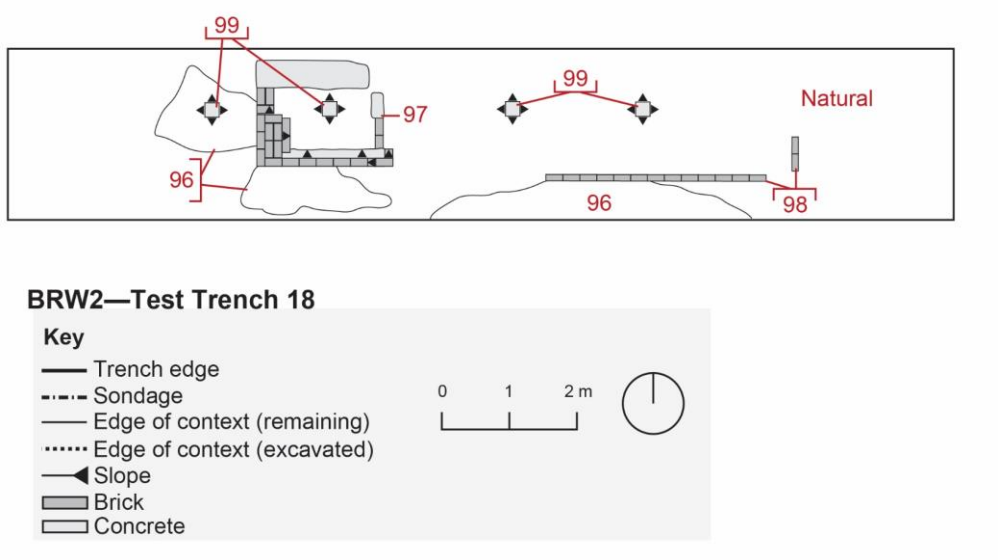


Figure 4.15 TT18.

Located between TT17 and 18 was a remnant coursed brick structure (*95*). Dislocated brick rubble was removed from the western face of the structure (Figure 4.16). The exposed structure comprised a number of strip footings ranging between a single course and 11 courses high. The entire feature had been constructed from a combination of bricks with 'simple', 'CANBERRA C'WEALTH', and 'CANBERRA' frogs laid in a mixture of stretcher and alternating header/stretcher bonds. The central part of the structure formed a rectangular enclosed space. Notable artefacts recovered from the rubble included a number of personnel and vehicle addressograph plates (Section 4.2.3).



Figure 4.16 Remnant coursed brick structure (*95*) between TT17 and TT18, facing northeast.

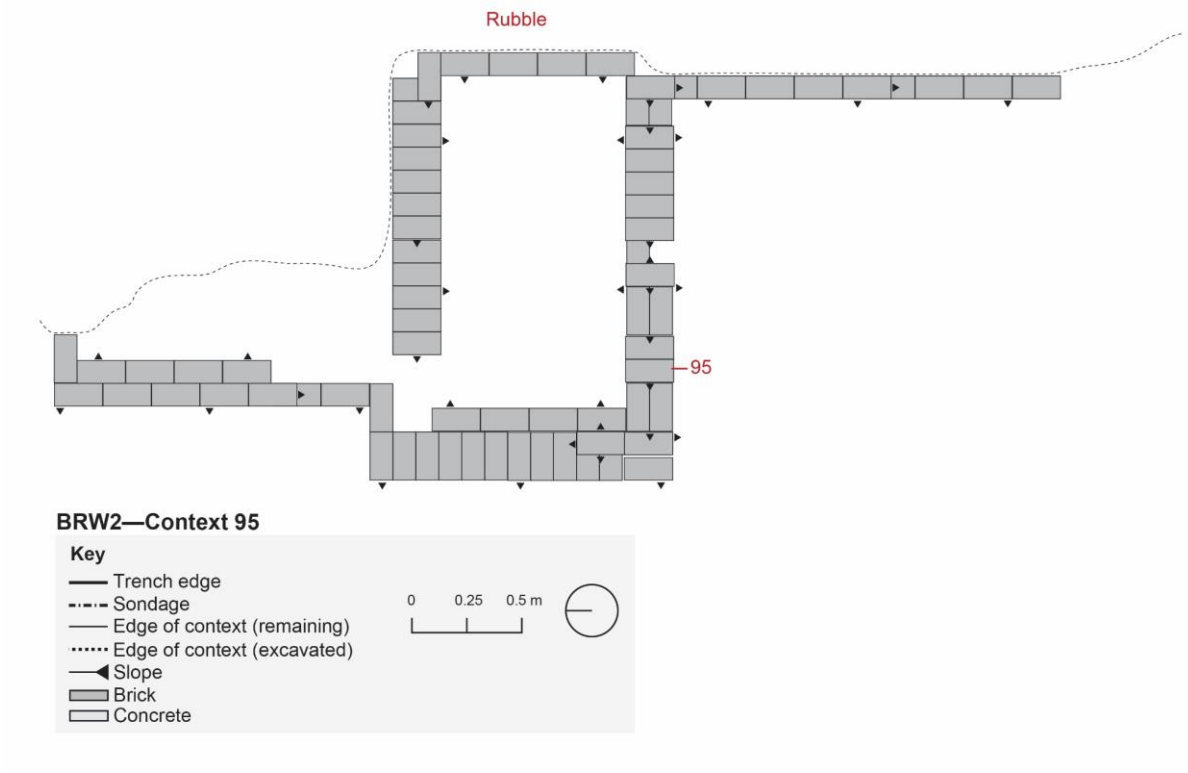


Figure 4.17 Remnant coursed brick structure (*95*) between TT17 and TT18.

BRW3

BRW3 consists of a complex of features relating to various structures. The AA describes this site as containing evidence of a modern fringe dweller's camp, including a hearth made of brick and concrete. Early plans indicate that this area was used as an ephemeral brickworks camp, and historical aerials from 1950 show two structures that were likely the 1940s Brickworks Hostel.[30]

Contamination and geotechnical investigations within BRW3 were undertaken by Agon Environmental on 18 February 2021. These works were monitored by GML for impact to any unidentified archaeological features. The results of the archaeological observations made during the works are included in Appendix E. No archaeological deposits or features were identified during the works.

Seven TTs (19, 20, 21, 22, 23, 28, and 29) were excavated in BRW3. The majority of these were located in areas of dense vegetation.

TT19, 20, 21, 22, and 23 contained no identifiable deposits or features, only natural soil profiles. TT28 contained a fragmented portion of a bonded brick footing (refer to Figure 4.21). This footing was resting on the topsoil and had no corresponding subsurface features; all other aspects of TT28 were consistent with natural soil profiles. Artefacts recovered from the topsoil generally comprised miscellaneous domestic items, such as window glass fragments, a stove filament, and a plastic doily (Section 4.2). Additional quantities of c late 1950s beer and condiment bottles were also identified.

TT29 contained a linear arrangement of five detached brick piers (*111*) aligned north–south, although the southernmost footing was askew (Figure 4.18 to Figure 4.20 and refer to Figure 4.22). The spacing between the piers was irregular and ranged from approximately 1.2 metres to 1.9 metres. Each pier comprised two courses of four bricks arranged in a faux basketweave-like bond, with the centre obscured by mortar. A corresponding set of footings was identified east of the piers (*111*) outside the excavated area in dense undergrowth. An asphalt surface (*109*)—which had been significantly degraded—abutted the piers (*111*) on their western edge (Figure 4.18). An ash deposit (*108*) was also present above the asphalt surface (*109*) (Figure 4.18). This deposit contained a number of recent beer cans and plastic rubbish.



Figure 4.18 TT29, brick piers (*111* [background]), asphalt surface (*109* [foreground]), and ash deposit (*108* [centre]), facing east.



Figure 4.19 TT29, two northernmost piers (*111*), facing west.



Figure 4.20 TT29, *111*, section, facing west.

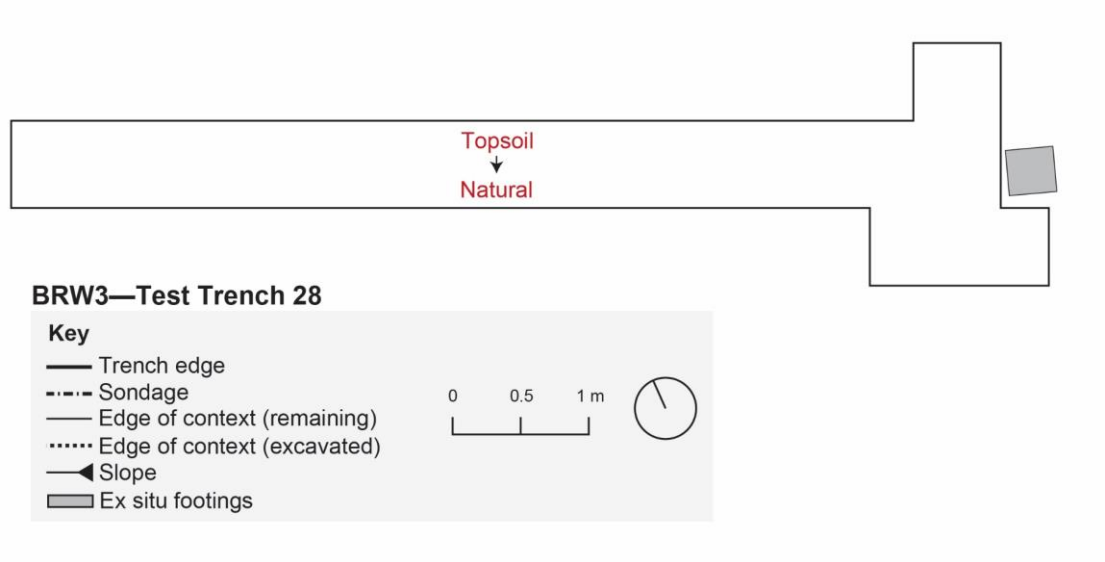


Figure 4.21 TT28.

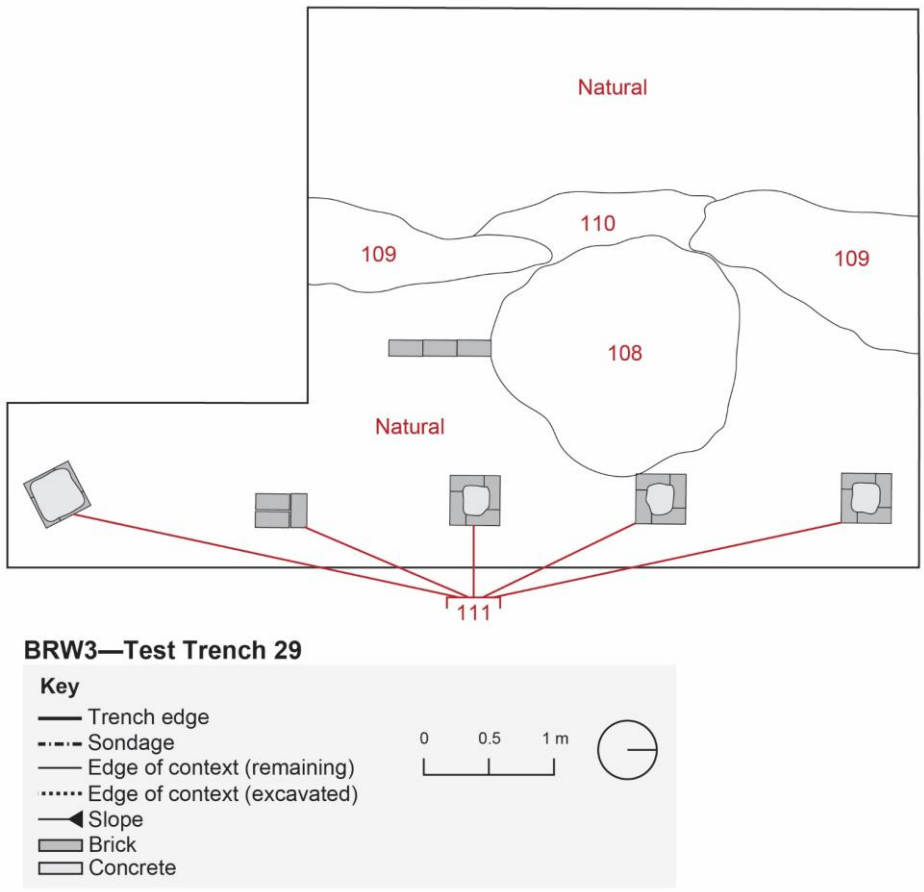


Figure 4.22 TT29.

Interpretation of structures

Evidence for a minimum of three structures was identified in the BRW2 and BRW3 areas (Section 4.1.2, Figure 4.30):

- remnant brick structure (*95*) and adjacent plumbing features (*94*);
- brick footings (*97* and *98*), concrete stumps (*99*), and asphalt surface in TT18; and
- brick piers (*111*) and asphalt surface (*109*) in TT29.

Due to the fragmentary nature of the footings in TT18 and TT29 and the lack of artefactual material that was securely identified with the associated deposits, few inferences could be made regarding the total footprints or purpose of the structures. Similar issues are associated with the remnant brick structure (*95*), however, due to its more substantial nature and association with the adjacent plumbing features, it is probable that it held a wet area of some nature.

Plans of the early married quarters or fringe camp have not been found. Existing photographs (Figure 4.23 to Figure 4.28) suggest the layout comprised a number of individual dwellings clustered around a communal building.

Several engineering drawings and aerial photographs for the later Brickworks Hostel complex, however, provide insight into the buildings that occupied the area from the mid 1940s. Some of these engineering drawings include:

- 'Amenities Block' (c1947) (Figure 4.23)—A single storey building divided into two halves, one containing a locker room, water closet, shower room, and drying room, and the other a dining room. The footprint measures 48 feet (14.6 metres) long x 42 feet (12.8 metres) wide, with offset entry ways on both short sides of the building.
- 'Amenities Block (Scheme B)' (c1947) (Figure 4.24)—A two storey building containing a locker room, water closet, drying room, and showers on the ground floor and a dining room on the upper floor. The footprint measures 42 feet (12.8 metres) long x 25 feet (7.6 metres) wide.
- 'Amenities Block' (c1947) (Figure 4.25)—A two storey building containing a locker room, water closet, drying room, and showers on the ground floor and a dining room on the upper floor. The footprint measures 46 feet (14 metres) long x 22 feet (6.7 metres) wide.
- 'Brickyard Mess House' (undated) (Figure 4.26)—A single storey 'T'-shaped building containing a kitchen, mess room, and external meat safe. The footprint for the mess room measures 60 feet (18.3 metres) long x 20 feet (6.1 metres) wide. The kitchen is adjoined at the centre, but no measurements have been provided for its dimensions. The elevation suggests foundations along the external walls.

- ‘Workmen’s Sleeping Hut’ (8 August 1945) (Figure 4.27)—A single storey building accommodating 16 bedrooms. The footprint measures 83 feet (25.3 metres) long x 15 feet (4.6 metres) wide. It is elevated off the ground by 17 sets of four stumps.
- ‘Additional Sleeping Hut’ (1 March 1948) (Figure 4.28)—A single storey building accommodating 16 bedrooms. The footprint measures 80 feet (24.4 metres) long x 19 feet (5.8 metres) wide. It is elevated off the ground by 17 sets of five stumps. An indicative plan of where this hut was to be placed in included on the right hand side of the drawing, which was adjacent to two existing huts of similar dimensions.

The three ‘Amenities Block’ drawings presumably represent multiple phases of planning for the same building.

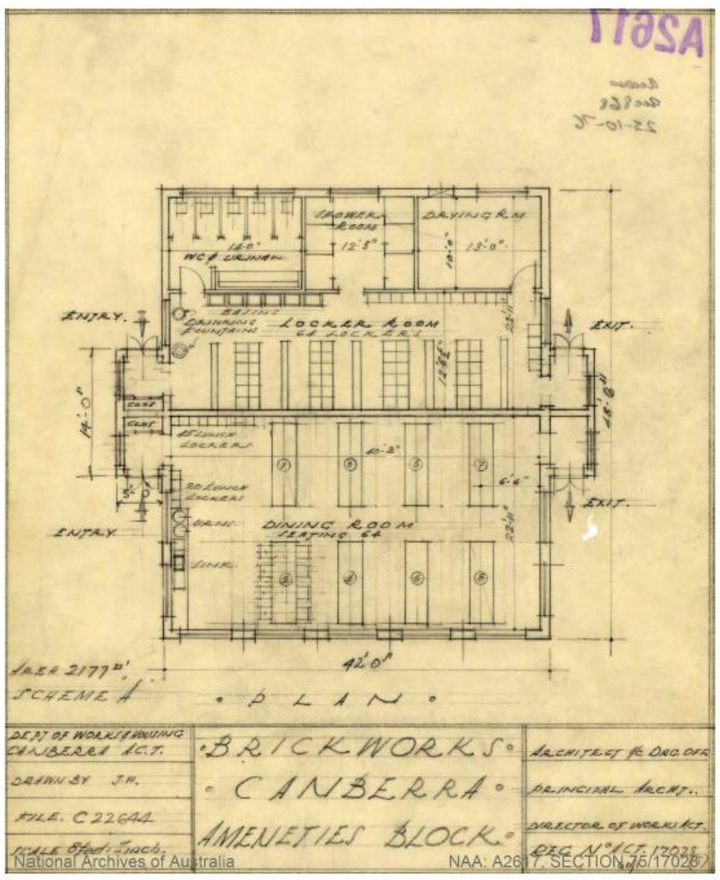


Figure 4.23 'Amenities Block'. (Source: NAA A2617, Section 75/17028)

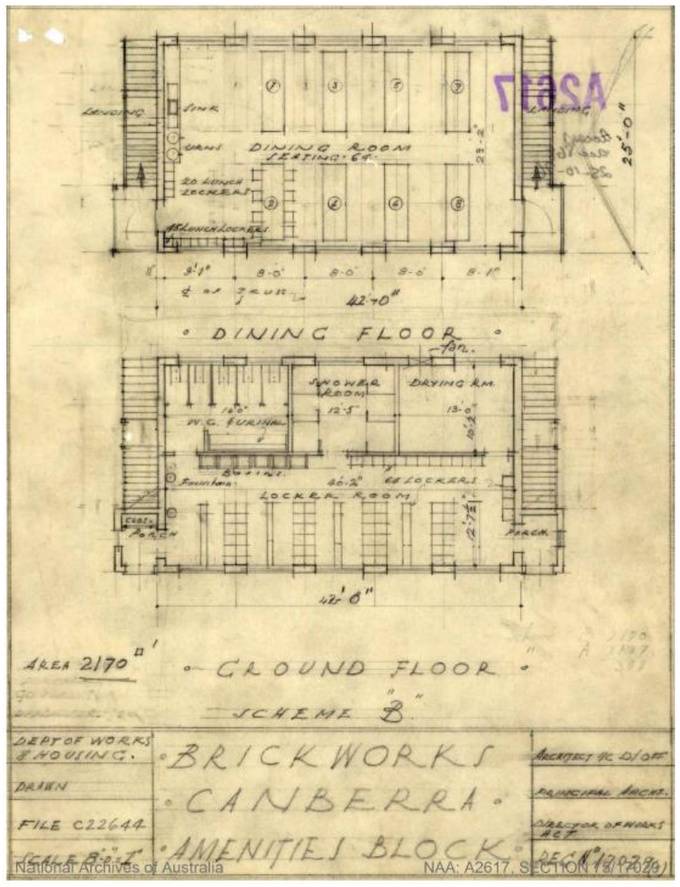


Figure 4.24 'Amenities Block'. (Source: NAA A2617, Section 75/17029)

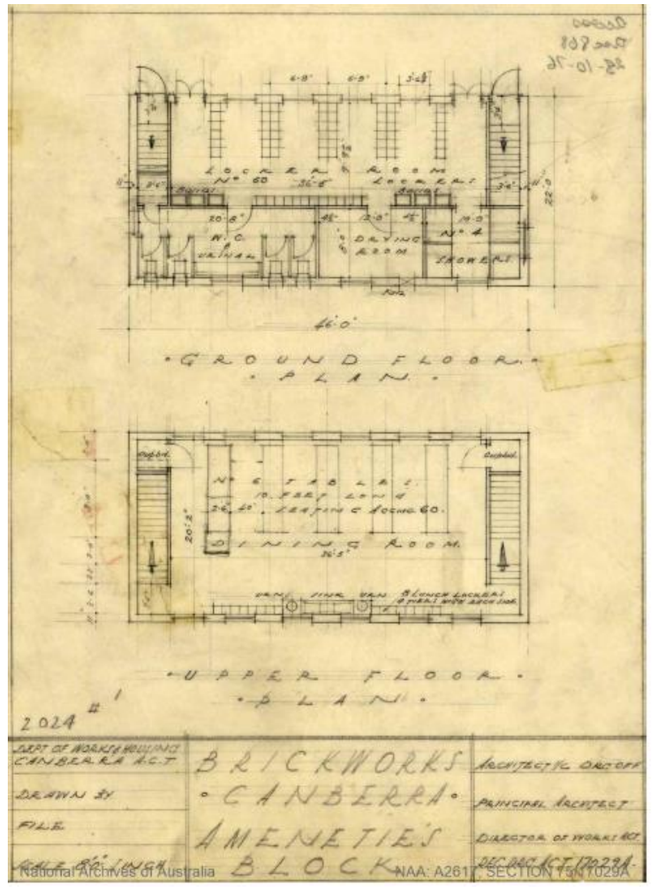


Figure 4.25 'Amenities Block'. (Source: NAA A2617, Section/17029A)

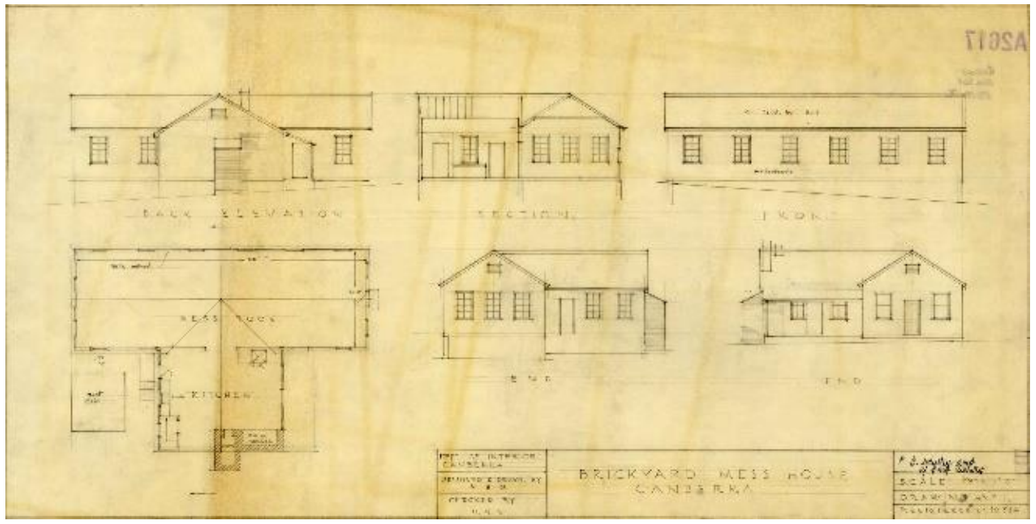


Figure 4.26 ‘Brickyard Mess House’. (Source: NAA A2617, Section75/17039)

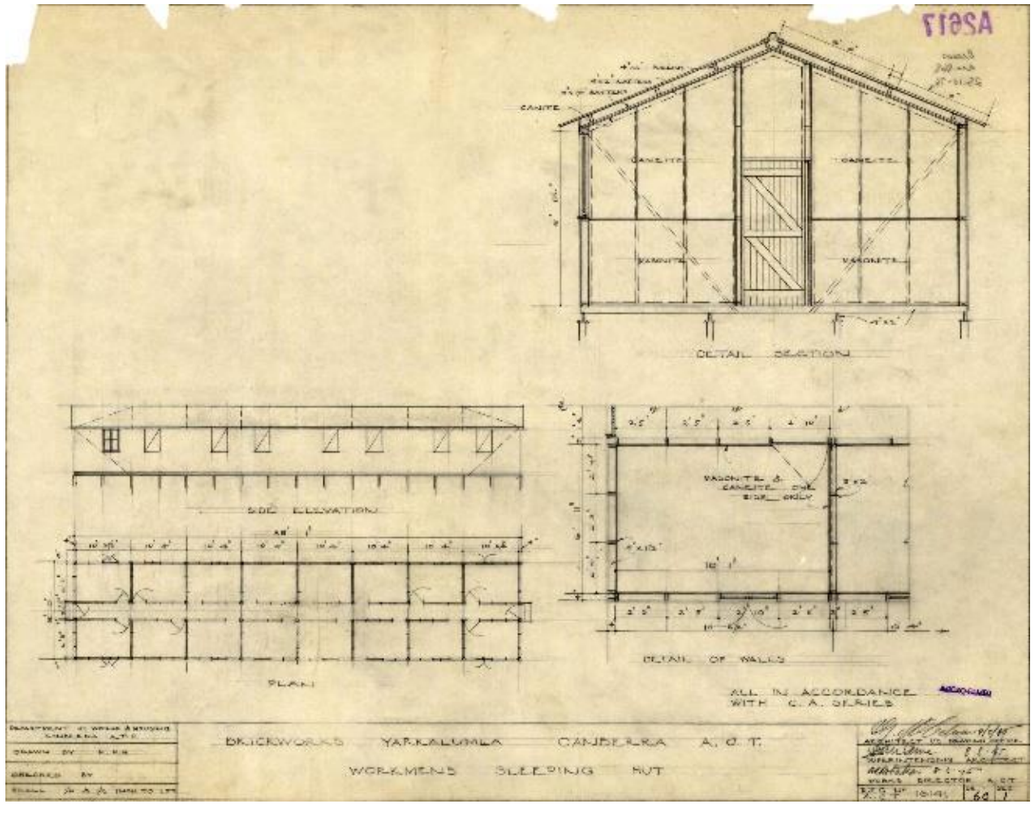


Figure 4.27 ‘Workmen’s Sleeping Hut’. (Source: NAA A2617, Section 75/16141)

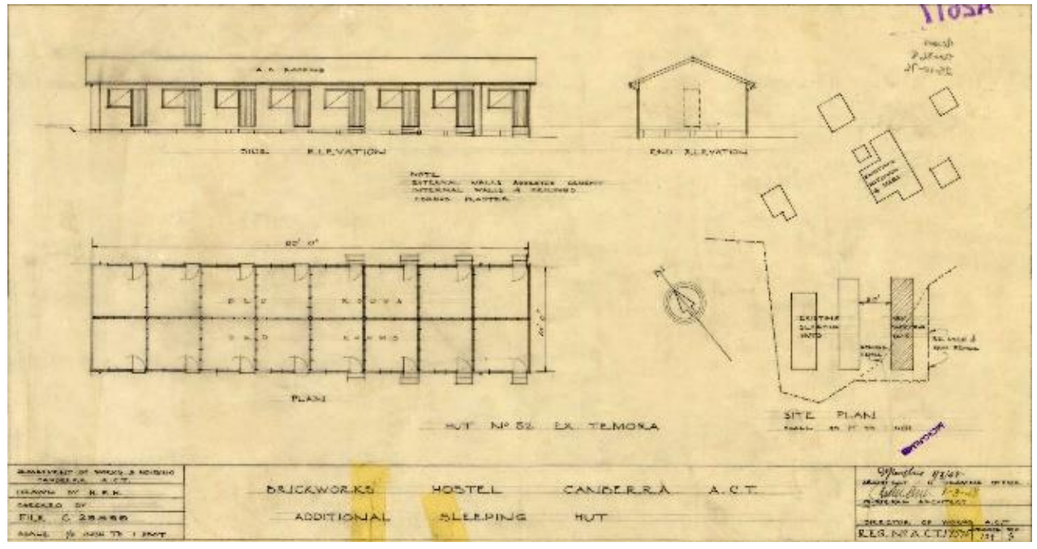


Figure 4.28 ‘Additional Sleeping Hut’. (Source: NAA A2617, Section 75/17575)

A 1950 aerial photograph shows how these buildings were laid out (Figure 4.29). Two buildings matching the approximate shapes of the 'Sleeping Huts' were located to the southwest of the site, at the end of the road and adjacent to the railway cuttings (BRW10). The 'T'-shaped building in the centre of the site is likely the 'Brickyards Mess House' (Figure 4.30), inclusive of a kitchen and messroom; adjacent to this building on its southeastern corner is a smaller structure, probably the meat safe. At least two more buildings to the north and east of the mess house are depicted in the photograph. The northernmost may be the 'Amenities Block'.



Figure 4.29 Detail from a 1950 aerial photograph showing the Brickworks Hostel area with overlaid engineering drawings. (Source: ACTPLA 29-11-1950 Run 2 Print 5101)

No archaeological evidence associated with the 1927 married quarters was securely identified. It is likely that all materials from this period of occupation were removed from site when it was demolished during World War II (Section 2.3).

The footprints of the structures identified in *95* and TT18 and 29 correlate with several of the buildings depicted in the engineering plans and 1950 aerial photograph.

The location of TT29 and the arrangement of the brick footings aligns with the 'Sleeping Huts' (Figure 4.22). The asphalt surface may have been located within the liminal space between the two huts and acted as a shared pathway. If this was the case, the footings likely belonged to the easternmost sleeping hut.

The irregular shape of the remnant brick structure (*95*) and its central location is indicative of the 'Brickyard Mess House'. The arrangement of the footings places them within the junction of the 'T'-shaped building, where the long wall of the mess room adjoins the smaller kitchen room (Figure 4.17). Given its proximity to a number of plumbing features, *95* was probably the kitchen.

The brick strip footings and concrete stumps in TT18 probably represent two structures. The more substantial brick and concrete footings in the western extent of the TT align with the remnant brick structure (*95*), indicating they probably supported the southeastern corner of the mess house (Figure 4.15). The brick strip footings adjacent to the asphalt surface, however, were too insubstantial to support a building the size of the mess house. Their location adjacent to this structure and the central road would suggest they formed part of the meat safe.

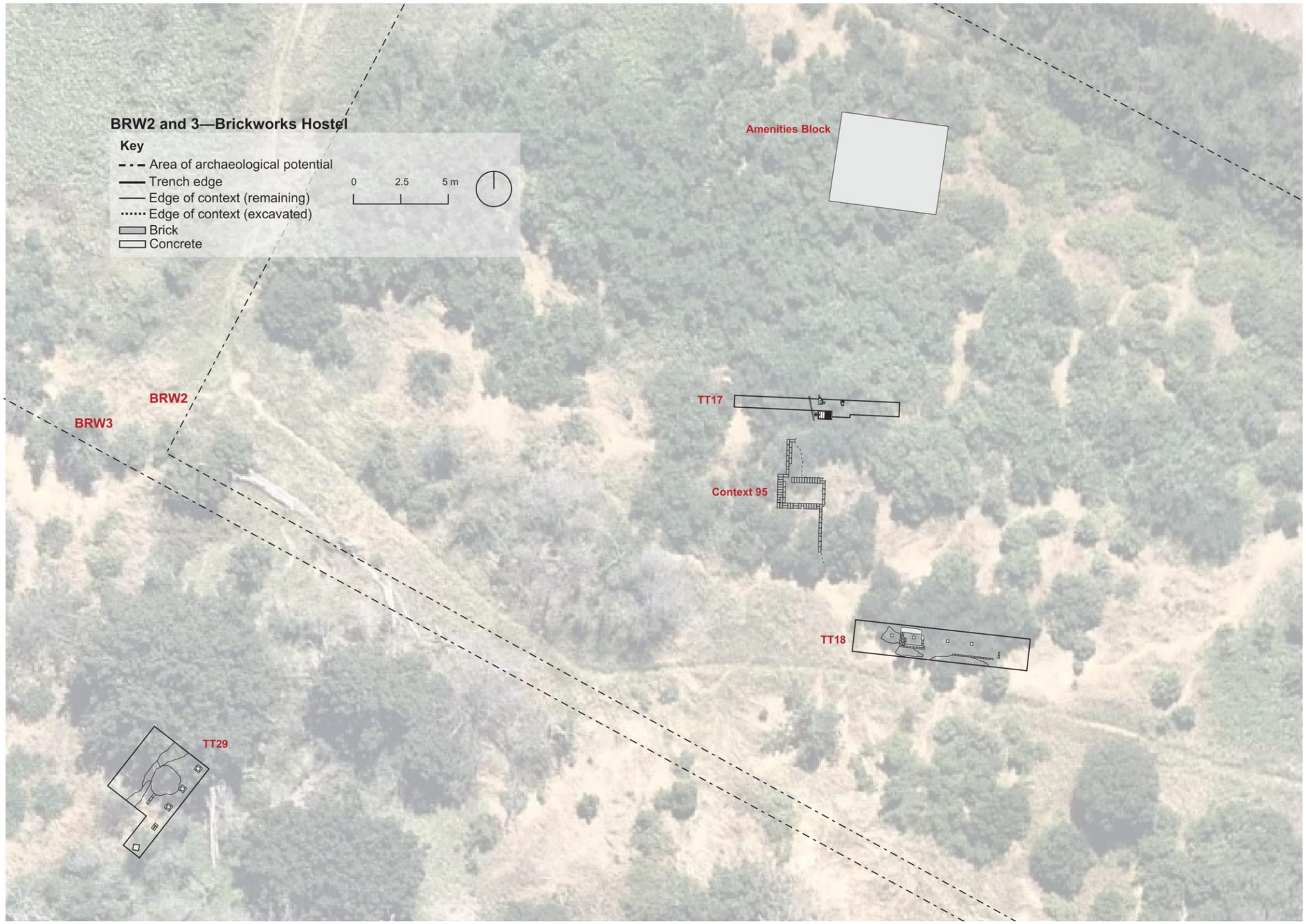


Figure 4.30 The layout of the remaining Brickworks Hostel structures. This includes the plumbing for the 'Brickyard Mess House' (TT17) and kitchen (*95* and TT18), the 'Meat Safe' (TT18), and a 'Sleeping Hut' (TT29). (Source: Near Map 2020 with GML additions)

4.1.3 BRW7—Quarry

BRW7 consists of the quarry, inclusive of the cutting and the eastern ridge. The AA identified several features:

- an in-ground circular, brick-lined tank (approximately 3 metres in diameter) that had been backfilled, located on the eastern ridge;
- a sequence of circular depressions in alignment with a row of mature pines on the southern boundary;
- two grassy mounds in the central extent, which may have been the remains of a demolished structure; and
- a raised earth embankment in the western extent of the quarry, which was likely the remnant of the c1977 model railway track.[31]

Additional inspections by GML also identified two distinct 'knoll'-like landforms located southeast of the quarry cutting on the eastern ridge, which were characteristic of spoil dumping.[32]

Contamination and geotechnical investigations within BRW7 were undertaken by Agon Environmental during 16–17 February 2021. These works were monitored by GML for impact to the identified archaeological features and the broader potential of the quarry itself. The results of the archaeological observations made during the works are included in Appendix E. Overall, the quarry was characterised by a consistent spread of brick rubble. The bricks were largely dominated by those with 'CB' frogs, followed by air bricks (bricks with holes through the centre—see Section 4.2.1), with isolated examples of bricks with frogs marked 'C'WEALTH CANBERRA', 'CANBERRA C'WEALTH', and 'CANBERRA'. The rubble varied between 3 metres to 7 metres deep. Miscellaneous discarded machinery pieces and other debris were included within the rubble. No evidence of demolished structures, model railway track embankment, or circular depressions were identified.

In addition to the 28 test units excavated by Agon Environmental, two TTs (1 and 2) were excavated in BRW7.

TT1 was oriented north–south and located adjacent to the western boundary fence of the quarry, opposite the model railway storage shed (refer to Figure 4.33). TT1 was predominantly characterised by waste deposits (*1*, *2*, *3*, and *4*) to a depth of 1.2 metres. One of these deposits—a varyingly compact crushed coal material (*2*)—had subtle stratigraphic differences within the overall matrix (Figure 4.31). This indicated that material from a single or multiple highly similar sources had been deposited in several sequential dumping events. A number of fragmented railway tracks were recovered within and below this material (Figure 4.32). Beneath this material was a varyingly compacted deposit of sandy clay containing shale and brick fragments (*3*). This in turn capped a

deposit with a 'slushy' composition that contained quantities of gravel and crushed brick inclusions (*4*).

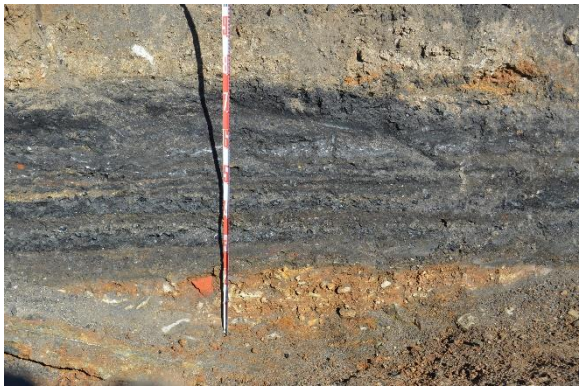


Figure 4.31 TT1, stratigraphic differences within *2*, facing west.



Figure 4.32 TT1, fragmented railway tracks within *2* and *3*, facing east.

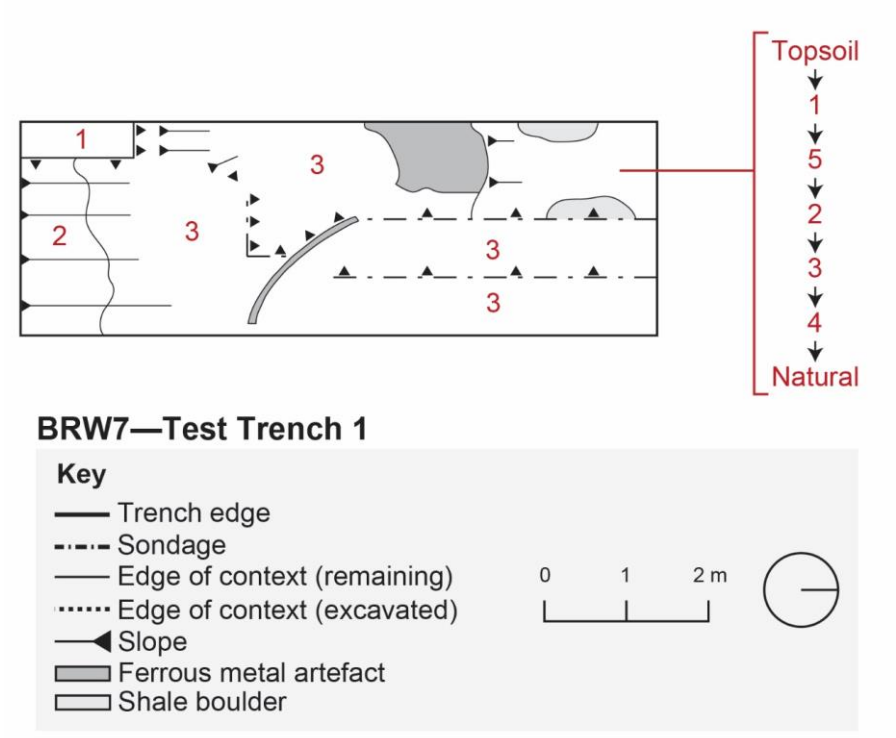


Figure 4.33 TT1.

TT2 targeted the backfilled brick-lined tank located on the eastern ridge overlooking the quarry face (refer to Figure 4.35). No evidence of a tank was identified. The circular surface expression was an incidental arrangement of brick rubble (*6*). The excavation revealed that the underlying soil matrix comprised only brick rubble to a depth of 1.7 metres, which was consistent with observations made during the geotechnical investigations (Figure 4.34).



Figure 4.34 TT2, brick rubble (*6*), facing west.

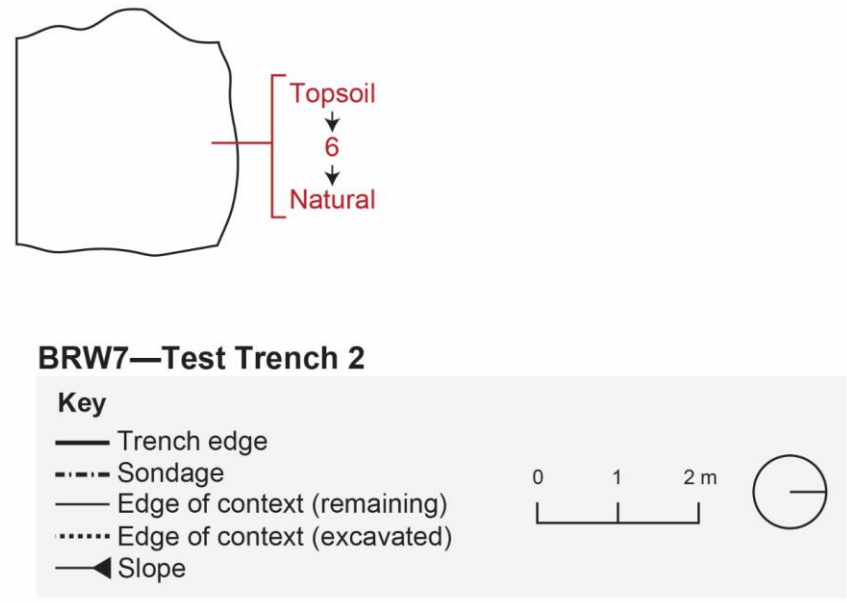


Figure 4.35 TT2.

4.1.4 BRW8—Old kiln and dormitories

BRW8 consists of the historical location of the 1913 kiln complex and 1916 dormitories and bathhouse area. The AA stated that these structures were likely demolished by the mid-1920s and replaced with a carpark in the 1960s–1970s.[33] None of these features were expressed on the ground surface.

Eight TTs were initially excavated in BRW7 (TTs 7, 8, 9, 10 North and South, 11, 30, 31, and 32). Five of these were incorporated into and re-excavated as part of OA1 (TTs 9, 10 North, and 30) and OA2 (TTs 10 South and 11). The results from TT9, 10 North, 10 South, 11, and 30 are discussed below as part of the relevant OA.

TT7 and 8 were located on a gently sloping east–west hill north of Denman Street, south of the southern quarry boundary fence (refer to Figure 4.37 and Figure 4.38). Both TTs were characterised by a widespread cut (*30*) that was filled with friable reddish brown clayey sand with a high proportion of brick rubble (predominantly 'CANBERRA' frog) (*29*). A large proportion of these bricks were misfired clinkers and callows. In TT7, this cut (*30*) had completely removed the cut (*33*) and fill (*31*) for a ferrous water pipe (*32*), leaving the pipe exposed at the base of the rubble (*29*) (Figure 4.36). The pipe was aligned southeast–northwest and was also identified in TT9, 10, and OA1.



Figure 4.36 TT17, the ferrous water pipe (*32*) at the base of a later cut (*30*) and rubble deposit (*29*), facing east.

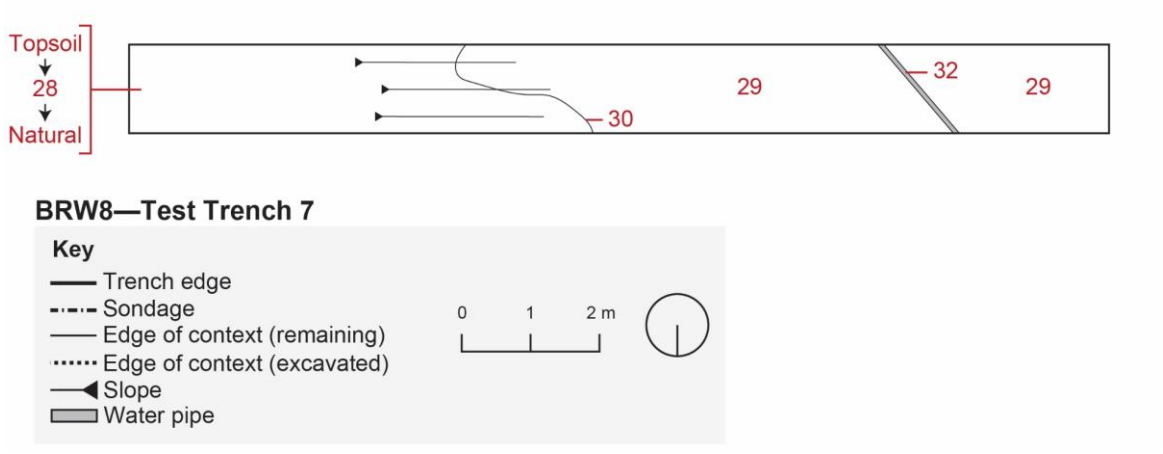


Figure 4.37 TT7.

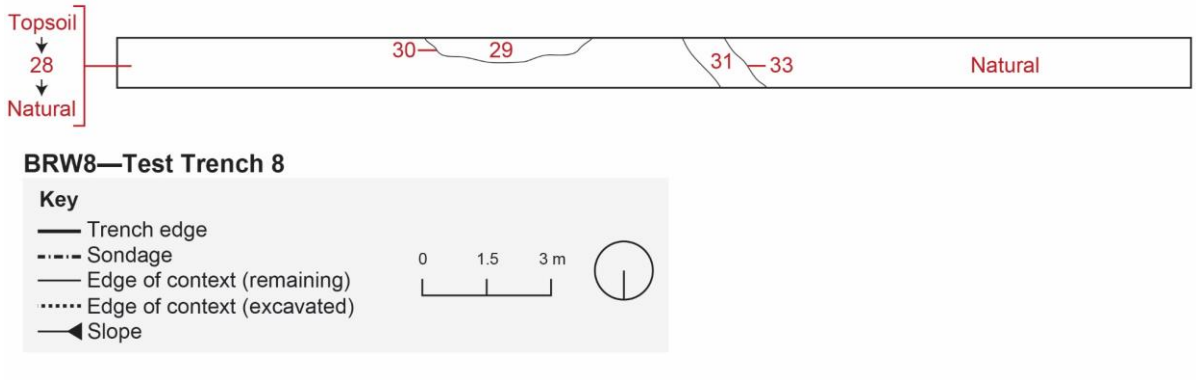


Figure 4.38 TT8.

The excavation of TT10 identified several areas of burnt and baked clay (discussed further below). At the northern extent of TT10 adjacent to one of these areas was a concentration of loosely compacted whiteish grey ash (*113*) and a loosely compacted mid reddish brown sandy clay containing crushed brick rubble (*114*) (Figure 4.39). TT31 and 32 were subsequently excavated either side of TT10 to investigate the extents of these deposits and whether they were associated with any in situ structures. They were found to be redeposited materials relocated from elsewhere on site.



Figure 4.39 Northern end of TT10, loosely compacted ash (*113*) and crushed brick rubble (*114*), facing southeast.

OA1

OA1 was located north of and adjacent to the southern boundary fence for the quarry. It comprised a predominantly level area and the termination of a slope to the east.

The upper stratigraphy of OA1 was largely homogenous across the entire excavation area. Removal of the topsoil revealed a number of discrete but associated deposits, including:

- a friable yellowish blue ashy clay with brick rubble and gravel in the eastern extent (*39*);
- a compact mid pinkish yellow mottled silty clay (*89*); and
- a loosely compacted mid reddish brown clayey sand containing brick rubble in the northeastern extent (*129*).

Underlying these deposits—and in some instances immediately below the topsoil—was a very compact crushed yellow granite gravel deposit (*41*, similar to *35* and *83*) (Figure 4.40). This gravel was consistent with materials used in 1960s–1970s carparks in Canberra. The deposit was level with a roughly consistent depth of 0.1 metres across almost the entire extent of OA1. All other archaeological features were identified in the stratigraphic matrix below the yellow gravel (*41*) (Figure 4.43 and Figure 4.51).



Figure 4.40 OA1, *41* (yellow gravel) beneath *129*, facing east.

A number of discrete features were identified in TT9, 10 North, and 30 that warranted further investigation. These included:

- a brick-lined spoon drain (*50*); and
- a sequence of brick features belonging to a kiln (*137*) embedded in an area of baked and heat-affected clay (*69* and *140*).

During the excavation of OA1, two additional structural features were identified:

- the partial remains of brick footings (*124*) and associated demolition rubble (*125*); and
- a brick box drain (*132*).

There was no clear association between any of these structural features (refer to Figure 4.41).

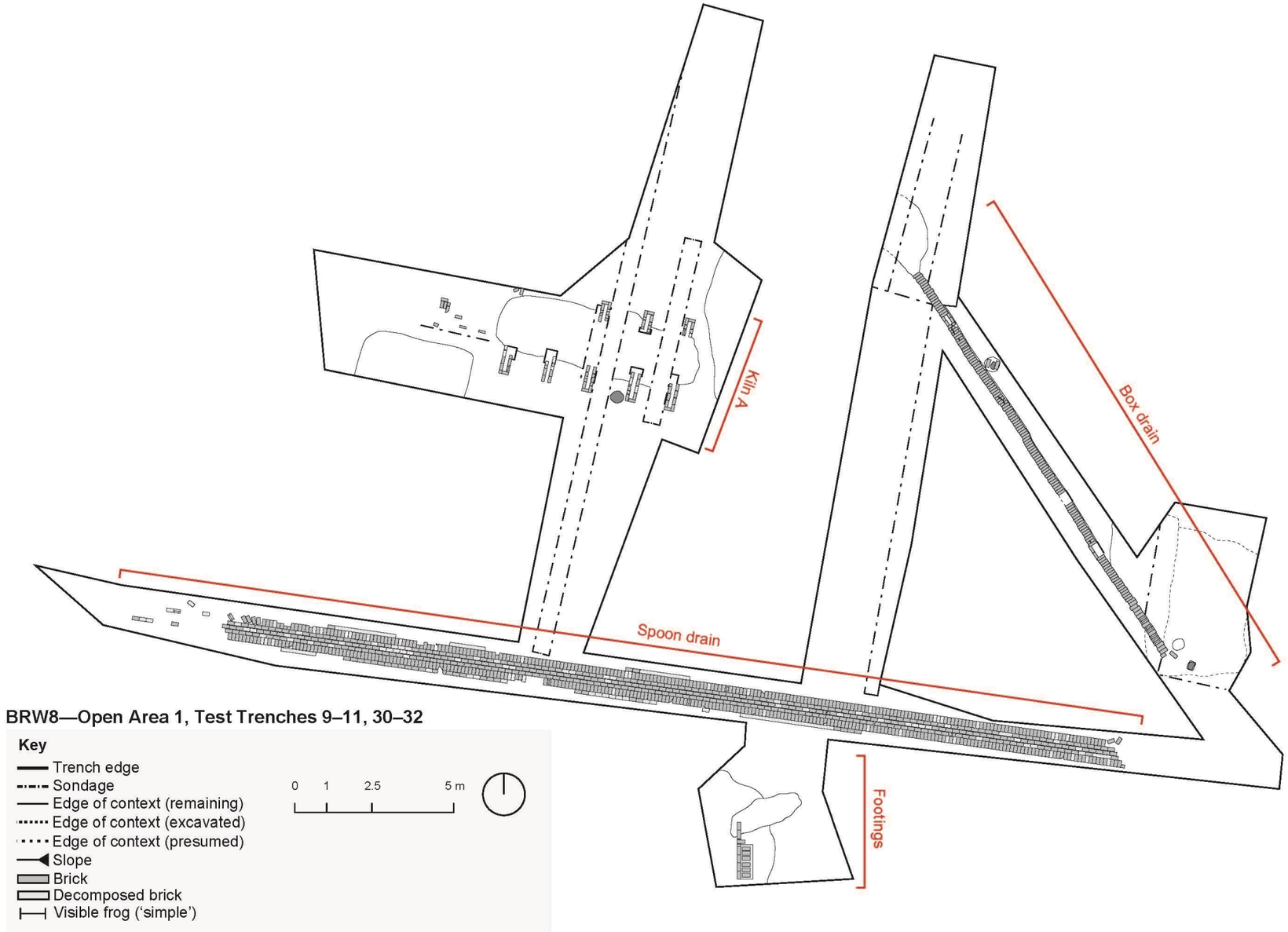


Figure 4.41 OA1 features.

Spoon drain (context *50* group)

The context *50* group comprised a brick-lined spoon drain aligned east–west through the centre of OA1 that measured approximately 32 metres long x 0.75 metres wide x 0.11 metres deep (Figure 4.47 and refer to Figure 4.48). The base of the drain (*50*) had been constructed from three rows of bricks set in a roughly regular stretcher bond pattern, with a gutter formed by a single row of perpendicular bricks at an angle of approximately 130 degrees (Figure 4.42). In some places, an additional stretcher bond row capped the perpendicular bricks. Where the brick frogs were visible, these were 'simple' (brick frogs are discussed in Section 4.2.1).



Figure 4.42 OA1, the spoon drain (*50*), facing east. The drain was constructed from three stretcher rows, guttered by a single row of soldiers. An additional stretcher row capped the soldiers in some places (right).

The drain (*50*) had been filled with a moderately compact mid greyish brown clayey silt (*49*), which contained a variety of artefacts, such as faunal remains, oyster shells, and a glass marble (Section 4.2). It is probable that this material accumulated during the use of the drain, rather than immediately prior to its decommissioning.

The surfaces that the drain (*50*) had been cut into was occasionally unclear. Often this comprised natural soils, however, south of feature *137* this included heat-affected clays (*46*, *52*, and *56*). It was unclear whether the baked clays had been heat-affected prior to the construction of the drain, or whether the heating event occurred after the installation of the drain.

The eastern extent of the drain (*50*) appeared to be its natural conclusion, although it had been partially disturbed on its northern margin. Embedded in natural clay, the bricks had been arranged in a staggered diagonal pattern (Figure 4.44). The western extent of the drain had, however, been removed by a later cut (*148*) (Figure 4.45). It is unknown how much of the drain had been removed by *148*. The drain had been cut in one other place by the installation of the subsurface electrical wires for an electrical services pole (*149*, *150*, and *151*) (Figure 4.46).



Figure 4.43 TT10 North, the spoon drain (*50*) and fill (*49*) were immediately overlaid by the yellow carpark gravel (*41*), facing east.



Figure 4.44 OA1, the spoon drain (*50*), the eastern extent, facing south.



Figure 4.45 OA1, the spoon drain (*50*), cut by *148*, facing east.



Figure 4.46 OA1, the spoon drain (*50*), cut by the subsurface services for the electrical services pole (*150*), facing east.



Figure 4.47 OA1, the spoon drain (*50*) and associated contexts, facing east.

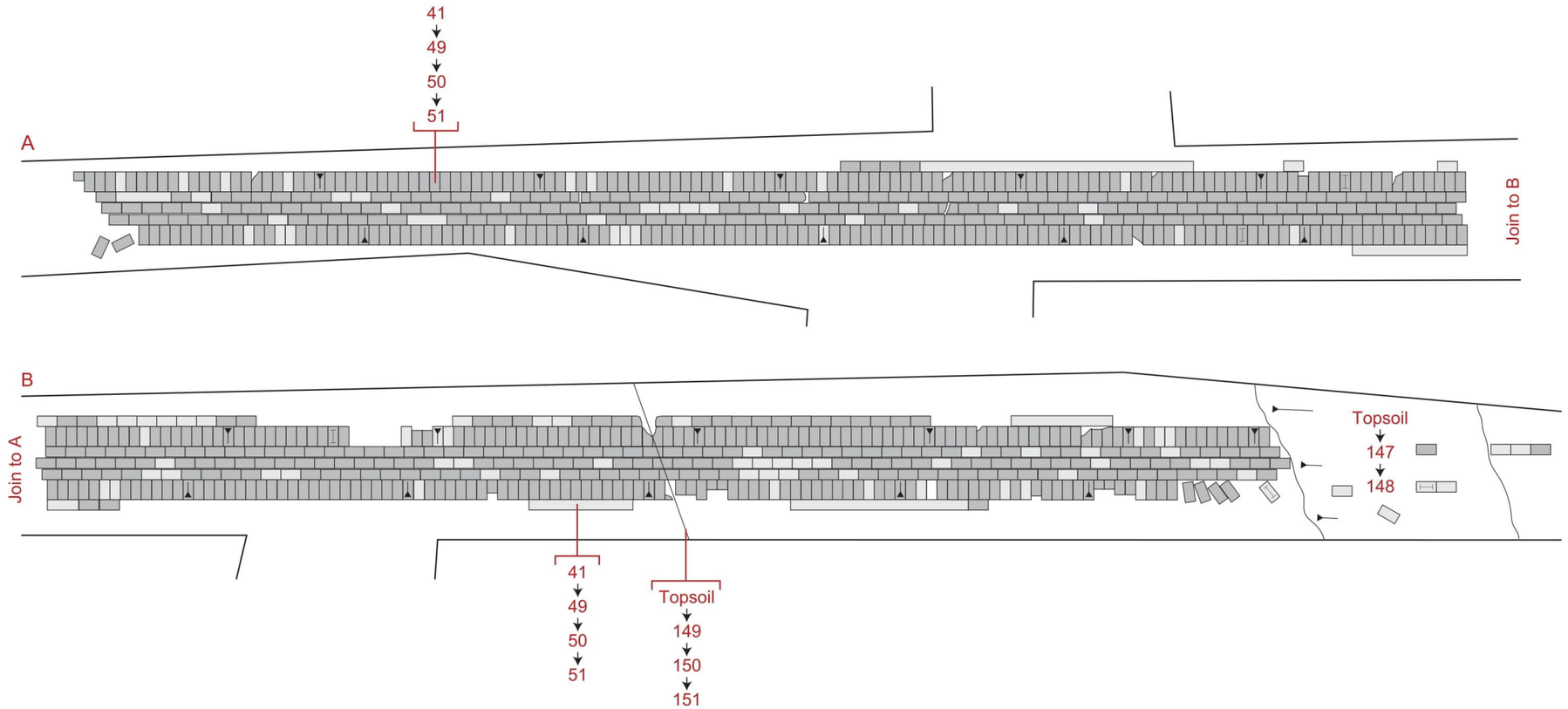


Figure 4.48 OA1, the spoon drain, context *50* group.

Brick and concrete footings (context *124* group)

The context *124* group consisted of a series of partially demolished brick and concrete footings (*124*) and associated demolition rubble (*125*) located in the southern extent of OA1 adjacent to the boundary fence (Figure 4.49 and refer to Figure 4.50). The footings had been constructed from a row of six bricks placed in the soldier position and bonded in cast concrete, which sloped on the eastern edge. These were adjoined to seven bricks on their western edge, six of which were arranged in stretcher bond. All visible frogs were 'simple'.

A friable ash and charcoal deposit (*126*) was identified adjacent to the footings, however, the connection between the two features could not be established.

The presence of a mature shrub in the internal space of the footings obscured identifying any further footings or deposits associated with their use. Additionally, no artefacts were identified in any of the excavated deposits.



Figure 4.49 OA1, the brick and concrete footings (*124* [left background]) and ash deposit (*126* [right mid- and foreground]), facing west.

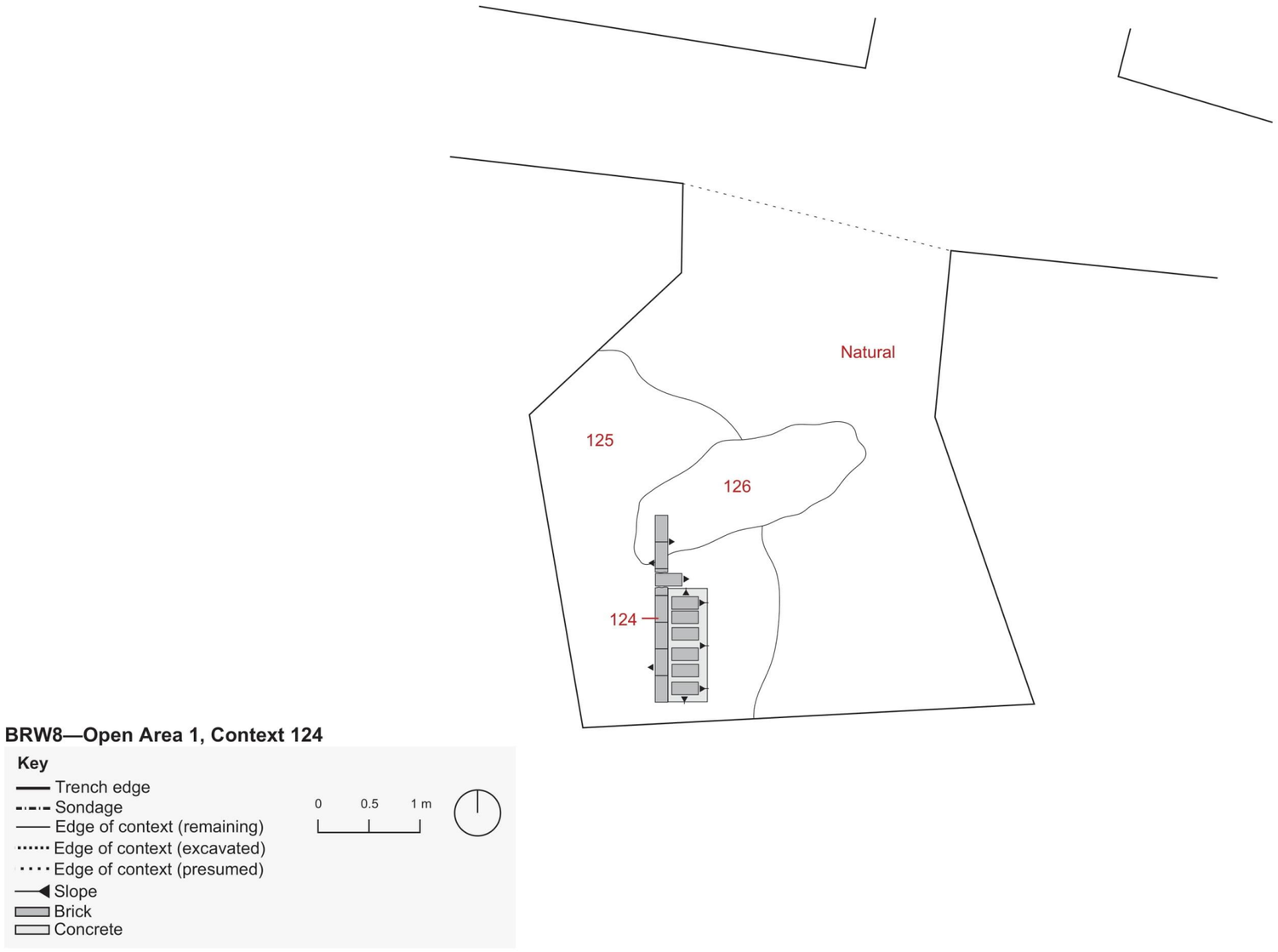


Figure 4.50 OA1, the brick and concrete footings, context *124* group.

Box drain and postholes (context *132* group)

A brick box drain (*132*) was located in the northeastern extent of OA1 (refer to Figure 4.56). The drain was oriented northwest–southeast and measured approximately 14.7 metres long x 0.24 metres wide x 0.2 metres high (Figure 4.55 and Figure 4.51). It had been constructed from two rows of shiner bricks placed approximately 0.06 metres apart, capped by a single line of row lock bricks. Many of the bricks were misaligned or crooked. All visible frogs were 'simple'. The fill (*131*) in the drain was a moderately compact dark reddish brown clayey silt. No artefacts were identified within the portions of fill that were sampled for excavation. The base of the drain rested directly on natural soils.



Figure 4.51 OA1, the brick box drain (*132*) and overlying stratigraphy (including *41*), facing northeast.

At its western end, the drain appeared to terminate naturally within a 'spill' of compact brownish orange silty clay (*133*) (Figure 4.52). However, a sondage excavated within the clay (*133*) identified a quantity of brick rubble, indicating the western extent of the box drain (*132*) had been disturbed. The eastern extent of the drain ended similarly ambiguously within a deposit of compact crushed charcoal (*135*) and loosely compact decomposed mortar (*134*) (Figure 4.53). The eastern end of the drain was not in an alignment that would have allowed it to join to the brick spoon drain (*50*).

Three postholes were aligned with the drain (Figure 4.54). The central posthole (*158* and *159*) was circular in plan, with two 'simple' frogged bricks embedded in the sides and filled with a partially decomposed rectangular timber post. The two eastern post holes (*160* and *161*, and *162* and *163*) were similar—*161* was circular in plan and filled with decomposed organics, whilst *163* was rectangular and contained a partially decomposed rectangular timber post. The eastern postholes had been overlaid by the crushed charcoal (*135*) and decomposed mortar (*134*) deposits.

The association of the crushed charcoal (*135*) and decomposed mortar (*134*) with the other features in the *132* group was ambiguous. The roughly rectangular shape of the deposits was reminiscent of a building footprint, however, no further structural features or accompanying artefacts were identified (Figure 4.53). Moreover, the lack of brick or timber inclusions within the decomposed mortar (*134*) suggested it did not originate during a demolition event, despite the high level of decomposition.



Figure 4.52 OA1, western extent of the brick box drain (*132*) where it terminates in orange silty clay (*133*), facing east.



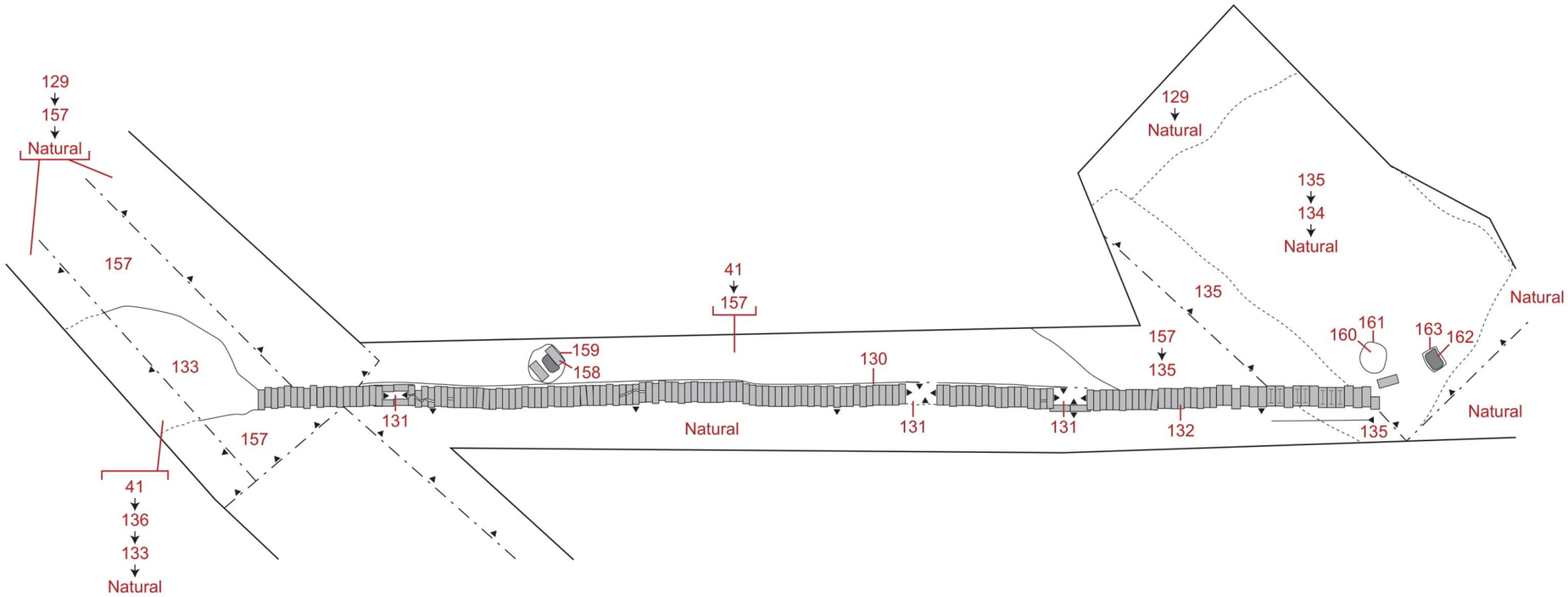
Figure 4.53 OA1, eastern extent of the brick box drain (*132*) where it terminates in decomposed mortar (*134*) and crushed charcoal (*135*), facing west.



Figure 4.54 OA1, postholes aligned with the brick box drain (*132*), facing northeast. Left: *158* (fill) and *159* (cut). Right: *160* (fill) and *161* (cut). Far right: *162* (fill) and *163* (cut).



Figure 4.55 OA1, the brick box drain (*132*) and associated contexts, facing north.



BRW8—Open Area 1, Context 132

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Brick
- Decomposed organics
- Visible frog ('basic')

0 0.5 1 m

Figure 4.56 OA1, brick box drain, context *132* group.

Kiln A (context *137* group)

The context *137* group was located in the western extent of OA1 (refer to Figure 4.60). It was characterised by several brick structures (*137*) embedded in an expanse of extremely compact heat-affected mid orangey red clay (*140*) (Figure 4.59). The structures formed the internal space of a kiln (Kiln A).

The structures consisted of three complete pairs and two partial pairs of elongated 'U'-shaped brick channels. The total feature measured 7.5 metres long x 3 metres wide, with 1 metre spacing between each structure. There was some consistency in the design of the structures—each had been formed from a single header brick and two rows of stretchers, one of which was placed in a head joint against the header brick (Figure 4.57). 'Simple' frogged bricks had been used. The number of courses varied between two and three, occasionally within the same pair of structures. This arrangement created a central cavity that had been filled with a friable mid orangey red sand with white ash and crushed brick (*139*), occasionally with additional slag inclusions (*221*). No other artefacts were identified within this matrix.

The presence of a considerable amount of rubble through the centre of the feature was initially interpreted as a later cut (*141*) and fill (*142*) event. However, further investigation between the two eastern-most structures suggested it may be part of the internal space and intended use of the feature (Figure 4.58). Regardless, the creation of this internal deposit resulted in disturbance to the brick features—whilst they appeared as 'pairs', the fragmented internal ends of the features was indicative of disturbance and that they had once been complete 'strips'.

The sondage also revealed the stratigraphy underlying the baked clay (*140*) (Figure 4.58). The upper 0.25 to 0.30 metres of stratigraphic matrix comprised the extremely compact clay (*140*), which capped intact natural soil horizons (*69*). These horizons had taken on a darkened, 'burnt' or 'smoke-affected' look.

Several additional features were present in the same area (Figure 4.59). West of the brick structures (*137*) was a small area of laid bricks (*143*), but due its fragmentary nature could not be definitively associated with the former feature. If it was part of the kiln structure (*137*), it may have acted as a production floor for shaping and preparing the green bricks for firing. A circular posthole filled with decomposed organics (*154* and *155*) was located on the southern edge of the brick structures (*137*); no corresponding postholes were found elsewhere within the excavated area. A later cut (*145*) filled with compact dark blackish brown silty clay (*146*) had removed the southwestern extent of the brick structures (*137*).



Figure 4.57 OA1, brick structures (*137*), heat-affected clay (*140*), and central rubble (*142*), facing west.



Figure 4.58 OA1, underlying darkened natural soil profile (*62*), brick structures (*137*), heat-affected clay (*140*), and central rubble deposit (*142*), sondage section, facing east.



Figure 4.59 OA1, brick structures embedded in the heat-affected clay (*137* and *140* [centre]), laid bricks (*143* [mid far left]) of Kiln A, and later cut (*145* [bottom left]), facing north.

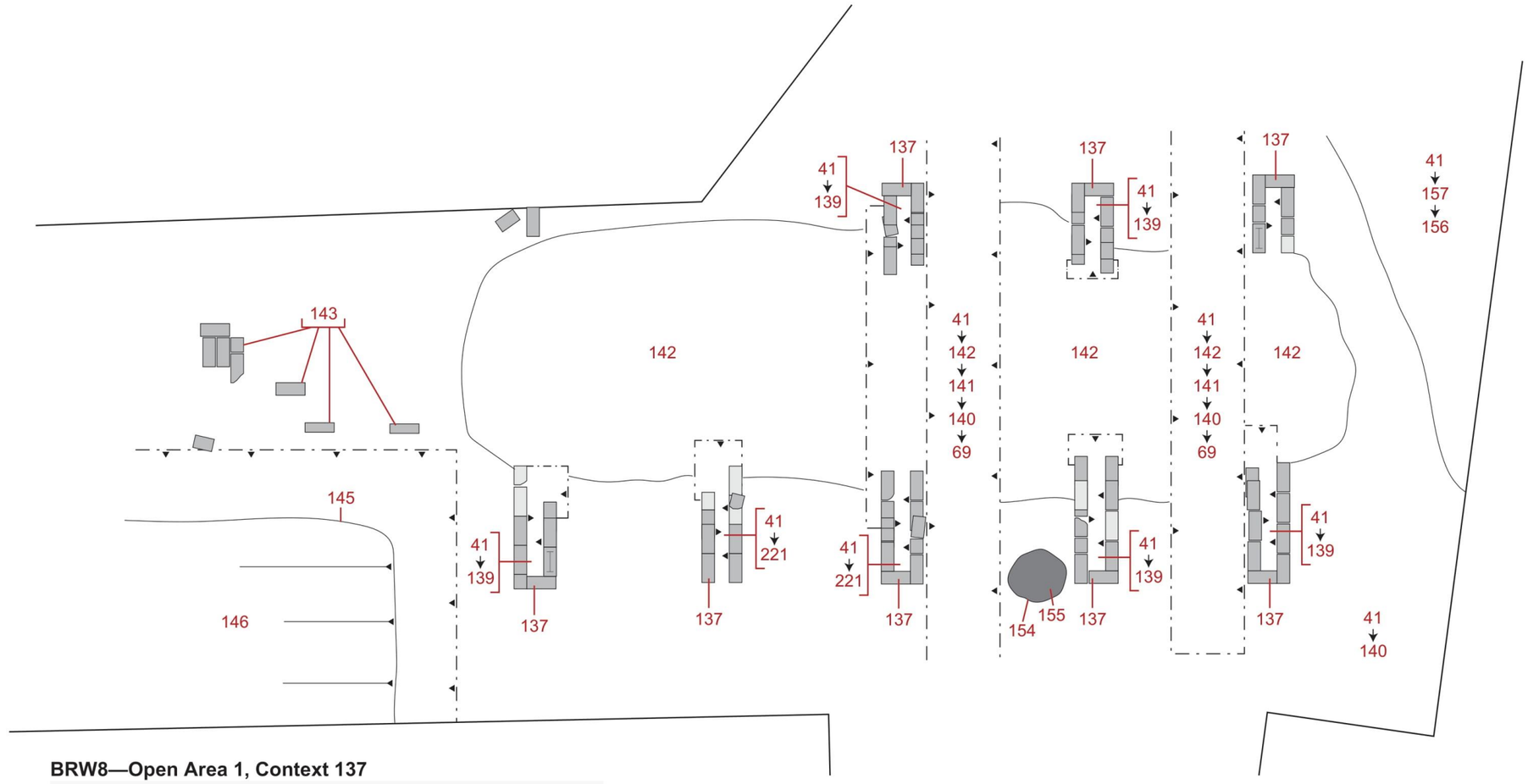


Figure 4.60 OA1, Kiln A, context *137* group.

OA2

OA2 was located south of the southern boundary fence for the quarry adjacent to Denman Street. It comprised a predominantly level area and the termination of a slope to the east.

The excavation of TT10 South identified part of the internal firing space and eastern external wall of a kiln (*115*), whilst further isolated remnant footings were identified throughout TT11 (*72*, *179*, and *195* and *196*). As a result, the area encompassing these features was opened up as OA2.

Similarly to OA1, the upper stratigraphy of OA2 was largely homogenous. The crushed yellow granite gravel deposit (*41*) was present in the western extent of OA2 and immediately overlaid the features associated with Kiln B (*115*). The remainder of the OA was characterised by widespread rubble deposits. In the central extent this was a moderately to loosely compact mid reddish brown deposit with a high proportion of brick rubble (*76*); the eastern extent was overlaid by a friable reddish brown clayey sand with a high proportion of brick rubble (*29*). Artefacts—predominantly glass beer bottles—associated with one of the rubble deposits (*76*) dated to the mid 1930s. A concentrated artefact lens (*222*) within the rubble (*76*) contained large quantities of glass condiment jars, personal hygiene product jars, and domestic electrical items such as light fittings and door locks (Section 4.2). Few artefacts were recovered from the second rubble deposit (*29*), however, the deposit contained 'CANBERRA' frogged bricks indicating it likely also dated to the 1930s (Section 4.2).

Beneath these deposits, four kiln structures were identified:

- a set of partial western (*164*) and eastern and northern (*115*) walls and associated internal heat-affected clay (*118* and *119*) surfaces;
- a set of partial eastern walls (*179* and *180*) and associated internal heat-affected clay (*173* and *174*) surfaces;
- a set of partial western (*72* and *223*), northern (*166*), and eastern (*167*) walls, including a brick-lined flue channel (*168* and *170*), and associated internal heat-affected clay (*203* and *204*) surfaces; and
- a set of partial western (*196*) and eastern (*195*) walls, including a flue channel (*193*), and associated internal heat-affected clays (*190* and *199*) surfaces.

These kilns were aligned in a single northwest–east row across the space (refer to Figure 4.61).

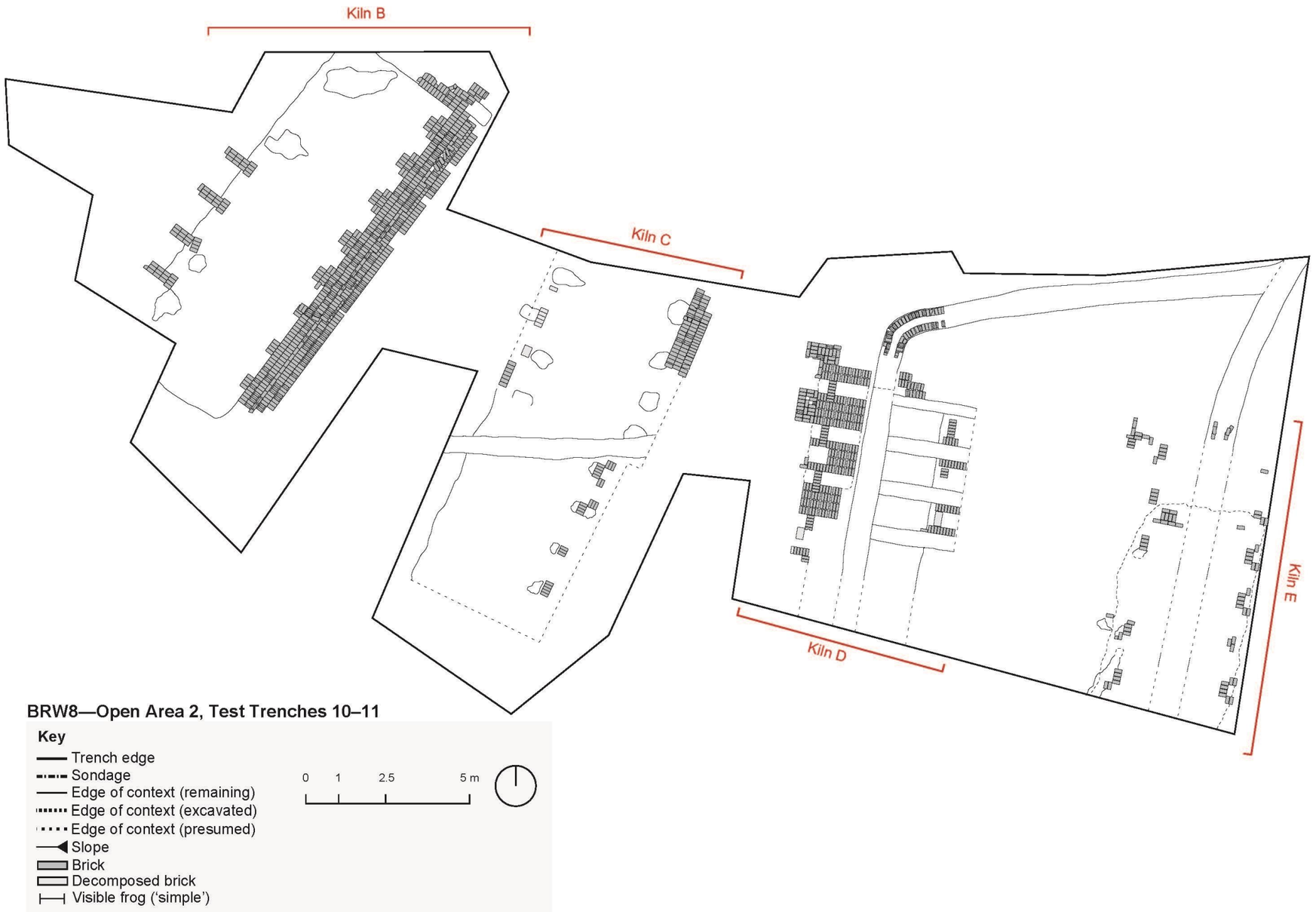


Figure 4.61 OA2 features.

Kiln B (context *115* group)

In the far western extent of OA2 was the context *115* group (Figure 4.67). It comprised an eastern and partial northern external wall (*115*) and several isolated footing pads for a western external wall (*164*) of a kiln structure (Kiln B). The internal floor space was composed of several discrete layers, including an area of extremely compact heat-affected mid orangey red clay (*118* and *119*). A number of ash deposits were also located throughout the internal space (*121* and *122*), however, not within the fireboxes formed by eastern external wall (*115*)—these had been filled with sandy deposits (*117* and *123*).

The eastern external wall (*115*) had been constructed from two courses of 'simple' frogged bricks (Figure 4.62). The bottom course consisted of four rows of header bricks, separated into pairs by a single line of stretchers. An additional fifth row of headers was occasionally present on the western edge of the formation when needed to support the upper course. This course had been used to create fireholes. Three rows of header bricks formed the northern and southern sides, whilst a 'U'-shaped formation of four headers and two pairs of stretchers 'capped' the gaps on the internal side of the eastern external wall (*115*) (Figure 4.65). Each firehole cavity was spaced 1.09 metres apart and measured 0.32 metres wide. The return northern external wall (*115*) comprised two rows of header bricks.

Between approximately 3.27 metres and 3.5 metres west of the eastern external wall (*115*) were the footings for the western external wall (*164*) (Figure 4.63). Highly fragmentary, *164* comprised four discrete brick footing pads. Whilst some of the pads had been disturbed, they generally had been constructed from a single course of four rows of header bricks capped by a single stretcher on the western edge. They were approximately aligned to the spaces between the fireholes in the eastern external wall (*115*).

The internal space between the eastern (*115*) and western (*164*) external walls was filled with a friable mid reddish orange clayey sand (*118*), which overlaid an extremely compact heat-affected mid reddish orange clay (*119*). The compact clay (*119*) was approximately 0.23 metres thick and capped a natural soil horizon that had taken on a darkened, 'burnt' or 'smoke-affected' look (*120*) (Figure 4.64).

Several ash deposits (*121* and *122*) were distributed throughout the internal space of the eastern (*115*) and western (*164*) external walls, some of which were located adjacent to the eastern wall on its western edge (Figure 4.66). No ash deposits were identified in the eastern fireholes. These had been filled with very compact mid whiteish yellow sandy clay (*117*) and loosely compacted greyish brown sandy silt (*123*). Artefacts identified in these contexts dated to the early 1920s (Section 4.2).

Beneath the northeastern corner of the eastern external wall (*115*) was a cut (*211*) and fill (*210*) feature. The cut was regular, with vertical sides and a flat base, and had been filled with a friable mid to dark greyish brown sandy clay, which included a quantity of crushed brick rubble and partially decomposed timber post.



Figure 4.62 OA2, the eastern external wall (*115*), facing northwest.



Figure 4.63 OA2, one pad in the western external wall (*164*), facing north.



Figure 4.64 TT10 South, the heat-affected clay (*119*, upper) and underlying darkened natural soil profile (*120*, lower), facing east.



Figure 4.65 TT10 South, the fireholes in the eastern external wall (*115*), facing northwest.



Figure 4.66 TT10 South, an ash deposit (*121*) in the internal space of Kiln B adjacent to the eastern and northern external wall (*115*).

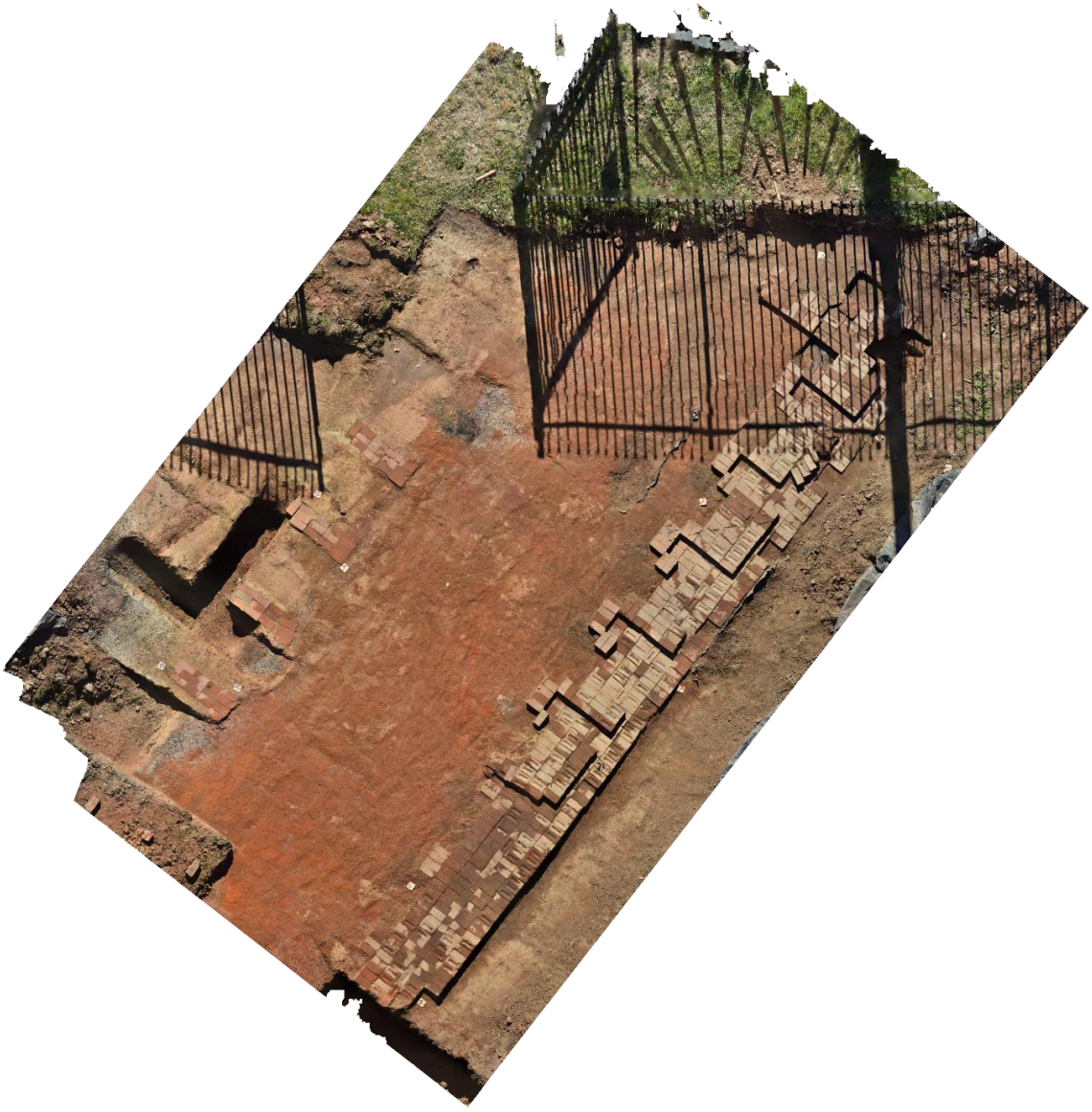


Figure 4.67 OA2, the western *164* (left) and eastern *115* (right) external walls, and heat-affected clay firing floor (*119*, centre) of Kiln B, facing north.

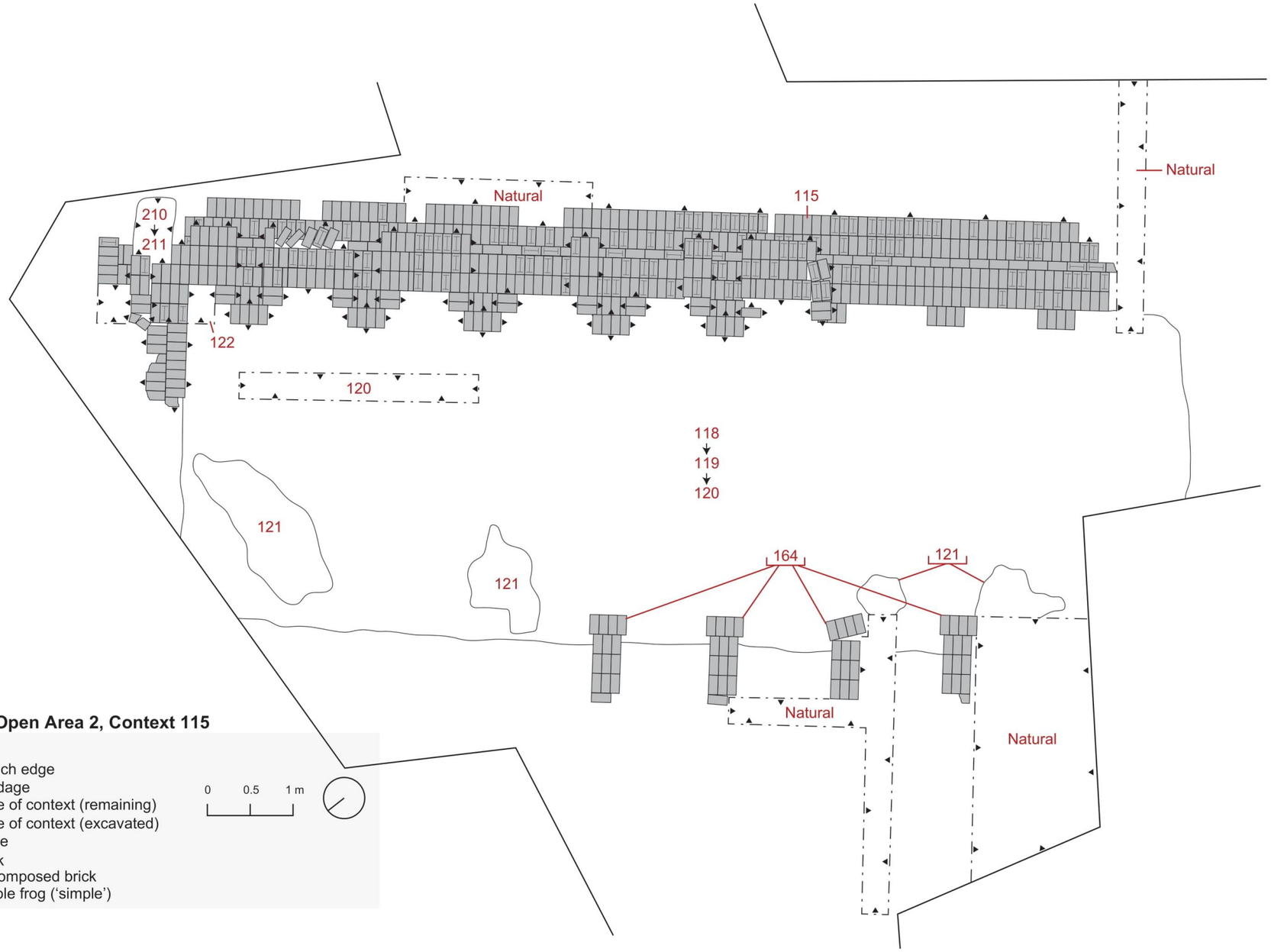


Figure 4.68 OA2, Kiln B, context *115* group.

Kiln C (context *179* group)

The context *179* group was located in the central western extent of OA2, occupying the space between Kiln D (context *72* group) and Kiln B (context *115* group) (Figure 4.72). It formed the partial eastern external wall (*179*) and fireboxes (*180*), and fragmentary western external wall (*181* and *218*) of a kiln structure (Kiln C). The internal floor space was composed of several discrete layers (*173* and *174*), which included areas of staining (*224*). Ash deposits (*201*) were located within the fireboxes formed by *180*. No artefacts were identified within this group.

The partial eastern external wall (*179*) had been constructed from 'simple' frogged bricks arranged in a mixture of single- and double courses—the western two rows comprised two courses of header bricks, which were capped on the east by a single course of rowlock bricks (Figure 4.69). The total feature measured approximately 2.55 metres long x 0.71 metres wide. The rowlock bricks only accounted for 1 metre of this length, with either side bordered by a continuation of the two-coursed headers.

South of the partial eastern external wall (*179*) was *180*, an alignment of four highly fragmentary fireboxes (Figure 4.70 and Figure 4.71). Only the northern-most firebox displayed the full 'U'-shaped arrangement—at least three rows of shiner bricks formed the northern and southern sides, whilst a row of five rowlock bricks 'capped' the gap on the internal side. Quantities of ash (*201*) were deposited within the 'U'-shaped cavity of the fireboxes.

The western external wall (*181* and *218*) of the feature was highly fragmentary (Figure 4.72). *181* comprised a single row of seven header bricks. North of this was *218*, a number of highly decomposed header bricks offset slightly from *181* to the east.

The internal space was filled with a friable mid reddish orange clayey sand (*173*), which overlaid four roughly linear series of mid to dark bluish or greenish grey localised patches of discoloured clay (*224*) (Figure 4.72). These discoloured patches were set into an extremely compact heat-affected mid orangey red clay (*174*), which capped a natural soil horizon that had taken on a darkened, 'burnt' or 'smoke-affected' look (*225*) (Figure 4.71).



Figure 4.69 OA2, the partial eastern external wall (*179*), facing west.



Figure 4.70 OA2, the eastern fireboxes (*180*) and associated ash (*201*) deposits, facing west.



Figure 4.71 OA2, sondage adjacent to the northern-most firebox (*180*) showing the heat-affected clay (*174*) and underlying darkened natural soil profile (*225*), facing west.

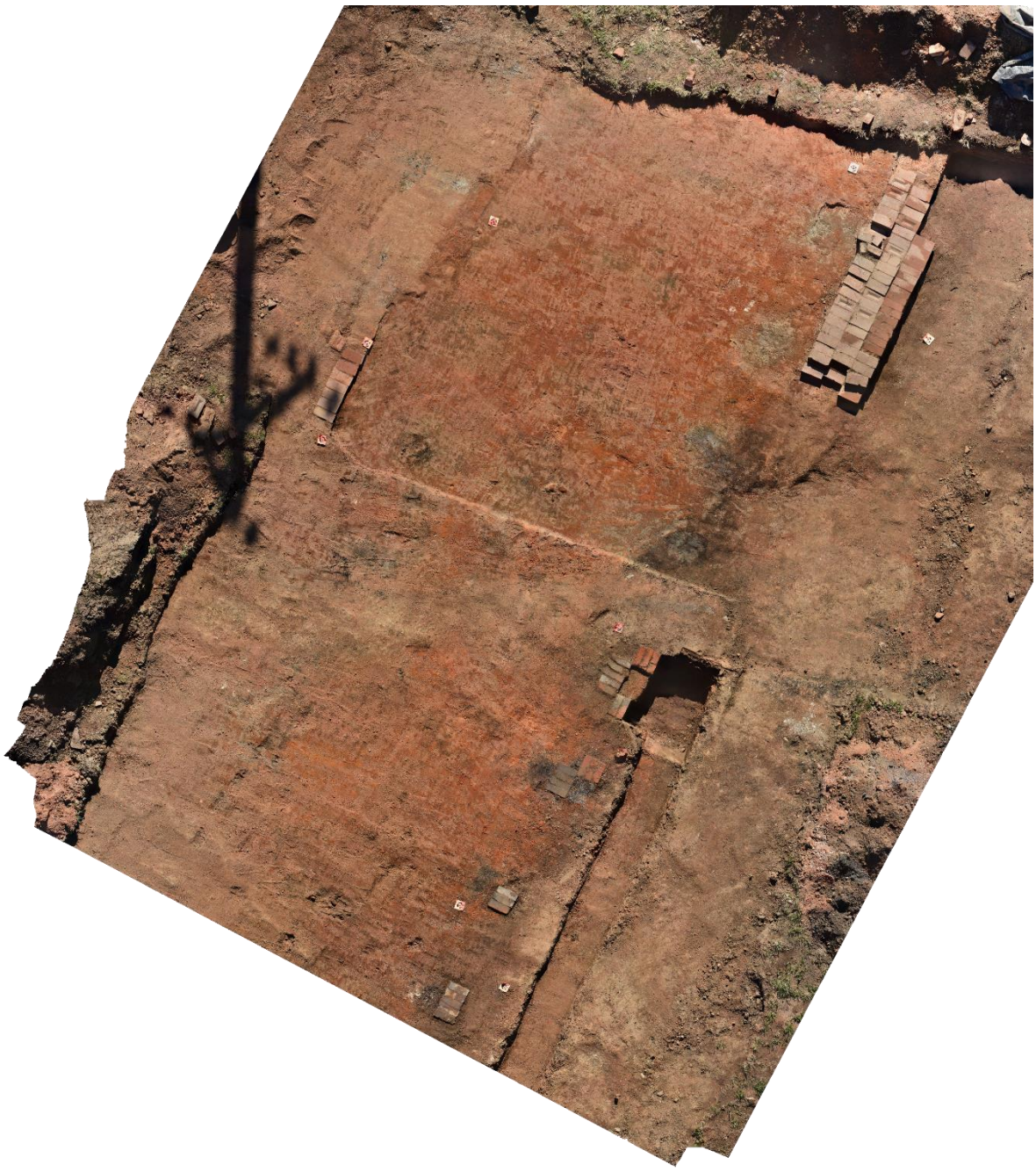


Figure 4.72 OA2, the partial eastern external wall (*179* , top right), fireboxes (*180*, bottom right), fragmentary western external wall (*181* and *218*, left), heat-affected clay firing floor (*174*, top centre) and discolouration patches (*224*, top centre), and sandy upper firing floor (*173*, bottom centre) of Kiln C, facing north.

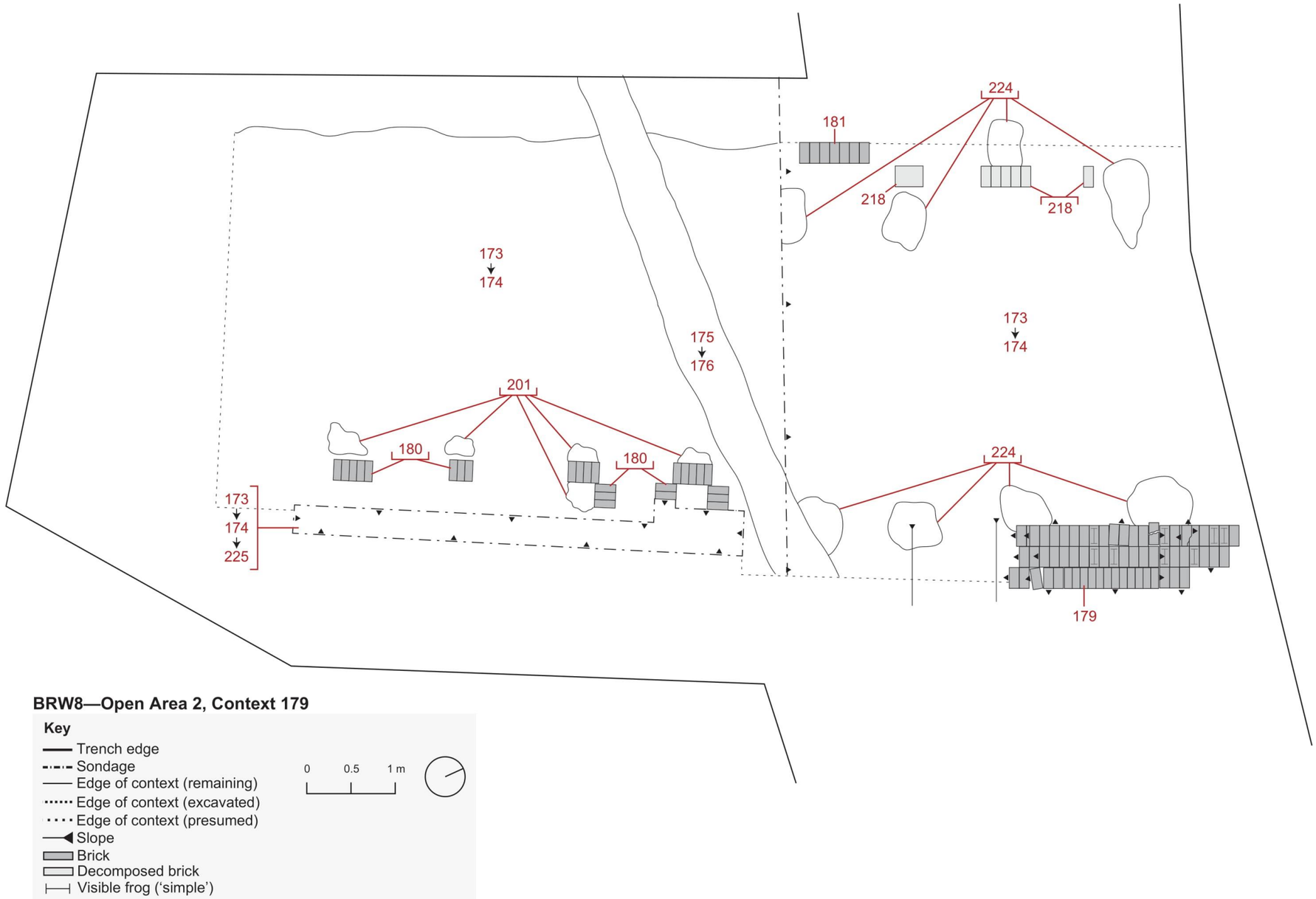


Figure 4.73 OA2, Kiln C, context *179* group.

Kiln D (context *72* group)

The *72* group was located in the central eastern extent of OA2, east of the Kiln C (context *179* group) and west of Kiln E (context *195* and *196* group). The group formed the western (*72* and *223*), eastern (*167*) and northern (*166*) external walls of a kiln structure (Kiln D), which included a partially demolished brick-lined flue (*169*), remnant flue cut (*170*), and associated fills (*168*, *203*, *212*, *213*, *214*, *215*, and *216*). The internal floor space was composed of several discrete layers (*203* and *204*), which included areas of staining (*208* and *217*). A number of ash deposits were located within the fireboxes formed by the western external wall (*72*) (*171*, *183*, *184*, *185*, *186*, and *187*) and around the wall structures (*205*). No artefacts were identified within this group.

The western external wall (*72*) measured 4.1 metres long x 2.1 metres wide (Figure 4.74). It had been constructed from 'simple' frogged bricks arranged predominantly in single courses of shiners and rowlocks. The body of the wall (*72*) comprised four discrete blocks of rowlock bricks; these had been set in groups of three, oriented north–south, and measured 1 metre wide. On their eastern edge, the blocks were separated by fireboxes that measured approximately 0.36 metres wide x 1 metre long (Figure 4.74 and Figure 4.75). Each block of rowlock bricks was connected to the adjacent block by a single row of shiners. The western termination of the blocks was more uncertain. Mirrored fireboxes were present within the western external wall (*72*), however, two additional sections of brick (*223*) had been added to the northwestern side. These additions comprised two courses of bricks, arranged in a pattern-less combination of stretcher and header bricks (Figure 4.83).

The eastern fireboxes had been filled with successive layers of friable to loosely compact mid orangey red clayey sand with ash inclusions (*183, 184*, and *185*), moderately compact crushed charcoal (*186*), and friable ash deposits (*187*). The western fireboxes contained similar materials (*187*), although with fewer distinguishable layers.

Approximately 2.63 metres east of the western external wall (*72*) was the eastern external wall (*167*). Highly fragmentary, the eastern wall (*167*) comprised three brick arrangements that mirrored the eastern fireboxes of the western wall (*72*) (Figure 4.75). It had been constructed from 'simple' frogged bricks which had been placed in single courses of shiners and rowlocks. Due to the level of disturbance, no further construction pattern could be determined.

Perpendicular to the western (*72*) and eastern (*167*) external walls on the northern extent of the feature was a partial northern wall (*166*) and a curved, subsurface brick-lined flue (*169*) extending south–northeast. The northern wall (*166*) comprised a highly fragmentary block of rowlock bricks, arranged in a matching pattern to the western external wall (*72*) (Figure 4.79). The subsurface flue (*169*) had also been partially demolished; only

approximately 2.47 metres of the brick lining remained in situ (Figure 4.76 to Figure 4.77). The outer curve had been constructed predominantly in header bond—the occasional stretcher used to account for the curve—in five courses; the inner curve contained more stretchers and had been constructed in six courses. All bricks were 'simple' frogged. The internal space of the flue (*169*) had been filled with loosely compact mid reddish brown silty sand which contained a high proportion of brick rubble (*168*), likely representative of its partial demolition.

The cut (*170*) for the flue (*169*) extended northeast to merge with the flue (*193*) for Kiln E (discussed below in 'Kiln E (context *195* and *196* group') and south into the internal space between the western (*72*) and eastern (*167*) external walls.

Northeast of the brick lining for the flue (*169*), the flue cut (*170*) contained a number of fills representative of simultaneous demolition and rubbish deposition (*213* and *216*) interspersed with layers of crushed coal (*212* and *214*). Beneath the second layer of crushed coal (*214*) was *215*, a layer of preserved textiles (Figure 4.78). The textiles represented a single, complete piece of fabric and had no formal garment or bag structure (Section 4.2). Artefacts identified in the fill included faunal remains, glass beer bottle fragments, and several leather shoe pieces (Section 4.2).

In the internal space between the western (*72*) and eastern (*167*) external walls, the flue cut (*170*) displayed a stepped break of base, suggesting that the brick lining (*169*) had extended south prior to demolition (Figure 4.81). Following the removal of the lining, the flue had been filled with a friable mid greyish orange clayey sand with a high proportion of crushed brick rubble (*203*).

This friable clayey sand (*203*) was also distributed throughout the space above the flue cut (*170*) between the western (*72*) and eastern (*167*) external walls, although it contained considerably less brick rubble at this level (Figure 4.80). Here it also overlaid *208*, which comprised four distinct lines of discolouration extending from the eastern fireboxes of the western external wall (*72*) to the corresponding spaces in the eastern external wall (*167*) (Figure 4.82). The discolouration gradated west–east, often appearing as mid mottled dark greenish or yellowish grey adjacent to the eastern external wall (*167*) and transitioning to a mid reddish orange where it met the western external wall (*72*). The discolouration (*208*) was set in an extremely compact heat-affected mid orangey red clay (*204*).



Figure 4.74 OA2, the western external wall (*72*), facing northwest.

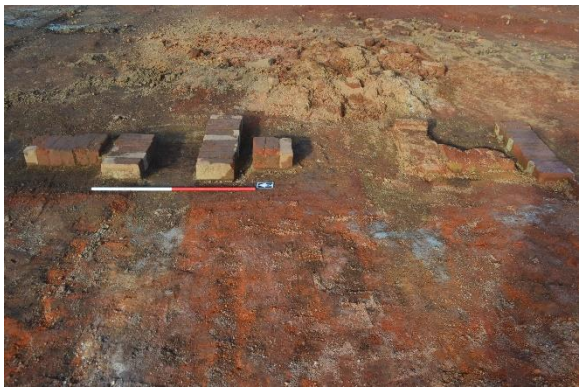


Figure 4.75 OA2, the eastern external wall (*167*), facing east.



Figure 4.76 OA2, the brick lining (*169*) for the flue cut (*170*), facing north.



Figure 4.77 OA2, the brick lining (*169*), facing north. Left: southern edge of the brick lining (*169*) within the flue cut (*170*). Right: northeastern edge of the brick lining (*169*) within the flue cut (*170*).



Figure 4.78 OA2, a layer of preserved textiles (*215*) within the flue cut (*170*), facing north.



Figure 4.79 OA2, the northern external wall (*166*), facing north.



Figure 4.80 OA2, the flue cut (*170*) where it passes through the internal space between the western (*72,* left) and eastern (*167*, right) external walls, facing north. *170* abuts *72*.



Figure 4.81 OA2, stepped base of the flue cut (*170*), facing east.



Figure 4.82 OA2, the discolouration (*208*) adjacent to the eastern external wall (*167*), facing south.



Figure 4.83 OA2, the western external wall (*72*) and addition (*223,* left), eastern external wall (*167,* right), northern external wall (*166*) and brick lining (*169*) for the flue (*170,* top), and heat-affected clay firing floor (*204,* centre) of Kiln D, facing north.

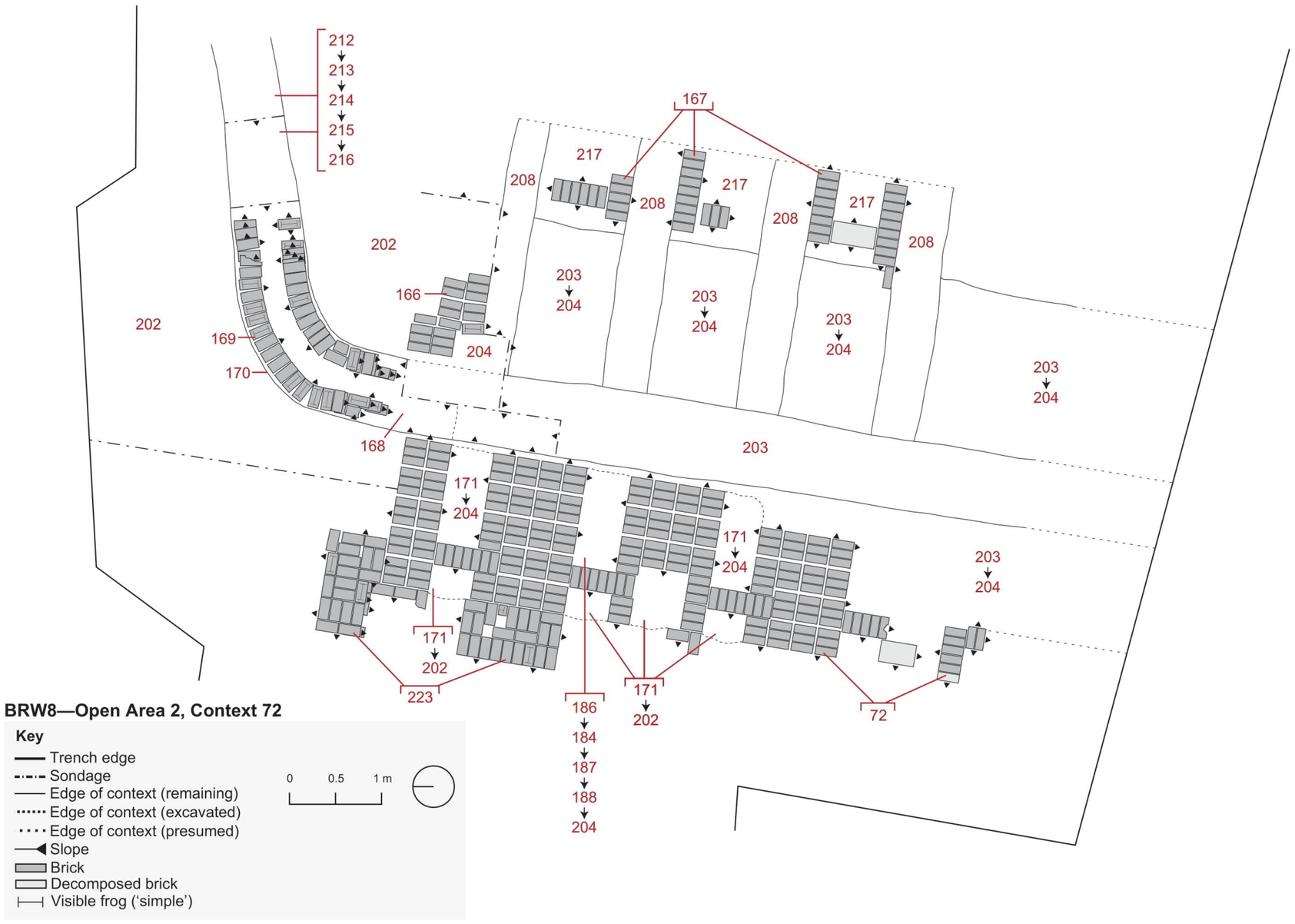


Figure 4.84 OA2, Kiln D, context 72 group.

Kiln E (context *195* and *196* group)

Located in the far eastern extent of OA2, the context *195* and *196* group consisted of the eastern external wall (*195*) and western external wall (*196*) of a kiln structure (Kiln E) (Figure 4.91). The structure also included the possible brick lining (192) and cut for a subsurface flue (*193*), and several later brick features (*197* and *198*). The internal floor space was composed of several discrete layers (*190* and *199*), including a layer of crushed coal (*194*).

Both the eastern (*195*) and western (*196*) external walls comprised partial alignments of fireboxes. These had been formed from a 'U'-shaped configuration of four headers and two pairs of stretchers 'capped' the gaps on the internal sides (Figure 4.85). Quantities of ash (*200*) were located within and around the fireboxes.

Adjacent to the western external wall (*196*) were several later structural additions (Figure 4.86). These comprised a single course of bricks arranged in a single row of header bond capped on the northern and southern edges by a row of stretchers (*198*). No identifiable pattern was determined in *197*, which had been constructed from two courses of mixed header and stretcher bricks adjacent to several rowlock bricks. Both *197* and *198* were raised above the level of the western external wall (*196*), making the relationships between the three features uncertain.

The internal space between the eastern (*195*) and western (*196*) external walls contained two heat-affected clay deposits. The upper deposit (*190*) was a very compact mid greyish orange sandy clay, which overlaid an extremely compact light orange clay with bluish discolouration (*199*). Above both of these layers was *194*, a widespread loosely to moderately compact crushed coal deposit approximately 0.03 metres thick (Figure 4.87).

Extending through the centre of the internal space and underlying the firing floor deposits (*194* and *190*) was the cut (*193*) for a subsurface flue (Figure 4.88 and Figure 4.89). The flue had been filled with a friable mid greyish red clayey sand with a high proportion of brick rubble (*191*); the quantity of this rubble decreased in the external space north of the kiln structure.

A possible remnant of brick lining was identified in this external space (*192*) (Figure 4.90). Although its fragmentary nature and the overall fill matrix made its identification unclear, the quantity of rubble present would suggest that a brick lining was present. This would have been completely demolished when the flue was decommissioned and a new firing floor layer (*190*) deposited over the feature.



Figure 4.85 OA2, the western (*196*, left) and eastern (*195*, right) external walls, facing various.



Figure 4.86 OA2, the later additions (*198*, left, and *197*, right) adjacent to the western external wall (*196*), facing north.



Figure 4.87 OA2, the crushed coal deposit (*194*), facing north.



Figure 4.88 OA2, the flue cut (*193*) and rubble fill (*191*), facing south.

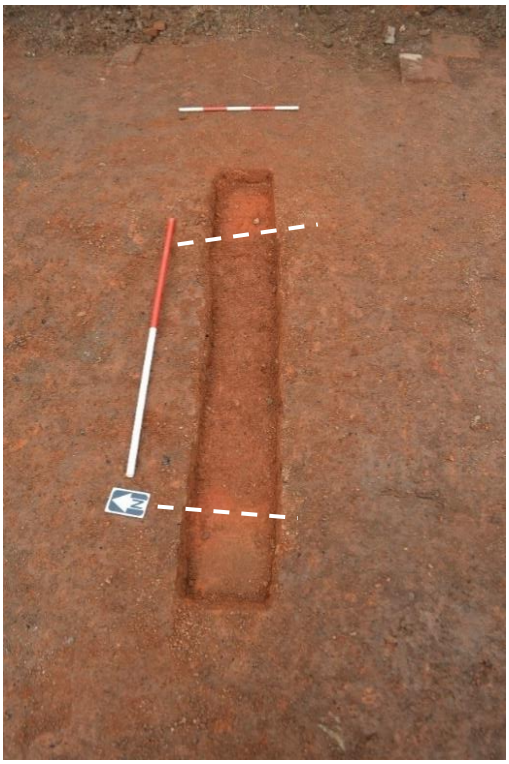


Figure 4.89 OA2, slot trench showing the flue cut (*193*) visible (annotated) beneath the second firing floor (*190*), facing east.



Figure 4.90 OA2, the possible brick lining (*192*) within the flue cut (*193*), a section of the rubble fill (*191*) visible in the background, facing south.

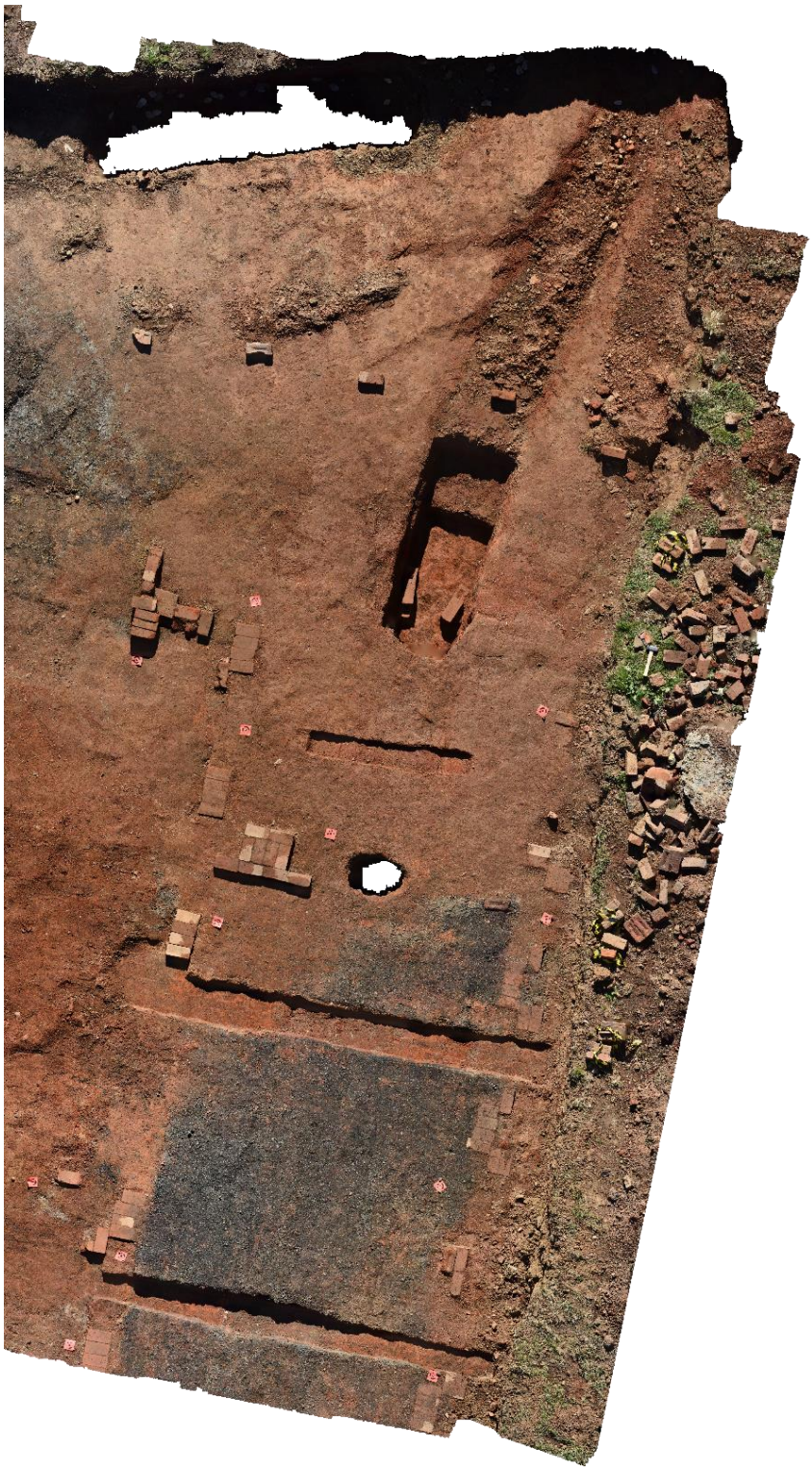


Figure 4.91 OA2, the western externa wall (*196*, left), eastern external wall (*195*, right), later additions (*197* , centre left, and *198*, centre), crushed coal deposit (*194*, centre), and flue cut (*193*, centre top) of Kiln E, facing north.

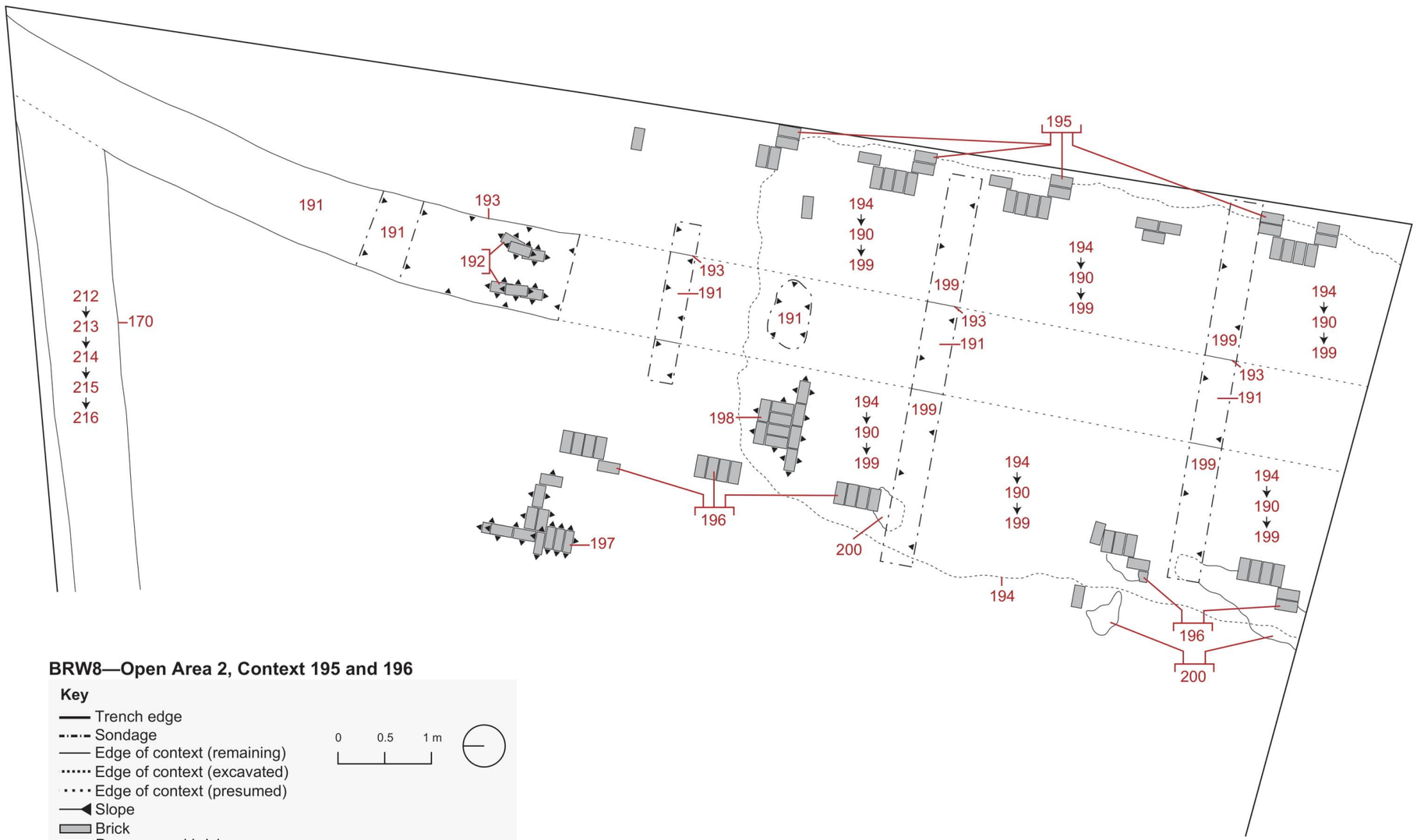


Figure 4.92 Kiln E, context *195* and *196* group.

Interpretation of structures

Kilns

Five kilns were identified in BRW8 during the archaeological excavations:

- Kiln A (context *137* group);
- Kiln B (context *115* group);
- Kiln C (context *179* group);
- Kiln D (context *72* group); and
- Kiln E (context *195* and *196* group).

While the extent of demolition present meant that the full footprint and structural composition of the kilns could not be determined, the remaining features provide valuable insight into their formations.

Prior to the construction of the kilns, the natural ground surface had been levelled to provide a base for the structural components. The external walls showed few similarities across the kilns. The solid eastern walls of Kilns B and C, and western wall of Kiln D each had a completely different construction style. Kiln B comprised two courses, with clear patterning in the use of header and stretcher bonds, whilst Kiln D had a single course composed of sets of rowlock bricks. The remnants of Kiln C were too fragmentary to determine a pattern, but had used both two courses of header bond and a single course of rowlock bricks.

In Kilns C and E, isolated fireboxes contributed to the walls—these were oriented externally and constructed largely in the same pattern, although Kiln C utilised shiner and rowlock bonds, compared to the stretcher and header bonds present in Kiln E. Fireboxes had been built into the eastern wall of Kiln B and western wall of Kiln D. In Kiln B, these formed the second course of the wall, utilising the lower course as a solid base, however, the fireboxes of Kiln D were located at the base of the wall. Additionally, the Kiln D fireboxes were mirrored, with boxes present on both the external and internal aspects of the western wall. Ash deposits were found in all fireboxes except for those in Kiln B, which also showed no sign of heat damage.

Each kiln had two identifiable floor surfaces. The upper surface comprised a friable clayey sand, often pinkish or reddish orange. This immediately overlaid a lower surface of extremely compact baked mid orangey red clay. Where areas of this lower floor were excavated (eg Kilns A, B, and C), the natural soil horizons below had darkened in colour and taken on a 'burnt' appearance. In Kilns C and D, the hardened clay floor had been stained in a linear pattern; in Kiln D these were aligned with the fireboxes present in the external walls.

Subsurface flues were identified in Kilns D and E. However, the characteristics of the two flues were very different:

- Location—In Kiln D, the flue was adjacent to the western wall, whilst in Kiln E it occupied the centre of the space.
- Orientation—The Kiln D flue curved after exiting the kiln to an almost perpendicular angle, whilst the Kiln E flue remained relatively parallel. The orientation of each flue may not be a specific differentiation between the two kilns. While the difference could have been used as a point of experiment—differing heat control and air flow between the two orientations—it is more likely that the two kilns shared a chimney (not identified during the excavations), and the flues were oriented differently because they were headed towards a common point.
- Internal treatment—A defined brick lining was identified in a portion of Kiln D (with evidence that it likely extended at least through the internal space of the kiln), whilst only possible evidence for a lining was identified in Kiln E.

At some point during the use of the two kilns, the flues had been decommissioned. The brick lining was largely or totally removed, and the channels were backfilled with a combination of rubble and other materials.

Flues were not identified in either Kilns B or C. The elongated structures in Kiln A, however, may have been a rudimentary form of flue; each structure forming a cavity within the internal space of the kiln, which may have assisted in the control of airflow during firing.

The overall similarities in the structures identified is consistent with that observed in kilns excavated in other archaeological contexts. This is discussed below.

Comparative archaeology

There are two main classes of kilns: intermittent kilns (where the fires are dampened at the completion of each firing) and continuous kilns (where fires are constantly maintained). A detailed discussion of these kiln types is provided in Appendix C of the 2021 CMP, however, a summary is provided here.

There are three primary intermittent kiln forms (Figure 4.93):

- Clamp kilns—Unfired (green) bricks are arranged in a manner that allows hot air to move through the stacks within the internal space of the kiln, whilst the outside surface is sealed, usually with mud. Heat distribution in clamp kilns is extremely uneven and brick wastage is unavoidably high. As they are only designed to withstand a single firing event, clamps typically leave little archaeological residue apart from a shallow depression in the ground; however, channels and flues have survived in the more sophisticated examples of the kiln.[34]

- Scotch kilns—These are open, roofless constructions with three permanent walls and one temporary wall, the latter of which would be erected after the green bricks had been placed within the kiln and demolished after firing.
- Downdraught kilns—The most elaborate of the intermittent kilns, downdraught kilns are typically rectangular in plan with a number of fireholes and/or fireboxes distributed down the long sides and wickets on the short ends. Inside the single chamber the hot air is channelled out through subsurface flues to a detached chimney stack. Occasionally low walls (bag walls) are constructed within the internal space to regulate the flow of heat.

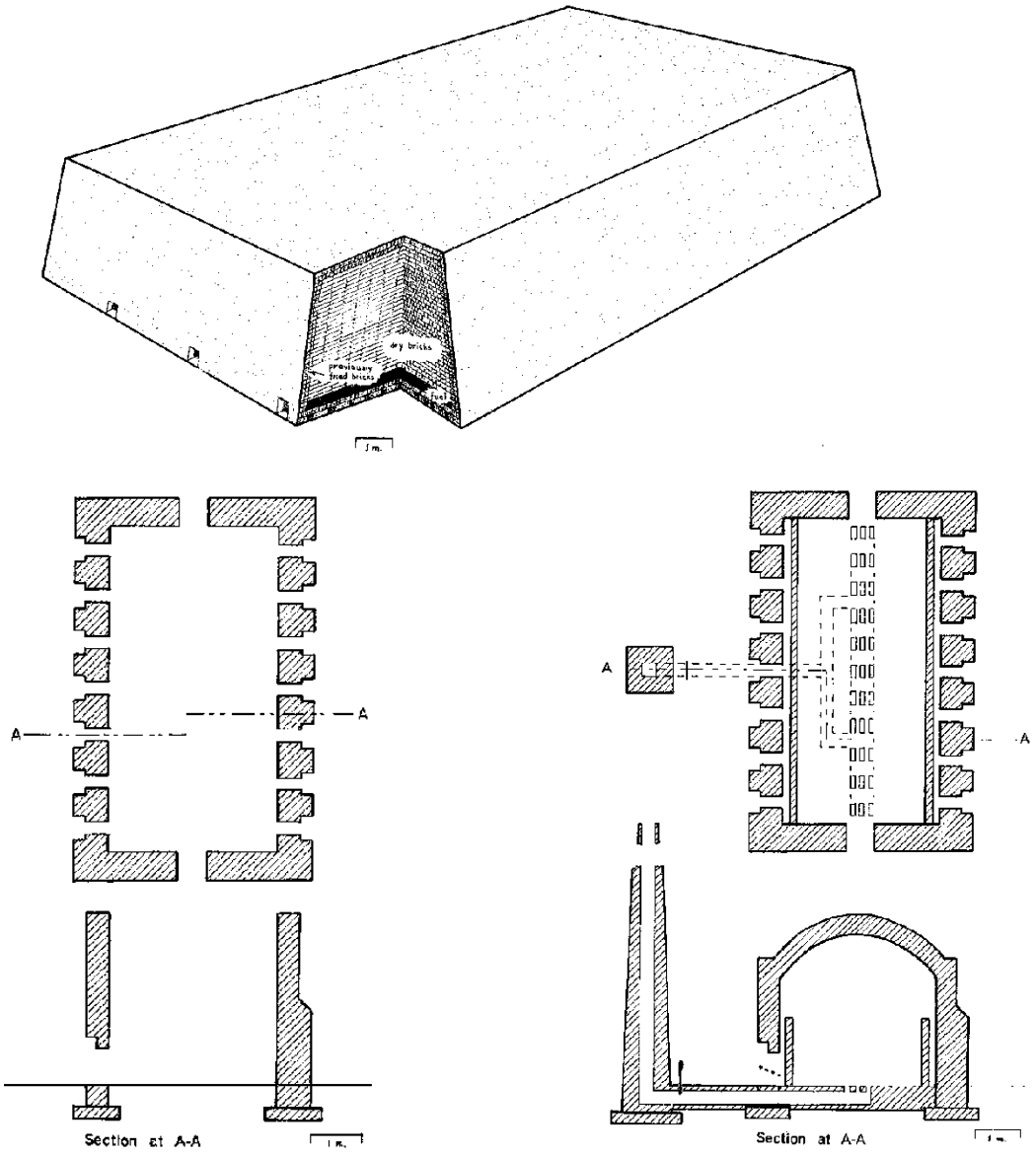


Figure 4.93 Schematic drawings of a clamp kiln (top), Scotch kiln (bottom left), and downdraught kiln (bottom right). (Source: International Labour Office, 1990

Continuous kilns come in a much wider variety of forms. The first major continuous kiln form was the Hoffman kiln design. This design features discrete firing chambers that can be operated independently, which allows for the continuous loading and unloading of the kiln without requiring the entire structure to cool. Variations on the Hoffman include Hardy patent, Staffordshire, and tunnel kilns.

The archaeological remnants of continuous kilns are generally easily identifiable and well understood, as they represent the larger, more distinctive kiln variations. However, archaeological traces of smaller kilns, intermittent kilns—particularly the clamp and Scotch kilns—can be more difficult to identify due to their more impermanent natures. As such, the following discussion will largely concentrate on archaeological investigations that have successfully identified intermittent kilns.

As clamp kilns are constructed from the green bricks intended for firing and designed to withstand a single firing event, the remaining evidence of clamp kilns can vary significantly. This can be from a shallow depression of burnt clay, a hard packed clay floor, a 'paved' floor of previously-fired bricks, or more extensive internal channels and flues.[35]

Excavations at the Whau Brickworks, West Auckland, New Zealand, in the 1980s identified a mid to late nineteenth century clamp kiln (Figure 4.94).[36] The kiln consisted of a fully paved floor. Although its footprint had been disturbed by the later Scotch kiln (Figure 4.94), the original space would have measured approximately 6.2 metres long x 6 metres wide.[37]

A similar nineteenth century clamp kiln was identified in 2009 in the Cortez Mining District, Nevada, United States of America (USA). The brick floor surface 'displayed wide, alternating banks of pink and white … The white bands [were] permanent ash discolourations delineating the [seven] flues' (Figure 4.95).[38] The structure measured approximately 9 metres long x 9 metres wide.[39] On the same site were the more subtle remains of a second clamp kiln:

> There was no brick or orange staining anywhere on the surface. It was not until the black thermal signature was uncovered that the excavators realised it was another clamp.[40]

It was suggested that the lack of structural definition may have been because the fired bricks were completely removed following firing (as opposed to left in situ as a 'floor').[41]

The remains of a clamp kiln identified near Shelbyville, Kentucky, USA, represents an intermediate between the clamp kilns observed at the Whau Brickworks and in the Cortez Mining District. Similar to the patterning present in the Cortez Mining District clamp kiln, this kiln floor had been differentially stained through the construction of several flue channels (Figure 4.96).[42] However, the kiln floor consisted of hard packed clay, rather than bricks.

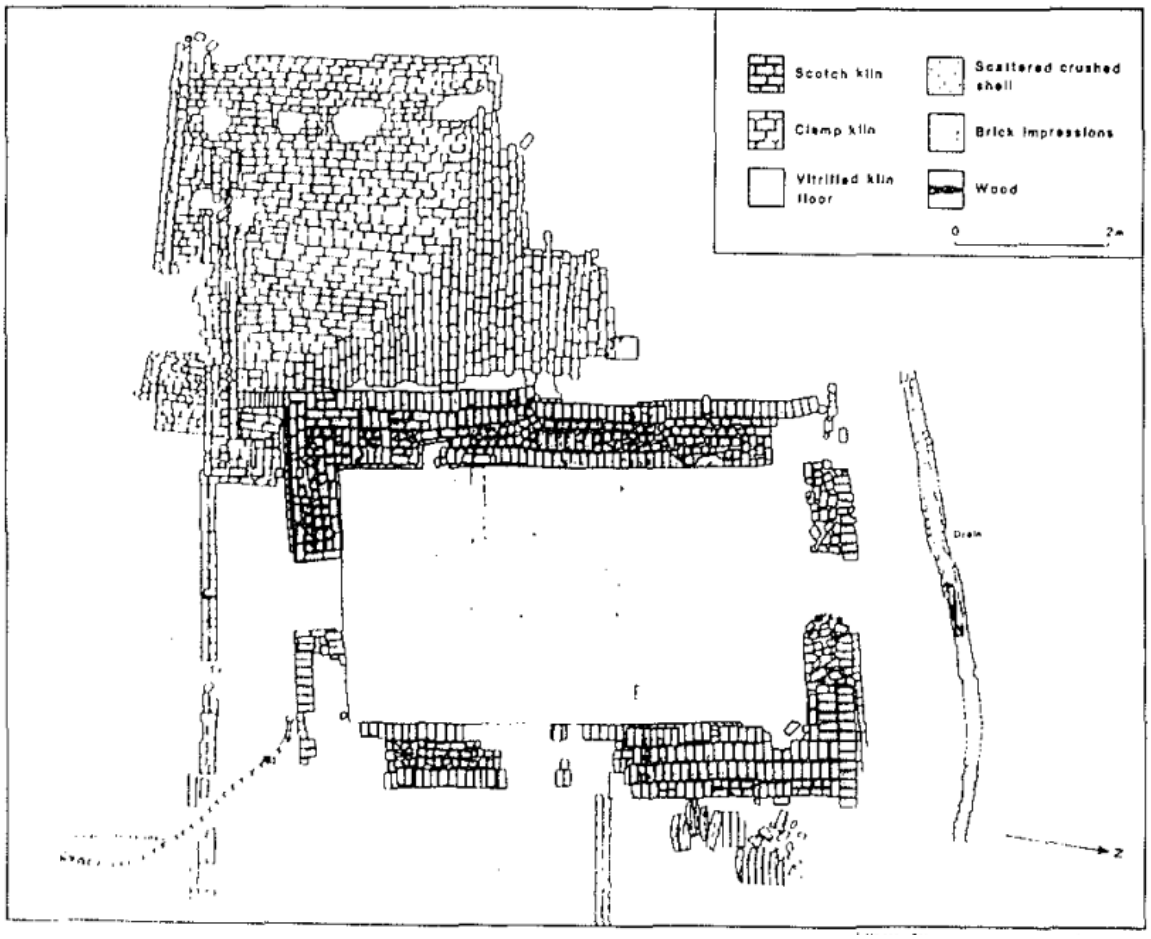


Figure 4.94 The clamp kiln (fully paved surface) and Scotch kiln (dark rectangle) identified at the Whau Brickworks. (Source: Clough 1989, p 4)



Figure 4.95 The partially intact 'paved' clamp kiln floor identified in the Cortez Mining District. (Source: McQueen and Ross-Hauer 2013, p 21)



Figure 4.96 Several flue channels present in the baked clay floor of a clamp kiln near Shelbyville. (Source: O'Neill 2001)

The construction of permanent walls during the use of a Scotch kiln generally aids in their identification when found in archaeological contexts.

In 2008, archaeological excavations were undertaken at a late nineteenth century Scotch kiln located on the Bridgman Ridge Estate, Singleton, NSW. The excavations uncovered two external walls of a rectangular brick kiln structure sitting on the levelled, natural ground surface (Figure 4.98).[43] Passing between the two walls through the internal kiln space were four pairs of flues, which were partially defined by brick lining and partially excavated into the ground surface.[44] Fireboxes were situated at each external end of the flues. The internal surface of the kiln (Figure 4.97):was characterised by an…

> … orange-red rubble and brick dust fill' which was above 'concentrated amounts of the baked clay which sat in a reddish-brown sand … above a hardened natural surface [and a centralised burnt deposit above a] blackened natural horizon.[45]

The whole kiln footprint measured 6.3 metres long x 6.4 metres wide, however, evidence of demolition at the western end of the kiln meant that its true extent was unknown.



Figure 4.97 The internal stratigraphy of the brick kiln at Bridgman Ridge Estate. (Source: AMAC 2011, p 60)

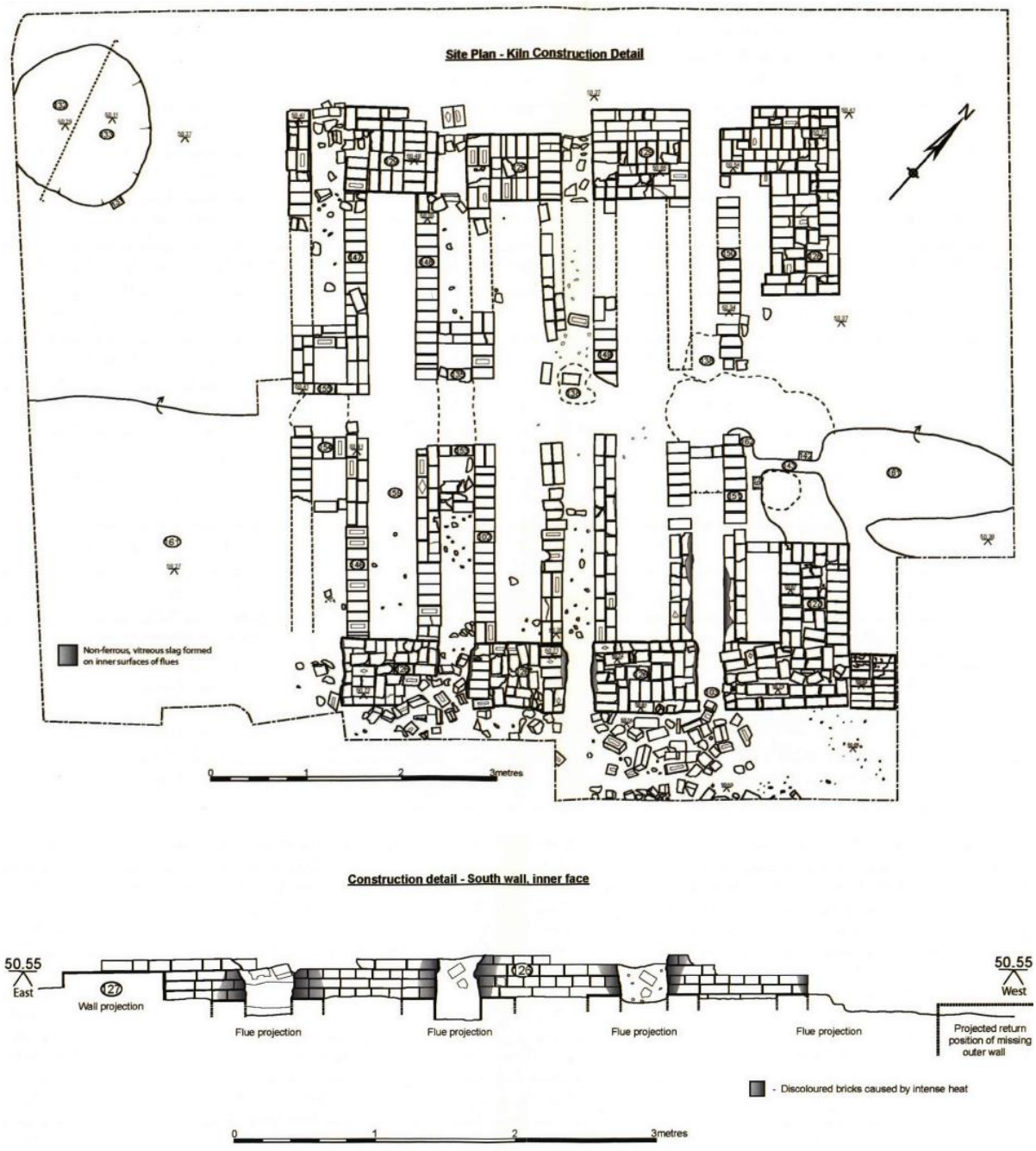


Figure 4.98 Plan of the brick kiln structure and section of the flue projections identified at Bridgman Ridge Estate. (Source: AMAC 2011, p 44–45)

Another example of a mid to late nineteenth century Scotch kiln was excavated at the Whau Brickworks, which partially overlaid the clamp kiln discussed above (Figure 4.94). The excavations at the Whau Brickworks identified a rectangular structure approximately 6.75 metres long x 5 metres wide.[46] The four walls were nearly complete, each

approximately 0.8 metres thick and with six fireboxes built into each of the long walls.[47] Unlike the Bridgman Ridge kiln, no surface flue structures or cuts were identified within the internal kiln space.

Downdraught kilns have a very similar footprint to Scotch kilns, albeit with a key difference—unlike open-roofed Scotch kilns, the enclosed space within a downdraught kiln necessitates the hot air to be vented via a subsurface flue to an external chimney stack. In more elaborate examples (such as the three extant downdraught kilns at the Precinct Section 4.1.7) there may be numerous flue channels connected to a central flue tunnel, however in smaller and/or simpler structures there is usually a single flue channel.

In the 1990s, a number of archaeological surveys were conducted at the brick kiln near the Fenny Compton tunnel, Warwickshire, United Kingdom (UK). Constructed in the mid nineteenth century, the site comprises the above ground remnants of a downdraught kiln measuring approximately 12.6 metres long x 5.8 metres wide (Figure 4.99).[48] The existing remains indicate that the kiln had eight fireholes/fireboxes on each of the long walls and wickets in both short walls.[49] A single subsurface flue channel was present beneath the floor surface, which vented air down through a latticed brick floor—approximately three courses deep—at either end of the kiln.[50] The external chimney was located approximately 0.5 metres from the southwestern corner of the kiln.[51]

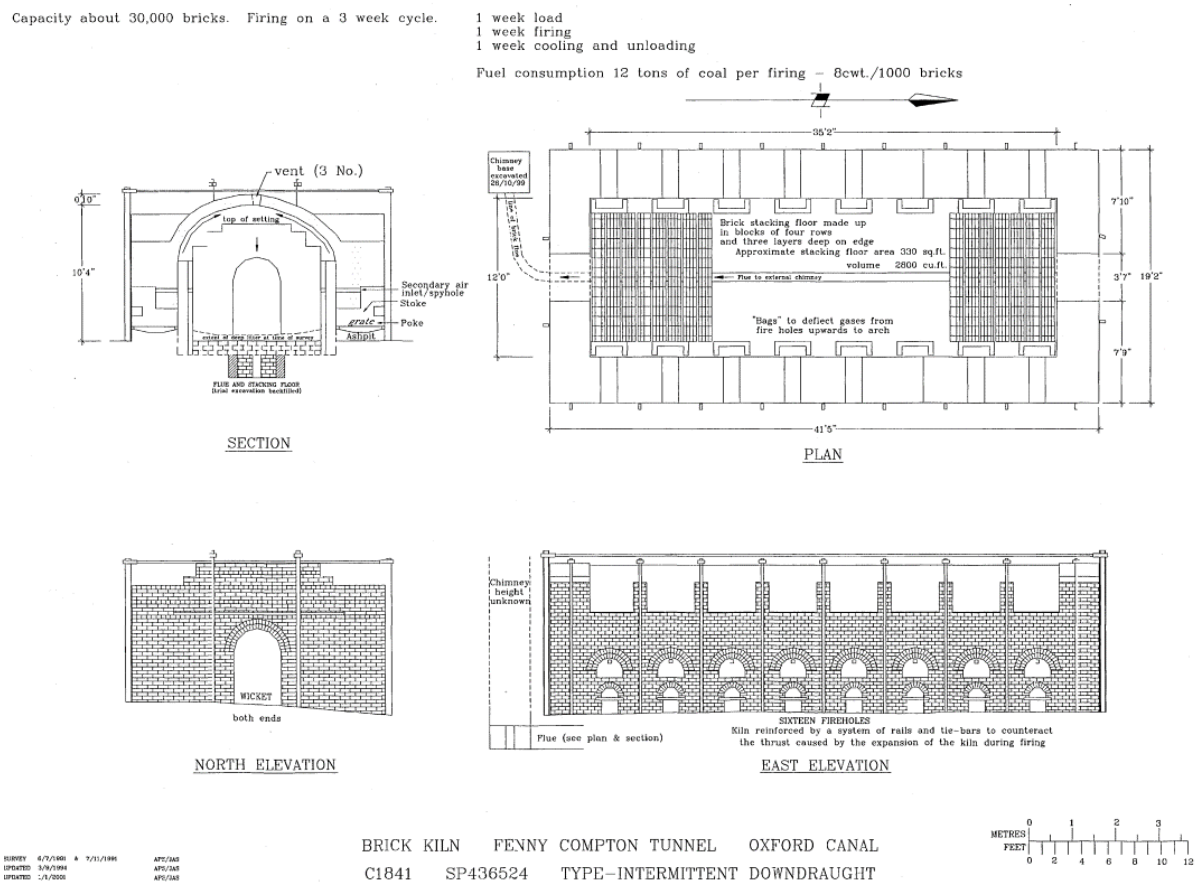


Figure 4.99 Plan of the downdraught kiln near the Fenny Compton tunnel. (Source: Selby 2002, p 113)

The Canberra Brickworks experimental plant

Although there are documentary references to the Canberra Brickworks experimental plant (Section 2.1), a plan for the layout of the plant has not been found. However, three photographs from the same time period are known.

Figure 4.100 shows a large crushing pan shed situated to the left and partially in front of several kilns. The two visible kilns immediately behind the crushing pan shed show open constructions—two long side walls are present, with at least one short end and the ceiling left open. Fireboxes or -holes can be seen at the base of the left kiln's right wall, although little detail can be made out. It is probable that they were similar to the fireboxes visible in the front-most kiln. These show five domed openings, constructed approximately one or two courses above ground level. The low height of the wall in this kiln and the adjacent stack of bricks suggests that the photograph was taken either part way through construction (if a Scotch or downdraught kiln) or dismantling (if a clamp kiln). The walls of a fourth kiln are partially visible behind this front kiln.

Figure 4.101 has been taken from the same angle as Figure 4.100, but at a different stage in the production process. The short ends of the two left-most kilns are sealed with bricks, indicating that the contents were being fired at the time the photograph was taken. The central kiln also appears to be rooved—several 'beams' appear to be present between the two external walls, shadowing the internal space. Although a chimney is not visible, the presence of the roof would suggest that the kiln was operating as a downdraught kiln. The lack of a lean-to on the side wall of the crushing pan shed indicates Figure 4.101 likely predates Figure 4.100.

Figure 4.102 has been taken from the rear of the experimental complex. Primarily it shows the beginnings of the quarry, with the roof of the crushing pan shed visible behind the landform in the background. Right of this—and barely discernible—are several fireboxes in the long wall of a kiln. This is likely the same kiln visible in Figure 4.100 behind the machinery shed. The large stack of bricks to the right of the photograph is also the same as seen in Figure 4.100.

The lack of identifying landmarks and the extent of landscape modification that has occurred means it is difficult to ascertain which aspect these photographs were taken from.



Figure 4.100 Photograph of the experimental plant. The date is catalogued as c1912–1920. Based on the construction timeline of the experimental plant and Staffordshire kiln, it is likely pre-1914. (Source: NLA, Trove, PIC Row 13/8/5 #PIC/P2184/5)



Figure 4.101 Photograph of the experimental plant. This photograph was taken from the same angle as Figure 4.100, but likely shows an earlier stage of the experimental plant. (Source: CDHS, 2295).



Figure 4.102 Photograph of the experimental plant. This photograph is contemporary with Figure 4.100 but was taken from the rear of the plant, in a quarry. This quarry might not be the same as the present quarry. (Source: NLA, Trove, PIC Row 13/8/5 #PIC/P2184/6)

Identifying the experimental plant kilns

Synthesis of the above archaeological observations for clamp, Scotch, and downdraught kilns indicate there are several key features that aid in assisting the identification of different kiln remains found within BRW8 (Table 4.1).

Table 4.1 Archaeological features of clamp, Scotch, and downdraught kilns.

Archaeological feature	Clamp kiln	Scotch kiln	Downdraught kiln
Permanent external walls	No, all walls are temporary	Yes, three permanent walls, one temporary wall	Yes, four permanent walls
Wickets	No, green bricks are used to construct the kiln	No formal wickets, although the temporary fourth wall acts as one	Yes, generally two wickets, one in each short wall
Fireboxes and fireholes	Yes, usually only fireboxes, constructed through the patterning of green bricks	Yes, usually only fireboxes	Yes, both may be present
Paved floor surface	Sometimes, present as remaining in situ fired bricks	No paved floor	Sometimes, present as a partial latticed floor for flue venting
Flues	Sometimes, may be on the floor surface as part of the firebox arrangement, or partially cut into the floor surface	Sometimes, may be on the floor surface as part of the firebox arrangement, or partially cut into the floor surface	Yes, one central subsurface flue, which is sometimes used in conjunction with smaller flue channels projecting into the external walls

In applying this model to the archaeological kiln remains identified in BRW8 (context groups *137, 115, 179, 72,* and *195* and *196*, Figure 4.103), the following conclusions can be drawn.

Kiln A had no evidence of external walls, fireboxes or -holes, or paved floor surfaces (Figure 4.60). It did, however, have five brick channels that may have acted as rudimentary flues. The simplicity of the structure and overall lack of features is consistent with observations made for other clamp kilns. It would have been dismantled following firing to collect the bricks intended for the next kiln. It is unknown where in the timeline this clamp would have

been active. The kiln visible in the foreground of Figure 4.100 had five fireboxes—it is probable that these openings correlated with the channels in Kiln A, and that the low wall height was indicative of the kiln being dismantled following firing.

Kiln B was a more complex structure. It had permanent external walls on its western, northern, and eastern aspects (Figure 4.68). No southern wall or flue channel was identified. The open short wall and lack of flue is indicative of a Scotch kiln. This kiln was likely the left-most kiln visible behind the crushing pan shed in Figure 4.100 and Figure 4.101.

The remains of Kiln C were highly fragmentary (Figure 4.73). A permanent eastern external wall and corresponding alignment of fireboxes were identified, with ephemeral evidence for a western wall present. The lack of flue channel and presumed absence of a permanent short wall on its southern end suggests that the structure was a Scotch kiln. It is likely the second left kiln visible in the background of Figure 4.100 and Figure 4.101.

Kilns D and E present much more complex structures, with multiple phases of use clearly defined.

The first phase of Kiln D included permanent eastern, western, and northern external walls (Figure 4.84). Fireboxes were present in the western wall, and likely had corresponding openings in the eastern wall. The original kiln included a flue channel, which had at least been partially lined with bricks (most likely just within the internal space of the kiln and immediately to the north of it). The presence of a flue channel is strongly indicative of a downdraught kiln structure. These kiln types, however, are not open—all four walls are permanent and the ceiling is enclosed. At some point during the use of Kiln D, the flue channel was dismantled and infilled. This is indicative of the kiln being converted to a Scotch kiln, which would have also required demolishing a short wall and the ceiling. As shown in Figure 4.93, the footprints of Scotch and downdraught kilns are highly similar, and little effort would be required to convert the latter kiln type into an open kiln. Kiln D may have been the central kiln visible with a roof in Figure 4.101 and without a roof in Figure 4.100.

Similar evidence for conversion from downdraught to Scotch kiln was present in Kiln E (Figure 4.92). Western and eastern alignments of fireboxes were identified, which likely formed part of the permanent external walls. No southern or northern walls were present. The central flue channel had also been decommissioned during the use of the kiln, with new floor surfaces overlaid onto the cavity. Several additional structures had been added to the northwestern corner of the kiln, supporting the evidence for ongoing alterations. By dismantling the flue and removing a short wall and ceiling, Kiln E would also have been converted from a downdraught kiln into a Scotch kiln.

The flue channels present in Kilns D and E connected to form a single tunnel north of Kiln E. It is probable that this was done to save effort in the construction of chimneys—by merging the two channels, only one chimney stack was required instead of two. Evidence for a chimney stack was not identified during the excavation.

Collectively, these kilns represent five of the six kilns referred to by Christie in his 1913 descriptions of the experimental plant (Section 2.1) and one additional clamp kiln. The variation of designs present in the structural remains demonstrates that the early Brickworks workers were trialling different construction methods for the kilns, in addition to experimenting with brick form. The workings of the experimental plant are discussed further in Section 5.1.1.

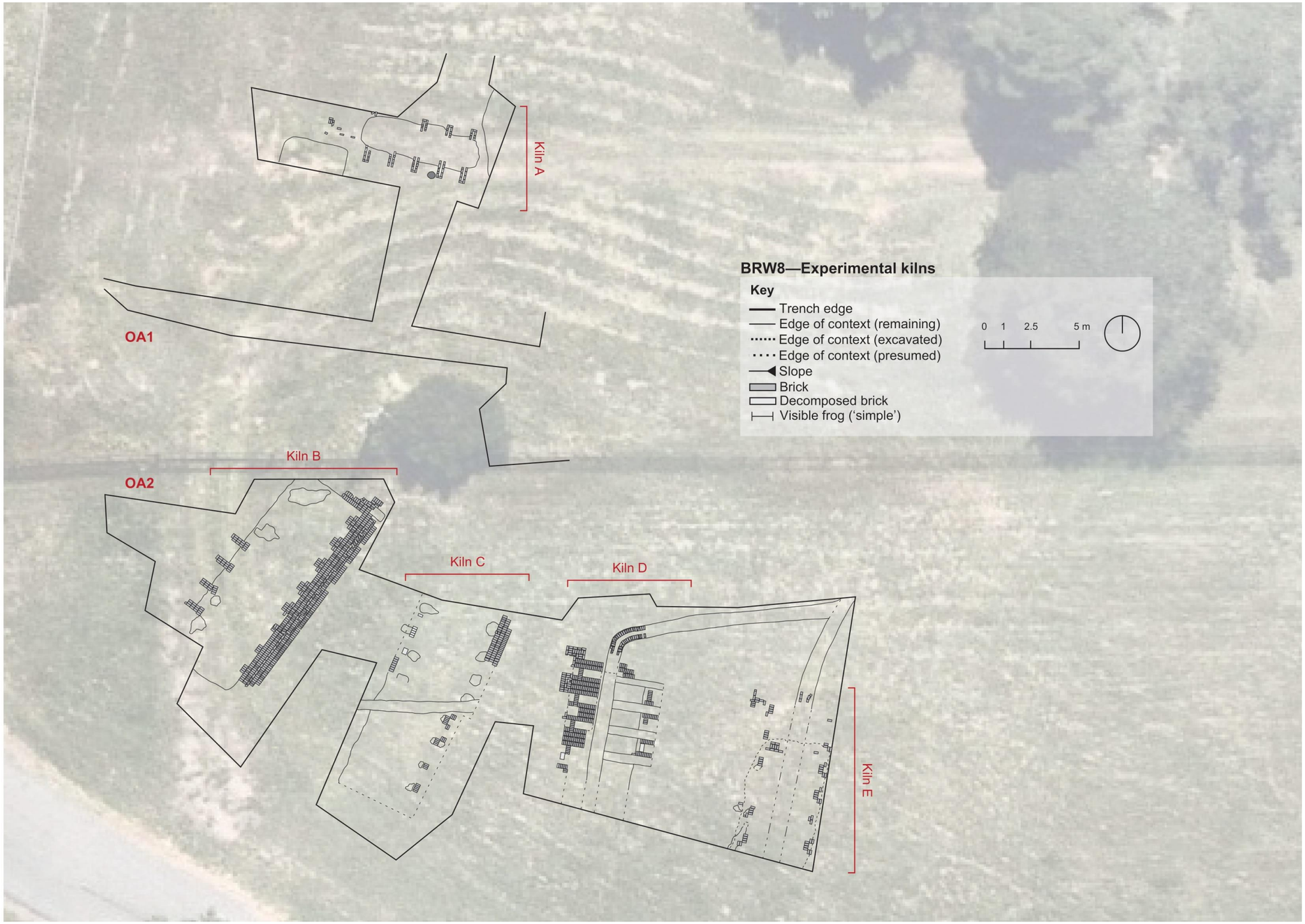


Figure 4.103 The layout of the five kilns identified in the experimental plant, OA1 and 2. (Source: Near Map 2020 with GML additions)

Dormitories and bathhouse

There was limited archaeological evidence for domestic structures within BRW8. The evidence that was identified was constrained to two areas of the site (Figure 4.105):

- southern extent—brick and concrete footings (*124*); and
- northeastern extent—an approximately rectangular area of decomposed mortar (*134*), three aligned postholes (*158* and *159,* 160 and *161*, and *162* and *163*), and a brick box drain (*132*).

There are no known documentary records for the dormitories and bathhouse other than the 1916 contour survey map (Figure 4.104). This map places both the dormitories and bathhouse north of the experimental plant. The two domestic buildings are separated by a 'Brick Drain', which appears as a partially dashed line.

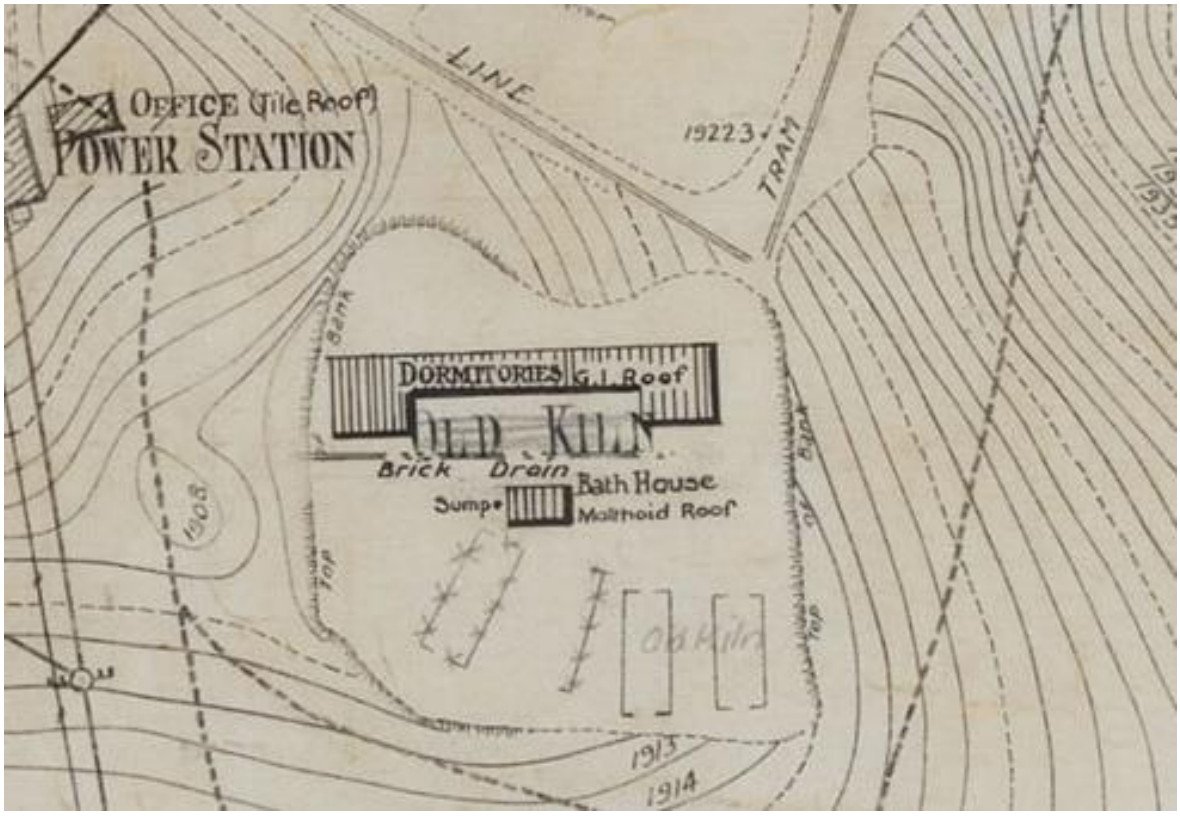


Figure 4.104 Detail from the 'Contour and Detail Survey, Canberra Brick Yards, 20 December 1916'. (Source: NAA A6664, L165A)

The brick and concrete footings correlate with the eastern wall of the bathhouse (Figure 4.50). Due to the location of the mature shrub adjacent to these footings, the internal space of the structure could not be examined.

The footprint of the dormitories in Figure 4.104 is not consistent with the identified archaeological features. The clearest departure from the illustrated layout of the dormitories is the brick box drain (Figure 4.56). Due to its rough construction, it is unlikely the drain was designed to be viewed on the ground surface. As such, it would have been located beneath the dormitories. However, the northwest–southeast orientation of the drain does not align with the west–east placement of the dormitories—this would have resulted in water being channelled from the northern external wall to the southeastern corner and no drainage for the western extent.

This may have been intentional if there was a particular directional drainage issue present on the site when the dormitories were constructed. The drain also would not have interacted with the footings of the dormitories if the above structure was supported on stumps rather than in-ground footings. The alignment of three postholes along the drain, however, is not indicative of a west–east building and suggests a structure on the same orientation as the drain.

No other structural evidence for the dormitories was identified. The lack of building debris (eg brick or timber fragments) within the decomposed mortar would suggest it did not originate during, or as part of, a demolition event. Its location above two postholes does not support this—if the mortar was contemporary with the postholes, it would be expected that the posts would not be covered by it.

It is unknown whether the spoon drain present between the bathhouse and the dormitories was associated with these structures or the earlier kilns (Figure 4.48). Its demarcation as a dashed line in Figure 4.104 may suggest it was partially demolished at the time of drawing, or, alternatively, was simply not drawn in full. The deposition of the c1960s carpark (*41*) directly above the spoon drain may indicate that it remained in use beyond the first phase of the Brickworks, although it is probably more likely that it was re-exposed during the construction of the carpark.

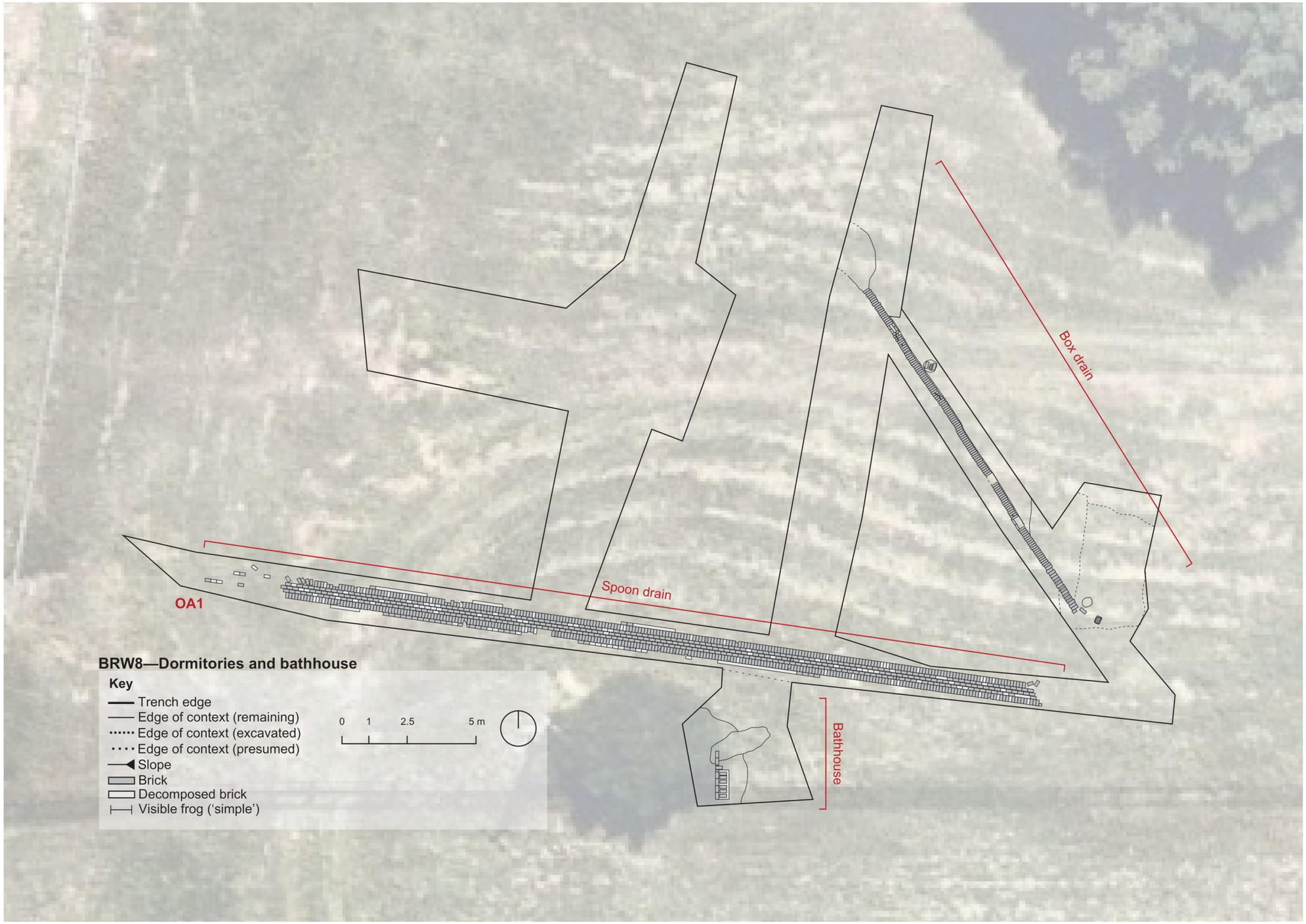


Figure 4.105 Layout of features in the area of the bathhouse and dormitory, OA1. (Source: Near Map 2020 with GML additions)

4.1.5 BRW10—Railway remnants

BRW10 consists of the remnant railway cuttings present in the southwestern extent of the precinct. The AA noted that, whilst the railway structure had likely been completely removed when the Brickworks railway was decommissioned by 1929, there was moderate potential for some materials to remain.[52]

Three TTs (25, 26, and 27) were excavated in BRW10.

TT25 was located in a clearing on an area of level ground (refer to Figure 4.106). Approximately 0.23 metres below the topsoil was a ferrous water pipe (*103*) aligned north–south. An isolated deposit of loosely compacted brownish grey sandy silt with brick rubble (*106*) had partially been cut by the insertion of the water pipe.

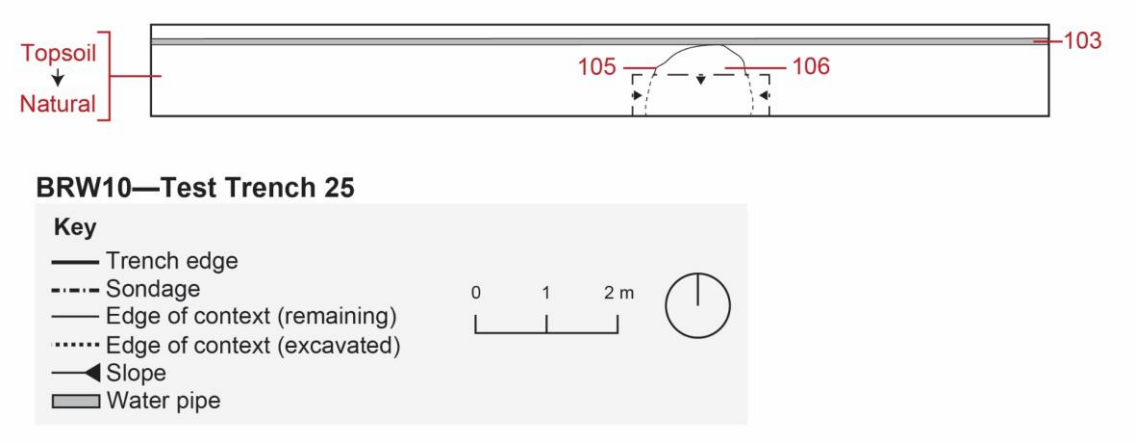


Figure 4.106 TT25.

TT26 and 27 were positioned to capture the cross section of two of the extant railway cuttings (refer to Figure 4.109 and Figure 4.110). Each TT was situated within one of the remnant cuttings and partially overlapped the central embankment. These cuttings were densely overgrown with self-seeded mature trees and low shrubs.

The excavation of the railway cuttings during the construction of the railway had removed the upper natural soil profiles, which had subsequently been deposited on the embankment between the two cuttings. A portion of stacked natural shale rubble was visible in the profile of TT27 (Figure 4.107).

A deposit of 22 steel railway joint bars was identified in TT26 (Figure 4.108, Section 4.2.3). The joint bars had been dumped adjacent to the eastern side of the cutting. Bolts, other railway track components, or archaeological deposits associated with the presence of the railway were not found.



Figure 4.107 Central embankment between TT26 and TT27, aspect east.



Figure 4.108 TT26, in situ deposit of railway joint bars.

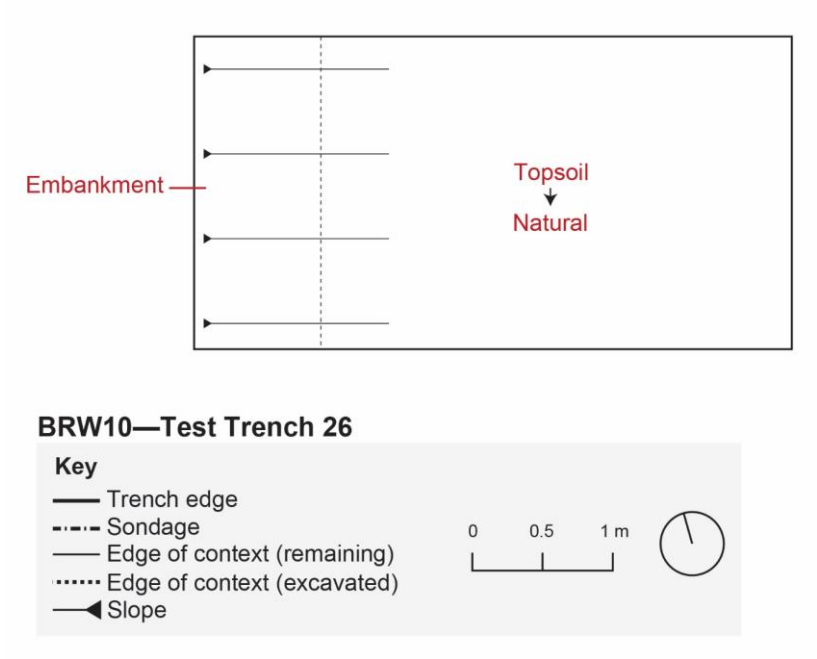


Figure 4.109 TT26.

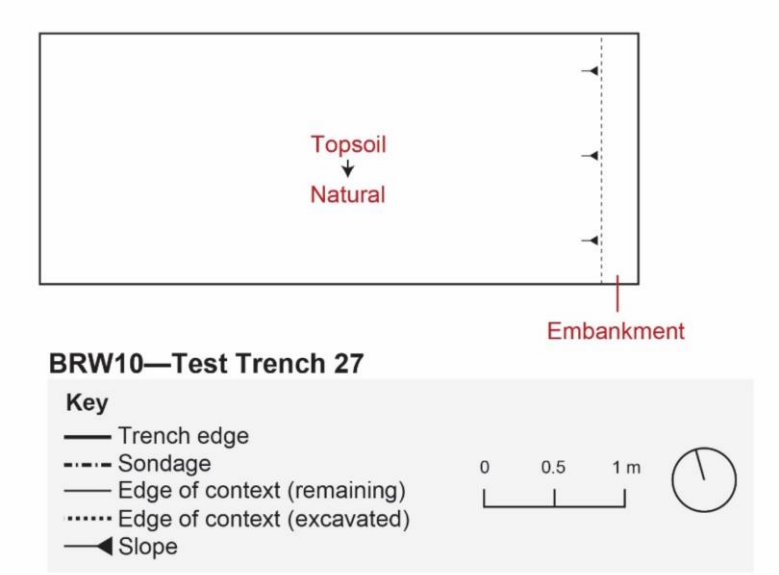


Figure 4.110 TT27.

4.1.6 BRW11—Railway siding extension

BRW11 consists of the northeastern extent of the Brickworks railway, where it extended into the Precinct and terminated adjacent to the Staffordshire Kiln. In c1971 this area was covered by a concrete slab for the extrusion plant, however, the AA noted that there was some potential for railway infrastructure to still be present.[53]

Contamination and geotechnical investigations within BRW11 were undertaken by Agon Environmental on 25 February 2021. These works were monitored by GML for impact to any unidentified archaeological features. The results of the archaeological observations made during the works are included in Appendix E. Overall, BRW11 was characterised by a high degree of contaminated soils and isolated deposits of asbestos material. No evidence of railway infrastructure was identified.

Four TTs (3, 4, 5, and 6) were excavated in BRW11.

TT3 comprised extensions to the west and south from the sunken footings (*18*) for absent machinery (refer to Figure 4.114). The footings consisted of three 'basins' constructed from cast concrete (Figure 4.111). The total structure measured 5.15 metres long x 3.25 metres wide (tapering to 1.4 metres wide at the base) x 0.5 metres deep. On the tops of the walls dividing each basin were two iron bolts for securing machinery in place. The western and central basins were filled with a friable bluish grey clay with a high proportion of shale fragments (*21*). The eastern basin contained an iron frame and pipe fitting embedded in a very compact light bluish grey sandy clay (*23*), which overlaid a moderately compact mid greenish grey clay (*24*) (Figure 4.112).

West of the sunken footings (*18*) was characterised by a vertical cut roughly delineated with amorphous cast in place concrete (*8*). The fill (7) for the cut comprised friable dark brown sandy clay with mixed rubble, charcoal, and timber fragment inclusions (Section 4.2). South of the sunken footings (*18*), a sondage identified a sloping cut (*16*) with three fills (*13*, *14*, and *15*). No artefacts were associated with any of these deposits. Adjacent to the external wall of the sunken footings (*18*) were three unbonded, unorganised 'CB' frogged bricks (*19*) (Figure 4.113). It was unclear whether these bricks were within the cut for the sunken footings (*20*) or the southern cut (*16*). The far western and southern extents of the two extensions consisted of *12*, a very compact mid yellowish brown sandy clay.



Figure 4.111 TT3, the sunken footings (*18*), aspect east.



Figure 4.112 TT3, eastern basin of the sunken footings (*18*) showing the compact clay fills (*23* and *24*), aspect east.



Figure 4.113 TT3, the stack of unbonded bricks (*19*) abutting the external wall of the sunken footings (*18*), aspect north.

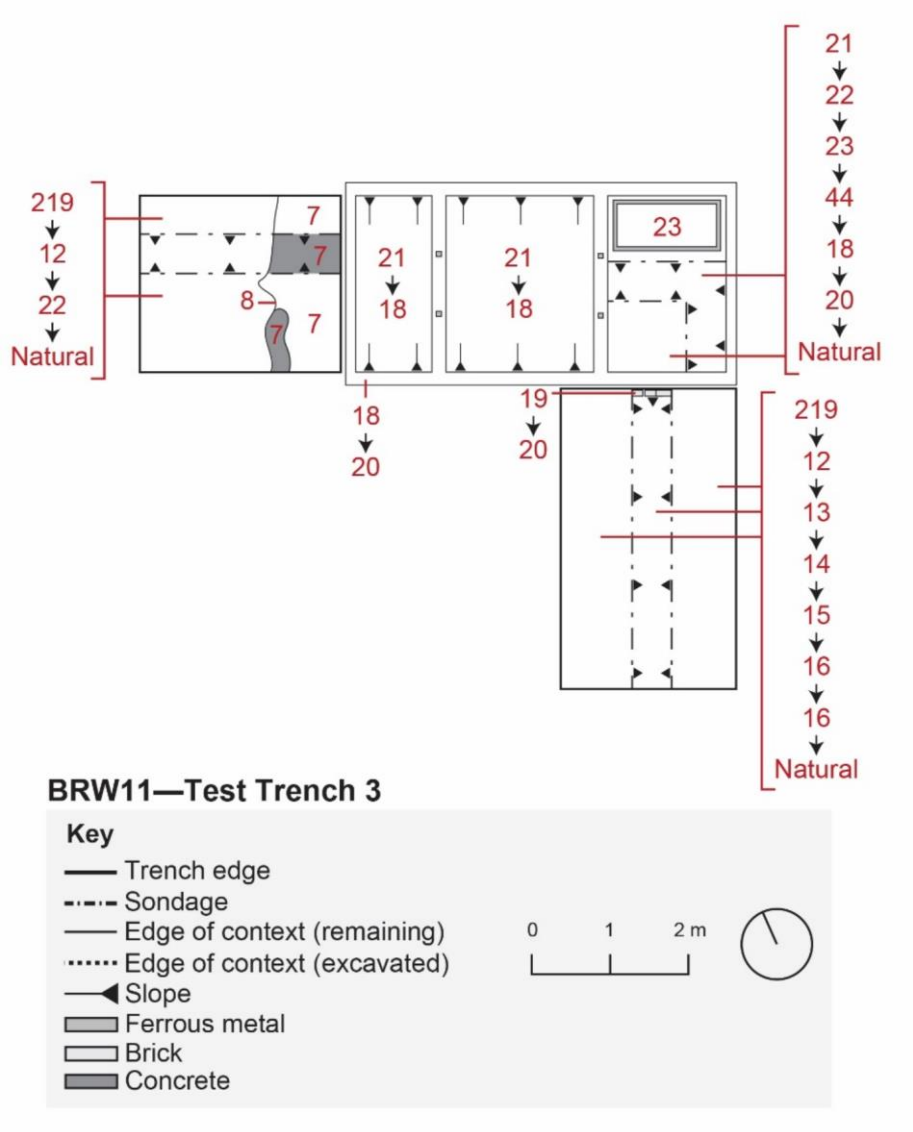


Figure 4.114 TT3.

TT4 was positioned at the far western extent of the concrete slab (*219*), partially within the footprint of the extrusion plant and partially within the adjacent grassed area. The stratigraphic matrix beneath the concrete slab (*219*) was consistent with the observations made during the geotechnical investigations—beneath was a levelling deposit of loosely compact gravel (*27*) and mid yellowish brown to brownish yellow sandy clay with brick rubble (*26*), which overlaid an oil-stained natural clay (Figure 4.115). Adjacent to the concrete slab (*219*) within the brownfield was a friable mottled brown silty sand (*25*) that contained a high proportion of worked and waste timber pieces and iron nails (Section 4.2).



Figure 4.115 TT4, oil-stained natural beneath the levelling gravel deposit (*27*) and clay with brick rubble (*26*), aspect south.

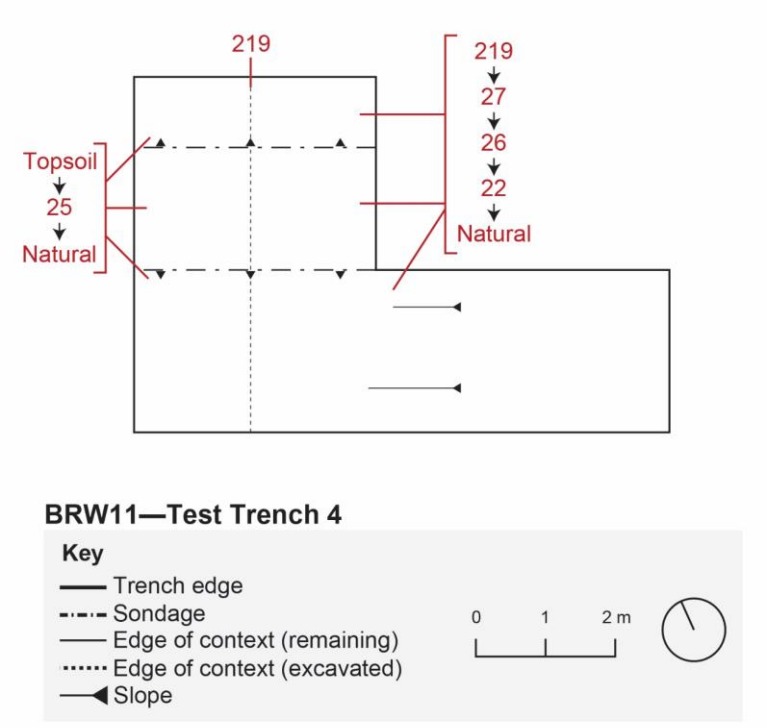


Figure 4.116 TT4.

TT5 and 6 were located entirely beneath the concrete slab (*219*) for the extrusion plant (refer to Figure 4.117 and Figure 4.118). They were characterised by a widespread cut (*22*) that had been used to level the area prior to the deposition of the concrete slab (*219*). The cut had been partially filled with a compact mid greyish brown clay (*17*), which contained isolated lenses of brown sand and brick rubble throughout.

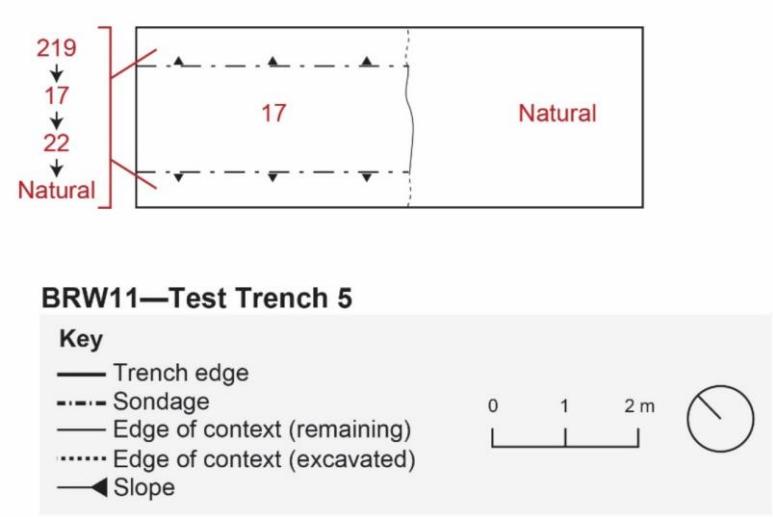


Figure 4.117 TT5.

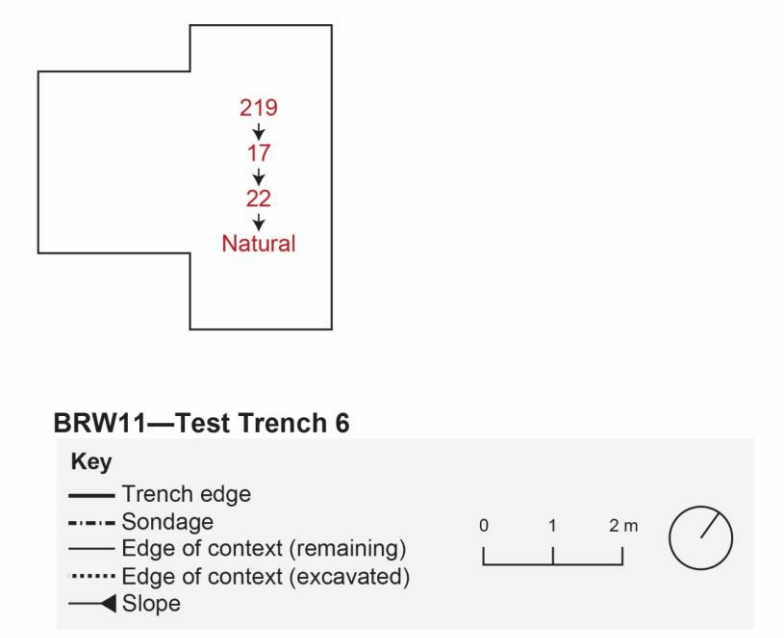


Figure 4.118 TT6.

4.1.7 BRW12—Flues and subsurface workings

There are four extant kilns in the Canberra Brickworks Precinct:

- Staffordshire Kiln and associated fan house and chimney, 1916;
- Hardy Patent Kiln 1 and associated fan houses and chimney, 1927 rebuilt c1955;
- Hardy Patent Kiln 2 and associated chimney, c1954; and
- Downdraught Kilns (consisting of three separate kiln structures) and associated chimney, c1960.

Each of the kilns is serviced by an arrangement of subsurface flues (Figure 4.3). These flues assisted in drawing hot air out of the kiln spaces and allowed for better temperature control during the firing process.

Staffordshire Kiln

The Staffordshire Kiln comprises a two storey structure, with 20 individual kiln chambers on the ground level and a firing floor above (see GML 2021 CMP for a full description of the kiln). Ventilation of the kiln is assisted by a single fan house and chimney, located 20 metres west of the kiln structure.

The subsurface flue for the kiln consists of one central tunnel, 60 metres long x 1.5 metres wide x 1.2 metres high (Figure 4.119). The rear wall of the tunnel—set in a modified English bond—has not been keyed into the domed ceiling and walls, suggesting it was constructed as a free-standing wall before the adjoining tunnel was built. The floor of the tunnel is approximately 1.8 metres below the ground surface. 20 smaller flue channels branch off the central tunnel, each one leading to an individual kiln chamber. These begin at 25.4 metres east of the fan house and are regularly spaced at 3.5 metre intervals (Figure 4.124). The channels on the northern side of the central tunnel are staggered from the southern side, resulting in alternating channel spacing. The entrance to each channel is approximately 0.8 metres high (exclusive of sediment build up) x 0.62 metres wide (Figure 4.120). The channels extend 9.5 metres from the central tunnel, before turning at a right angle and ascending to two openings within each kiln chamber—one in the floor surface within the wicket and one in the external wall adjacent to the wicket (Figure 4.121).

There is a single service hole for accessing the flues from the ground surface, which is located 3.1 metres west of the kiln structure. The service hole measures 0.6 metres x 0.8 metres wide. The channel leading to the service hole from the central flue tunnel is 1.4 metres long. The only other openings into the flue are located in the fan house. The floor of the central tunnel steps up divides in two to enter the fan machinery, where the tunnel then reconverges to direct air towards the chimney (Figure 4.122 and Figure 4.123).

The entire structure appears to have been constructed from 'simple' frog bricks. It is generally in good condition, with no vandalism and little visible deterioration of the bricks or structural condition.




Figure 4.119 The central tunnel and rear wall, aspect southeast. Entrances to the smaller flue channels are visible in each wall of the tunnel.

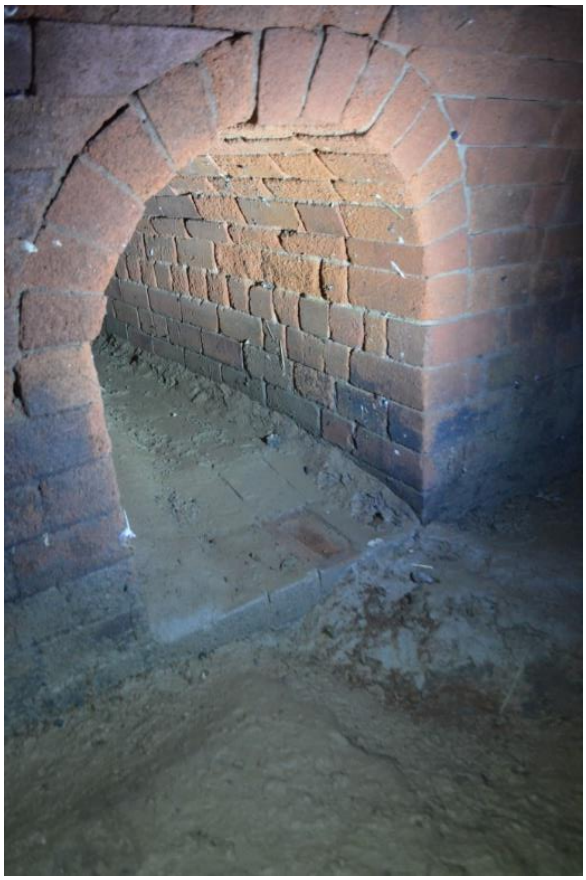



Figure 4.120 One of the smaller flue channels leading off the central tunnel.



Figure 4.121 Each smaller flue channel leads to an individual kiln chamber, where it meets the surface in two locations—one in the floor surface within the wicket (front left, visible adjacent to internal wall) and one in the external wall adjacent to the wicket (right, visible as arched opening).



Figure 4.122 Entrance to the central tunnel via the fan house where the fan machinery has been removed.



Figure 4.123 Split in the central tunnel where it funnels air through the fan machinery towards the chimney.



Figure 4.124 The subsurface flues for the Staffordshire Kiln.

Hardy Patent Kiln 1

The Hardy Patent Kiln 1 comprises a two storey structure, with two long chambers running through the centre of the kiln and a firing floor above (see GML 2021 CMP for a full description of the kiln). Ventilation of the kiln is assisted by a two fan houses and a chimney, located 18 metres west of the kiln structure.

The flues could not be physically accessed. This was due to intact fan machinery still being present within the fan houses and no service hole on the ground surface. A combination of ground penetrating radar (GPR) and hydro excavation was used to identify the likely arrangement of the subsurface flues.

GPR identified a single tunnel leading east from the fan houses to the kiln, aligned along the southern wall of the kiln (Figure 4.125). This tunnel turns north to enter the kiln space approximately 45 metres from the fan houses, coinciding with the 'Kent' oxygen analyser mounted on the external wall (Figure 4.125). Readings from the internal space indicated that two flue tunnels are aligned through the centre of each chamber. These presumably connect to eight smaller flue channels (four in each chamber), identified by the downwards shaft in the firehole (Figure 4.130).

Results from the hydro excavation predominantly supported the observations made through GPR, although indications of considerable alteration to the subsurface flues were identified.

Externally, the single tunnel leading from the fan houses to the kiln was corroborated. However, this appeared in two different forms. Two hydro excavation potholes—1.8 metres and 11.2 metres west of the fan houses—revealed a rectangular cast concrete structure (Figure 4.126). Between these, a third pothole identified a partial brick arch and significant brick rubble collapse (Figure 4.127). This arch had been constructed predominantly from 'CANBERRA C'WEALTH' frog bricks, which included a single bullnose brick.

Within the internal space of the kiln, hydro excavation indicated that further alterations had been made to the original flue layout. A pothole excavated in the western passage between the two kiln chambers revealed a quantity of brick rubble embedded in the stratigraphy beneath the floor surface (Figure 4.128). No concrete flue channels were identified within the kilns—all other identified intact flues were constructed from brick (Figure 4.129).





Figure 4.125 GPR identified a single tunnel leading from the fan houses to the kiln, which enters the kiln at the location of the 'Kent' oxygen analyser.



Figure 4.126 Part of the central concrete flue leading from the fan houses.



Figure 4.127 Part of a damaged remnant brick flue.



Figure 4.128 Brick rubble embedded beneath the floor surface in the western passage between the two kiln chambers.



Figure 4.129 An intact brick flue.

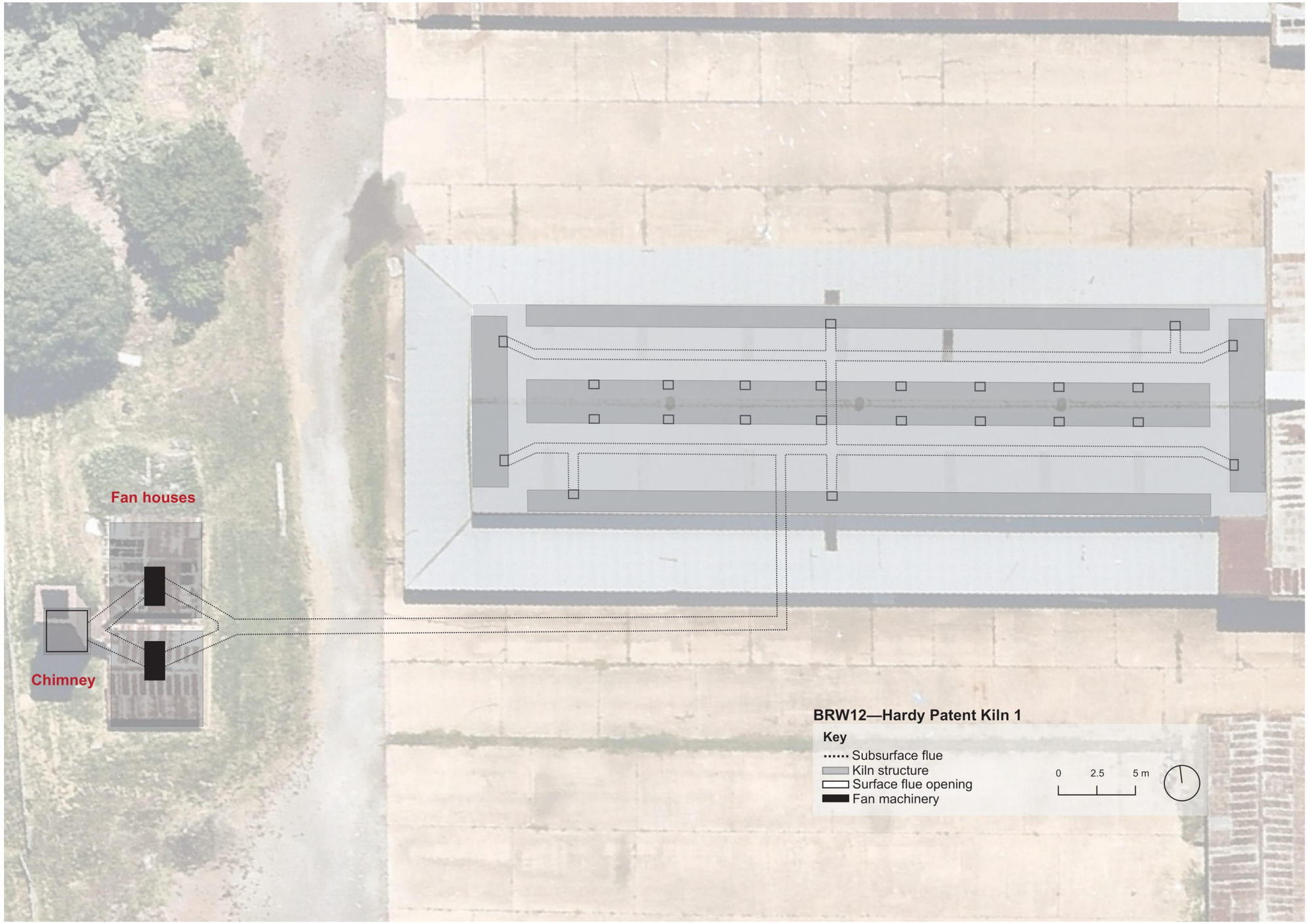


Figure 4.130 The subsurface flues for the Hardy Patent Kiln 1.

Hardy Patent Kiln 2

The Hardy Patent Kiln 2 is constructed in the same style as the Hardy Patent 1 Kiln (see GML 2021 CMP for a full description of the kiln). Ventilation of the kiln is assisted by a single chimney, located 12.5 metres north of the kiln structure.

The flues could not be physically accessed. This was due to both channels leading from the chimney and the chimney feeder being blocked with steel dampers (Figure 4.131). GPR and hydro excavation were used to identify the likely arrangement of the subsurface flues.

GPR readings indicated an almost identical layout to that in Hardy Patent Kiln 1, with two tunnels aligned through the centre of each kiln chamber. However, the arrangement in Hardy Patent Kiln 2 differs in two places. Lacking a return wall at the western end of the kiln (comprising instead of two wickets), the flue openings within the kiln are located in the north and south walls and connected by a channel that crosses through the western passage between the two kiln chambers (Figure 4.135). The other departure from the configuration used in the Hardy Patent Kiln 1 is the apparent presence of two tunnels leading from the kiln to the chimney. Although both tunnels are parallel and aligned directly to the chimney, one is located slightly to the south and appears to divert air through a duct for (now absent) fan machinery before it exits the chimney (Figure 4.135).

Hydro excavation in the southern kiln chamber indicated the Hardy Patent Kiln 2 flues had undergone a similar level of disturbance observed in Hardy Patent Kiln 1. The majority of the hydro excavation potholes revealed collapsed rubble, with only one intact brick arched tunnel located (Figure 4.132 and Figure 4.133). Brick rubble was also found in many of the flue channels within the internal walls of the kiln (Figure 4.134).



Figure 4.131 Steel dampeners blocked the flue tunnels from the chimney (left) and adjacent tunnel (right).





Figure 4.132 Brick rubble embedded beneath the floor surface in the southern kiln chamber.



Figure 4.133 An intact brick flue.



Figure 4.134 Brick rubble in the downwards shaft of a flue channel in the internal wall of the southern kiln chamber.

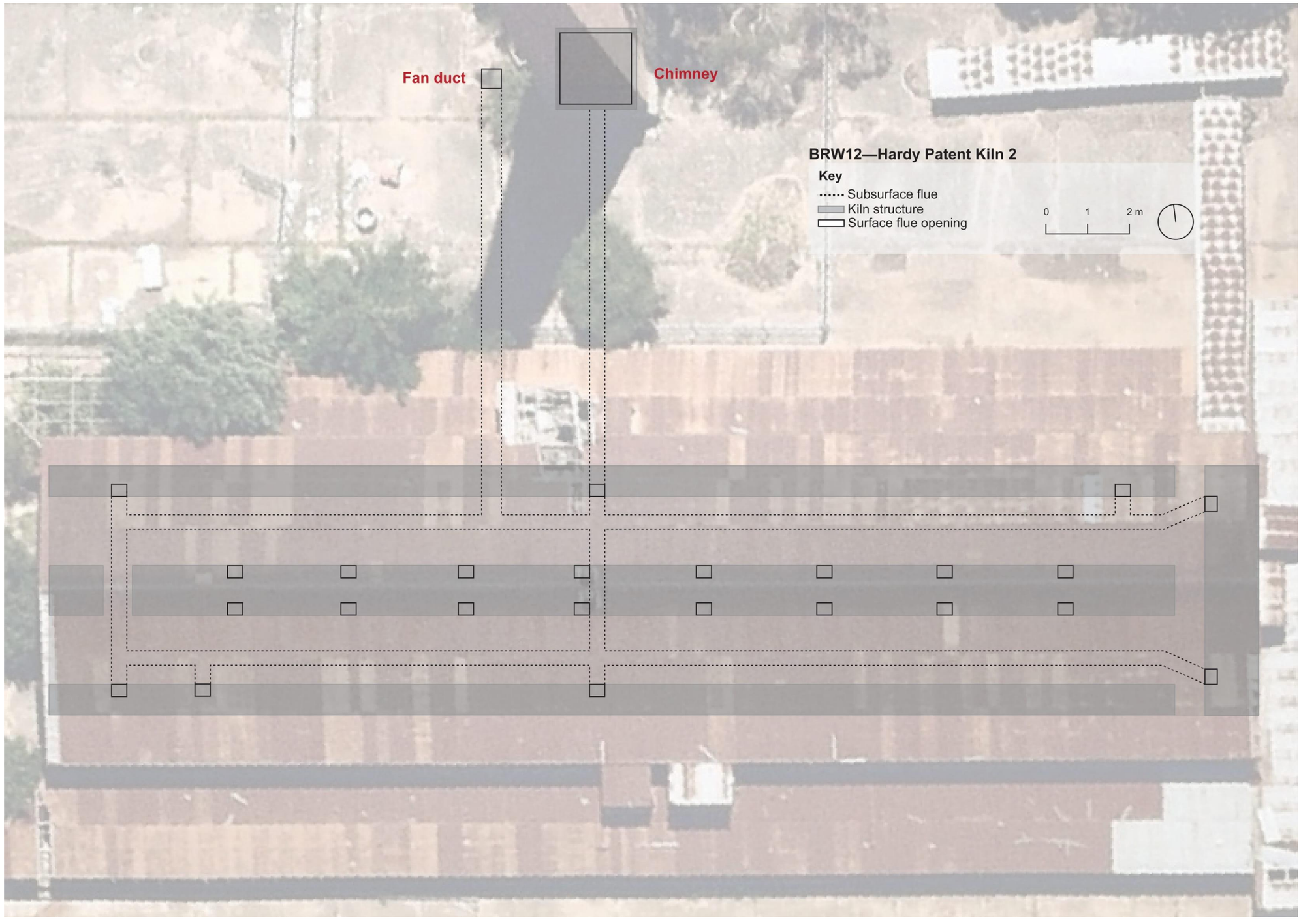


Figure 4.135 The subsurface flues for the Hardy Patent Kiln 2.

Downdraught Kilns

There are three Downdraught Kilns present in the precinct. Each kiln is a single storey, single chamber structure (see GML 2021 CMP for a full description of the kilns). Ventilation of the kilns is assisted by a fan house (since removed) and a chimney, located 24 metres south of the kilns.

The subsurface flue for the kilns comprises a series of tunnels. The central tunnel leading from the fan machinery duct is 15 metres long x 1.4 metres wide x 2.2 metres high (Figure 4.136). The floor of the tunnel is approximately 3.3 metres below the ground surface. At the northern end of the tunnel, four smaller tunnels branch off, two to the west (A and B) and two to the east (C and D) (Figure 4.136 and Figure 4.142).

The openings to the two northern-most side tunnels (B and C) measure 1.2 metres high x 0.67 metres wide and step up 0.74 metres from the floor of the central tunnel (Figure 4.137). Both tunnels service the central Downdraught Kiln, and are located either side of the external walls (Figure 4.137). Each tunnel has three clear segments, measuring:

- Tunnel B—Total length 33.7 metres (consisting of 5.2 metres + 3.9 metres + 24.6 metres).
- Tunnel C—Total length 32.3 metres (consisting of 6.1 metres + 2.9 metres + 23.3 metres).

The openings to the southern-most side tunnels (A and D) measure 1.7 metres high x 0.76 metres wide and step up 0.16 metres from the floor of the central tunnel (Figure 4.138). These tunnels service the western and eastern Downdraught Kilns, and split into two further passages located either side of the external walls (Figure 4.138). These measure:

- Western Downdraught Kiln:
  - Tunnel A1—Total length 49.5 metres (consisting of 20.6 metres + 4.4 metres + 24.5 metres). At the division of A1 and A2, A1 decreases in size to measure 1.28 metres high x 0.76 metres wide and steps up 0.57 metres from the floor. An inclined slope is present in the north–south portion of the tunnel.
  - Tunnel A2—Total length 30.6 metres (consisting of 5.6 metres +25 metres). It branches from A1 at 5.7 metres west of the opening, and decreases in size to match A1. An inclined slope is present in the north–south portion of the tunnel.
- Eastern Downdraught Kiln:
  - Tunnel D1—Total length 47.8 metres (consisting of 20.8 metres + 4.8 metres + 22.2 metres). At the division of D1 and D2, D1 decreases in size to measure 1.28 metres high x 0.76 metres wide and steps up 0.57 metres from the floor. An inclined slope is present in the north–south portion of the tunnel.

- Tunnel D2—Total length 32.2 metres (consisting of 5.6 metres + 26.6 metres). It branches from D1 at 5.7 metres east of the opening, and decreases in size to match D1. An inclined slope is present in the north–south portion of the tunnel.

The subsurface flues have several openings on the surface. These include several vents along the length of each flue and connections into the flue channels located within the external walls of each kiln (Figure 4.139).

Two vents are present along each external side of each Downdraught Kiln. The southern-most vents are aligned with the southern wickets of each kiln (Figure 4.139). These measure:

- A1—0.91 metres long x 0.3 metres wide, 1.35 metres west of the external kiln wall.
- A2—0.91 metres long x 0.34 metres wide, 1.4 metres east of the external kiln wall.
- B—0.91 metres long x 0.32 metres wide, 1.4 metres east of the external kiln wall.
- C—0.83 metres long x 0.35 metres wide, 1.4 metres west of the external kiln wall.
- D1—0.83 metres long x 0.34 metres wide, 1.4 metres west of the external kiln wall.
- D2—Obscured by modern concrete deposit.

The positioning of the northern-most vents differs, although they are generally towards the northern extent of each kiln. These measure:

- A1—0.77 metres long x 0.77 metres wide, 1.42 metres west of the external kiln wall, 1.88 metres south of the northern wicket.
- A2—0.79 metres long x 0.75 metres wide, 1.39 metres east of the external kiln wall, 3.9 metres south of the northern wicket.
- B—0.77 metres long x 0.77 metres wide, 1.39 metres west of the external kiln wall, 1.8 metres south of the northern wicket.
- C—0.77 metres long x 0.77 metres wide, 1.4 metres east of the external kiln wall, 3.9 metres south of the northern wicket.
- D1—0.77 metres long x 0.77 metres wide, 1.32 metres west of the external kiln wall, 11.2 metres south of the northern wicket.
- D2—0.77 metres long x 0.77 metres wide, 1.47 metres east of the external kiln wall, 3.3 metres south of the northern wicket.

Each Downdraught kiln has 10 fireholes on each long wall (Figure 4.140). The fireholes are regularly spaced at approximately 2.1 metres apart. Four fireholes out of each set also act as flue channels that connect to the subsurface tunnels. These are indicated by the presence of steel dampers.

The overall condition of the flues is poor. The central tunnel is prone to flooding during rain events, which had led to the entire structure being subject to damp. This has resulted in extensive salt damage to the eastern tunnels and cracking in the brickwork throughout

(Figure 4.136 and Figure 4.141). However, there is little evidence of vandalism; the accumulated rubbish in the side tunnels has predominantly been dropped through the surface vents.

The extent of deterioration and combination of brickwork used in the flues obscures the identification of construction or design choices, or different phases of repair. Several different types of brick appear to have been used throughout the structure, including red bricks (presumably made on site, although no frogs were observed) and fire bricks. Cream or white-painted bricks were also keyed into the tunnel openings, creating a quoin-like appearance (Figure 4.136). In the domed ceilings of the side tunnels, irregular striations of different coloured brick are present (Figure 4.137 and Figure 4.138). Additionally, there are distinct changes in the brick appearance in certain parts of the tunnel walls. The inconsistency of the patterning cannot be explained by differential heat damage or by deliberate design choice.

It is possible that isolated parts of the brick bond had to be replaced due to deterioration, however, the short period in time between the completion of the Downdraught Kilns and the closure of the Precinct would suggest there was too little time for complete repairs to be required.



Figure 4.136 Right: the central tunnel, aspect south towards the entrance of the fan duct. Left: the rear wall of the central tunnel, with the four branching side tunnels: A (left foreground), B (left background), C (right background), and D (right foreground).



Figure 4.137 Left: the entrance to Tunnel B from the central tunnel. Right: the inclined slope in the north–south portion of Tunnel C, showing the rear wall of the flue where it exits at the northern-most vent adjacent to the northern wicket of the central Downdraught Kiln. *Note: the B and C tunnels are mirrored, so these characteristics are present in both tunnels.*



Figure 4.138 Top left: Tunnel A from the entrance in the central tunnel, the step up into A1 visible in the background. Top right: the split between Tunnels D1 (right) and D2 (left). Bottom left: the bend in Tunnel A2 as it heads north towards the western Downdraught Kiln. Bottom right: the slope upwards in Tunnel D1 in the north-south alignment. The light in the background is from the vent adjacent to the southern wicket. *Note: the A and D tunnels are mirrored, so these characteristics are present in both tunnels.*



Figure 4.139 Top: western side of the western Downdraught Kiln, showing the southern vent aligned with the wicket. Bottom left: view down the southern vent aligned to the eastern side of the western Downdraught Kiln. Bottom right: northern vent aligned to the western side of the eastern Downdraught Kiln.



Figure 4.140 Two fireholes in the western side of the western Downdraught Kiln. The left firehole is connected to the subsurface flues, as indicated by the steel damper, whilst the right firehole leads directly to the internal kiln space.





Figure 4.141 Damp conditions have resulted in extensive salt damage and cracking in the brickwork (see also Figure 4.136).

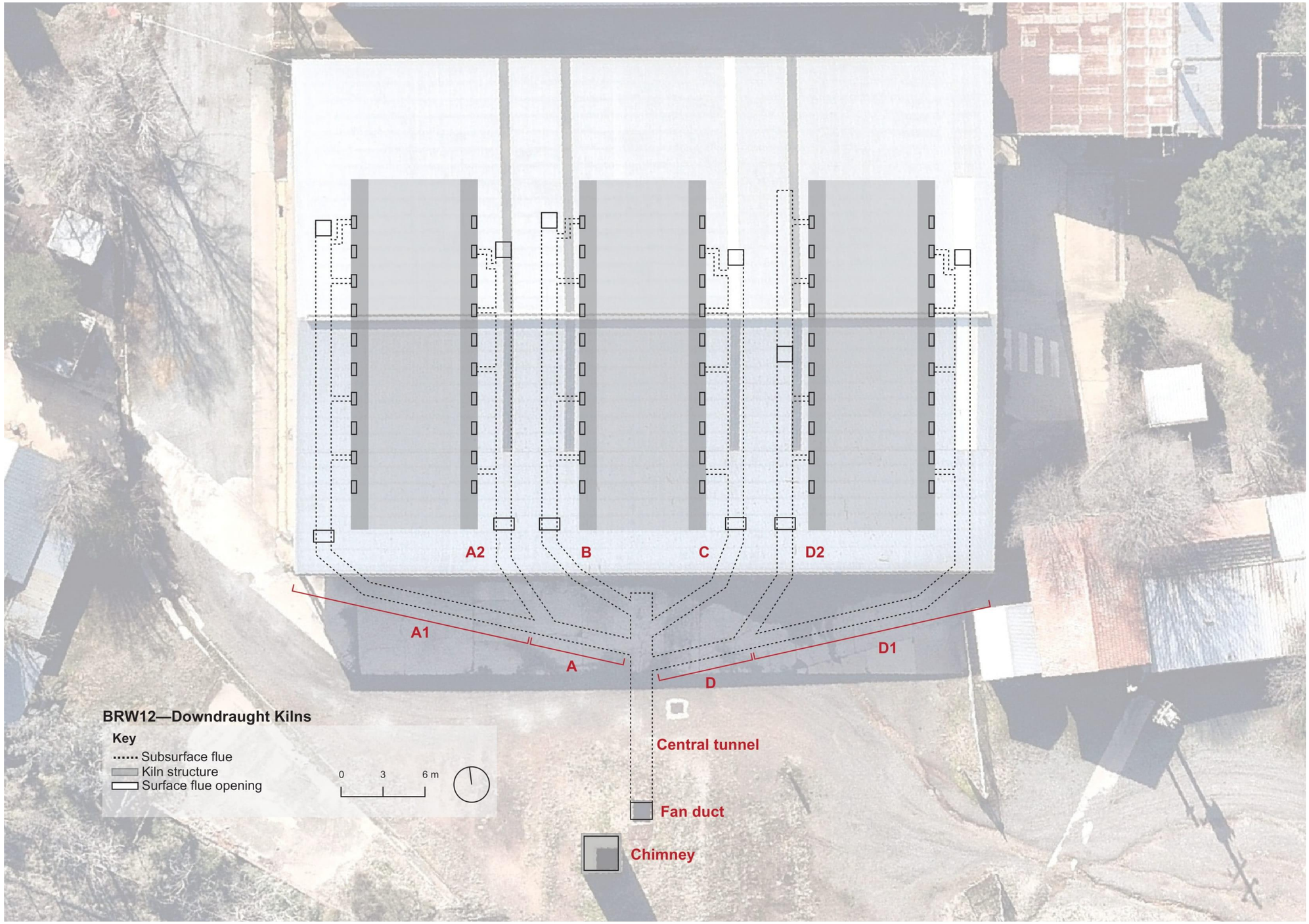


Figure 4.142 The subsurface flues for the Downdraught Kilns.

4.2 Artefacts

The final artefact assemblage recovered during the archaeological investigations comprised of 231 catalogue entries, which included both individual artefacts and typological groups recovered from the same archaeological context. These artefacts had been collected from 38 contexts, the majority of which were demolition or general rubbish deposits, characteristic of the widespread movement of debris around the site.

The catalogue entries were dominated by metal artefacts (29.9 per cent) and building materials (29.4 per cent). This was followed by glass (17.7 per cent). Smaller numbers of ceramic (7.4 per cent), plastic items (5.2 per cent), and faunal remains (5.2 per cent) and other organic materials (4.8 per cent) were also recorded. When assessed for their function, the catalogue entries predominantly related to subsistence (22.1 per cent) (eg beverage bottles and butchered faunal remains), and industrial purposes (13 per cent) and building materials (11.7 per cent) (eg machinery parts, timber pieces, and nails). Few entries were associated with personal items (4.3 per cent).

4.2.1 Building materials

Brick—either whole, rubble, or crushed—was encountered in approximately 40 per cent of recorded archaeological deposits and fills. It was also found in a number of instances to be pressed into natural soil horizons.

Nine frog and maker's mark variations were identified in the collected brick samples (Table 4.2, Figure 4.143 to Figure 4.145).

Seven of these variations were known to be produced at the Brickworks during its numerous stages of operations (Figure 4.143). The earliest frog was 'simple'. Bricks with this frog had been used to construct the Staffordshire Kiln and the five kilns identified as part of the experimental plant (Section 4.1.4). Limited examples of the frog were also identified in other contexts across the complex, although these consisted largely of demolition rubble. As such, they were likely solely produced by the experimental plant during its operational years. When the Precinct reopened in 1921, two new frogs—'CANBERRA C'WEALTH' and 'C'WEALTH CANBERRA'—were used. In the early 1930s the 'C'WEALTH' component of the frog was removed, resulting in a simple 'CANBERRA' stamp. This was then produced until the closure of the Brickworks in 1942. Following the reopening of the Precinct in 1944, the frog was further simplified to 'CB'—presumably standing for 'Canberra Brickworks'—which was then produced until its final closure in 1976. At some point during this final phase, an air brick was also produced. Two variations of a 'blank' frog and an unfrogged brick were also identified. These bricks could not be definitively attributed to a phase of operation.

In addition to these bricks, two additional maker's marks were found (Figure 4.145). This included a firebrick imprinted with a 'W'. Firebricks were not manufactured at the Brickworks and were only imported for the construction of select kilns. The only kilns on the site that have firebricks are the Downdraught Kilns. The firebricks identified in the Downdraught Kilns flues, however, are imprinted with 'IFD'. It is unknown which phase of kiln construction the 'W' firebrick was intended for. A cream common brick with a stylised 'E' or '3' stamp was also located. The manufacturing origins of this brick are unknown. The Brickworks produced limited numbers of cream coloured bricks from c1930s to c1966, however, no definite examples of these bricks were identified during the archaeological investigations. If the cream brick was manufactured at the Precinct, it would be expected it would share one of the standard frogs used for the red bricks (Figure 4.143). The presence of a different frog suggests that it was produced at a facility elsewhere.

In addition to bricks, several other building material forms were recovered (Figure 4.145). This included fragments of three different types of roof tiles. Two of the roof tile types were likely manufactured at the Brickworks—both were low profile interlocking tiles, likely of the 'Marseilles' design. The fragments recovered showed that one type had been frogged with 'C'WEALTH' while the other had been imprinted with 'AUSTRALIA'. The 'C'WEALTH' roof tiles were likely produced in the 1920s with the corresponding brick frog, although it is unknown when the 'AUSTRALIA' roof tiles were produced. The third roof tile was a green painted concrete variety imprinted with 'M'. In addition to the roof tiles, a paver manufactured at the Brickworks was also recovered.



Figure 4.143 Bricks made at the Precinct. Top row, left to right: common 'simple' frog, common 'CANBERRA C'WEALTH' frog, common 'C'WEALTH CANBERRA' frog'. Second row: single bullnose 'simple' frog, squint brick 'CANBERRA C'WEALTH', single bullnose 'CANBERRA C'WEALTH'. Third row: common 'CANBERRA' frog, common 'CB' frog, air brick. Bottom row: common 'blank' frog (Type 1), common 'blank' frog (Type 2), common unfrogged brick.



Figure 4.144 Other building materials made at the Precinct include 'C'WEALTH' roof tiles (far left), 'AUSTRALIA' roof tiles (centre left), and common pavers (right).



Figure 4.145 Other building materials identified during the excavation included a possible common Canberra cream brick (left), 'W' imprinted common brick (centre), and 'M' imprinted green-painted concrete roof tile (right).

Table 4.2 Identified building material types.

Frog / brick type	Description	Date	Type specimen
Bricks produced at the Canberra Brickworks			
'Simple' red	Red (2.5YR 4/6) brick with a total size of 240 millimetres long x 110 millimetres wide x 82 millimetres high. The frog presents as an inverted triangular prism set in the approximate centre of the brick. It measures 163 millimetres long x 57 millimetres wide x 13 millimetres deep. Two clamp imprints are present between the outer edges of the frog and the edges of the brick. One special brick was identified: • Single bullnose—Reddish brown (2.5YR 5/3) brick with a total size of 230 millimetres long x 110 millimetres wide x 7.5 millimetres high. The left side of the brick has been curved to form a rounded arc. The frog shape has been shrunk but retains its rectangular form. It measures 123 millimetres long x 56 millimetres wide x 10 millimetres deep.	1912–1916	CBW_54 (commons), CBW_30 (single bullnose)
'CANBERRA C'WEALTH' red	Reddish brown (2.5YR 4/4) brick with a total size of 230 millimetres long x 110 millimetres wide x 73 millimetres high. The frog presents as a rectangle set in the approximate centre of the brick. It measures 180 millimetres long x 63 millimetres wide x 10 millimetres deep. The frog has been imprinted with 'CANBERRA C'WEALTH' spaced over two lines. Two special bricks were identified:	1921–c1930	CBW_157 (commons), CBW_29 (squint brick), CBW_192 (single bullnose)

Frog / brick type	Description	Date	Type specimen
	• Squint brick—Reddish brown (2.5YR 5/4) brick with a total size of 220 millimetres long x 105 millimetres wide x 73 millimetres deep. The left side of the brick has been tapered to form an off-centred point. The frog shape has been adjusted accordingly. • Single bullnose—Reddish brown (2.5YR 5/4) brick with a total size of 225 millimetres long x 150 millimetres wide x 73 millimetres high. The bottom left corner of the brick has been curved to form a rounded arc. The frog shape has been adjusted accordingly but retains the standard 'CANBERRA C'WEALTH' imprint.		
'C'WEALTH CANBERRA' red	Red (2.5YR 4/6) brick with a total size of 225 millimetres long x 110 millimetres wide x 73 millimetres high. The frog presents as a rectangle set in the approximate centre of the brick. It measures 185 millimetres long x 65 millimetres wide x 10 millimetres deep. The frog has been imprinted with 'C'WEALTH CANBERRA' spaced over two lines.	1921–c1930	CBW_82
'CANBERRA' red	Red (2.5YR 5/6) brick with a total size of 225 millimetres long x 105 millimetres wide x 80 millimetres high. The frog presents as a rectangle set in the approximate centre of the brick. It measures 170 millimetres long x 60 millimetres wide x 10 millimetres deep. The upper half of the frog has been imprinted with 'CANBERRA' spaced 20 millimetres inwards from the outer edges of the frog. Two clamp imprints are present 50 millimetres inwards from the outer edges of the frog.	C1930–1942	CBW_31

Frog / brick type	Description	Date	Type specimen
'CB' red	Red (2.5YR 4/6) brick with a total size of 227 millimetres long x 105 millimetres wide x 75 millimetres high. The frog presents as a rectangle set in the approximate centre of the brick. It measures 150 millimetres long x 53 millimetres wide x 10 millimetres deep. The centre of the frog has been imprinted with 'CB', which is flanked by two clamp imprints. The clamp imprints are present 35 millimetres inwards from the outer edges of the frog.	1944–1976	CBW_23
Air red	Red (2.5YR 4/8) brick with a total size of 225 millimetres long x 110 millimetres wide x 76 millimetres high. Three cylindrical holes ('air' holes) are present through the broad surface of the brick. Each hole has a diameter of 35 millimetres. The outer holes are spaced 35 millimetres inwards from the edge of the brick, with 20 millimetres between each hole.	Late 1960s–1976	CBW_133
'Blank' red	Two variations of the 'blank' frogged red bricks were identified: • Type 1—Red (2.5YR 4/6) brick with a total size of 230 millimetres long x 110 millimetres wide x 80 millimetres high. The frog presents as a blank rectangle set in the approximate centre of the brick. It measures 175 millimetres long x 57 millimetres wide x 10 millimetres deep. Two clamp imprints are present 55 millimetres inwards from the outer edges of the frog. • Type 2—Reddish brown (2.5YR 5/4) brick with a total size of 235 millimetres long x 110 millimetres wide x	Unknown	CBW_63 (Type 1), CBW_210 (Type 2)

Frog / brick type	Description	Date	Type specimen
	72 millimetres high. The frog presents as a blank rectangle set in the approximate centre of the brick. It measures 190 millimetres long x 67 millimetres wide x 7 millimetres deep. Two clamp imprints are present 60 millimetres inwards from the outer edges of the frog.		
Unfrogged red	Red (2.5YR 4/6) brick with a total size of 225 millimetres long x 110 millimetres wide x 75 millimetres high. No frog or other mark is present on the brick.	Unknown	CBW_132
Other building materials produced at the Canberra Brickworks			
'AUSTRALIA' roof tile	Red (2.5YR 5/6) low profile interlocking ceramic roof tile, likely of 'Marseilles' design. Incomplete examples only, full dimensions unknown. Visible incomplete 'AUSTRALIA' stamp on right corner of tile. Remaining lettering unknown.	Unknown	CBW_156
'C'WEALTH' roof tile	Red (2.5YR 4/6) low profile interlocking ceramic roof tile, likely of 'Marseilles' design. Incomplete examples only, full dimensions unknown. Visible incomplete 'C'WEALTH' stamp on left corner of tile. Remaining stamp lettering unknown, may be same as 'C'WEALTH CANBERRA' frog bricks.	c1920s	CBW_156
Paver red	Reddish brown (2.5YR 5/4) paver with a total size of 225 millimetres long x 105 millimetres wide x 50 millimetres high.	Unknown	CBW_34

Frog / brick type	Description	Date	Type specimen
Building materials produced elsewhere			
'W' firebrick	White (2.5YR 8/1) firebrick with a total size of 220 millimetres long x 110 millimetres wide x 75 millimetres high. The maker's mark presents as a single 'W' imprinted in the approximate centre of the brick. It is oriented vertically and measures 45 millimetres long.	Unknown	CBW_137
'M' concrete roof tile	Concrete low profile interlocking roof tile, likely of 'Marseilles' design. Incomplete examples only, full dimensions unknown. Visible incomplete 'M' stamp on centre of tile. Remaining lettering unknown. Remnants of green paint on portions of tile.	Unknown	CBW_131
Unknown			
Cream	White (10YR 8/1) brick with a total size of 230 millimetres long x 115 millimetres wide x 75 millimetres high. The frog is partially obscured by mortar. It presents as a rectangle set in the approximate centre of the brick. It measures a minimum of 105 millimetres long x 40 millimetres wide x 13 millimetres deep. The centre of the frog has been imprinted with a stylised 'E' or '3'.	Unknown	CBW_209

4.2.2 Glass

Glass artefacts dominated the total assemblage recovered from the Brickworks. Large concentrations of whole and fragmented beer bottles, soft-drink bottles, condiment jars, and several personal toiletries jars were recovered. These generally dated to the 1920s and 1950s–1960s, with limited examples from the 1930s–1940s.

Beer bottles from all decades were found. Bottles from the 1920s had short bulged necks and high shoulders (eg CBW_25) (Figure 4.146). The upper half of the body was marked with 'This bottle is the property of', which was completed near the heel with 'The NSW Bottle Company Ltd'. By the 1950s the bottle shape had elongated and the neck tapered to lower shoulders to resemble a more modern beer bottle shape (eg CBW_56) (Figure 4.146). The positioning of the manufacturer's mark split between the shoulder and heel of the bottle was maintained, as was the date of manufacture on the base of the bottle. This shape was continued through the 1960s. No brewery brands were identified on any of these bottles (see Section 4.2.3 for cans).

Examples of other beverage bottles were limited. A 1920s 'Udolpho Wolfe's Schiedam Aromatic Schnapps' bottle (CBW_97) was recovered, as were several 1930s 'Brooke's Lemos' cordial bottles (CBW_221 and 233). A number of soft-drink brands appeared in the 1960s (see Section 4.2.3 for cans). These included 'Pepsi Cola' (CBW_143), 'Dixi-Cola' (CBW_216), 'Big Sister Tutti Frutti' (CBW_175), 'Schweppes', and 'Tarax' (CBW_49) (Figure 4.147).

Condiment jars were generally dated to the pre-1940s occupation of the Precinct. Many of the condiments were from staple brands such as 'H M Leggo & Co', 'Rosella P & M Co Ltd', and 'Sanitarium Health Food Co' (CBW_221), which manufactured products such as pasta sauces, chutneys, spreads, and other preserves.

A number of late 1920s to early 1930s personal toiletry product jars were also recovered. These included men's grooming products such as 'Ingram's Shaving Cream' (CBW_233) and 'Brylcreem' styling cream (CBW_221). Several medical products were also identified, including 'Vicks VapoRub' (CBW_230), 'Kruschen Salts' dietary supplement (CBW_233), and the tincture 'Clarke's World Famed Blood Mixture' (CBW_221) which was advertised as a remedy for a number of skin and blood diseases (Figure 4.148).

A single marble (CBW_95) was identified in the fill of the spoon drain (*49*, Section 4.1.4). Likely a machine-made marble, it had been crafted from a black glass base with loose swirls in seafoam green and light blue. Some pitting was present on the surface (Figure 4.149).



Figure 4.146 The shape of the beer bottle changes markedly between the 1920s (left, CBW_25) and the 1960s (right, CBW_56).



Figure 4.147 A number of other beverages were consumed, including (left to right): schnapps (CBW_97), cordial (CBW_233), and a variety of soft-drinks (right, CBW_216, 143, 175, and 49).





Figure 4.148 Personal products were also consumed at the Precinct, including Vicks VapoRub (left, CBW_230) and dietary salts (right, CBW_233).

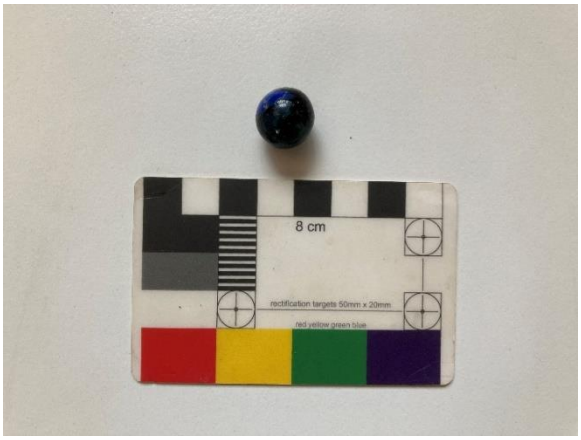


Figure 4.149 A glass marble (CBW_95).

4.2.3 Metal

Metal artefacts predominantly consisted of miscellaneous iron nails, bars, machine and structural fittings, sheets, and non-diagnostic fragments. These would have contributed to the industrial function of the site.

Twenty-two steel rail joint bars were found in one of the abandoned railway cuttings (Section 4.1.5). Each joint measures 460 millimetres long x 50 millimetres wide x 15 millimetres high and weighs approximately 3 kilograms. The joints are perforated with four holes for bolts, which were used to fix each joint to two railway tracks, holding the tracks together.

In addition to the glass beer and soft-drink bottles recovered (Section 4.2.2), a number of steel can examples were also located. The brands included 'Foster's Lager' (CBW_47), 'Tooheys Draught' (CBW112), 'Woolworths Sparkling Lemonade' (CBW_19), 'Fanta' (CBW_47), 'Tarax' (CBW_130), and 'Coca Cola' (CBW_220). These cans were also dated to the late 1960s and early 1970s operation of the Precinct.

Thirty-five addressograph plates were recovered from the rubble of the Brickyards Mess house (*95*, Section 4.1.2). Originally patented in 1896, the addressograph was a common administrative tool of the 1960s. It provided a quick way in which to print addresses or other information onto letterhead. Thin steel plates embossed with the appropriate information were fitted into the addressograph machine, run across an inked ribbon, and then pressed onto the printing medium. When not in use, the addressograph plates were placed in steel cassettes. Twenty-two of the recovered plates were related to personnel—they detailed a full name, address, birth date, and what was presumably an employee code and start of employment date (Table 4.3, Figure 4.150). The remaining 13 plates were associated with vehicles and their registered drivers (

Table 4.4, Figure 4.150). It is unknown whether the individuals or vehicles detailed on the addressograph plates were directly employed or associated with the Brickworks.





Figure 4.150 The addressograph plates included the details of individuals (top, CBW_51) and vehicles (bottom, CBW_52).

Table 4.3 Personnel addressograph plates recovered from the remains of the Brickworks Hostel mess house (*95*).

Employee code	Date of employment	Name	Address	Birth date
E/3922	27 Nov 1969	James Pantos	90 La Perouse St, Griffith ACT	16/01/1938
E/4518	30 Nov 1964	John M Houston	Flat G3 Block C Currong Flats, Braddon ACT	21/09/1928
T/1574	–	Lillian E Colebatch	RMC Duntroon ACT	–
C/7306	31 Oct 1960	James K Nell Thorpe-Quibell	Kambah Lane, Via Queanbeyan	1918
–	1959	Harold Herbert Strachan	Wentworth Ave, Kingston ACT	12/11/1899
C/35371	21 Jan 1970	Allen T Watson	40 Causeway, Canberra ACT	2/11/1925
D/17998	9 Nov 1960	Thomas Livesley Phillips	21B Currong Flats, Braddon ACT	19/01/1920
A/29811	1 Sep 1962	William McGinn	Ainslie Hostel	27/06/1921
T/1870	–	Kevin J Johnston	8 Hart St, O'Connor	–
T/1526	–	William E Clarke	35 Nardoo Cres, O'Connor	–
T/1511	–	Colin Francis Gunn	Bolderwood St, Turner	–
A/34825	3 Dec 1964	James M Calvert	Lawley House, Barton ACT	6/03/1913
C/34241	16 Oct 1969	Alois Dukkl	Hillside Hostel, Canberra	2/03/1936
A/35227	11 Jan 1969	Daryl Gai Chalker	22 Shortland Cresc, Ainslie ACT	26/02/1939
A/30467	11 Nov 1960	Alfred Krotil	Capital Hill House, Canberra	25/11/1930
A/24916	31 Oct 1960	Marion R Bosci	10 Ebden St, Ainslie ACT	3/05/1932

Employee code	Date of employment	Name	Address	Birth date
C/34857	4 Dec 1969	Guen E R Koch	Lot 26 Duffy St, Ainslie ACT	24/11/1928
A/30478	13 Nov 1962	Barbara A Cowdroy	3 Turner Place, Yarralumla ACT	17/09/1940
A/4198	20 Oct 1960	Lillian L Lamidey	12 Arthur Circle, Forrest ACT	25/4/1895
E/1480	28 Oct 1969	Donald G Roberts	97 Canberra Ave, Griffith ACT	24/10/1919
C/8655	12 Apr 1962	Darcy A Armstrong	12/16th St, Narrabundah ACT	23/06/1923
A/35758	22 Feb 1963	Joseph Conrad	35 Blackbutt St, Lyneham ACT	10/09/1916

Table 4.4 Vehicle addressograph plates recovered from the remains of the Brickworks Hostel mess house (*95*).

Vehicle type	Car code	ID	Manufacturer	Driver name	Driver address
Car	23976	65562	Holden	Donald N Kime	7 Glover St, Lyneham ACT
Car	23410	EOTTA131688	Ford (Zephyr)	Elvin K Blewitt	Mt Causeway, Canberra ACT
Car	29/837	1G17690	Austin	George R Graf	12 Landsborough St, Griffith ACT
Car	20344	EP154/D4/48754	Morris	Antonius A Van Huet	Gorman House, ACT
Car	34506	V16814E	Standard	Francis M Sheppard	Lennox House, Canberra ACT
Car	28445	L320800	Holden	Capital Motors Pty Ltd	Flinders Way, Manuka ACT
Car	26971	C473841	Ford	William C Coulthard	20 Carstenz St, Griffith ACT
Lorry	25896	ARA1303	Ford	Karl Schreiner Transport Shipping Corp Pty Ltd	Cotter Rd, ACT
Car	25078	L614570	Holden	John F & Nancy M Rillatt	15 Wandoo St, O'Connor ACT
Car	28-609	72483	Morris	Colin J Duff	20 Coranderrk St, Reid ACT
Car	8562	APHM84998	Morris	Bert F Ward	10 Gunn St, Yarralumla ACT
Car	18330	EP98548	Vauxhall	Robert J O'Doherty	32 Nardoo Cres, O'Connor ACT
Lorry	24096	270333080	Commer	AS Heaton (Holding P/Ltd	47 East Row, Civic ACT

4.2.4 Ceramic

Nine ceramic telegraph insulator brackets were identified. These primarily consisted of stay or guy insulators (CBW_166, 181, 182, 198, and 201), with a single whole spool shackle insulator (CBW_229). They were generally found around the electrical services pole in BRW8.

Fragments of 13 teacups and mugs were collected. These largely comprised undecorated, simple white glazed fragments. Where decoration was present, it was typically simple gold rims (eg CBW_96, 194, and 236) or floral patterns (eg CBW_50 and 113) (Figure 4.151).



Figure 4.151 Decoration included gold motifs (left, CBW_236), simple gold lines (centre, CBW_96), and floral patterns (right, CBW_50).

4.2.5 Organics

Leather

The fragments of approximately six leather boots were recovered (CBW_60, 123, and 185). These fragments included pieces from a men's dress shoe and pull-on ankle boot and the pointed toe of a possible women's shoe.



Figure 4.152 Leather shoe fragments, including a pull-on ankle boot (left, CBW_60), throat with eyelets (centre, CBW_123), and pointed toe (right, CBW_185).

Wood

A variety of raw and worked wooden pieces were identified. These were largely unidentifiable, non-diagnostic pieces that were likely waste from the crafting or repair of timber implements and joinery on site.

The exception to this was a composite timber sheet, constructed from four individual thin layers of plywood (CBW_24, Figure 4.153). Each layer was cut on an alternate grain to the preceding sheet. A semi rounded ferrous 'knob' was embedded in one side of the sheet. It may have been a plywood door with latch from a storage unit.



Figure 4.153 The top (left) and second (right) layers of the composite timber sheet (CBW_24), in situ in TT3 (*12*).

Faunal remains

Faunal remains were identified in a limited number of contexts. However, the majority of these contexts dated to the pre-1930s activity of the Brickworks, providing insight into the subsistence of the early workers and inhabitants of the site.

Notably, the faunal assemblage was dominated by sheep remains, which were primarily leg and mandible pieces. Butchery marks were present on a number of the remains. Also identified was almost three kilograms of *Saccostrea glomerata* (Sydney Rock Oyster) shells

(CBW_202). The entire assemblage of shell was located within the fill (*49*) of the spoon drain (*50*) (Section 4.1.4), likely dumped either during or shortly after consumption.

A single shell button was also recovered (CBW_98) (Figure 4.154).



Figure 4.154 A shell button (CBW_98).

4.2.6 Other

Plastic items were generally recovered from debris associated with the 1976 closure and subsequent demolition of the Brickworks buildings and following use of the site. These included plastic soft-drink bottles, food wrappers, and other single-use items.

4.2.7 Interpretation

The artefactual assemblage recovered during the archaeological investigations was not only characteristic of the industrial nature of the site, but also provided insight into the lives of the workers and inhabitants of the Brickworks over its operation.

A total of 15 brick and building products manufactured at the Precinct was identified. These would have been a small representative sample of the total quantity and variation of

materials produced. As the Brickworks successively closed and reopened, new frogs were designed for each stage. In some instances, two variations of a similar frog were in circulation around the same time, such as the 1920s 'CANBERRA C'WEALTH' and 'C'WEALTH CANBERRA' frogs. It is possible that the two different frogs were produced to denote two different markets, such as bricks intended for the construction of government and public buildings versus privately owned dwellings. The 1920s were a significant period of development for Canberra, with many of the early government buildings established at this time coupled with a push to increase the accommodation options and population density of the city. The production of the two different frogs may also explain the two 'blank' frog variations, which could have been produced concurrently to other frogs for alternate consumer markets.

Although all phases of worker accommodation that had been present at the Precinct have since been demolished, a considerable quantity of material relating to the occupation of the site remained. This was dominated by glass beverage bottles, which notably included a vast number of beer bottles, although smaller amounts of soft-drink, cordial, and schnapps bottles were also recovered. It is probable that the consumption of alcoholic beverages was used for relaxation or team bonding. Regarding the consumption of solid foods, this was generally represented by butchered faunal remains. The lack of representation of the full skeletal assemblage was indicative of select meat cuts being sourced off-site and brought back for consumption, rather than complete animals being processed on site. The prevalence of sheep—a large meat yielding animal—is suggestive of larger groups of people being fed, perhaps in a communal-style. The identification of a single quantity of oyster shell suggests that shellfish were not a common component of the workers' diets.

The Brickworks workers were also characterised through their remaining personal artefacts. These objects included items that would have contributed to grooming habits—such as shaving cream, hair styling cream, and leather dress shoes—and health—such as decongestant, blood and skin tonics, and dietary supplements. The ownership of these items shows that at least a number of the workers cared about their appearances and wellbeing, which would have been affected by the hard manufacturing labour. The addressograph plates recovered from the Brickyard Mess House may detail a number of the individuals who worked at the Precinct, although this requires further research to confirm.

4.3 Endnotes

[28] GML Heritage Pty Ltd, Canberra Brickworks Precinct—Archaeological Research Design, prepared for Doma Group, September 2020, p 20.

[29] GML Heritage Pty Ltd, Canberra Brickworks Precinct—Archaeological Research Design, prepared for Doma Group, September 2020, p 21.

[30] GML Heritage Pty Ltd, Canberra Brickworks Precinct—Archaeological Research Design, prepared for Doma Group, September 2020, p 22.

[31] GML Heritage Pty ltd, Canberra Brickworks Quarry—Statement of Heritage Effects, prepared for Doma Group, September 2021, p 13.

[32] GML Heritage Pty ltd, Canberra Brickworks Quarry—Statement of Heritage Effects, prepared for Doma Group, September 2021, p 13.

[33] GML Heritage Pty Ltd, Canberra Brickworks Precinct—Archaeological Research Design, prepared for Doma Group, September 2020, p 28.

[34] Lester Firth Associates Pty Ltd, *Old Canberra Brickworks, Conservation Plan*, June 1986, Section 2.1.1 (Brick Firing Kilns).

[35] Lester Firth Associates Pty Ltd, *Old Canberra Brickworks, Conservation Plan*, June 1986, Section 2.1.1 (Brick Firing Kilns); McQueen, R and Ross-Hauer, J, 2013, 'Brick manufacturing in the Cortez missing district, Nevada', *Nevada Archaeologist* 26, p 19.

[36] Clough, R, 1989, 'Documents and Digs—Investigation of the Copper and Clay Industries in New Zealand', *Australian Historical Archaeology* 7, p 4.

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[43] Archaeological Management and Consulting Group Pty Ltd, Scotch Kiln at Bridgman Ridge, Singleton, NSW, Final Archaeological Report, October 2011, prepared for Bridgeman Ridge Holdings, p 40.

[44] Archaeological Management and Consulting Group Pty Ltd, Scotch Kiln at Bridgman Ridge, Singleton, NSW, Final Archaeological Report, October 2011, prepared for Bridgeman Ridge Holdings, p 40.

[45] Archaeological Management and Consulting Group Pty Ltd, Scotch Kiln at Bridgman Ridge, Singleton, NSW, Final Archaeological Report, October 2011, prepared for Bridgeman Ridge Holdings, p 41.

[46] Clough, R, 1989, 'Documents and Digs—Investigation of the Copper and Clay Industries in New Zealand', *Australian Historical Archaeology* 7, p 4.

[47] Clough, R, 1989, 'Documents and Digs—Investigation of the Copper and Clay Industries in New Zealand', *Australian Historical Archaeology* 7, p 4.

[48] Selby, J, 200, 'The Fenny Compton tunnel, Oxford Canal', *Industrial Archaeology Review* 24(2), p 113.

[49] Selby, J, 200, 'The Fenny Compton tunnel, Oxford Canal', *Industrial Archaeology Review* 24(2), p 113.

[50] Selby, J, 200, 'The Fenny Compton tunnel, Oxford Canal', *Industrial Archaeology Review* 24(2), p 113.

[51] Selby, J, 200, 'The Fenny Compton tunnel, Oxford Canal', *Industrial Archaeology Review* 24(2), p 113.

[52] GML Heritage Pty Ltd, Canberra Brickworks Precinct—Archaeological Research Design, prepared for Doma Group, September 2020, p 30.

[53] GML Heritage Pty Ltd, Canberra Brickworks Precinct—Archaeological Research Design, prepared for Doma Group, September 2020, p 32.

5 Discussion

5 Discussion

The 2021 CMP outlines four phases of development for the Precinct (discussed in Section 2):

- Establishment Phase, 1911–1920
- Expansion Phase, 1921–1942
- Post World War II Phase, 1944–1976
- Post Closure Phase, 1976–2017

The archaeological evidence identified during the investigations primarily relates to the later phases of use, particularly the late Expansion Phase and Post World War II Phase. The discovery of the early experimental plant, however, enables several subphases to be added to the chronology under the Establishment Phase:

- Experimental Plant Operation Subphase, 1913–c1916
  - Kiln A, 1913
  - Kiln B, 1913–c1916
  - Kiln C, 1913–c1916
  - Kiln D Downdraught, 1913–c1914
  - Kiln D Scotch, c1914–c1916
  - Kiln E Downdraught, 1913–c1914
  - Kiln E Scotch, c1914–c1916

The following section examines the archaeological evidence for each phase and contextualises it with the research questions proposed in the ARD (Appendix C).

5.1 Phases

5.1.1 Establishment phase, 1911–1920

Archaeological evidence for the first few years of the Brickworks is mainly associated with the experimental plant (discussed below) and the Staffordshire Kiln.

The Staffordshire Kiln comprises a two storey structure, with 20 individual kiln chambers on the ground level and a firing floor above. Construction of the kiln began in 1914 and was completed in early 1916. Prior to the construction of the superstructure, the trench for the subsurface flue would have been excavated. This was then lined with bricks—made in the experimental plant—to create the domed flue tunnel (Section 4.1.7). Once the flues were completed, the remainder of the structure was formed. There is some ambiguity

concerning whether the extant flues are the original 1915 construction. This is discussed further in Section 5.1.3.

With regards to the accommodation of workers on the site, this predominantly occurred outside the area of investigation. However, the location of the dormitories as depicted on the 1916 contour survey plan was examined. A small number of features—such as several postholes and a box drain—indicative of a structure was present. However, these were largely insubstantial and did not correspond with the building footprint depicted on the 1916 contour survey (Section 4.1.4). No domestic artefacts were identified in connection with these features. There was, however, a concentrated dump of domestic items within the larger spread of c1930s rubble overlying the experimental plant (Section 5.1.2). These artefacts included glass condiment jars, personal hygiene product jars, and domestic electrical items such as light fittings and door locks (Section 4.2). The location of these artefacts within the rubble deposit would suggest they originated from a nearby domestic building. This may not have necessarily been the dormitories or the c1913 single men's quarters that was located immediately south of the experimental plant. The dating of 1930s artefacts would suggest this rubble is related to the demolition of the 1927–1942 married quarters, which was located further west. This is discussed further below.

Experimental Plant operation subphase, 1913–c1916

Work at the Precinct began with the construction of the experimental plant. Although this plant was neither designed nor intended to be the long-term solution for the Brickworks, it was more than a makeshift or temporary operation. The aim of the experimental plant was twofold: to produce bricks for the construction of the Kingston Powerhouse and, later, the Staffordshire Kiln; and to trial the local materials and types of bricks that could be made.

The first kiln—a clamp kiln—was a truly temporary kiln. The purpose of this kiln was to produce bricks for the construction of the first experimental kiln, probably a Scotch kiln. To construct a Scotch kiln, somewhere in the order of 15,000 bricks would be required for a kiln approximately 8 metres long x 4 metres wide with walls 2 metres thick x 2 metres high. Hill wrote in June 1913 that this 'first kiln of bricks about 20,000' would be burnt to obtain bricks for the construction of the following kiln (Section 2.1). This quantity would account for the approximately 20 per cent of brick loss that would occur during a clamp kiln firing whilst ensuring that enough good bricks would be produced.

It is possible that—in order to concentrate the efforts of the open kilns on producing bricks for use outside the plant—a separate clamp kiln was used to construct each experimental kiln. When Christie wrote in August 1913 about the experimental plant containing six kilns (Section 2.1) this number likely did not include any clamp kilns. As many as 12 kilns—accounting for one clamp kiln for each Scotch or downdraught kiln—may have been present in the experimental plant. Evidence for any additional clamp kilns would have been

ephemeral (as seen with Kiln A), and has likely since been removed by the construction of other kilns, structures, or the advancement of the quarry.

Following the firing of the first clamp kiln, the construction of No 1 Kiln commenced. Based on Figure 4.100 and Figure 4.102, at least two Scotch kilns were constructed before further experimentation with kiln types was undertaken. Although both Scotch kilns would have been consistent in their layout, the variations in brick bond and firebox positions demonstrate that experiments with construction methods were occurring.

Archaeological evidence from Kilns D and E show that the early Precinct workers did not limit themselves to open kilns, but also trialled downdraught kilns. It is unknown why these downdraught kilns were eventually converted into Scotch kilns. There are several viable theories:

- Inefficiency—Based on Christie's letters (Section 2.1), the Scotch kilns were surpassing expectations in terms of brick quality and productivity. The downdraught kilns may not have been as much of a success, perhaps resulting in high proportions of misfired bricks or requiring excessive effort to conduct each firing. Given the enclosed nature of downdraught kilns, they tend to be generally more fuel efficient and consistent in temperature than open kilns like Scotch kilns. So while it would seem unlikely the downdraught kilns were less efficient than the Scotch kilns, there may have been peculiarities or defects in their design and construction that rendered them less desirable in this setting.
- Flawed design—Two different forms of flue channel were used in Kilns D and E. The channel in the former kiln was positioned off-centre adjacent to the western external wall and curved as it left the kiln. Accounting for the brick lining, the width of the channel was approximately 0.25 metres wide. Conversely, the flue in Kiln E ran through the centre of the internal space and was approximately 0.6 metres wide (assuming a brick lining was present originally). The two kilns shared a chimney. Given the different characteristics, it is likely the two flues vented hot air at different rates or with different levels of success. If the functionality of one (or both) flues was compromised, it may have been preferable to decommission both instead of attempting to redesign them or the chimney. Alternatively, there may have been a flaw with the way the chimney had been constructed or was operating.
- Damage—The presence of the chimney is key to the operation of a downdraught kiln. If the chimney had been damaged and had to be removed, once again, it may have been easier to alter the kilns than build a new chimney.

A year prior to the first closure of the Precinct in 1916, the Staffordshire Kiln had been completed. Initially, it had not been planned to continue using the experimental plant once the Staffordshire Kiln was functional. However, the modification of Kilns D and E show an active investment in the longevity of the experimental plant—if the kilns were not expected

to produce bricks for more than a year or two, supplying resources for ongoing repair and modification would be wasteful when these could be put towards a new temporary kiln. The investment of effort in altering the two kilns demonstrates that extending their lifespan was a key consideration.

It is unknown when the two downdraught kilns were converted into Scotch kilns. No chimney stack is visible in any of the early photographs of the experimental plant (Figure 4.100 to Figure 4.102). The enclosed nature of one of the kilns visible in Figure 4.101 and the changes visible in Figure 4.100 suggest that the conversion occurred early in the developmental sequence, potentially prior to 1914.

The experimental plant was likely to have still been partially functional at the time of the first closure of the Brickworks. The 1916 contour map depicts four of the six kilns (Figure 2.5). Two of these kilns have been crossed out—suggesting either demolition or lack of use—whilst two other kilns have not. The continued depiction of these kilns, despite the lack of detail, may indicate that they were at least still being informally used.

5.1.2 Expansion phase, 1921–1942

To prepare for the reopening of the Brickworks, several modifications were made. If the dormitories were present, they would have been demolished at this time. The experimental plant was also certainly fully decommissioned and demolished as part of the reinvigoration of the Precinct. The nature of this demolition appears to have been the removal of the upper walls, leaving the floors and footings behind. The quantity of rubble present in the area indicates the debris was not removed from site and simply levelled. Much of this was left exposed, allowing a topsoil to accumulate. Further rubble deposits and a carpark (Section 5.1.3) were overlaid onto parts of the rubble at later dates.

Despite the loss of the experimental plant, the output of the Staffordshire Kiln was initially able to keep up with the demand for bricks. To support the effective distribution of the finished materials, a railway network was constructed from the Precinct to major building locations within Canberra (eg the Provisional Parliament House). Where the network connected to the Brickworks, two cuttings through the western hill landform led to the sidings adjacent to the Staffordshire Kiln. The only identified archaeological evidence of this railway network was these cuttings—all railway infrastructure had been effectively removed when the network was decommissioned by 1929. Any remnants of the sidings were likely removed prior to the construction of the extrusion plant (Section 5.1.3).

In the late 1920s, further developments came in the form of a new kiln and expanded accommodation facilities—Hardy Patent Kiln 1 and the new married quarters.

In 1927, construction of the Hardy Patent Kiln 1 was completed. The Hardy Patent Kiln 1 comprises a two storey structure, with two long chambers running through the centre of

the kiln and a firing floor above. The original brick flues had presumably been installed in a similar manner to the Staffordshire Kiln flues, where the channel was excavated and the brick lining fitted before the superstructure was constructed. These flues were subsequently modified c1945 (Section 5.1.3).

No structural evidence of the 1927–1942 married quarters was identified during the excavations in BRW2. This is likely due to the demolition of the site during World War II and subsequent construction of the Brickworks Hostel (Section 5.1.3). If the rubble had been allowed to remain in situ immediately following the demolition of the quarters, it would have been removed from the area at this time. The quantity of 1930s artefacts in the rubble above the experimental plant is likely to have originated from the married quarters. Instead of completely clearing the married quarters rubble from the Precinct, it would have been easier to deposit the rubbish in a vacant part of the Precinct—if the experimental kilns were already in a visibly ruinous state, this would have provided an obvious location for the dumping of additional debris.

5.1.3 Post World War II phase, 1944–1976

The Post World War II Phase represents a large proportion of the archaeological remains at the Brickworks. Numerous alterations and additions were made during this period.

Some of the most extensive changes made concerned the extant kilns. Both the Hardy Patent Kiln 1 and Staffordshire Kiln underwent repairs, which were followed by the installation of the Hardy Patent Kiln 2 and Downdraught Kilns.

In 1945, there was a report that the two 'dome kilns' were in poor condition (Section 2.3). It is unknown which two specific kilns this was in reference to.

The archaeological investigations identified that extensive modifications had been made to the Hardy Patent Kiln 1 flues. The main tunnel leading from the fan houses to the kiln had been completely replaced with a new concrete structure. A large quantity of brick rubble was identified beneath the floor in the internal kiln space suggesting that at least some tunnels had been collapsed and replaced. If concrete was used to replace the main tunnel, it may have also been used to construct any new tunnels within the internal kiln space. This should not be assumed though, as one intact brick flue and no concrete flues were identified within the internal space.

There was no evidence within the Staffordshire Kiln flues to indicate this was the other 'dome kiln' affected by deterioration. Presumably, if the Staffordshire Kiln flues had been replaced around the same time as the Hardy Patent Kiln 1 flues, the same methods and materials would have been used. In this case, the brick Staffordshire Kiln flues would have been replaced with the same concrete forms. This was not the case, and the visible brick frogs matched those produced by the experimental kilns (Section 4.2). However, the brick bonding used throughout the Staffordshire Kiln flues closely match those used in the

Downdraught Kiln flues. It is possible that the latter flue system was constructed to match the earlier one, if this had demonstrated effective use and longevity. Alternatively, both flues were constructed around the same time and the same approach was used.

It is unknown what the form, or condition, of the Hardy Patent Kiln 2 flues are, as these could not be accessed. Given the similarity between the two Hardy Patent Kilns, it is probable that the latter kiln's flues were designed to replicate the modifications made to the first Hardy Patent Kiln flues.

In the 1960s, a crushed yellow granite carpark was installed at the entrance to the Precinct. This material was found immediately overlying several of the Establishment Phase features, such as the spoon drain and Kiln B (Section 4.1.4). The minimal thickness of the crushed granite carpark surface suggests that the early structures may have been visible on the ground surface prior to or during the construction of the carpark. If they were, there was evidently no effort expended to expose or remove the entire features, although additional portions may have been removed to aid in levelling the area.

Despite the widespread demolition that had occurred in the area of the Brickworks Hostel following the closure of the Precinct (Section 5.1.4), the remaining structural features were consistent with the documentary evidence. Partial footings were found for one sleeping hut, the kitchen portion of the mess hall, and the meat safe, and the concrete slab for the wet area portion of the amenities block were all still extant (Section 4.1.2). The artefacts recovered from this area provided little insight into the people who occupied the hostel. The materials comprised a large quantity of beer and soft-drink bottles—particularly dating to the mid to late 1960s—with few personal artefacts (Section 4.2). The main personal items recovered included a number of stamped identification plaques (Section 4.2), although these related to individuals who resided outside of the hostel.

The final modification made in this period was the installation of the extrusion plant. This required the levelling of a large area west of the Downdraught Kilns to support the laying of a concrete slab. Widespread cuts and fills were identified in this area, which included several in-ground cast concrete structures. If any remnant material from the 1920s railway siding had been present in the area following its decommission in c1929, the construction of the extrusion plant would have removed all remaining features.

5.1.4 Post-closure phase, 1976–2017

The archaeological deposits derived following the closure of the Brickworks are predominantly associated with demolition. These are concentrated in the area to the southwest of the extant Precinct and within the quarry.

Following the vacation of the Brickworks Hostel, the area was effectively razed. Large quantities of brick rubble—particularly associated with the kitchen and mess hall—were present throughout the area (Section 4.1.2).

Enormous quantities of brick rubble were identified along the eastern boundary of the quarry. Initially this area had generally been considered to be an intact hill landform with isolated spoil heaps and minimal amounts of disturbance. However, excavation in this area revealed widespread and deep (up to 7 metres) deposits of brick rubble (Section 4.1.3). The bricks in southern extent of this distribution tended to have 'CB' frogs, whilst the bricks to the north comprised a higher quantity of 'air' bricks. Both types of bricks were manufactured post World War II. The generally high quality of these bricks and low quantity of misfired bricks indicates that the deposits were unlikely to represent the general accumulation of misfired batches, which is supported by the homogeneity of the deposits. As a result, the brick dumps along the eastern boundary of the quarry are likely to be representative of unsold brick stock that was dumped when the Precinct was closed.

The floor of the quarry presented a similar story. The depth of quarrying activity on the western face of the landform had suggested that a base geological deposit had been reached, and that this formed the extant floor of the quarry. Excavation within the floor, however, identified further deposits of brick rubble—although not of the same quantity and depth as the eastern deposits—and various matrices of dumped materials (Section 4.1.3). These materials included artefacts such as broken railway tracks, beverage bottles and cans, machinery pieces, and household appliances (Section 4.2). No evidence of the miniature railway planned by Marr in the centre of the quarry was identified (Section 2.4).

5.2 Research framework

Following the observations made in the AA, the potential of the 12 identified areas to contain archaeological remains was discussed (Appendix D). Based on the data collected during this investigation, the predicted archaeological potential has been updated to reflect the results (Table 5.1).

Table 5.1 The updated archaeological potential of the BRW areas. (Source: after NOHC, 2016, p 44–46).

Area	NOHC, 2016	Update
BRW1—Building platform and concrete features	Moderate archaeological potential This feature suggests a function associated with water, either for storage or drainage. The in situ surface features suggest a level of intactness	Nil archaeological potential The identified surface features were ephemeral pre-cast concrete remnants and were not associated with any further subsurface features, such as water storage or drainage

Area	NOHC, 2016	Update
		infrastructure, or other structural purposes. This area has nil potential to contain further archaeological features or deposits.
BRW2—Married quarters and Brickworks Hostel	High archaeological potential The married quarters were built to the southwest of the Brickworks in the 1920s, and were subsequently replaced in the 1940s by the Brickworks Hostel. The hostel was then demolished in the 1970s. This area has remained undisturbed since the demolition of the hostel.	Moderate archaeological potential No archaeological evidence of the 1927–1942 married quarters was identified. All structures were completely removed in preparation for the construction of the Brickworks Hostel. Partial footings for several of the hostel buildings were identified, including the kitchen, meat safe, and wet area of the amenities block. Few domestic or personal artefacts were recovered. This area has moderate potential to contain further fragmented footings and plumbing features associated with the Brickworks Hostel. There is low potential for any remains associated with the married quarters to be present.
BRW3—Area of postholes and other remains	High archaeological potential This area was originally a more ephemeral Brickworks camp and then later the location for dormitories or hostel-like accommodation.	Low archaeological potential No evidence of an ephemeral camp was identified. Partial footings for a sleeping hut associated with the Brickworks Hostel was identified. No domestic or personal artefacts were recovered. This area has low potential to contain further structural features. Any remaining features would likely be associated with the sleeping hut.
BRW4—Single men's quarters	Low archaeological potential	Not investigated

Area	NOHC, 2016	Update
BRW5—Clay feature and rubble	Low archaeological potential	Not investigated
BRW6—Rubble heap/refuse dump	Low archaeological potential	Not investigated
BRW7—Quarry	High archaeological potential The quarry comprises fragments of in situ concrete slab and a number of depressions.	High archaeological potential No evidence of structures located within the quarry cutting were identified. However, vast quantities of brick rubble and general waste deposits were located throughout the quarry, especially on the eastern ridge. Artefacts were reflective of the nature of this debris, primarily consisting of broken mechanical equipment and domestic rubbish. This area has high potential to contain further similar deposits. There is low potential for any remains associated with structures to be present.
BRW8—Old kiln and dormitories	Low archaeological potential This area has remained relatively undisturbed since the demolition of the kilns and dormitory. Some carparking was introduced in the c1960–1970s, which involved the layout of concrete. This was removed by 1980. There may have been some disturbance through vehicle movement. No other land disturbance appears to have occurred here.	High archaeological potential Four of the six experimental kilns were identified, plus an additional clamp kiln. The remains of these kilns were generally fragmentary, but certain features had been well preserved. Limited evidence was identified for the dormitories and bathhouse, however, this may be due to inaccurate recording in the documentary evidence rather than disturbance. Some domestic and personal artefacts were identified, although these may have originated from one of the other contemporary accommodation areas.

Area	NOHC, 2016	Update
		This area has high potential to contain additional kilns. These kilns may comprise the remains of two unidentified experimental kilns or further clamp kilns. There is low potential for any structural remains associated with the dormitory or bathhouse to be present.
BRW9—Cottage, stables, coal store	Low archaeological potential	Not investigated
BRW10—Railway remnants	Moderate archaeological potential Evidence of the railway siding, in the form of cuttings in the landscape, could be seen in aerial views well into the 1970s. Although all remnants of the track were removed in the 1920s, there is some limited potential for archaeological evidence of the railway and its operation.	Low archaeological potential Two railway cuttings were identified, which included the artificially raised bank between the two channels. No evidence of remnant railway infrastructure was identified. An isolated deposit of discarded railway joints was located within the topsoil. This area has low potential to contain features or structures associated with the railway. Apart from isolated deposits of discarded infrastructure, all materials were likely removed when the railway was decommissioned.
BRW11—Railway siding extension	Moderate archaeological potential Aerials indicate that part of this area was later covered by the concrete slab for the extrusion plant, however, there is some potential for archaeological evidence.	Nil archaeological potential Prior to the deposition of the concrete slab, the entire area was levelled through cutting and packing with waste materials. No evidence of the railway sidings were identified. This area has nil potential to contain archaeological deposits associated with the railway siding. The construction of the extrusion plant likely removed all remaining evidence of this infrastructure.
	High archaeological potential	High archaeological potential

Area	NOHC, 2016	Update
BRW12—Flues and subsurface workings	Underground flues and workings connected the kilns and their associated fan stacks. These are understood to still remain in situ and are unlikely to have been disturbed.	The subsurface flues for the Staffordshire and Downdraught Kilns were accessed. The Staffordshire Kiln flues are in good condition, with little evidence of vandalism or visible signs of structural defects. The Downdraught Kiln flues also had little vandalism, although are in poor condition due to ongoing damp conditions and salt damage to the brickwork. The subsurface flues of the Hardy Patent Kilns 1 and 2 could not be accessed. However, they are likely to still be largely intact and show similar conditions to the Staffordshire and Downdraught Kiln flues.

Section 4.3 of the ARD outlined a number of research questions. These questions were developed in response to the themes outlined in the ACT Heritage Council's *Heritage Assessment Policy* (2018) and the Australian Heritage Commission's *Australian Historic Themes Framework* (2001). These themes included:

- ACT themes
  - Canberra as the nation's capital—Exploring, surveying and mapping; and developing ACT and regional economies.
  - Canberra as a planned environment—Griffin's Canberra; and early federal government landscape and urban planning.
- Australian themes
  - Developing local, regional, and national economies—Industry, mining, and transport
  - Building settlements, towns, and cities—Accommodation
  - Working—Labour
  - Developing Australia's cultural life—Domestic life

The following table discusses the research questions developed from these themes in light of the information collected during the archaeological excavations.

Table 5.2 Response to the ARD research questions.

Research question	Theme	Response
What is the nature and extent of the archaeological resources within each of the nominated zones of sensitivity (all BRW zones)?	-	The vast majority of the archaeological deposits identified at the Brickworks comprised quantities of rubble and other waste materials. These were found across all BRW areas that were investigated. In some instances, the rubble derived from structures that had been demolished in the immediate vicinity (eg BRW2, 3, and 8), however, there was also an observable trend of debris being relocated across the site (eg to BRW7 and 8). The preservation of structures was variable. In most instances, there were no surface indications of the underlying remains. Several discrete cast concrete features were found to have no underlying structural presence (eg BRW1), and the high concentration of rubble was not a reliable indicator of in situ remains (eg BRW7). Where structures were found (eg BRW2, 3, and 8), these were often completely concealed by rubble or a thin layer of topsoil. Much of the identified material dated to the Post World War II Phase. In addition to being the longest phase of use at the Brickworks, it also saw some of the most widespread changes. This included the establishment of the Brickworks Hostel (BRW2), the construction of the extrusion plant (BRW11), Hardy Patent Kiln 2, and Downdraught Kilns, and extensive modifications to the Staffordshire Kiln and Hardy Patent Kiln 1 (BRW12). These works had comprehensively removed the majority of archaeological deposits associated with the Expansion Phase. Where materials dated to this period were identified, they also consisted of relocated rubble deposits. Extensive structural remains associated with the Establishment Phase had been preserved (BRW8). This comprised a minimum of five kilns associated with the experimental plant.

Research question	Theme	Response
Is there any remaining archaeological evidence of the early phase operation of the site (BRW1 and 8)? What light can be shed on the operation of the site in its early years from those remains? Can technological change be determined / mapped / investigated further through those remains?	ACT: • Canberra as the nation's capital—Developing ACT and regional economies • Canberra as a planned environment—Early federal government landscape and urban planning Australia: • Developing local, regional, and national economies—Industry, mining, and transport • Working—Labour	Few archaeological features were identified in BRW1. Those that were identified were associated with demolition and the dumping of waste materials. No evidence of early phase operation was identified. Extensive archaeological remains were located in BRW8. These included the remains of five kilns, two drains, and the remains of several structures (the latter two discussed below). The kiln remains were representative of three types of intermitted kiln design—clamp, Scotch, and downdraught. Each of these kilns presents different technological requirements for construction and use. Clamp kilns are the only truly temporary type of kiln. They are constructed from green bricks and designed to be fired a single time, producing approximately 80 per cent of useable bricks from the total number fired. One clamp kiln was identified in BRW8. It is not possible to determine where in the timeline of the experimental plant this kiln occurred, however, it likely fired the bricks used to construct one of the experimental kilns. Two Scotch kilns were identified. These are open kilns, with no ceiling and only three permanent walls. These kilns are generally easy to construct, although are less energy efficient and predictable. The two Scotch kilns—whilst being of the same kiln type—showed different construction methods, indicating that experiments were being conducted with the best way to construct this kiln type. Two downdraught-turned-Scotch kilns were identified. Downdraught kilns are an enclosed kiln, with four permanent walls and a ceiling. To aid in ventilation, they also have a subsurface flue and external chimney stack. Whilst they are a more complex kiln to construct and operate, they provide more predictable firing conditions. At some point during the use of the two downdraught kilns, the flues were

Research question	Theme	Response
		decommissioned, and the ceiling and fourth wall were removed to convert them into Scotch kilns. It is unknown why this occurred, but could be related to functionality, flaws in the design, or accidental damage. Historical documents indicate there was at least six experimental kilns in the plant. This suggests that at least one further kiln has not been identified. Moreover, if clamp kilns were not included in the historical kiln count, there are likely to be additional kiln remains. The use of the three variations of intermittent kiln demonstrates technological change. The first bricks would have been made in a clamp kiln—this would have been the first opportunity for the workers to experiment with size, shape, and ingredient quantities. The use of these bricks in the No 1 Kiln also would have provided valuable insight into the quality and durability of the bricks. As subsequent bricks and kilns were made, the workers would have gained detailed knowledge about the methods to create the best quality brick. Likely once the first couple of Scotch kilns were constructed and working effectively, then a foray was made into downdraught kilns. This would have required the acquisition of a number of skills, including the construction of subsurface flues and a chimney stack, and how to control the kiln for the best firing outcome. Further, the conversion of the two downdraught kilns into Scotch kilns would have required skill and effort. Rather than demolishing the kilns and constructing new ones, this action shows investment in the longevity of the kilns and the experimental plant. The identification of further kilns in the experimental plant may provide additional information, such as: • a more complete count of the total number of kilns;

Research question	Theme	Response
		• whether further variations of the Scotch kiln were made; and • whether additional downdraught kilns had been experimented with, and whether these were maintained as downdraught kilns.
Is there any remaining archaeological evidence of the extraction processes used in the quarry? Can we see phases of change in those processes? How likely is the survival of clay extraction processes in this quarry and other quarries?	-	Archaeological evidence of extraction processes was not identified in BRW7 (the quarry). Isolated remnants of broken railway track and fastener plates were recovered, although these were out of situ. It is unlikely that evidence of the extraction processes survives in the quarry. During the operation of the Brickworks, the quarry underwent continuous change and disturbance. The quarry floor comprises various deposits of debris and waste material, whilst the eastern ridge is characterised by a deep, widespread distribution of late 1960s to 1970s brick rubble. Evidence of extraction processes may survive in other quarries, however, this would be dependent on the level and nature of subsequent disturbances.
What evidence remains of the accommodation structures on site? What was their nature and configuration (BRW2, 3, and 8)?	ACT: • Canberra as a planned environment—Early federal government landscape and urban planning Australia: • Building settlements, towns,	Limited evidence was identified for the c1916 dormitories and bathhouse in BRW8. The southeastern corner of the bathhouse was located, although it had been significantly disturbed by demolition and bioturbation from a mature shrub. Structural features (eg a box drain, several postholes) were identified in the area of the dormitories. These features did not align with the 1916 contour survey plan, nor were any substantial remains or artefacts indicative of a domestic structure identified. No evidence for the 1927–1942 married quarters was identified in BRW2. It is likely all of this material was removed following its demolition and prior to the construction of the Brickworks Hostel.

Research question	Theme	Response
	and cities—Accommodation • Developing Australia's cultural life—Domestic life	The quantity of 1930s artefacts located in BRW8 may relate to the occupation of the married quarters. Several remnants of the Brickworks Hostel buildings were identified in BRW2 and 3. These included the kitchen portion of the mess hall, the meat safe, a sleeping hut, and the amenities block. The locations of these structures match the surviving plans and 1950 aerial photograph of the site.
Can we find out anything about the people who worked at the site and how they lived (BRW2, 3, and 8)? Is there a material culture difference apparent in the artefacts that show status/living conditions between living quarters? Can phases of occupation be found in the archaeological remains?	Australia: • Developing Australia's cultural life—Domestic life	Due to the effective demolition of the married quarters and Brickworks Hostel and limited evidence for the dormitories, few inferences could be made regarding status, living conditions, or phases of occupation. The remains of beverage bottles, butchered faunal remains, and personal objects provided insight into the lives of the workers who occupied the Brickworks. The quantity of alcohol bottles—particularly beer bottles—was indicative that the consumption of alcoholic beverages was commonplace. This may have been supplemented by communal cooking and meals, as sheep was a large meat-yielding animal. The presence of a number of hygiene and grooming products and dress shoes showed a consideration for personal appearance, which would have suffered during daily hard labour at the Brickworks. The addressograph plates collected during the investigations could not be determined as being directly associated with employees or vehicles at the Brickworks. These require further research to determine their purpose and why they were located within the Brickworks Hostel mess hall.
Is there any remaining archaeological evidence of the	ACT:	Two railway cuttings were identified in the northern extent of BRW10. Excavation within these cuttings identified a modified

Research question	Theme	Response
railway system used to connect the brickworks to Canberra? What can we deduce about its nature and function? Can this information be used to build a picture of the railway and similar railway remains for elsewhere in Canberra such as Old Parliament House (BRW10 and 11)?	• Canberra as a planned environment—Early federal government landscape and urban planning Australia: • Developing local, regional, and national economies—Industry, mining, and transport	embankment separating the two channels, which had been raised by the deposition of material removed during excavations for the cuttings. No evidence of the cuttings was present in the landscape once they merge into a single track. No in situ remnant railway infrastructure was identified within the two cuttings. A quantity of railway joint bars was exposed, however, these had been deposited in a pile following the removal of all other fabric. The partial presence of the cuttings and lack of further archaeological evidence of the railway line means that little can be inferred about its nature and function that is not already known from historical documentation.
Do the underground flues show evidence of change over time and modification? Do they exhibit signs of 'usewear'—vitrification of the brick surfaces from hot gases? Can they tell us more about the operation of the place than is apparent from the surface remains?	ACT: • Canberra as the nation's capital—Developing ACT and regional economies • Canberra as a planned environment—Early federal government landscape and urban planning Australia:	The subsurface flues for the Hardy Patent Kilns 1 and 2 could not be physically accessed. Hydro excavation investigations identified that the flues associated with the Hardy Patent Kiln 1 had been extensively modified—portions of the original brick flue had been collapsed and replaced by cast concrete channels, and the quantity of brick rubble below the internal floor surface may suggest that the flues were rerouted when the modifications were made. It is probable that the Hardy Patent Kiln 2 flues were constructed to reflect the changes made to the earlier kiln. There was some ambiguity concerning whether the Staffordshire Kiln flues had also been replaced in the c1950s. Overall, the flues were in good condition with no obvious signs of alteration and the observable brick frogs were consistent with those produced by the experimental kilns. This would suggest the present flues are the

Research question	Theme	Response
	• Developing local, regional, and national economies—Industry, mining, and transport • Working—Labour	original 1915 structures. However, the historical report of disrepair and that the c1960s Downdraught Kiln flues have been constructed using a highly similar brick bond casts some doubt on this. No obvious 'usewear' was identified in the Staffordshire Kiln flues. Irregular striations of white and grey brick and distinct changes in brick appearance were identified in the Downdraught Kilns flues. However, the inconsistency of the patterning cannot be explained by differential heat damage. The mapping of the subsurface flues of the Staffordshire and Downdraught Kilns provides additional information to understand how the heat generated during the firing process was managed.

6 Significance assessment

6 Significance assessment

The following section provides an assessment of the archaeological features identified during this investigation against the ACT Heritage criteria.

The archaeological investigation did not adhere to existing registered heritage curtilages, and—instead—investigated the Precinct as a wholistic historical landscape. As such, it has resulted in the understanding of new information, some of which is located outside of the curtilage. This significance assessment should be seen as a contributory component to that provided in the 2021 CMP.

6.1 Statutory framework

The ACT heritage legislation (the Heritage Act and the *Heritage Legislation Amendment Bill 2013*) aims to represent and protect the rich natural and cultural heritage of the ACT. The legislation establishes a system for the recognition, registration, and conservation of natural and cultural heritage places and objects, including Aboriginal places and objects. Amendments made to the Heritage Act in 2014 formally adopted the Heritage Convention (HERCON) criteria for assessing heritage significance:

a) Importance to the course or pattern of the ACT's cultural or natural history
b) Uncommon, rare, or endangered aspects of the ACT's cultural or natural history
c) Potential to yield important information that will contribute to an understanding of the ACT's cultural or natural history
d) Importance in demonstrating the principal characteristics of a class of cultural or natural places or environments
e) Importance in exhibiting particular aesthetic characteristics valued by the ACT community or a cultural group in the ACT
f) Importance in demonstrating a high degree of technical achievement for a particular period
g) Strong or special association with the ACT community or a cultural group within the ACT for social, cultural, spiritual reasons. This includes the significance of a place to Indigenous peoples as part of the continuing and developing of cultural traditions
h) Special association with the life or works of a person, or people, important to the history of the ACT

The 'Yarralumla Brickworks' and the 'Yarralumla Brickworks Railway Remnants' are included on the ACT Heritage Register (Appendix A).

A significance assessment of entire Precinct is provided in Section 4 of the CMP. The assessment found that:

- 'Yarralumla Brickworks' meets criteria a), b), c), d), e), and g);
- 'Railway Remnants' meets criteria a) and b).

6.2 Archaeological significance

The archaeological components of the Brickworks are not referenced in the 'Yarralumla Brickworks' or 'Railway Remnants' citations. The significance assessment of the Brickworks and railway remnants in the 2021 CMP noted that the archaeological potential of the site may contribute to criteria a), b), c), d), and f).

A number of the features identified as intrinsic to the heritage significance of the 'Yarralumla Brickworks' citation have been subject to archaeological assessment during this investigation (eg the quarry and railway remnants). Where archaeological features have been assessed as not meeting the relevant heritage criterion, the overall significance of the item should not be considered diminished as they may meet other criteria for attributes beyond their archaeological value.

The following table provides an assessment of the identified archaeological remains against the HERCON criteria.

Table 6.1 Significance assessment of the archaeological remains.

Heritage significance criteria	Assessment
a) Importance to the course or pattern of the ACT's cultural or natural history	**Establishment Phase, 1911–1920** Archaeological remains associated with this phase included those found in BRW7, 8, and 12. • BRW7—The quarry was important to the ongoing function of the Brickworks, supplying the majority of the materials required. In this way, it contributed to the course of the ACT's history, playing a crucial role in the brick manufacturing process. This is not reflected in the archaeological resource present within the quarry, which was predominantly representative of its later closure years and general waste deposition. • BRW8—The experimental plant provided the means in which to build Canberra. The kilns did this in a multitude of ways. They allowed the early brickmakers to experiment with the brick production process, such as different recipes, firing techniques, and brick forms. They also provided a space to experiment with brick kiln construction, demonstrating that a number of kiln forms were trialled. Moreover, their contribution to the course of the ACT's history went beyond the immediate experimental aims, manufacturing the bricks for the construction of the Staffordshire Kiln and the Kingston Powerhouse. In turn, both of these latter structures played significant roles in the supply of building materials and power to the growing capital city. Whilst the experimental plant was not intended nor designed to be long lasting, this does not diminish the role in played in the establishment and course of the ACT's history. • BRW12—Discussed below. The archaeological remains of this phase as present in BRW8 meet this criterion. **Expansion Phase, 1921–1942** The archaeological remains associated with this phase included those found in BRW10 and 12. • BRW10—The railway was a key component in the operation of the Brickworks, as it allowed for the bulk transport of bricks from the Precinct to major building sites around Canberra.

Heritage significance criteria	Assessment
	The two cuttings and dividing embankment are surviving elements indicative of this contribution to the course of the ACT's history. • BRW11—Archaeological evidence of the railway sidings was not identified. • BRW12—Discussed below. The archaeological remains of this phase as present in BRW10 meet this criterion. **Post World War II Phase, 1944–1976** Archaeological remains associated with this phase included those found in BRW2, 3, and 12. • BRW2 and 3—The Brickworks Hostel was an important part of the operation of the Brickworks and a component of the wider supply of worker accommodation in the ACT. This is not reflected in the archaeological resource present within this area, which was highly fragmentary and not demonstrative of its residential nature. • BRW12—The six extant kilns contributed to the course of the ACT's history as the first industrial manufacturing facility commissioned for and constructed in the Territory, with the specific purpose to construct the new capital city. The subsurface flues are extensions of this significance, as they are integral to their effective functioning. The archaeological remains of this phase as present in BRW12 meet this criterion. **Post-Closure Phase, 1976–2017** No meaningful archaeological deposits or features were identified for the Post Closure Phase. The archaeological remains for this phase do not meet this criterion. **Other** Archaeological remains that could not be attributed to the above phases included those found in: • BRW1—No meaningful archaeological deposits or features were identified in this area. The archaeological remains for this area do not meet this criterion.
b) Uncommon, rare, or endangered aspects of	**Establishment Phase, 1911–1920**

Heritage significance criteria	Assessment
the ACT's cultural or natural history	Archaeological remains associated with this phase included those found in BRW7, 8, and 12. • BRW7—The quarry is a singular example of its type for the Brickworks and an uncommon aspect of the ACT's industrial history. This is not reflected in the archaeological resource present within the quarry, which predominantly consisted of large quantities of general waste deposition and brick rubble accumulated during its later closure years. These deposits were not uncommon. • BRW8—The archaeological remains of the experimental plant are a rare aspect of the ACT's history. The Brickworks as a whole complex is the only example of a twentieth century industrial brick making complex within the ACT, and the experimental plant represents the establishment of this key facility. Moreover, the experimental plant is a rare example of archaeological remains demonstrative of the early twentieth century beginnings of the ACT • BRW12—Discussed below. The archaeological remains of this phase as present in BRW8 meet this criterion. **Expansion Phase, 1921–1942** The archaeological remains associated with this phase included those found in BRW10 and 12. • BRW10—The railway remnants are the rare example of the once extensive industrial railway network in Canberra. This network was fundamental for the for the bulk transport of bricks from the Precinct to major building sites around Canberra. The two cuttings and dividing embankment are surviving elements are the only known surviving elements of this network, making them a rare aspect of the ACT's history. • BRW11—No archaeological evidence of the railway sidings was identified in this area. • BRW12—Discussed below. The archaeological remains of this phase as present in BRW10 meet this criterion. **Post World War II Phase, 1944–1976** Archaeological remains associated with this phase included those found in BRW2, 3, and 12.

Heritage significance criteria	Assessment
	• BRW2 and 3—The Brickworks Hostel was one phase of worker accommodation at the Brickworks and one of a number of mid twentieth century worker hostels in the ACT. The archaeological resource present within this area was high fragmentary and not uncommon. • BRW12—The six extant kilns are an unusually complete example of a complex demonstrating the operation of a twentieth century large scale urban brickworks. The Staffordshire and Hardy Patent Kilns are part of a relatively small number of surviving continuous kilns in a national context. The subsurface flues are extensions of this significance, particularly as given their intact nature. The archaeological remains of this phase as present in BRW12 meet this criterion. **Post-Closure Phase, 1976–2017** No meaningful archaeological deposits or features were identified for the Post Closure Phase. The archaeological remains for this phase do not meet this criterion. **Other** Archaeological remains that could not be attributed to the above phases included those found in: • BRW1—No meaningful archaeological deposits or features were identified in this area. The archaeological remains for this area do not meet this criterion.
c) Potential to yield important information that will contribute to an understanding of the ACT's cultural or natural history	**Establishment Phase, 1911–1920** Archaeological remains associated with this phase included those found in BRW7, 8, and 12. • BRW7—Whilst the quarry is an outcome of the mining processes, the archaeological resource present within the area was not reflective of this, predominantly consisting of general waste and brick rubble deposition. • BRW8—The experimental plant has the potential to yield information to further the understanding of early twentieth century intermittent kiln construction and use, in addition to the developmental timeline of the Brickworks and the industrial processes related to brickmaking in the ACT. The early years of the Brickworks are largely unknown, and the experimental plant has the potential to identify key events and changes within this

Heritage significance criteria	Assessment
	timeline. More broadly, intermittent kilns are an under-represented feature in the archaeological record, and information from the experimental plant could contribute to the understanding of their construction, use, and maintenance. • BRW12—Discussed below. The archaeological remains of this phase as present in BRW8 meet this criterion. **Expansion Phase, 1921–1942** The archaeological remains associated with this phase included those found in BRW10 and 12. • BRW10—The railway remnants are representative of a small portion of the once extensive industrial railway network in Canberra. The archaeological resource associated with the railway did not have the potential to contribute further information about the construction, nature, or configuration of the railway. • BRW11—No archaeological evidence of the railway sidings was identified in this area. • BRW12—Discussed below. The archaeological remains for this phase do not meet this criterion. **Post World War II Phase, 1944–1976** Archaeological remains associated with this phase included those found in BRW2, 3, and 12. • BRW2 and 3—There is little documentary evidence regarding the Brickworks Hostel and its inhabitants. The archaeological resource was highly fragmentary and did not contain any deposits indicative of its residential nature. • BRW12—The superstructures of the six extant kilns are well understood for their technical achievement, functional processes, and successive alterations. The subsurface flue components have the potential to contribute further to the understanding of how the use of the kilns changed over the course of the Brickworks. The archaeological remains of this phase as present in BRW12 meet this criterion. **Post-Closure Phase, 1976–2017**

Heritage significance criteria	Assessment
	No meaningful archaeological deposits or features were identified for the Post Closure Phase. The archaeological remains for this phase do not meet this criterion. **Other** Archaeological remains that could not be attributed to the above phases included those found in: • BRW1—No meaningful archaeological deposits or features were identified in this area. The archaeological remains for this area do not meet this criterion.
d) Importance in demonstrating the principal characteristics of a class of cultural or natural places or environments	**Establishment Phase, 1911–1920** Archaeological remains associated with this phase included those found in BRW7, 8, and 12. • BRW7—The quarry demonstrates the principal characteristics of a twentieth century industrial resource extraction zone. The archaeological resource present within the area was not reflective of this, predominantly consisting of general waste and brick rubble deposition. • BRW8—The experimental plant, whilst fragmentary in places, demonstrates the principal characteristics of its kind. It comprises the footprints of multiple kilns, each one with differing characteristics indicative of the experimental nature and intentions. • BRW12—Discussed below. The archaeological remains of this phase as present in BRW8 meet this criterion. **Expansion Phase, 1921–1942** The archaeological remains associated with this phase included those found in BRW10 and 12. • BRW10—The railway remnants do not demonstrate the principal characteristics of a railway and the archaeological resource present in the area did not contribute to its character. • BRW11—Archaeological evidence of the railway sidings was not identified. • BRW12—Discussed below. The archaeological remains for this phase do not meet this criterion.

Heritage significance criteria	Assessment
	Post World War II Phase, 1944–1976 Archaeological remains associated with this phase included those found in BRW2, 3, and 12. • BRW2 and 3—The Brickworks Hostel was a precinct comprising of communal mess areas, amenities blocks, and sleeping huts. Although the archaeological resource was consistent with its function, it did not demonstrate the principal characteristics of an accommodation area. • BRW12—The six extant kilns demonstrate aspects of the processes and operations common to large scale, industrial brick production. The subsurface flues are extensions of this significance, as they are integral to their effective functioning. The archaeological remains of this phase as present in BRW12 meet this criterion. **Post-Closure Phase, 1976–2017** No meaningful archaeological deposits or features were identified for the Post Closure Phase. The archaeological remains for this phase do not meet this criterion. **Other** Archaeological remains that could not be attributed to the above phases included those found in: • BRW1—No meaningful archaeological deposits or features were identified in this area. The archaeological remains for this area do not meet this criterion.
e) Importance in exhibiting particular aesthetic characteristics valued by the ACT community or a cultural group in the ACT	**Establishment Phase, 1911–1920** Archaeological remains associated with this phase included those found in BRW7, 8, and 12. • BRW7—The quarry is an aesthetically distinctive area, comprising a combination of open space and exposed rock outcrops. The archaeological resource present in this area did not contribute to its character. • BRW8—The experimental plant was not designed to have an aesthetic quality and the archaeological remains are not indicative of any particular aesthetic design. • BRW12—Discussed below.

Heritage significance criteria	Assessment
	The archaeological remains for this area do not meet this criterion. **Expansion Phase, 1921–1942** The archaeological remains associated with this phase included those found in BRW10 and 12. • BRW10—The railway remnants are not aesthetically distinctive and the archaeological resource present in this area did not contribute to its character. • BRW11—Archaeological evidence of the railway sidings was not identified. • BRW12—Discussed below. The archaeological remains for this area do not meet this criterion. **Post World War II Phase, 1944–1976** Archaeological remains associated with this phase included those found in BRW2, 3, and 12. • BRW2 and 3—There are no extant buildings belonging to the Brickworks Hostel, and the archaeological resource of the area was highly fragmentary. It had no aesthetic characteristics. • BRW12—The six extant kilns have aesthetic significance for their industrial characteristics. The subsurface flues have aesthetic values as part of this industrial character of the Brickworks, demonstrating the use of varying brick bonds to create domed ceilings and arched passageways. The archaeological remains of this phase as present in BRW12 meet this criterion. **Post-Closure Phase, 1976–2017** No meaningful archaeological deposits or features were identified for the Post Closure Phase. The archaeological remains for this phase do not meet this criterion. **Other** Archaeological remains that could not be attributed to the above phases included those found in: • BRW1—No meaningful archaeological deposits or features were identified in this area.

Heritage significance criteria	Assessment
	The archaeological remains for this area do not meet this criterion.
f) Importance in demonstrating a high degree of technical achievement for a particular period	**Establishment Phase, 1911–1920** Archaeological remains associated with this phase included those found in BRW7, 8, and 12. • BRW7—The quarry, whilst integral in the function of the Precinct, is not a technical achievement. The archaeological resource identified in this area were not reflective of any technological processes. • BRW8—Although the experimental plant demonstrates that technical processes were being trialled, the archaeological resource of the area does not demonstrate a high degree of technical achievement. The archaeological remains for this area do not meet this criterion. **Expansion Phase, 1921–1942** The archaeological remains associated with this phase included those found in BRW10 and 12. • BRW10—The railway remnants do not display a high degree of technical achievement. • BRW11—Archaeological evidence of the railway sidings was not identified. • BRW12—Discussed below. The archaeological remains for this area do not meet this criterion. **Post World War II Phase, 1944–1976** Archaeological remains associated with this phase included those found in BRW2, 3, and 12. • BRW2 and 3—The Brickworks Hostel was an accommodation precinct built to house workers. The archaeological resource present within this area was not demonstrative of creative or technical achievement. • BRW12—The process of brick production and the six extant kilns at the Brickworks are important for the achievement of building the capital city with locally produced materials. The subsurface flues have value as part of this. However, they were not innovative or demonstrative of a high degree of technical achievement at the time of construction.

Heritage significance criteria	Assessment
	The archaeological remains for this area do not meet this criterion. **Post-Closure Phase, 1976–2017** No meaningful archaeological deposits or features were identified for the Post Closure Phase. The archaeological remains for this phase do not meet this criterion. **Other** Archaeological remains that could not be attributed to the above phases included those found in: • BRW1—No meaningful archaeological deposits or features were identified in this area. The archaeological remains for this area do not meet this criterion.
g) Strong or special association with the ACT community or a cultural group within the ACT for social, cultural, spiritual reasons. This includes the significance of a place to Indigenous peoples as part of the continuing and developing of cultural traditions	**Establishment Phase, 1911–1920** Archaeological remains associated with this phase included those found in BRW7, 8, and 12. • BRW7—The quarry as a landscape feature and component of the Brickworks holds special associations with the ACT community. The archaeological resource of this area is not reflective of the association. • BRW8—The Brickworks holds strong associations with the local Yarralumla community and with the wider Canberra population. As the experimental plant represents the establishment of the Precinct, it, by extension, may also have the same strong associations. This would require consultation with the community. The archaeological remains of this phase as present in BRW8 may meet this criterion. **Expansion Phase, 1921–1942** The archaeological remains associated with this phase included those found in BRW10 and 12. • BRW10—The railway remnants do not individually hold special associations with the ACT community. • BRW11—Archaeological evidence of the railway sidings was not identified. • BRW12—Discussed below.

Heritage significance criteria	Assessment
	The archaeological remains for this area do not meet this criterion. **Post World War II Phase, 1944–1976** Archaeological remains associated with this phase included those found in BRW2, 3, and 12. • BRW2 and 3—The Brickworks Hostel provided accommodation to the workers at the Brickworks, many of whom still reside or have descendants who reside in Canberra. The Brickworks Hostel likely held strong associations for them. However, the archaeological resource of the area is highly fragmentary and not reflective of this connection. • BRW12—The Brickworks holds strong associations with the local Yarralumla community and with the wider Canberra population. The six extant kilns are integral to this association. The subsurface flues are extensions of this significance. The archaeological remains of this phase as present in BRW12 meet this criterion. **Post-Closure Phase, 1976–2017** No meaningful archaeological deposits or features were identified for the Post Closure Phase. The archaeological remains for this phase do not meet this criterion. **Other** Archaeological remains that could not be attributed to the above phases included those found in: • BRW1—No meaningful archaeological deposits or features were identified in this area. The archaeological remains for this area do not meet this criterion.
h) Special association with the life or works of a person, or people, important to the history of the ACT	**Establishment Phase, 1911–1920** Archaeological remains associated with this phase included those found in BRW7, 8, and 12. • BRW7 and 8—The Brickworks has been associated with many locally employed workers during its operation. This is not represented within the archaeological resource of these areas. The archaeological remains for this area do not meet this criterion. **Expansion Phase, 1921–1942**

Heritage significance criteria	Assessment
	The archaeological remains associated with this phase included those found in BRW10 and 12. • BRW10—The Brickworks has been associated with many locally employed workers during its operation. This is not represented within the archaeological resource of this area. • BRW11—Archaeological evidence of the railway sidings was not identified. • BRW12—Discussed below. The archaeological remains for this area do not meet this criterion. **Post World War II Phase, 1944–1976** Archaeological remains associated with this phase included those found in BRW2, 3, and 12. • BRW2, 3, and 12—The Brickworks has been associated with many locally employed workers during its operation. The addressograph plates found in the Brickyards Mess house (Section 4.2.3) may identify some of those people. Further detailed research may show if any of those people made a significant contribution to the history of the Brickworks and/or the ACT. At this stage there is no clear evidence that this criterion is met. The archaeological remains for this area do not meet this criterion. **Post-Closure Phase, 1976–2017** No meaningful archaeological deposits or features were identified for the Post Closure Phase. The archaeological remains for this phase do not meet this criterion. **Other** Archaeological remains that could not be attributed to the above phases included those found in: • BRW1—No meaningful archaeological deposits or features were identified in this area. The archaeological remains for this area do not meet this criterion.

6.3 Statement of significance

The Canberra Brickworks Precinct is significant as the first industrial manufacturing facility commissioned for and constructed in the ACT, developed specifically to facilitate the construction of the new capital city. On the surface, the Precinct is an unusually complete example of a complex demonstrating aspects of the operation of a twentieth century large scale urban brickworks. It has a diverse range of heritage values, such as the role it has played in the course of the ACT's history, its aesthetic qualities, and the connection it holds with both the local Yarralumla community and the wider Canberran population. These values are manifested in the intact industrial landscape and the key role it played in the course of the ACT's history.

The archaeological remnants identified in this investigation are only partially reflective of these values. The site has undergone several distinct phases of operation, the later ones often obscuring the earlier activities. However, where archaeological remains that demonstrate the early and complex nature of the site are present, these have the ability to contribute to an understanding both of the site and brick making processes more widely.

The Precinct underwent several distinct phases of operations, each reflective of the broader political contexts that have determined the fluctuation of construction in the capital city.

The archaeological remains of the Establishment Phase are a significant aspect of this development, as the 1913–1916 experimental plant played an integral role in the course of the Brickworks' and the ACT's histories (BRW8). The plant provided the means in which to build the capital city, producing the materials used to construct the Staffordshire Kiln and the Kingston Powerhouse, both of which, in turn, assisted in the further development of Canberra. The surviving kiln structures yield important information that contribute to the understanding of the establishment of the Brickworks and early twentieth century brick making technologies, and embody the principal characteristics of a brickmaking plant. Although previously considered to be a temporary part of the Brickworks, the modification of two kilns to continue operations show an active investment in the longevity of the experimental plant—this demonstrates the value the experimental kilns held, and the efforts expended to continue their operation.

When the Brickworks reopened in 1921, the Expansion Phase saw a suite of changes. The archaeological remnants of these are predominantly restricted to the railway remnants (BRW10). Although no evidence of the railway infrastructure was identified, the cuttings and central embankment are evidence of the process and the surviving elements of the once extensive railway network. They demonstrate the importance of the railway network

to the early twentieth construction efforts in Canberra, particularly as a rare surviving element of this network.

The presence and generally highly intact nature of the subsurface flues (BRW12) are representative of technological developments across the entire life of the precinct. The six extant kilns contributed to the course of the ACT's history as the first industrial manufacturing facility commissioned for and constructed in the Territory, with the specific purpose to construct the new capital city. The subsurface flues are extensions of this significance, as they are integral to their effective functioning and contribute to the industrial character of the site.

Alterations made during the Post World War II and Post Closure Phases resulted in the removal of a large quantity of archaeological material. The archaeological resource of the quarry (BRW7) was particularly reflective of this, with any earlier features associated with the mining technologies obscured by accumulations of general waste and extensive brick rubble deposits. The construction of the extrusion plant in 1971 likely removed any remaining features associated with the 1920s railway sidings (BRW11), and the demolition of the Brickworks Hostel resulted in the loss of domestic deposits left by its inhabitants (BRW2 and 3).

In summary:

- The archaeological remains of the experimental plant (BRW8) have been assessed as meeting criteria a), b), c), and d). They are highly significant.
- The archaeological remains of the railway remnants (BRW10) have been assessed as meeting criteria a) and b). They are moderately significant.
- The subsurface flues (BRW12) have been assessed as meeting criteria a), b), c), d), e), and f). They are highly significant.

7 Impact assessment

7 Impact assessment

The following Statement of Heritage Effects (SHE) assesses the potential heritage impacts from the proposed works to the Precinct in relation to its identified archaeological values.

7.1 The proposal

In formulating the initial concept design for the site, a strategic approach to revitalise the historic landscape for re-use in an urban setting was established. This approach proposes to integrate the site's heritage, cultural and geological elements so that the connection to the industrial process that took place at the Brickworks is maintained.

The redevelopment works would be framed around a central 'heritage precinct', comprising a number of the extant heritage buildings and features. These would be adapted to provide for café and dining spaces, recreational facilities, and commercial and business areas.

The broader setting of the site and areas in the periphery are proposed to be developed, with 360 residential dwellings in a range of mixed-density residential accommodation, including houses, townhouses, and apartment blocks.

7.2 Assessment of impacts

The following impact assessment has been informed by the Masterplan (Figure 7.1 and Figure 7.2).

Table 7.1 Impact to the identified archaeological features and areas of potential.

Area	Impact assessment
BRW1—Building platform and concrete features	The proposed works in this area comprise: • the construction of five townhouses; and • associated landscaping for amenity and services installation. Investigation in this area did not identify any meaningful archaeological deposits or features. There would be **nil** impact to identified archaeological features.
BRW2—Married quarters and Brickworks Hostel	The proposed works in this area comprise: • the construction of 14 townhouses; and • associated landscaping for amenity and services installation.

Area	Impact assessment
	Investigation in this area identified several remnant footings associated with the 1945 Brickworks Hostel, including the 'Brickyards Mess House' and 'Meat Safe' and the concrete slab for the 'Amenities Block'. These features were highly fragmentary due to their comprehensive demolition following the closure of the Brickworks. No domestic deposits associated with the residents of the Brickworks Hostel were identified. No deposits or structures associated with the 1927–1942 married quarters were identified. There would be a **negligible** impact to identified archaeological features. Although features are present in this area, they have been identified as having no significance.
BRW3—Area of postholes and other remains	The proposed works in this area comprise: • the construction of four townhouses; • the construction of two apartment blocks; and • associated landscaping for amenity and services installation. Investigation in this area identified the remnant footings associated with a 1945 Brickworks Hostel 'Sleeping Hut'. These features were highly fragmentary due to their comprehensive demolition following the closure of the Brickworks. No domestic deposits associated with the residents of the Brickworks Hostel were identified. There would be a **negligible** impact to identified archaeological features. Although features are present in this area, they have been identified as having no significance.
BRW4—Single men's quarters	The proposed works in this area comprise: • the construction of one apartment block; • the construction of the main access road to the redevelopment; and • associated landscaping for amenity and services installation. This area has not been investigated. It has been assessed as having low archaeological potential. There **may be** impact to unidentified archaeological features.
BRW5—Clay feature and rubble	The proposed works in this area comprise: • the construction of one apartment block; and • associated landscaping for amenity and services installation. This area has not been investigated. It has been assessed as having low archaeological potential. There **may be** impact to unidentified archaeological features.

Area	Impact assessment
BRW6—Rubble heap/refuse dump	The proposed works in this area comprise: • the construction of one apartment block; and • associated landscaping for amenity and services installation. This area has not been investigated. It has been assessed as having low archaeological potential. There **may be** impact to unidentified archaeological features.
BRW7—Quarry	The proposed works in this area comprise: • infilling across two areas of the existing quarry cutting to provide level surfaces for the construction of six free-standing houses and park landscaping; and • grading of one area of the eastern ridge to provide a level surface for the construction of eight townhouses. Investigation in this area identified vast quantities of brick rubble and general waste deposits, especially on the eastern ridge. The proposed works have been assessed as part of a separate SHE. This is provided in Appendix I. There would be a **negligible** impact to identified archaeological features. Although archaeological features are present in this area, they have been identified as having no significance.
BRW8—Old kiln and dormitories	The proposed works in this area comprise: • the construction of five townhouses; and • associated landscaping for amenity and services installation. Investigation in this area identified four of the six kilns associated with the 1913–1916 experimental plant, plus an additional clamp kiln. The remains of these kilns were generally fragmentary, but certain features had been well preserved. The plant not only provided a space for the early brickmakers to experiment with varying recipes, firing techniques, and brick forms, in addition to different kiln types, but also the means in which to build the capital city—it was the operation and output of the experimental kilns that allowed for the Staffordshire Kiln and the Kingston Powerhouse to be constructed, which in turn provided the means for the ACT to develop. Although previously considered to be a temporary part of the Brickworks, the modification of two kilns to continue operations show an active investment in the longevity of the experimental

Area	Impact assessment
	plant—this demonstrates the value the experimental kilns held, and the efforts expended to continue their operation. There would be a **severe** impact to identified archaeological features. These features have been assessed as meeting ACT Heritage criteria a), b), c), and d).
BRW9—Cottage, stables, coal store	There are no proposed works for this area. This area has not been investigated. It has been assessed as having low archaeological potential.
BRW10—Railway remnants	The proposed works for this area comprise: • landscaping for amenity and provision of public green space. Investigation in this area identified two remnant railway cuttings and central embankment. No evidence of associated railway infrastructure was identified. There **may be** impact to unidentified archaeological features. The exact nature of the landscaping works has yet to be finalised. Care should be taken to maintain the legibility of the railway cuttings and embankment.
BRW11—Railway siding extension	The proposed works for this area comprise: • the construction of two apartment blocks; and • associated landscaping for amenity and services installation. Investigation in this area did not identify any meaningful archaeological deposits or features. There would be **nil** impact to identified archaeological features.
BRW12—Flues and subsurface workings	The are no proposed works for this area. The flues would be made safe and retained in situ. Investigation in this area identified that the Staffordshire Kiln flues are in good condition and the Downdraught Kilns flues are in poor condition. The subsurface flues of the Hardy Patent Kilns 1 and 2 could not be accessed. However, they are likely to still be largely intact and show similar conditions to the Staffordshire and Downdraught Kiln flues. There **may be** impact to identified archaeological features. The proposed method to stabilise and make the flues safe has not been determined.

7.3 CMP policies

The 2021 CMP includes specific conservation policies and advice on the potential incorporation of the archaeological features and potential of the Brickworks. The relevant policies have been extracted from Section 6 of the CMP and are discussed in the following table.

Action	Discussion
Policy 18. Respect the heritage significance of the site when planning to introduce new development 18.1. Ensure new development is based on a whole-of-site appreciation for the heritage significance of the site, the core, and supporting intrinsic features of the Brickworks, railway remnants, and areas of archaeological potential 18.2. Respect the heritage significance of the Brickworks as a whole complex of elements in a landscape setting, with the quarry, railway remnants, and areas of archaeological potential when introducing new development	The investigation of the archaeological features and potential of the Brickworks has provided new information and insights into the history and significance of the site. This understanding was not available at the time of the Masterplan development. The identified archaeological features located in BRW1, 2, 3, and 11 have been assessed as having no significance and, therefore, provide no constraint to the proposed redevelopment. There may be interpretation opportunities to reference these archaeological features within the broader development (eg the married quarters and Brickworks Hostel). The identified archaeological features located in BRW7 are not reflective of the quarry's established landscape and historical values. They have been assessed as having no significance and, therefore, provide no constraint to the proposed redevelopment. The identified archaeological features located in BRW8 have been assessed as having heritage significance for the integral role they played in the establishment of the Brickworks. Opportunities to incorporate the archaeological remains within the redevelopment should be investigated. The identified archaeological features within BRW10 comprise the two cuttings and central embankment of the remnant railway. These features are already recognised as part of its landscape and heritage values. These values have been appropriately incorporated into the Masterplan. The identified subsurface flues part of BRW12 have been assessed as having heritage significance as extensions of the six extant kilns. They would be retained and made safe as part of the redevelopment. There may be interpretation opportunities to reference these archaeological features within the broader development.

Action	Discussion
Policy 28. Assess for impacts from development on areas of archaeological potential 28.1. Refer to the historic archaeological analysis for the site at Section 3.4 of the CMP to understand areas of archaeological potential 28.2. Assess potential development impacts based on the historic archaeological analysis provided at Section 3.4 of the CMP 28.3. Seek an Excavation Permit under Section 61F of the Heritage Act if undertaking an archaeological excavation at the site 28.4. When undertaking excavation work on the site, following an Unanticipated Finds Protocol	This report details the investigation of the archaeological potential of the site as identified in Section 3.4 of the CMP. It has undertaken this investigation in accordance with the Excavation Permit approved under Section 61 of the Heritage Act. This report has provided an assessment of the potential development impacts based on the findings of the archaeological investigation. It is acknowledged that the Masterplan was developed prior to the understanding of the archaeological resource of the site, and that the new information has provided clarity and opportunities for the further advancement of the plan. An Unanticipated Finds Protocol (UFP) should be implemented when undertaking works in BRW1, 2, 3, 7, and 11. This is discussed further in Section 8.



Figure 7.1 Proposed redevelopment Masterplan for the Brickworks. (Source: Doma)



Figure 7.2 Impact of the redevelopment on the areas of archaeological potential. (Source: Doma, with GML overlay)

8 Recommendations

8 Recommendations

The Canberra Brickworks Precinct is significant as the first industrial manufacturing facility commissioned for and constructed in the ACT, developed specifically to facilitate the construction of the new capital city. On the surface, the Precinct is an unusually complete example of a complex demonstrating aspects of the operation of a twentieth century large scale urban brickworks.

The archaeological remnants identified in this investigation are only partially reflective of these values. The site has undergone several distinct phases of operation, the later ones often obscuring the earlier activities.

However, several key findings were made, including the 1913–1916 experimental plant—comprising four of the approximately six experimental kilns and an additional clamp kiln—and the subsurface flue networks for the Staffordshire and Downdraught Kilns, with insights into the possible layouts of the two Hardy Patent Kiln flues.

In light of this, the following recommendations are made:

- **Heritage induction for site personnel—**All site contractors involved in the earthworks stage of the redevelopment should participate in a heritage induction. This induction should include information on the history, heritage values, and significance of the Precinct, the areas of archaeological potential, and the Unexpected Finds Protocol (UFP). This induction should be prepared and delivered by a heritage specialist.
- **Interpretation Strategy**—The significant archaeological remains identified in this report should be interpreted and presented to the public as a means of mitigating any loss of the original fabric. The findings of this report should be incorporated into the Interpretation Strategy for the Precinct, allowing dissemination of the results to the current residents of Yarralumla and the future residents of the Brickworks development. This Interpretation Strategy should identify opportunities for the interpretation of the highly significant experimental plant, subsurface flues, and public display of select artefacts recovered during the excavations.
- **Archival recording**—The subsurface flues should be subject to archival recording prior to the commencement of any major interventions. This should be undertaken in accordance with the *Photographic Recording of Heritage Items Using Film or Digital Capture* (Heritage Council of New South Wales [NSW], 2006) and *How to Prepare Archival Records of Heritage Items* (NSW Heritage Office, 1998). Additional efforts should be made to access the subsurface flues of the Hardy Patent Kilns.

- **Stabilising the subsurface flues**—In accordance with Policy 10.2 of the CMP (Section 5.4.1), repair work should be undertaken to the subsurface flues (particularly the Downdraught Kilns flues) to ensure that they are made safe prior to any actions associated with the redevelopment works commencing. These works should be developed in consultation with an appropriate engineer and assessed for their impact to the heritage significance of the flues through a SHE.
- **Archaeological monitoring**—Monitoring of the proposed works should be undertaken in the following areas:
  - BRW4, 5, 6, and 9—These areas remain uninvestigated. They have been assessed as having low archaeological potential, however, monitoring during the initial groundworks should be undertaken to confirm this potential and that no archaeological features of significance are present.
  - BRW2 Brickworks Hostel 'Mess Hall' (context *95*)—A number of personnel and vehicle record plaques containing identifying information of individuals who worked at the Brickworks were identified in this area. Demolition of the remaining structure should be monitored to allow for the recovery of further plaques, if present.
  - BRW8—Any proposed works to this area should be monitored. There is high archaeological potential for additional kilns associated with the 1913–1916 experimental plant to be present, which may include two further experimental kilns, a chimney, and an unknown number of clamp kilns.
- **Unanticipated Finds Protocol (UFP)**—The proposed works may proceed in BRW1, 2, 3, 7, and 11 without archaeological monitoring. If archaeological material is identified during the works, the UFP should be implemented (Appendix J). Under the UFP, works should stop to allow for the inspection and recording of the finds by a suitably qualified archaeologist. If isolated objects not in situ are found, then these items should be collected. If structural features and/or in situ deposits are found, then the works should be suspended in that location until further assessment is undertaken and appropriate permissions are sought from the ACT Heritage Council.
- **Amendment of the 'Yarralumla Brickworks Precinct' heritage citation**—The ACT Heritage Council should review the existing heritage citation for the Brickworks and update it where necessary with the findings of this report to reflect the new understanding of the historical components and significance of the site.
- **Dissemination of this report—**A hard and digital copy of this report should be provided to the ACT Heritage Library and Canberra District Historical Society.

Appendices

Appendices

Appendix A—'Yarralumla Brickworks' and 'Yarralumla Brickworks Railway Remnants' ACT Heritage Register citation sheets

Appendix B—Excavation Permit Yarralumla-S102-B1

Appendix C—GML Heritage, Canberra Brickworks Precinct—Archaeological Research Design, prepared for Doma Group, September 2020

Appendix D—Navin Officer Heritage Consultants, Archaeological Assessment of the Canberra Brickworks and Environs, Denman Street, Yarralumla, South Canberra, prepared for Land Development Agency, September 2016

Appendix E—GML Heritage, Canberra Brickworks Precinct—Contamination Testing Archaeological Monitoring, March 2021

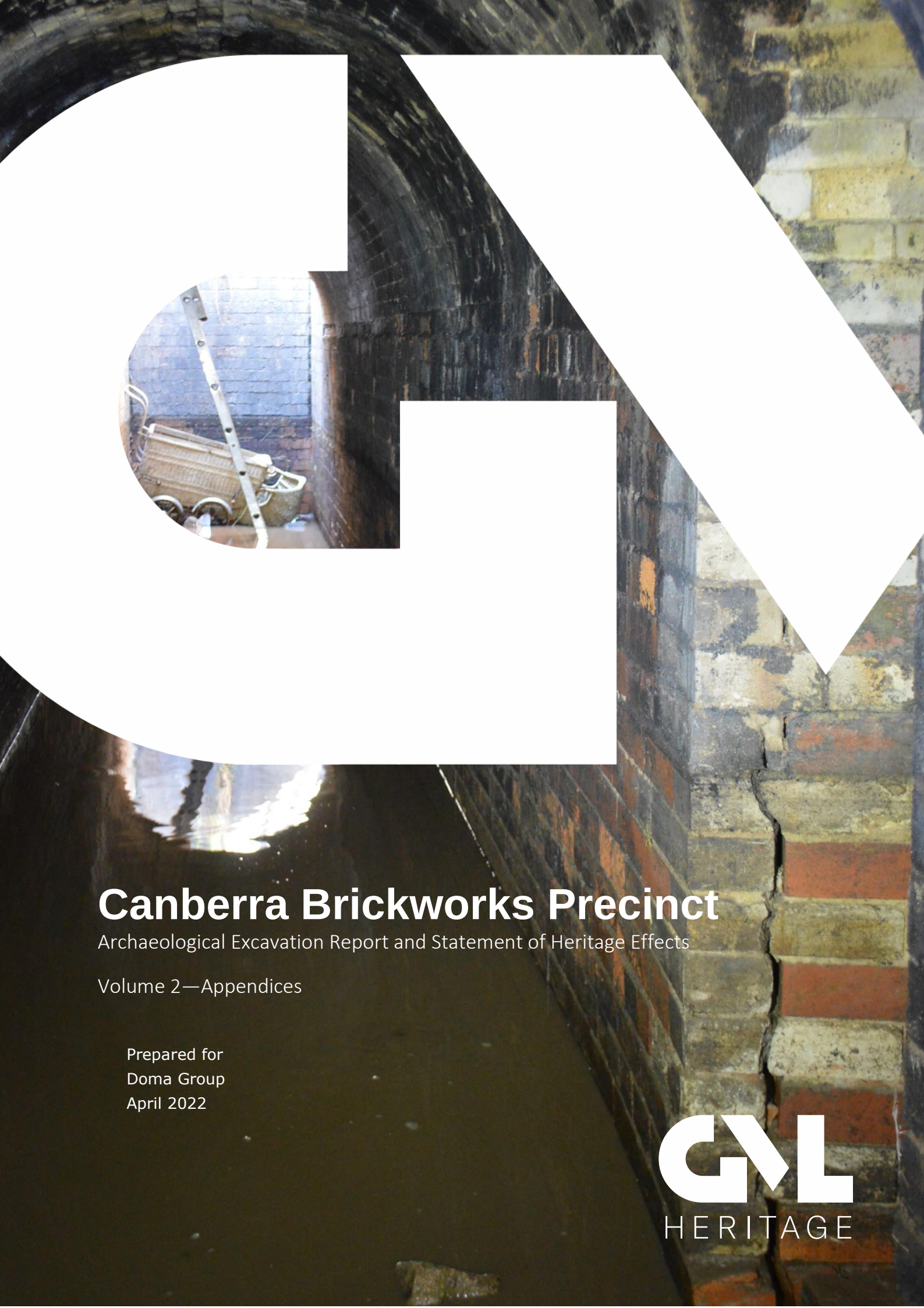
Appendix F—Records made during March–April and July–August 2021 archaeological test excavations

Appendix G—GML Heritage, Canberra Brickworks Precinct—Archaeological Investigations Artefact Management Strategy, prepared for Doma Group

Appendix H—Catalogue of artefacts recovered during March–April and July–August 2021 archaeological test excavations

Appendix I—GML Heritage, Canberra Brickworks Quarry—Draft Statement of Heritage Effects, prepared for Doma Group, September 2021

Appendix J—Unanticipated Finds Protocol



Canberra Brickworks Precinct

Archaeological Excavation Report and Statement of Heritage Effects

Volume 2—Appendices

Prepared for
Doma Group
April 2022

GML HERITAGE

Appendices

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Appendix A

Appendix A—'Yarralumla Brickworks' and 'Yarralumla Brickworks Railway Remnants' ACT Heritage Register citation sheets

ACT Heritage Council

Entry to the ACT Heritage Register

Heritage Act 2004

20068. Yarralumla Brickworks

Section 102 Block 1

YARRALUMLA

This document has been prepared by the ACT Heritage Council.

This entry which was previously part of the old heritage places or the old heritage objects registers (as defined in the ***Heritage Act 2004***), as the case may be, is taken to be registered under the ***Heritage Act 2004***.

Conservation Requirements (including Specific Requirements), as defined under the ***Heritage Act 2004,*** that are contained within this document are taken to be Heritage Guidelines applying to this place or object, as the case may be.

Information restricted under ***the old heritage places register or old heritage objects register*** is restricted under the ***Heritage Act 2004***.

Contact: ***ACT Heritage Council*** ***c/o Secretary*** ***PO Box 144*** ***Lyneham ACT 2602***
Enquiries: ***phone 02 6207 2164*** ***fax 02 6207 5715*** ***e-mail heritage@act.gov.au***

68. Yarralumla Brickworks, Yarralumla [V118][1]

Location

District of Canberra Central, Division of Yarralumla, Section 102 Block 1 as identified in Figure 68 and indicated on the Territory Plan Map by the Heritage Places Register Overlay H68.

Features Intrinsic To The Heritage Significance Of The Place
The place comprises the elements listed in Schedule 1 (rated as possessing exceptional significance) and Schedule 2 (rated as possessing considerable significance), as identified in Figure 68a.

Schedule 1 Elements Of Exceptional Significance

1) Kiln - Staffordshire (1915)
2) Fan House for Staffordshire Kiln (1915)
3) Kiln - Hardy-Patent (1927)
4) Fan House for Hardy Patent Kiln (1953)
5) Kiln - Hardy-Patent (1953)
6) Kilns - Downdraft a, b, c (1963)
7) Chimney Stacks for Staffordshire Kiln (1915)
8) Chimney Stack for Hardy Patent Kiln (1927)
9) Chimney Stack for Hardy Patent Kiln (1953)
10) Chimney Stack for Downdraft Kiln (1963)
11) Quarry
12) Geological features A, B, C, D

Schedule 2 Elements Of Moderate Significance

13) Office (1916)
14) Power House (1915)
15) Machine Bay for Staffordshire and Downdraft Kilns (1955)
16) Machine Bay for Hardy-Patent (1955)
17) Machine Bay for Hardy-Patent (1955)
18) Workshop (1955)
19) Large Crusher House (1955)
20) Primary Crusher House (1955)
21) Small Crusher House
22) Elevator Conveyor (1955)
23) Remains of the Brickworks Accommodation Village

Statement Of Significance

Operational from 1913 to 1976, the Yarralumla Brickworks is of historical value as the first industrial manufacturing facility within the ACT, and for its integral role in providing the base material used in the construction of the early buildings in the National Capital.

The Yarralumla Brickworks is a relatively intact representative example of large urban brickworks from the early 20th Century, a type that is becoming increasingly rare nationally and internationally. The Brickworks comprise a cultural landscape where the remaining buildings, structures, equipment and landscape features have the ability to demonstrate the evolution of a range of industrial processes associated with brick and clay production-over a 60 year period.

The Yarralumla Brickworks is of considerable technical value from the presence in the one location of a number of different kiln types: Staffordshire (1915), Hardy-Patent (1927) and Downdraft (1953) kilns, which demonstrate an unusually wide range of firing processes. The Staffordshire kiln is especially significant as the only surviving example of this kiln type in Australia. The Staffordshire kiln variation to the Hoffman design of kiln allowed bricks, tiles and pipes to be fired in cycles and utilises an unusual fan-forced draft system to aid firing.

[1] [V118: Added to Heritage Places Register Number 68 10/05/2001 (Variation Number 118)]

The largest chimney stack (element 9) is of aesthetic and social value as a prominent landmark in the central urban area, visible from the Lake Burley Griffin foreshores, New Parliament House and mountain lookouts around the City. Additional aesthetic value is associated with the composition and sculptural forms of the built elements, specifically the kilns, stacks and larger elements of equipment.

The Yarralumla Brickworks is one of a broad thematic group of remnant industrial and engineering heritage places that were built to facilitate the initial development of Canberra including the Cotter Dam and Pumping Station and the Kingston Power House.

The brickpits have historical value as a primary source of clay and are also of considerable geological value as the type locality for the 'Yarralumla Formation', dating from the Silurian Period 425 million years ago. The scheduled stratigraphic rock units constitute the reference section against which all other outcrops within the Formation are compared. It is the only fossil marine unit within the extensive volcanic marker horizons of South Canberra. Sites A and D show excellent examples of an anticline in calcareous siltstone, Site B shows a typical tuffaceous mudstone and siltstone of the Yarralumla Formation and Site C shows abundant fossils of mainly gracitiopods, trilobites, coral and a simple crinoid preserved in a bedding plane.

Specific Requirements

In accordance with s54 (1) of the *Land (Planning and Environment) Act 1991* the following requirements are identified as essential to the conservation of the heritage significance of the place. These requirements are prepared to implement the following conservation policy for the place:

The identified heritage values and intrinsic features of the place shall be conserved whilst allowing for the integrated and sympathetic redevelopment of the place as a single entity, consistent with contemporary practices for the adaptive reuse of industrial and commercial heritage places. In conserving and developing the place, its significant historical use as an industrial site for the production of bricks and clay products shall continue to be evident and accessible to the public.

Redevelopment of all or part of the place shall be in accordance with a Conservation and Management Plan endorsed by the ACT Heritage Council.

i) Landscape Setting

a) The quarry landform (11) should be retained in a manner whereby it is clearly evident to be a man made excavation, associated with the industrial use of the site. Subject to the recommendations of the Conservation and Management Plan, revegetation, enhanced hard and soft landscaping and low-medium height buildings with a high proportion of landscape open space may be permitted in the vicinity of the quarry, including on land overlooking the quarry and within the quarry excavation. The shape of the quarry may be altered in a minor manner, however access points into and out of the quarry area should utilise existing openings and gradients within the landform. The historical linkage between the quarry and kiln areas shall be expressed in any new development.

b) The geological features (12 A-D) shall be integrated within any site landscaping treatment. Disturbance of the immediate surface shall be limited to works that protect, stabilise or enhance the interpretation of the geological values. The immediate environs of the geological features to a distance of approximately 10 metres shall be retained as landscape open space.

c) To reflect historical usage patterns at the site and protect the setting of significant elements, the immediate environs of the kilns (1, 3, 5, 6) as identified below shall be retained as landscape open space, clear of any major structures. Minor structures and landscaping treatments that retain the kilns, stacks and fan houses as the dominant visual elements to the space may be permitted within:

- The open concourse running north-south from the Hardy Patent Kiln (Element 5) to the Downdraft Kilns (6a-c), between the kilns and fan houses (2, 4),
- The spaces between the kilns: (5-3, 3-1, 1-6)
- The immediate environs of the chimney stacks (7, 8, 9, 10), fan houses (2, 4) and primary crusher house and elevator conveyor (20, 22) to a distance of generally 10m.

d) New hard and soft landscaping treatment should generally express the historical spatial relationships and movement patterns of brick making operations about the site.

ii) Built Structures - including alterations and additions

a) The existing large chimney stack (9) shall be conserved and maintained in its current form as a prominent urban landmark.
b) The external form, including the arrangement of openings and detailing that reflects the industrial use of the built elements in Schedule 1 (1-10) and the Primary Crusher House (Schedule 2: 20) shall be retained.
c) Minor external alterations and additions and major internal alterations to the built elements in Schedule 1 may be permitted to suit a new use where the proposed works will not adversely affect the heritage significance of the elements or the place as a whole.
d) Alterations and additions to the original built fabric of elements in Schedule 1, including alterations to external finishes, shall complement the historical industrial use and architectural style of the place.
e) Subject to the recommendations of the Conservation and Management Plan, the elements in Schedule 2 may be conserved to interpret the historical use of the place or adapted to suit a new use for the place.
f) Elements in Schedule 2 that no longer include substantial evidence to describe industrial processes (15, 16, 17, 18, 19 and 21) may be replaced with new development that is generally consistent with the scale, form, external materials and industrial character of the place. The Office, the Powerhouse, Primary Crusher House and the Elevator Conveyor (13, 14, 20 and 22) may be relocated elsewhere within the place, subject to the relocation process being fully documented and full reconstruction of the buildings taking place within a specified period. Development may occur on the site of the remains of the Brickworks Accommodation Village (23), subject to detailed recording and suitable interpretation of the historical significance of the site.
g) Construction of new buildings or elements in the place may be permitted if any new building(s) or element(s) do not significantly diminish the heritage value of the place. The scale, form, detailing and external materials of any new buildings or structures shall be consistent with the architectural style and industrial character of the built elements in Schedule 1.

iii) Industrial Equipment

a) Major equipment and machinery associated with the historical industrial use of the place shall be retained and conserved in situ. Minor equipment should be retained and conserved but may be relocated to a new location within the site for interpretative purposes and/or its own protection.
b) The Primary Crusher House (20), including the integral equipment and machinery, and the Elevator Conveyor (22) shall be conserved for their ability to demonstrate and interpret industrial processes and secondary aesthetic values.

iv) Demolition

a) Subject to (iv)(b) (c) and (d) demolition of elements listed in Schedule 1 and 2 shall not be permitted, other than in exceptional circumstances, including circumstances in which the building or structure is structurally unsound and beyond economic repair or where there are significant public health and safety reasons to warrant demolition. Demolition shall not be permitted unless it can be demonstrated that there is no prudent and feasible alternative.
b) The demolition of the original internal fabric of buildings within Schedule 1 shall only be permitted in the context of sympathetic alteration and additions, as identified within the Conservation and Management Plan.
c) Elements in Schedule 2 may be demolished only to allow for new development in accordance with the Conservation and Management Plan and specific requirements (ii) (e) and (f).
d) Comprehensive recording of a building or structure shall be undertaken prior to any demolition or removal of fabric.

Figure 68: Yarralumla Brickworks, Yarralumla: Location

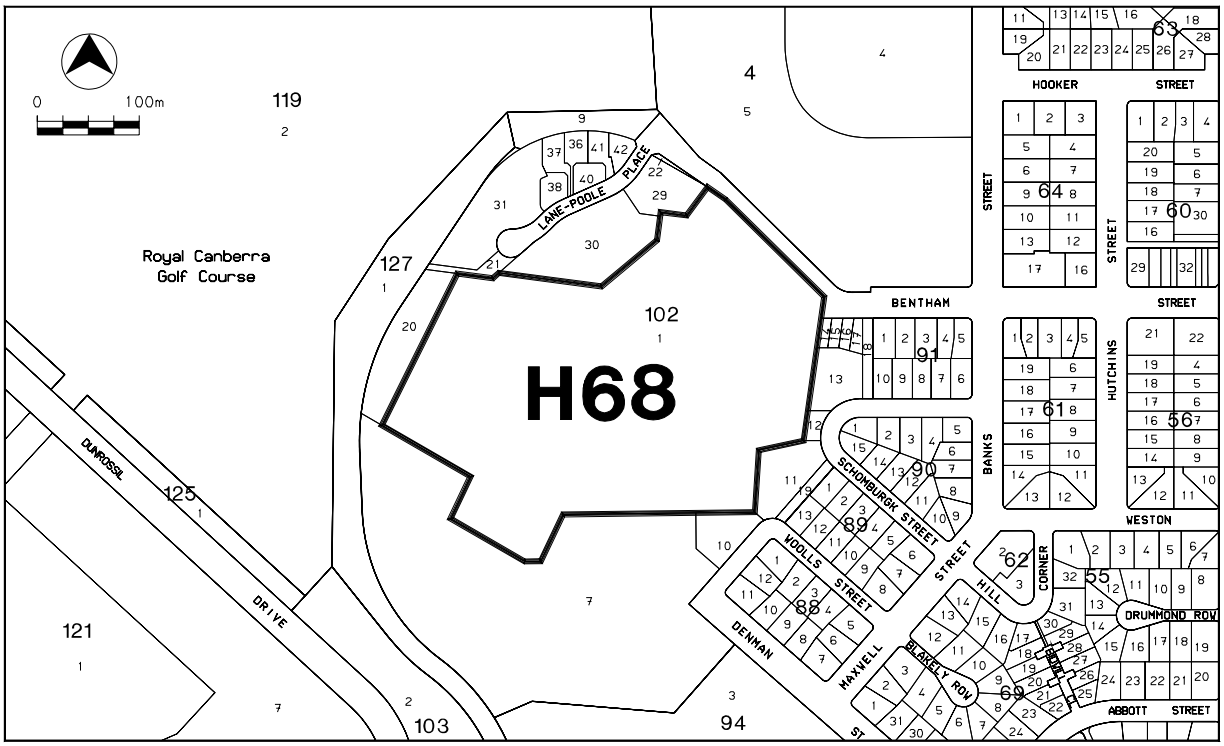
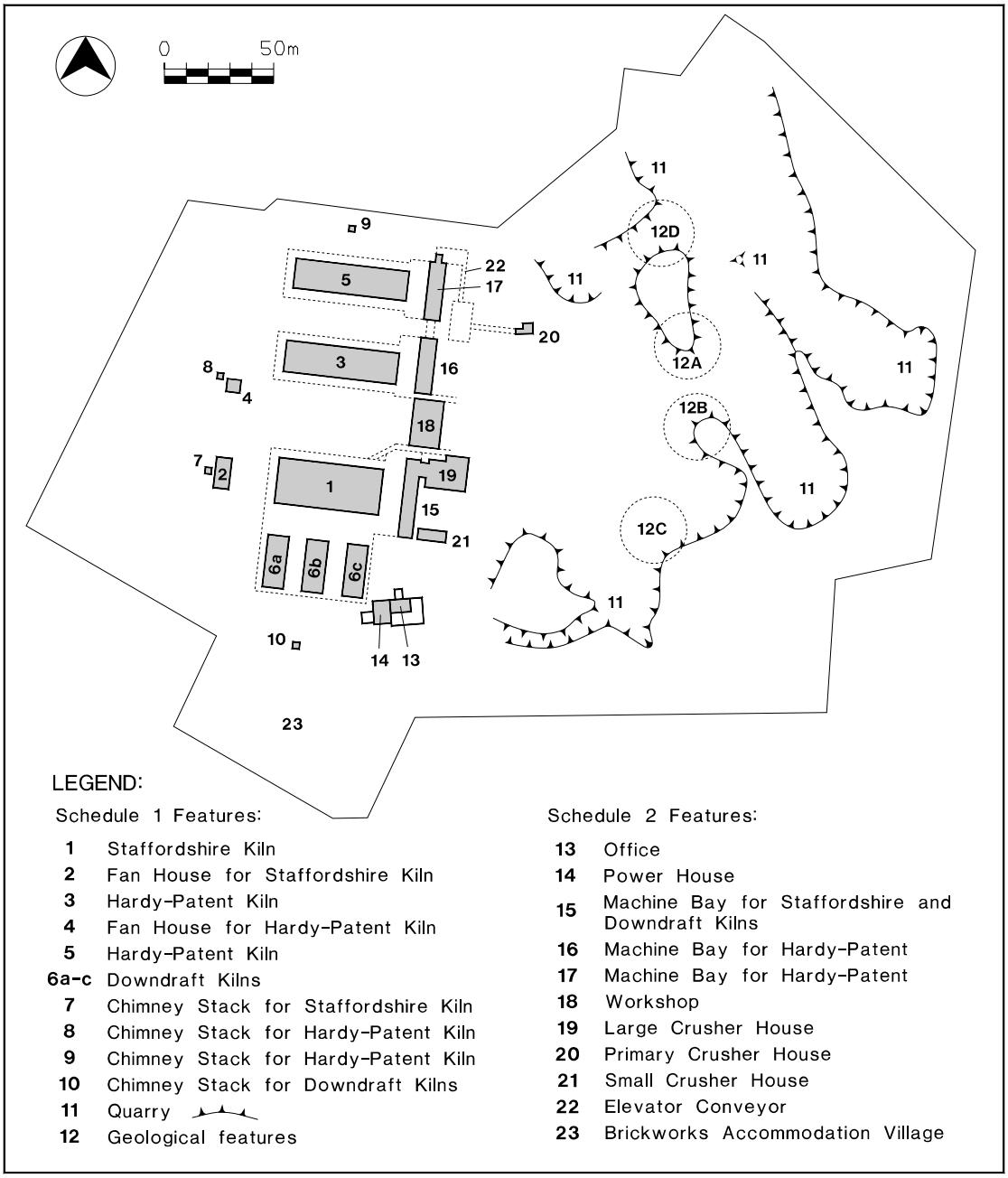


Figure 68a: Yarralumla Brickworks, Yarralumla: Significant Features



Australian Capital Territory

Heritage (Decision about Registration of Yarralumla Brickworks Railway Remnants) Notice 2013 (No 2)*

Notifiable Instrument NI2013–507

made under the

Heritage Act 2004, section 42 Notice of decision about registration

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1 Revocation

This instrument revokes the *Heritage (Decision about Registration of Yarralumla Brickworks Railway Remnants) Notice 2013*, NI 2013-38.

2 Name of instrument

This instrument is the *Heritage (Decision about Registration of Yarralumla Brickworks Railway Remnants) Notice 2013 (No 2).*

3 Registration details of the place

Registration details of the place are at Attachment A: Register entry for Yarralumla Brickworks Railway Remnants.

4 Reasons for decision

On 24 January 2013, the ACT Heritage Council (the **Council**) decided to register the Yarralumla Brickworks Railway Remnants (the **Decision**), see NI 2013-38.

On 5 March 2013, the Land Development Agency made an application to the ACT Civil and Administrative Tribunal (the **Tribunal**) seeking a review of the **Decision**.

On 10 September 2013, the Tribunal made orders by consent to vary the Decision.

On 7 November 2013 the Council prepared a register entry for the Remnants to accord with the Tribunal orders. The register entry is at Attachment A.

5 Date of registration

7 November 2013

Jennifer O'Connell
A/g Secretary (as delegate for)
ACT Heritage Council
8 November 2013

*Name amended under Legislation Act, s 60

Authorised by the ACT Parliamentary Counsel—also accessible at www.legislation.act.gov.au

ACT Heritage Council

AUSTRALIAN CAPITAL TERRITORY

HERITAGE REGISTER
(Registration Details)

For the purposes of s. 41 of the *Heritage Act 2004*, an entry to the heritage register has been prepared by the ACT Heritage Council for the following place:

Yarralumla Brickworks Railway Remnants

Part Block 7 Section 102 Yarralumla, Canberra Central

DATE OF REGISTRATION

7 November 2013 Notifiable Instrument: 2013—

Copies of the Register Entry are available for inspection at the ACT Heritage Unit. For further information please contact:

The Secretary
ACT Heritage Council
GPO Box 158
Canberra ACT 2601

Telephone: 13 22 81 Facsimile: (02) 6207 2229

IDENTIFICATION OF THE PLACE

Part Block 7, Section 102 Yarralumla, extending south of the Yarralumla Brickworks (See Figure 1).

This statement refers to the Heritage Significance of the place as required in s12(d) of the *Heritage Act 2004*.

STATEMENT OF HERITAGE SIGNIFICANCE

The Remnants of the former Yarralumla Brickworks Railway is significant for its association with the early construction of the national capital from 1923 until 1927. This was a critical period in the development of Canberra, and included major construction works in the lead-up to the Commonwealth Parliament moving to Canberra. The railway transported bricks for many prominent as well as ordinary buildings from this period, and major examples include Old Parliament House, Hotel Canberra, East Block and the Hotel Kurrajong.

The Remnants highlights one of the many challenges of building a city within a short time frame, in a relatively undeveloped area and with constraints on transport and technology.

The brickworks railway, of which the Remnants is a remaining portion, transported up to six million bricks per annum. The Remnants provides tangible evidence that can assist an understanding of the circumstances surrounding aspects of Canberra's construction.

FEATURES INTRINSIC TO THE HERITAGE SIGNIFICANCE OF THE PLACE

Features intrinsic to the heritage significance of the place which require conservation include:

- Remnants of the original earthen railway embankment, cutting and terraces.

APPLICABLE HERITAGE GUIDELINES

The guiding conservation objective is that the Yarralumla Brickworks Railway Remnants shall be conserved and appropriately managed in a manner respecting its heritage significance and the features intrinsic to that heritage significance, and consistent with a sympathetic and viable use or uses. Any works that have a potential impact on significant fabric shall be guided by a professionally documented assessment and conservation policy relevant to that area or component (i.e. a Statement of Heritage Effects – SHE).

The ACT Heritage Council may adopt heritage guidelines applicable to the place under s25 of the *Heritage Act 2004*.

For further information on whether guidelines apply please contact the ACT Heritage Council.

REASON FOR REGISTRATION

The Yarralumla Brickworks Railway Remnants have been assessed against the heritage significance criteria and been found to have heritage significance when assessed against three criteria under the ACT *Heritage Act 2004*:

(c) it is important as evidence of a distinctive way of life, taste, tradition, religion, land use, custom, process, design or function that is no longer practised, is in danger of being lost or is of exceptional interest;

(f) it is a rare or unique example of its kind, or is rare or unique in its comparative intactness;

(h) it has strong or special associations with a person, group, event, development or cultural phase in local or national history;

ASSESSMENT AGAINST THE HERITAGE SIGNIFICANCE CRITERIA

Pursuant to s.10 of the *Heritage Act 2004,* a place or object has heritage significance if it satisfies one or more of the following criteria. Significance has been determined by research as accessed in the references below. Future research may alter the findings of this assessment.

(a) it demonstrates a high degree of technical or creative achievement (or both), by showing qualities of innovation, discovery, invention or an exceptionally fine level of application of existing techniques or approaches;

The Yarralumla Brickworks Railway Remnants does not meet this criterion.

(b) it exhibits outstanding design or aesthetic qualities valued by the community or a cultural group;

The Yarralumla Brickworks Railway Remnants does not meet this criterion.

(c) it is important as evidence of a distinctive way of life, taste, tradition, religion, land use, custom, process, design or function that is no longer practised, is in danger of being lost or is of exceptional interest;

The Yarralumla Brickworks Railway Remnants meets this criterion.

Bricks were first manufactured at the Canberra (Yarralumla) Brickworks in 1913 for use in the construction of major developments across Canberra including provisional Parliament House and the Hotel Canberra. From 1923 – 1927 bricks were transported from the Brickworks via rail across the city to major developments. The railway ceased operation in 1927 and the remnants of the embankment, cuttings and terraces are important as evidence of the process by which bricks used in the construction and development of the new city were transported.

(d) it is highly valued by the community or a cultural group for reasons of strong or special religious, spiritual, cultural, educational or social associations;

The Yarralumla Brickworks Railway Remnants does not meet this criterion.

(e) it is significant to the ACT because of its importance as part of local Aboriginal tradition;

The Yarralumla Brickworks Railway Remnants does not meet this criterion.

(f) it is a rare or unique example of its kind, or is rare or unique in its comparative intactness;

The Yarralumla Brickworks Railway Remnants meets this criterion.

The Remnants of the former railway is rare in their comparative intactness, an example of one of few surviving remnants of the once extensive rail network used in the early development of Canberra.

(g) it is a notable example of a kind of place or object and demonstrates the main characteristics of that kind;

The Yarralumla Brickworks Railway Remnants does not meet this criterion.

(h) it has strong or special associations with a person, group, event, development or cultural phase in local or national history;

The Yarralumla Brickworks Railway Remnants meets this criterion.

The Remnants of the former Yarralumla Brickworks railway have a strong association with the development of Canberra between 1923 – 1927. Bricks (especially those referred to colloquially as 'Canberra Reds') manufactured at the Brickworks were loaded onto timber tip wagons and transported via a narrow gauge rail line to major developments across the city such as Parliament House, the Kingston Powerhouse, Hotel Canberra and buildings in Civic.

The railway enabled faster transport of the bricks than the previous use of steam traction engines that hauled heavy iron wheeled trailers on mostly unmade roads. The railway was removed in 1927 prior to the opening of Parliament House. However, it had a strong association with the early development of the new city.

(i) it is significant for understanding the evolution of natural landscapes, including significant geological features, landforms, biota or natural processes;

The Yarralumla Brickworks Railway Remnants does not meet this criterion.

(j) it has provided, or is likely to provide, information that will contribute significantly to a wider understanding of the natural or cultural history of the ACT because of its use or potential use as a research site or object, teaching site or object, type locality or benchmark site;

The Yarralumla Brickworks Railway Remnants does not meet this criterion.

(k) for a place—it exhibits unusual richness, diversity or significant transitions of flora, fauna or natural landscapes and their elements;

The Yarralumla Brickworks Railway Remnants does not meet this criterion.

(l) for a place—it is a significant ecological community, habitat or locality for any of the following;

(i) the life cycle of native species;

(ii) rare, threatened or uncommon species;

(iii) species at the limits of their natural range;

(iv) distinct occurrences of species.

The Yarralumla Brickworks Railway Remnants does not meet this criterion.

SUMMARY OF THE PLACE
HISTORY AND PHYSICAL DESCRIPTION

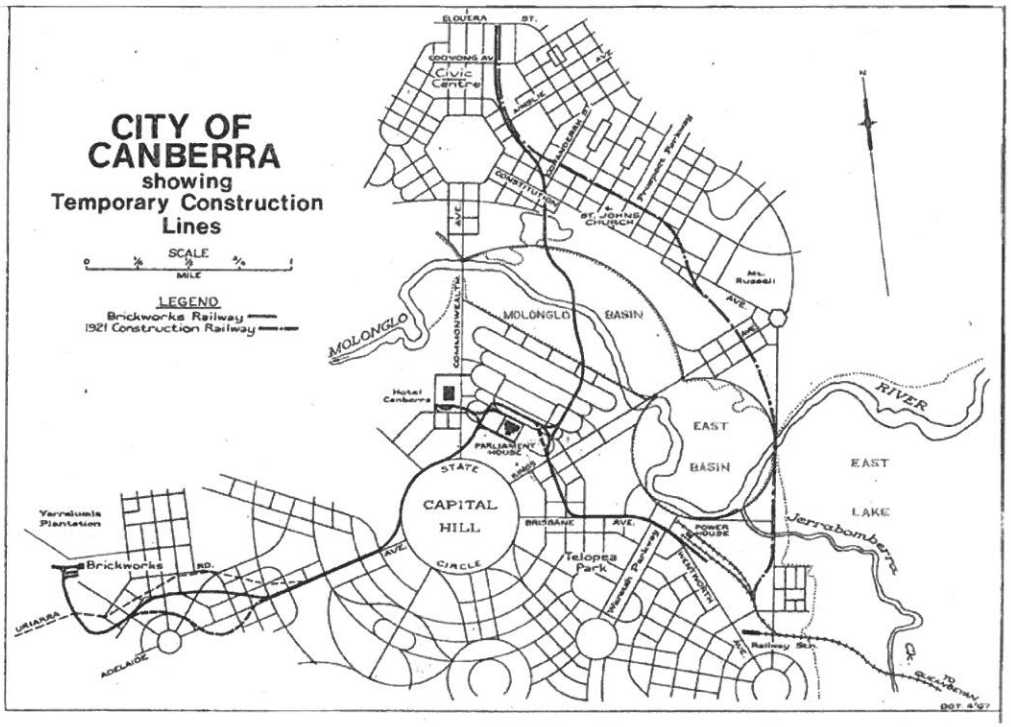
Description of Place

Remnants of the three lines of the former Brickworks railway are evident closest to the southwest corner of the Yarralumla Brickworks, converging to form a single embankment. Close to the Brickworks two of the former lines are evident as earth terraces, which go through a short cutting to become distinctive earth mounds. The third line runs approximately parallel to the western boundary of the Brickworks and is evident as an earth terrace. Along some sections of the embankment there are mature pine trees within close proximity, with other trees and shrubs growing along side and over the former rail line. The setting of the remnants of the former rail line within the pines creates an attractive vista.

In 2011 the area was extensively slashed and cleared for survey purposes, allowing greater visibility and identification of the railway remnants.

The following description is given of the former railway: *The track at the Brickworks was set out in three parallel lines, one on either side of the Staffordshire kilns and the remaining one ran to the coal dump. Immediately after leaving the proximity of the kilns, these tracks swung around rather sharply to the left, the points that gave access to the sidings being at an angle of 53 degrees to the straight part along the kilns.....After converging to a single track, the line ran straight for about two hundred yards, then, after crossing Uriarra Road swung again to the left in a curve on an*

embankment and straightened out with a slight down grade for ¾ mile where a reverse curve brought it alongside Adelaide Avenue. It continued beside this road to the State Circle where it followed the left contour of the Circle for about one third of its circumference until it met Commonwealth Avenue which it crossed at an angle……'. (Australian Railway Historical Society Bulletin No 355- May, 1967)



Source: the *Australian Railway Historical Society Bulletin No 355- May, 1967*

History

One of the most obvious prerequisites to the speedy establishment of Canberra, which was in an open, relatively uninhabited area, was an adequate supply of good bricks. No time was lost therefore in seeking out a local site for a brick-works, and satisfactory clays were found at Yarralumla or "Westridge" as Griffin had named it. There the Commonwealth Brickworks was established in 1913.

Bricks were required for construction at the Power House at Kingston (completed 1915), Parliament House(1927), Hotel Canberra (now the Hyatt, 1927) and other public buildings and offices including Telopea Park School (1923), East Block (1927), Albert Hall (1928) and Hotel Kurrajong (1926).

The bricks were moved by steam traction engines that hauled heavy iron-wheeled trailers on mostly unmade roads. This proved unsatisfactory and time consuming as the traction engines only achieved two round trips a day between the brick-works and the Parliament House. By the end of 1923, a 3 ft 6 inch (1067 mm) gauge steam-hauled railway was constructed to provide more effective transport. The southern terminus was at the Power House, where the line connected with a small engine shed.

After the failure of the standard gauge railway to Civic Centre, following collapse of the causeway bridge in the floods of 1922, the brickworks railway was extended to Civic, crossing the Molonglo River on a small timber bridge near the Scott's Crossing

Road. It is understood that in the city area the abandoned standard gauge track was used by moving one rail a distance of 14.5 inches across on the existing sleepers to form the narrower gauge. It is believed the brickworks tramway terminated about 40 feet beyond the Civic Centre platform.

In the clean up and extensive landscaping works prior to the opening of Parliament House on 9 May 1927, and possibly also because it had by that stage become more economical to transport the bricks by motor lorry, the railway was removed. At the time of closure, the capacity of the brickworks was 6 million bricks per annum. The bricks produced at the Brickworks are often colloquially referred to as 'Canberra Reds'.

References

Institution of Engineers, *Engineering Heritage of the ACT, Chapter 2, The Canberra Branch*

BT McDonald, The Australian Historical Railway Society, Vol. XVIII Bulletin No 355 May 1967, *Railways in the Australian Capital Territory*.

Draft Proposed Entry to an interim Heritage Places Register Yarralumla Brickworks Railway Remnants, National Trust of Australia c 2004

IMAGES



One of the three former lines where it goes through a short cutting

SITE PLAN

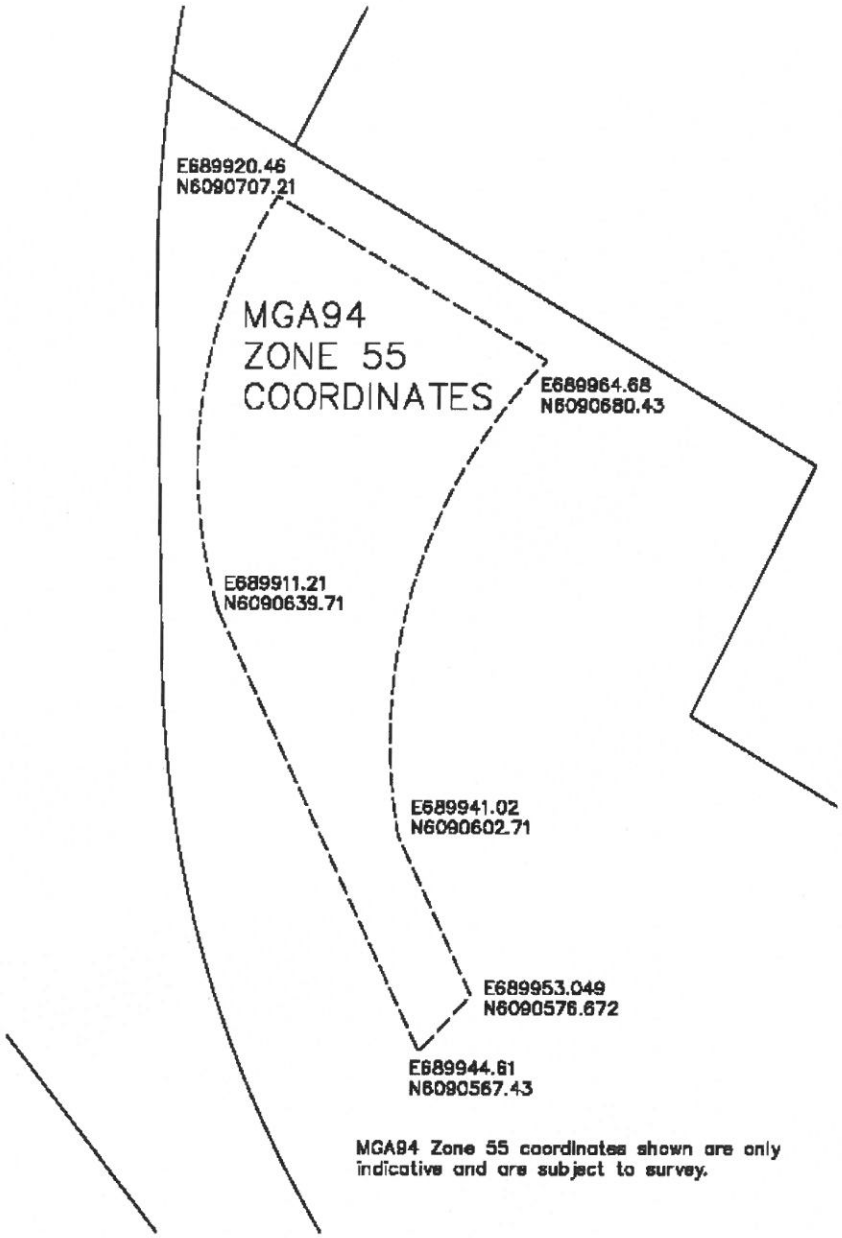


Figure 1 – Yarralumla Railway Brickworks Remnants GPS references

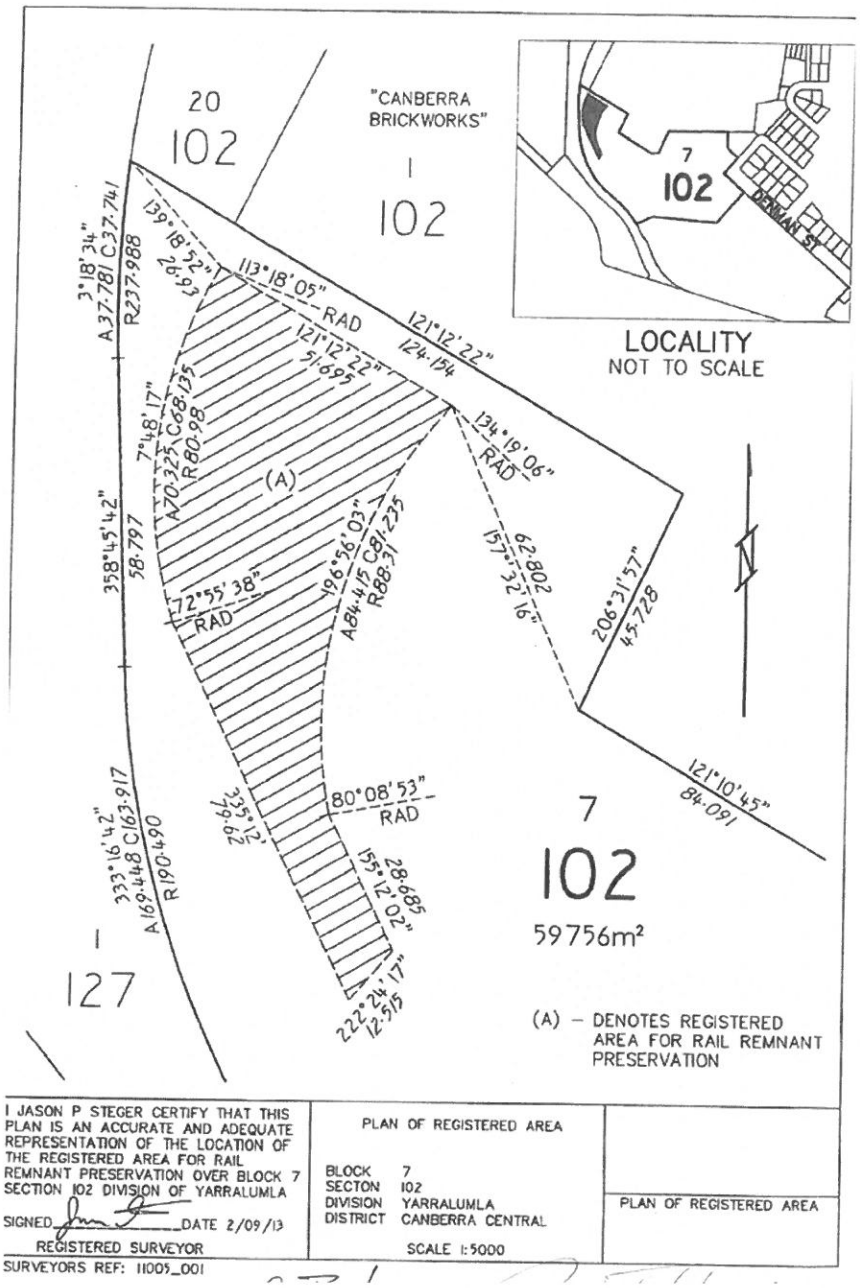


Figure 2 – Yarralumla Railway Brickworks Remnants boundary survey

Appendix B

Excavation Permit Yarralumla-S102-B1

ACT Heritage Council

Excavation Permit Approval

Under Section 61F of the *Heritage Act 2004*

Heritage Reference: Yarralumla-S102-B1
Contact Officer: MR
Received by Council: 6 May 2020

TO: **GML Heritage**
Martin Rowney, Principal/Archaeologist
martinr@gml.com.au

Block:	Section:	Division:	Heritage Place:
1, 7 and 20	102	Yarralumla	Yarralumla Brickworks; Yarralumla Brickworks Railway Remnants; Areas of historic archaeological potential

Status of Place:	Registered Heritage Place
Description of Works:	Archaeological Excavation
Report Details:	"*Canberra Brickworks Precinct. Archaeological Research Design*" (GML Heritage, September 2020)
Council Advice provided by:	Chair / Heritage Council

Pursuant to Section 61F of the *Heritage Act 2004*, the ACT Heritage Council advises that:

☒ **The proposed activity is approved, with conditions** as set out below, on the basis that:

(a) the proposed excavation is a justifiable part of the work required at the place;

(b) there are no reasonably practicable alternatives to excavation; and

(c) that reasonable steps have been identified to reduce the risk of diminishing the heritage significance of, or damage, to the place.

Background:

On 6 May 2020, GML Heritage made an application to the ACT Heritage Council (the Council) for permission to carry out archaeological excavation work within Blocks 1, 7 and 20, Section 102, Yarralumla.

On 25 September 2020, further information to support the application was also provided, in the form of the *"Canberra Brickworks Precinct. Archaeological Research Design"* (GML Heritage, September 2020); following an information request from the Council on 18 September 2020.

Block 1 Section 102 Yarralumla is registered on the ACT Heritage Register (the Register) as the 'Yarralumla Brickworks'; which is of heritage significance as the first industrial manufacturing facility within the ACT, operational between 1913 and 1976. The Register entry identifies an archaeological area, being the 'remains of the Brickworks accommodation village', as a Schedule 2 element of moderate significance.

Part of Block 7 Section 102 Yarralumla is also registered on the Register as the 'Yarralumla Brickworks Railway Remnants'; which is of heritage significance for its association with the early construction of the national capital, operational between 1923 and 1927.

Additionally, Blocks 1, 7 and 20 Section 102 Yarralumla contain previously identified areas of archaeological potential, which may contain subsurface features and deposits associated with the industrial development of the Brickworks. Specifically, Navin Officer Heritage Consultants (2016) and GML Heritage (2020) identify the following 12 areas of historical archaeological sensitivity:

- 3 areas of high archaeological potential, being the married quarters and Brickworks hostel (BRW2), an area of post holes and other remains (BRW3), and flues and subsurface workings (BRW12);
- 3 areas of moderate archaeological potential, being the building platform and concrete features (BRW1), railway remnants (BRW10) and railway siding extension (BRW11);
- 1 area of moderate to low archaeological potential, being the quarry pit (BRW7); and
- 5 areas of low archaeological potential, being the single men's quarters (BRW4), clay feature and rubble (BRW5), rubble heap and refuse dump (BRW6), old kiln and dormitories (BRW8), and cottage, stables and coal store (BRW9).

Archaeological investigation of these areas is proposed to inform design and management of the Canberra Brickworks Precinct (the Precinct) redevelopment, which is a significant ACT Government renewal project to be delivered by Doma Group. Specifically, archaeological test trenches are proposed in all areas of high and moderate archaeological potential, to determine the nature and extent of archaeological deposits present, and to assess their heritage significance.

In this context, GML Heritage (2020) propose the following works:

- Preparation of detailed archaeological plans for BRW1, BRW2, BRW3, BRW7, BRW10 and BRW12, which requires clearance of trees and grasses at BRW2, BRW3, and BRW10.
- Placement of archaeological test trenches as follows within areas of archaeological potential:
    - BRW1: two archaeological test trenches, each 20 metres long by 1.5 metres wide, at locations identified on Figure 5.3;
    - BRW2: five archaeological test trenches, each 15 metres long by 1.5 metres wide, at locations identified on Figures 5.4 and 5.5;
    - BRW3: five archaeological test trenches, each 15 metres long by 1.5 metres wide, at locations identified on Figures 5.6 and 5.7;
    - BRW7: three archaeological test trenches, two 15 metres long and one 10 metres long, at locations identified on Figure 5.8;

    - BRW8: four archaeological test trenches, each 15 metres long, at locations shown on Figure 5.9;
    - BRW10: between two and four archaeological test trenches, each 15 metres long, at locations shown on Figures 5.10 and 5.11; and limited additional machine trenches if possible and deemed necessary by the field team;
    - BRW11: three archaeological test trenches, each 15 metres long by 1.5 metres wide, at locations shown on Figures 5.12 and 5.13; and
    - BRW12: archaeological test trenches at locations to be determined in consultation with the Council following internal survey of flue structures by GPS and camera.

- Archaeological test trenches will be excavated using a combination of mechanical and manual methods, as set out below:

    - Mechanical investigation will be used to remove modern surface materials and fills, and will cease when *in situ* archaeological features and deposits are found. Mechanical excavation will use a flat edged bucket to remove deposits in 50 millimetre spits; and

    - Manual excavation will be used to clean and investigate all *in situ* archaeological features and deposits found. Manual excavation will sample up to 25% of each feature or deposit, and may include small sondages as required. Excavation will be undertaken stratigraphically where required, or in nominal 50 millimetre spits.

- Should initial results identify that areas of archaeological interest extend beyond nominated testing locations, or that a greater testing sample is required, Council advice will be sought on an expanded testing program prior to continuation of works.

- Excavated sediment will be sample sieved to test for artefacts, with 50% of underfloor occupation deposits sieved through a five millimetre mesh. Should significant artefacts be found, sieving will increase to 100% of the subject occupation deposit.

- All trench locations will be archaeologically recorded and surveyed as set out in Section 5.6.

- All artefacts recovered during excavation will be collected and temporarily stored at the GML Heritage office, and will be subject to recording and analysis. Following this, a long term artefact management strategy will be developed and concurrence from the Council sought on proposed outcomes.

All aspects of the archaeological investigation will be guided by the research framework and questions set out in Section 4 the application, which have been developed with reference to the heritage themes set out in the Council's 2018 *Heritage Assessment Policy*.

Decision and Conditions:

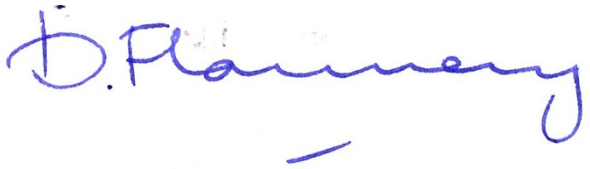
Following review, the Council is satisfied that the proposed excavation is justifiable, and that there are no reasonably practicable alternatives to excavation, and that reasonable steps have been identified to reduce the risk of diminishing the heritage significance of or damage to the place.

On this basis, the Council approves the Excavation Permit application for the Canberra Brickworks Precinct subject to the following conditions:

1. All excavation and related activities are to be undertaken in accordance with the "*Canberra Brickworks Precinct. Archaeological Research Design*" (GML Heritage, September 2020);

2. The long term artefact management strategy is to be submitted to the Council for endorsement within 12 months of this approval; and

3. The Excavation Permit is approved for a period of 12 months.



David Flannery FRAIA MPIA
Chair (as delegate for),
ACT Heritage Council

20 October 2020

Appendix C

GML Heritage, Canberra Brickworks Precinct—Archaeological Research Design, prepared for Doma Group, September 2020

Canberra Brickworks Precinct

Archaeological Research Design

Report prepared for DOMA Group

September 2020



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Report Register

The following report register documents the development and issue of the report entitled Canberra Brickworks Precinct—Archaeological Research Design, undertaken by GML Heritage Pty Ltd in accordance with its quality management system.

Job No.	Issue No.	Notes/Description	Issue Date
19-0443A	1	Draft Report	6 February 2020
19-0443A	2	Final report	29 April 2020
19-0443A	3	Revised Final Report	September 2020

Quality Assurance

GML Heritage Pty Ltd operates under a quality management system which has been certified as complying with the Australian/New Zealand Standard for quality management systems AS/NZS ISO 9001:2016.

The report has been reviewed and approved for issue in accordance with the GML quality assurance policy and procedures.

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Executive Summary

Doma Group is undertaking a project to redevelop the Canberra Brickworks Precinct site located in Yarralumla, ACT (the site). The proposed redevelopment includes new residential areas and associated infrastructure, as well as retail and office spaces which will be accessible to the public. Several historical structures at the site will be retained and adapted into these new facilities. Doma Group has commissioned GML Heritage Pty Ltd (GML) to provide heritage and archaeological services for the project.

An Archaeological Assessment (AA) of the site was previously prepared by Navin Officer in 2016. This report identified 12 areas of archaeological sensitivity and recommended that areas of moderate and high archaeological potential be subjected to an archaeological testing program prior to any works or development in these areas (BRW1–BRW12). This report presents the Archaeological Research Design (ARD) for a preliminary archaeological testing program at the site. The aim of this program is to determine the nature and extent of archaeological deposits within the site and to develop recommendations for any future management requirements for archaeological deposits.

Based on a review of the AA and an inspection of the site, GML determined that eight of the 12 areas of archaeological sensitivity identified in the AA should be subjected to further archaeological testing (BRW1, BRW2, BRW3, BRW7, BRW8, BRW10, BRW11 and BRW12). The proposed methodologies for archaeological testing at these areas are presented in this report and have been developed based on a review of the AA and relevant documents, as well as a site inspection undertaken by GML.

This ARD is required to be submitted with an Excavation Permit application under Section 61E of the *Heritage Act 2004* (ACT).

1.0 Introduction

1.1 Project Background

Doma Group is undertaking a project to redevelop the Canberra Brickworks Precinct site located in Yarralumla, ACT (the site/study area). The proposed redevelopment includes new residential areas and associated infrastructure, as well as retail and office spaces which will be accessible to the public. Several historical structures at the site will be retained and adapted into these new facilities.

Doma Group has commissioned GML Heritage Pty Ltd (GML) to provide heritage and archaeological services for the project. GML has recently prepared an updated Conservation Management Plan (CMP) for the site. An Archaeological Assessment (AA) was prepared for the study area by Navin Officer in 2016 to inform future works.

The proposed works have the potential to impact the study area's archaeological resource. This report builds on the AA prepared by Navin Officer in 2016 to provide an Archaeological Research Design (ARD) for the proposed development.

1.2 Study Area

The location of the Canberra Brickworks Precinct, the study area for this CMP, is shown in Figures 1.1 and 1.2.

The Canberra Brickworks Precinct comprises Blocks 1, 7 and 20, Section 102, which includes the heritage listed areas of the 'Yarralumla Brickworks' (located in Block 1, Section 102) and the 'Yarralumla Brickworks Railway Remnants' (located in part Block 7, Section 102) (refer to Figure 1.2).

The Precinct is located in the suburb of Yarralumla, to the west of central Canberra. The site is bordered to the north and east by low density residential development, to the west by the Royal Canberra Golf Course and Westbourne Woods, and to the south by open space.



Figure 1.1 Location of the Canberra Brickworks Precinct in the broader context of Canberra. (Source: Google Earth with GML overlay)

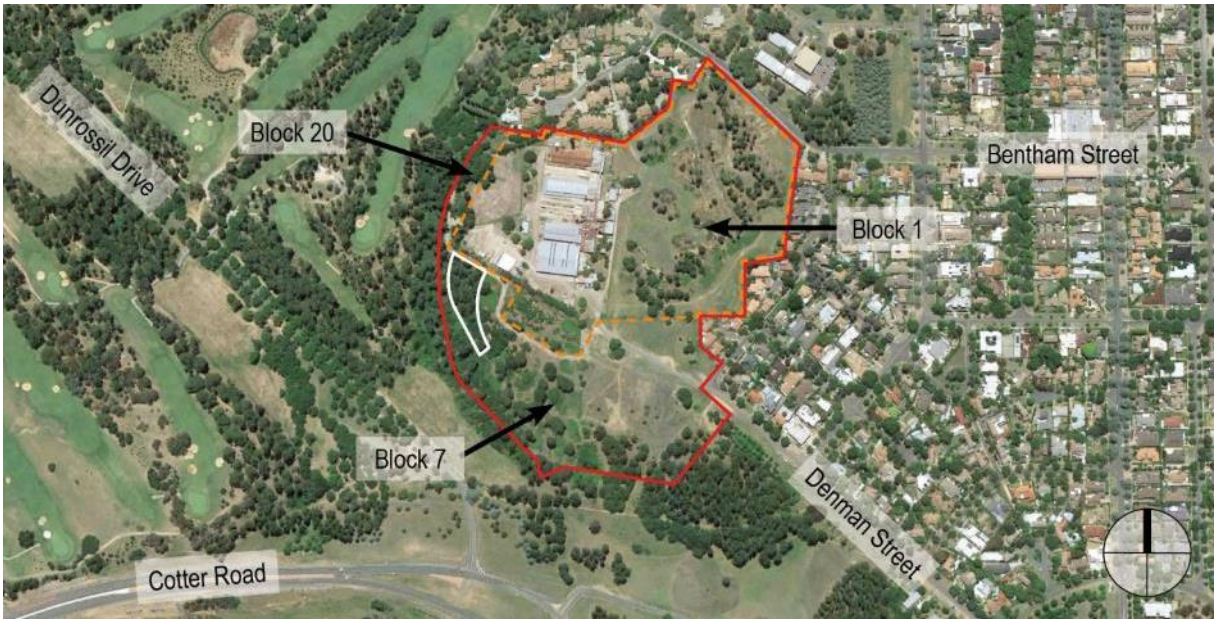


Figure 1.2 CMP study area—Canberra Brickworks Precinct is shown in the red boundary. The study area consists of Blocks 1, 7 and 20, Section 102 and includes the ACT heritage listed boundaries for the 'Yarralumla Brickworks' (Block 1) (orange dashed line) and the 'Yarralumla Brickworks Railway Remnants' (part Block 7) (white boundary). (Source: Google Earth with GML overlay, 2017)

1.3 Heritage Status

1.3.1 ACT Heritage Register

The *Heritage Act 2004* (ACT) (Heritage Act) aims to represent and protect the rich natural and cultural heritage of the ACT. The legislation establishes a system for the recognition, registration and conservation of natural and cultural heritage places and objects, including Aboriginal places and objects.

The 'Yarralumla Brickworks' (Block 1, Section 102 Yarralumla) and the 'Yarralumla Brickworks Railway Remnants' (Part Block 7, Section 102 Yarralumla) are recognised as having heritage significance by their inclusion in the ACT Heritage Register. The heritage significance of the site is explained further in Section 4.0 of this report.

1.3.2 Non-Statutory Listings

The 'Yarralumla Brickworks' is listed on the Australian Institute of Architects (AIA) ACT Chapter Register of Significant Twentieth Century Architecture (RSTCA), item No. R063.

The 'Canberra Brickworks' was identified as a 'Classified' place by the National Trust of Australia (ACT) on 20 July 1981.

1.3.3 Heritage Places in the Vicinity

The site is also within close proximity to four heritage places that are included on the ACT Heritage Register and the Commonwealth Heritage List (CHL):

- Government House and Surrounds (CHL Place ID: 105381);
- the CSIRO Forestry Precinct (CHL Place ID: 105595);
- Westbourne Woods (ACT Heritage ID: 444); and
- Early Canberra Brickworks Housing Precinct (ACT Heritage ID: 1002).

1.4 Proposed Works

The proposed works involve the redevelopment of the study area into a residential area with associated infrastructure and retail and office spaces (Figures 1.3 and 1.4). Several of the remnant historical structures will be retained and utilised as infrastructure for the residents, and as retail and office spaces for the public. The site will be landscaped, and services and utilities will be installed. Structures are proposed to be constructed within areas found to have archaeological potential including BRW1, BRW2, BRW3, BRW4, BRW5, BRW6, BRW7, BRW8, BRW10 and BRW11. No structures are currently proposed for the BRW9 area. The quarry area will be landscaped, and a pool is proposed to be installed in the existing dam area. Several structures are proposed along the eastern boundary of the site, above the former quarry area.



Figure 1.3 Preliminary proposed development design over a current aerial. (Source: Google Earth with GML overlay)



Figure 1.4 Proposed development Masterplan for the Canberra Brickworks (Source: Doma Group)

1.5 Purpose of Report

This ARD has been prepared to guide the historical archaeological investigations required to manage and mitigate construction related impacts. It includes:

- a summary historical background based on the AA and CMP;

- an archaeological assessment of potential significance;
- an assessment of potential impacts of the proposed works; and
- an archaeological research design and excavation methodology to manage and mitigate impacts.

This ARD report will be submitted to the ACT Heritage Council to support an Excavation Permit application.

1.6 Authorship and Acknowledgements

This report has been prepared by Janene May (GML Heritage Consultant) and reviewed by Martin Rowney (GML Principle). GML wishes to acknowledge the assistance of personnel from Doma Group and the ACT Heritage Unit.

1.7 Limitations

This report presents the research design and methodology for historical archaeology. The methodology includes an initial testing stage to determine the nature and extent of the potential archaeological resource.

2.0 Historical Background

2.1 Introduction

This section provides a summary of the historical development of the Canberra Brickworks Precinct including a background history of Canberra, a contextual history of the Brickworks, and a comparative analysis of other Australian brickworks.

The history and comparative analysis has been drawn predominantly from the 2019 CMP, and revised and updated where necessary.

2.2 Background History of Canberra

2.2.1 Ngunnawal Country

The Brickworks is located on traditional lands held by the Indigenous people of the Ngunnawal group. The Ngunnawal people have occupied the land for thousands of years and their descendants continue to live in Canberra and the surrounding region. Several Indigenous groups, including the Ngunnawal and Ngambri, were recorded to have settled along the sandy banks of the Molonglo River. As an important resource, the Molonglo River corridor attracted a hunter-gatherer lifestyle and Aboriginal people set up shelter and camps throughout the area as they travelled in response to the availability of natural resources.[1]

The Aboriginal people were displaced from their land following European settlement of the area and their numbers dwindled dramatically, possibly associated with a smallpox epidemic in 1830, influenza and a measles epidemic in the 1860s.[2] There are few records of Aboriginal people on the Limestone Plains after it was settled by pastoralists, perhaps because of Indigenous seasonal lifestyles, or because they retreated from settlers and their horses, and moved to the hills.[3] The new settlers may also have simply failed to record their ongoing presence in any detail.

2.2.2 Colonial History

European colonisation of the area commenced in the 1820s with small and large estates for farming and grazing. The Brickworks site was established on part of a large sheep grazing property held by Frederick Campbell, a descendant of Robert Campbell who owned the early Canberra pastoral estate Duntroon.

During the late 1890s, there was much debate over the location of the seat of government for the new Commonwealth of Australia. It was eventually decided that the future capital's location would be selected by the new Parliament following Federation in 1901.[4] On the recommendation of Commonwealth surveyor Charles Scrivener, the district of Yass–Canberra was chosen in 1908. Scrivener's specific choice was an elevated site straddling the Molonglo River with mountains and hills to the northwest, northeast and south.

2.2.3 Planning the National Capital

The Griffin Plan

In 1911, an international competition to design the new city was launched and 137 entries were received. After considerable debate, Chicago architect Walter Burley Griffin was announced as the winner of the competition in May 1912.

Griffin's 1911 plan for the national capital was based on a geometry dictated by the landscape rather than the principal points of the compass, with a water axis formed from the flow of the Molonglo River at right angles to a land axis between two hill summits. A municipal axis lay just to the north of, and parallel to, the water axis. The central land axis ran from Mount Ainslie through Camp Hill (the site of Old Parliament House) to Capital Hill (the site of New Parliament House) and then nearly 50 kilometres further inland to Mount Bimberi.[5]

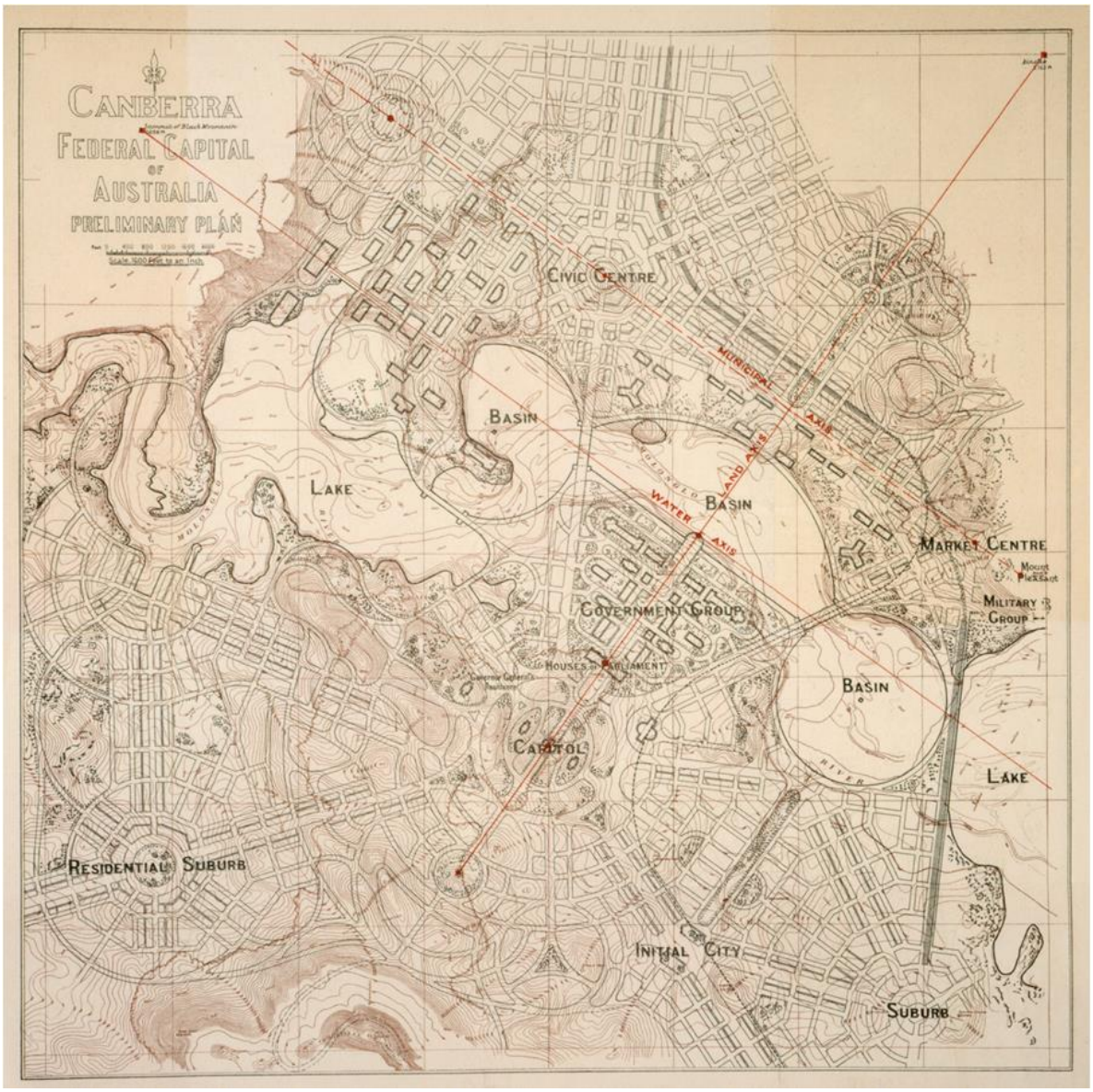


Figure 2.1 The Griffin Plan of Design for the federal capital showing the land, water and municipal axes, 1911. (Source: National Archives of Australia [NAA] A1, 1917/7242)

The Departmental Plan

Following the announcement of the top four winning entrants to the design competition, the Minister for Home Affairs, King O'Malley, appointed a Department Board to evaluate the winning proposals and create a plan for their practical implementation.

The Departmental Plan was completed by November 1912 and officially endorsed by King O'Malley in January 1913. Hearing of the Departmental Plan, Walter Burley Griffin visited Australia in an

attempt to view the site, understand the proposed amendments and deter the government from changing his vision. Of note in the Departmental Plan was the allocation of a brickworks site, which had not been included in Griffin's plan. A compromise between Griffin and the Board could not be reached and in October 1913 the incoming Minister for Home Affairs, William Kelly, dismissed the Board. Griffin was appointed as Federal Capital Director of Design and Construction to implement his original plan.[6]

By 1918 Griffin had developed his scheme into a practical plan that could be implemented. In 1920, the Commonwealth Government established a Federal Capital Advisory Committee (FCAC) to ensure the plan's timely execution. Griffin did not approve of the Advisory Committee's appointment and this, along with other ongoing unease and tension between Griffin and other staff and governmental departments, led to him to leaving Canberra in 1920 on the completion of his contract.[7]

While Griffin was no longer involved in the process, the 'Griffin Plan' for Canberra of 1925 (called the 'Statutory Plan for Canberra') was gazetted as a result of *Seat of Government (Administration) Act 1910* (Cwlth). This plan effectively set the agenda for city planning until the 1950s.

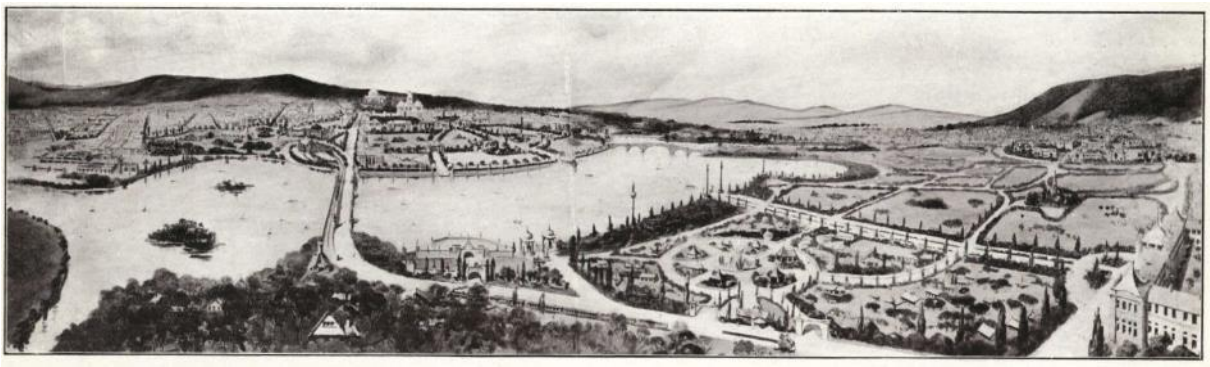


Figure 2.2 An artist's impression of the city's layout according to the Departmental Plan in Figure 2.3. (Source: NAA: M4071, 48, 1913, p 70)



Figure 2.3 The 1913 Departmental Plan, of the Federal Capital Commission, was a combination of two of the winning designs and lacked the clarity and structured form of the Griffin Plan. (Source: NAA: M4071, 48, 1913, p 68)

2.3 Overview History of the Brickworks

2.3.1 Phases of Development

The Brickworks site contains evidence from each of its main phases of development: establishment, expansion, postwar, and post closure, when the site was permanently closed as a brick manufacturing facility.

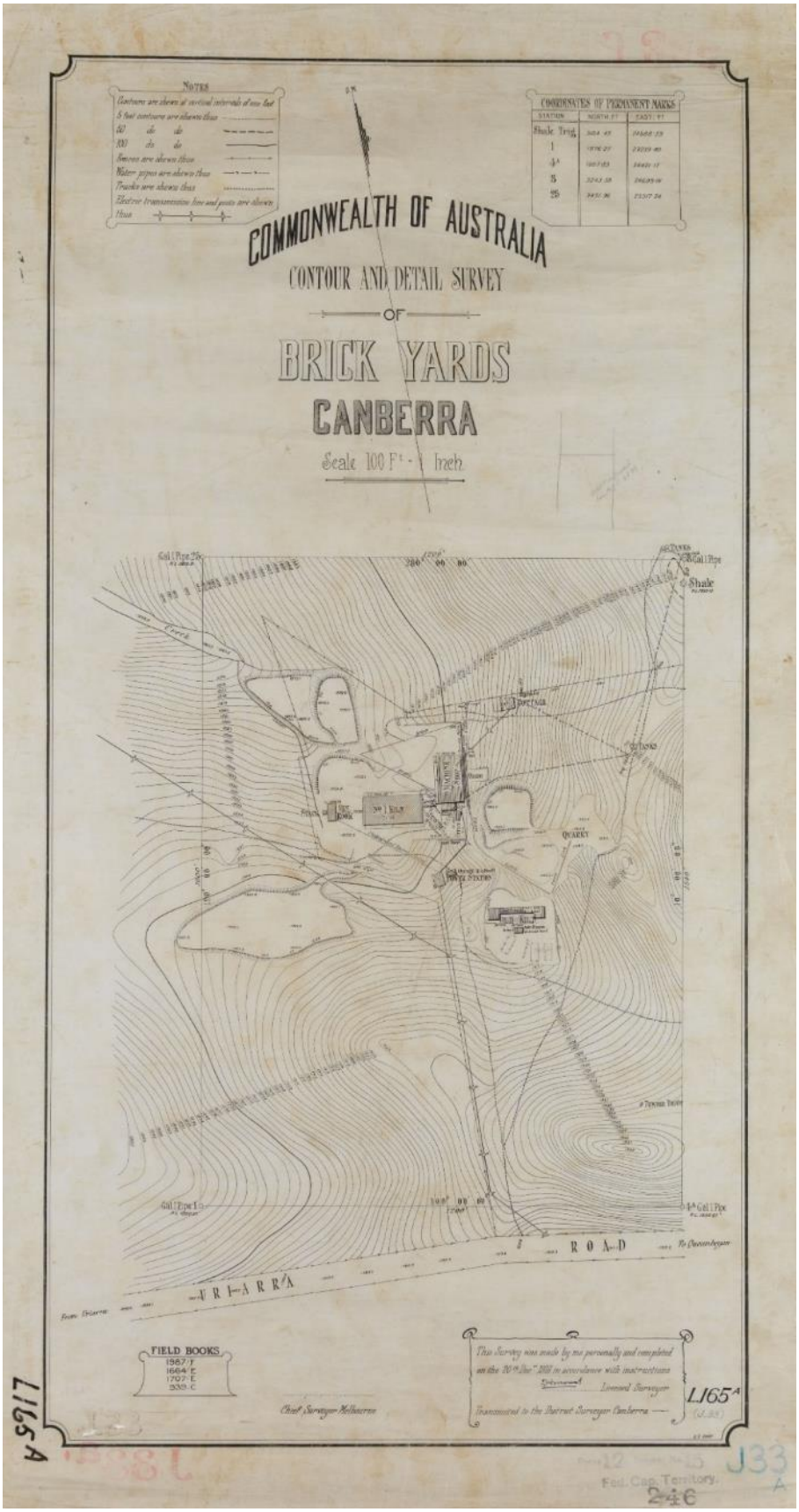


Figure 2.4 1916 contour and detail survey of the Brick Yards Canberra. (Source: NAA: A6664, L165A, 1916)



Figure 2.5 Staffordshire kiln construction at the Brickworks, c1915. (Source: Canberra District Historical Society, ID15652)



Figure 2.6 Chimney stack under construction, c1926. (Source: NAA, A3560, 2455)



Figure 2.7 Scotch kilns were in operation at the Brickworks until the mid-1920s. (Source: NAA, A3560, 1968)



Figure 2.8 Hardy patent kiln 1 under construction, c1926. (Source: NAA, A3560, 2111)

2.3.2 Establishment Phase, 1911–1920

The Brickworks was established by the Commonwealth Government in the early days of Canberra's development as the federal capital. Due to the costs associated with transporting bricks outside of the Territory, it was decided that a local quarry and brickworks be established to support the construction of houses and government buildings, and the population growth in the new town. Of the two sites investigated, 38 acres of sheep grazing land on Frederick Campbell's property Yarralumla Station was selected for its potential to produce bricks of an excellent quality, equal to the best commercially produced bricks for hardness and porosity.[8]

Development of the Brickworks began in 1913 with initial infrastructure comprising a grinding pan, brick making machine and elevator, portable steam engine, and four open kilns. It was expected that much of this equipment would be temporary and that more permanent infrastructure would be established in 1914. A single 20-chamber Staffordshire kiln, the first to be built in Australia, was completed in 1915. The arrival of World War I led to a shift in government priorities and commitments, and resulted in restrictions on the works program for Canberra. This shift, together with a coal strike, caused the first closure of the Brickworks in December 1916. A 1916 contour and detail survey identified early Brickworks infrastructure including: a 'Machine Shop', 'No.1 Kiln', 'Fan Room', 'Stack', 'Office', and 'Power Station' (see Figure 2.4).

Many workers from the Brickworks were housed in two tent camps (single and married quarters) in an area popularly known as 'Westridge', part of Griffin's planned suburb of Westlake (now part of the contemporary suburb of Yarralumla). The first permanent dwellings for workers were constructed in the 1920s.

2.3.3 Expansion Phase, 1921–1942

With the end of World War I, the government proceeded with the construction of Canberra and formally reopened the Brickworks in 1921, which had undergone machinery repairs the previous year. A tile making plant was constructed in 1922 but it was reported in 1925 that the tiles were of a poor quality and the government invested £2000 into improving the product. The 1920s saw an increase in residential construction and major civic construction projects throughout Canberra in response to government plans to move public servants from Melbourne and the completion of the Provisional Parliament House in 1927 was a significant achievement for the fledgling capital. To cope with the increased demand, a Hardy patent kiln and two 'temporary' Downdraught kilns and associated stack were constructed, and the brick manufacturing Machine Shop established in c1916 near the quarry

was expanded by two bays to accommodate brick machines and grinding pans.

During the 1920s, more permanent workers' accommodation was established in the form of timber tenements and brick cottages adjacent to the earlier accommodation camps. In 1927, additional married quarters and a single men's camp were constructed in response to the growing workforce.

To assist in the accelerated residential and civic construction of Canberra, a steam powered narrow-gauge railway was built in 1923 to improve the mass transportation of bricks. The bricks had previously been transported by steam traction engines, but this was a slow process unsuited to the capital's rapid growth and underdeveloped roads. A track leading from the Brickworks was constructed and branched out to the site of the new Hotel Canberra (now the Hyatt Hotel), the Provisional Parliament House, and the Kingston Powerhouse. A track was originally proposed to extend over the Molonglo River into Civic but the 1922 floods destroyed the connecting bridge. Eventually the Civic branch was established by narrowing an existing abandoned standard gauge track.[9] From 1927 the railway infrastructure was gradually removed and transportation continued by motor lorry.[10]

The Depression curtailed production at the Brickworks and timber was used instead of the more expensive coal to operate the kilns. With significant reduction in demand, the Brickworks closed for a second time in 1931. It reopened in 1935, but this proved to be short-lived due to the arrival of World War II. The Brickworks closed for a third time in 1942 and staff were laid off with a caretaker instituted to issue bricks for essential works only.

2.3.4 Post-World War II Phase, 1944–1976

In 1944 the Brickworks reopened on a limited scale. This soon increased to respond to the postwar housing shortage, which led to major expansion and redevelopment works at the Brickworks. Efforts were made to seek out experienced and qualified workers to meet the increased demand on the Brickworks. However, recruitment proved challenging and in an effort to attract workers, a new amenities block was constructed, as was the 'Brickworks Hostel' which was positioned south of the site and completed in 1945.

In 1952, plans and equipment for a new 'Tunnel' kiln were purchased and foundations laid, but the project was soon abandoned amid spiralling costs. A second Hardy patent 20-chamber kiln was constructed c1954 on the foundations of the abandoned Tunnel kiln. It utilised natural draught for firing, as opposed to being fan-induced, which required a tall chimney stack.



Figure 2.9 The Brickworks quarry face with workers, c1920–30. (Source: NAA, A3650, 3315)



Figure 2.10 The Brickworks quarry and narrow gauge railway track, c1920–30. (Source: NAA, A3650, 3314)



Figure 2.11 View from Old Parliament House roof with the railway and carts that delivered the bricks in the top right. (Source: NAA, A3560, 1398)

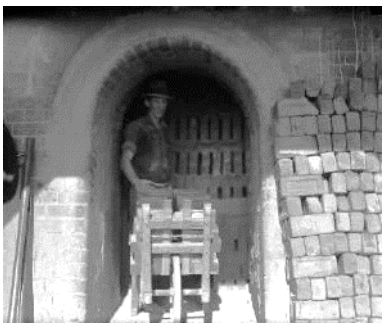


Figure 2.12 Man loading a kiln, c1926. (Source: NAA, A3560, 1973)



Figure 2.13 Canberra Brickworks, c1927. (Source: NAA, A3560, 2696)



Figure 2.14 Brick kilns and brick stacks, c1926. (Source: NAA, A3560, 167)



Figure 2.15 View to the kilns, c1928. (Source: NAA, A3560, 4557)



Figure 2.16 Stone crushing and screening plant. (Source: NAA, A3560)

The 1950s saw a change in the brick making process and a series of new crushers and hoppers was introduced, as well as an elevator and a series of conveyor belts. New brick press buildings and a workshop replaced the early machine shop adjacent the Staffordshire kiln. Despite extensive upgrades and works, a 1959 report on the operations, management, equipment, and economics of the Brickworks addressed concerns over low productivity at the site and the quality of bricks being produced.

In 1958, the two 1925 Downdraught kilns were demolished to allow for the construction of three new Downdraught kilns from 1960–1963. The new kilns had the capacity to hold 120,000 bricks and were reputed to be the longest in Australia. At this time, oil replaced coal as the fuel for firing the kilns.

By 1973, the Brickworks was considered in need of extensive modernisation and proposals were prepared by Commonwealth Brickworks Pty Ltd for upgrade works. These proposals were rejected by the National Capital Development Commission (NCDC) on environmental grounds and a new brickworks site was released at Mitchell in Canberra's north. The allocation of a new brickworks led to the final closure of the Brickworks and the kilns were unloaded for the last time in August 1976.

2.3.5 Post Closure Phase, 1976–2017

In 1976, local developer and businessman Alan Marr (A R Marr Pty Ltd) put forward a proposal to develop the Brickworks as an integrated tourist, recreation, and retail centre with medium density housing to the east and north of the site. Marr succeeded in having the land rezoned to accommodate his vision and carried out maintenance and reconstruction works to the kilns. Landscaping of the quarry, involving land fill and the creation of the reflection lake, proceeded in 1978. The redeveloped Brickworks was opened to the public as a tourist attraction in July 1979. However, limited income opportunities and high capital costs forced Marr's business into provisional liquidation. In the early 1980s, Marr was seriously injured in a fall at the site and later died of complications. The Commonwealth accepted the surrender of Marr's company's lease in 1984 and management of the site was transferred to caretaker Bruce McDonald. While many of Marr's tenants remained at the Brickworks, concerns about the safety of some of the buildings and potential redevelopment of the site led to the tenants being asked to leave and the caretaker role being abolished.

The 1988 *Canberra Brickworks South Canberra Policy Plan* suggested a range of potential uses for the site such as housing, commercial accommodation, and office and retail space. The

government adopted the plan, despite it being poorly received by the community. Hooker Projects submitted the preferred EOI, which proposed a development that adapted the kilns and machine bays, and contained a sports precinct, museum, restaurant, hotel, and visitor attractions. A depressed economy led to Hooker Projects being placed in provisional liquidation and by 1992 their proposal was defunct. It is around this time that the Commonwealth handed the Brickworks site over to the ACT Government.

Further development proposals were investigated but none proceeded and during this phase the Brickworks continued to accommodate a range of tenants, including artists, designers, and manufacturers. In 1994 a timber recycling business, Thor's Hammer, was established at the site, and operated until 2019.

In 2001 the Brickworks was included on the ACT Heritage Register as the 'Yarralumla Brickworks'. In 2013, the remnants of the former 1920s narrow-gauge railway were individually listed as the 'Yarralumla Brickworks Railway Remnants'.

In September 2013, the ACT Government's Land Development Agency (LDA) (now the Suburban Land Agency) released the *Canberra Brickworks and Environs Planning and Development Strategy*, which sought to promote the adaptive re-use of the site and its surrounds with respect to its heritage significance. Following revision of the strategy in 2015, the LDA called for development proposals to be submitted and in 2017 it was announced that the preferred tenderer was local Canberra developer Doma Group with its submission for a mixed-use residential, commercial, and retail development that utilised much of the historic Brickworks infrastructure.

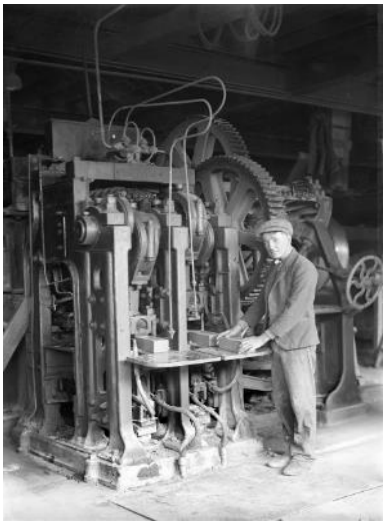


Figure 2.17 Brick pressing machine and operator, c1926. (Source: NAA, A3560, 1920)



Figure 2.18 Brick pressing machinery being installed at the Brickworks, c1925. (Source: NAA, A3560, 1210)

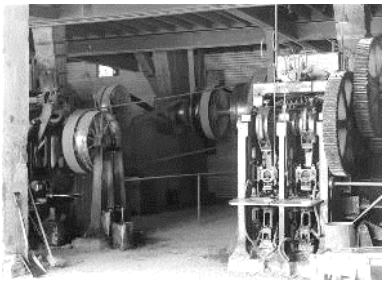


Figure 2.19 Brick presses for pressing clay bricks before firing, c1926. (Source: NAA, A3560, 159)

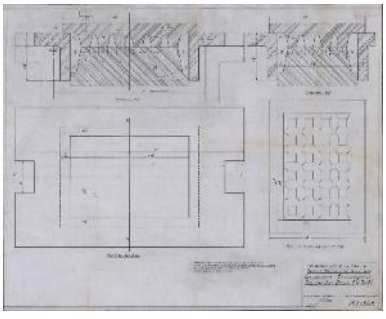


Figure 2.20 Dies for Air Brick, c1922. (Source: NAA, A2445, M2156B)

2.3.6 Chronology

The following table outlines the development phases and the construction dates of the remnant elements at the Canberra Brickworks Precinct.

Table 2.1 Chronology of the Development of the Remnant Elements On Site at the Canberra Brickworks Precinct.

Number	Element	Date
Establishment Phase: 1911–1920		
01	Quarry	1913–1940
02	Concrete Retaining Wall	c1913
03	Power House	1915–16
04	Staffordshire Kiln	1914–15
05	Fan House for Staffordshire Kiln	1914–15
06	Chimney Stack for Staffordshire Kiln	1914–15
36	Original brickyard area between Staffordshire Kiln, Hardy Patent Kiln 1, and fan houses	c1915, c1926
Expansion Phase: 1921–1942		
35	Narrow Gauge Railway (remnants)	1923
07	Offices	c1925
08	Hardy Patent Kiln 1	c1926–27 (rebuilt 1955)
09	Fan House for Hardy Patent Kiln 1	c1927 (second structure c1955)
10	Chimney Stack for Hardy Patent Kiln 1	c1926–27
Post World War II Phase: 1944–1976		
11	Amenities Block	c1950, c1977
12	Hardy Patent Kiln 2	c1954
13	Chimney Stack for Hardy Patent Kiln 2	c1953, c2005
14	Machine Bay 1 for Staffordshire Kiln and Downdraught Kilns	c1955
15	Machine Bay 2 for Hardy Patent Kiln 1	c1955
16	Machine Bay 3 for Hardy Patent Kiln 2	c1955
17	Workshop	c1955
18	Small Crusher House (Crusher House I)	c1958
19	White Pan Room (Large Crusher House/Crusher House II)	c1955
20	Primary Crusher House (Crusher House III)	c1955
21	Elevator/Conveyor	c1955
22	Downdraught Kilns	c1960–63

Number	Element	Date
23	Downdraught Kilns Control Room	c1961
24	Chimney Stack for Downdraught Kilns	c1961
Post Closure Phase: 1976–2017		
33	Model Railway Workshop	c1979
34	Model Railway Storage Shed	c1979



Figure 2.21 Site plan showing the location and development phase of individual elements within the Canberra Brickworks Precinct. (Source: Google Earth with GML overlay, 2017)

3.0 Historical Archaeological Resources

Twelve areas of potential archaeological sensitivity were identified in the AA, with varying levels of archaeological potential (low, moderate, high) and potential significance. These areas have been previously surveyed and are described in the AA. GML undertook an inspection of the site on 15 January 2020 to re-inspect these features and identify any other areas of archaeological sensitivity, if present.

3.1 Site Inspection

An inspection of the site was undertaken by GML Principal Martin Rowney, GML Heritage Consultant Janene May and GML Intern Caitlin Harvey on 15 January 2020. This aimed to examine the presence and extent of physical features at the site and review areas of archaeological sensitivity previously identified in the AA. The inspection also aimed to examine each of the areas of archaeological sensitivity to determine appropriate investigation strategies. Results of this site inspection are provided in Section 3.2 below. The site inspection confirmed the results of the AA and has informed the methodology provided in Section 4 of this report.

3.2 Archaeological Resources

The 12 areas of archaeological sensitivity (BRW1-12) at the site which were identified in the AA were assigned varying levels of potential, as shown in Figure 3.1 below. These areas are discussed below, with more detailed descriptions for some of the areas provided in the AA at Appendix A of this report.



Figure 3.1 Areas of archaeological potential in the study area. (Source: Navin Officer, 2016)

BRW1: Possible Building Platform and Concrete Features

This archaeological site consists of several surface features and potential subsurface features including a square concrete feature and a visible line of grass die back. The AA report suggested that this feature had a function with water, either for storage or drainage (refer to Appendix A). Some disturbance from erosion was noted. Preliminary investigations in this area may reveal the function of features in this area and their relationship to the wider Canberra Brickworks site.

The site inspection undertaken by GML confirmed the moderate potential of this area. If intact archaeological features are identified they may provide some information on the running of the brickworks; however, the significance of these features would likely be low. A review of historical imagery shows that the area remained largely cleared without structures present. Some roads appear to have potentially intersected the area during the twentieth century. One structure in the eastern portion of the site is visible on a 1972 aerial.

The description for the BRW1 area provided in the AA is included in Appendix A.



Figure 3.2 View towards BRW1. (Source: GML 2020)



Figure 3.3 Modern services at BRW1. (Source: GML 2020)

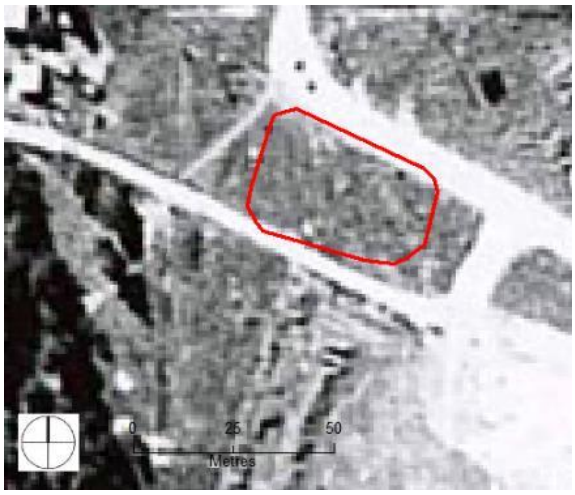


Figure 3.4 Site BRW1 overlaying a 1958 aerial. (Source: ACT Planning & Land Authority [ACTPLA] Plan Room 1958-5-21, Run 7, Print 5061)



Figure 3.5 Site BRW1 overlaying a 1972 aerial. (Source: ACTPLA Plan Room 24-2-1972, Run 9, Print 047)

BRW2: Married Quarters and Brickworks Hostel

The AA describes this archaeological site as consisting of the brickworks accommodation village, which contains a complex of structural features including a brick feature and mound (BRW2-A), a metal spoil heap (BRW2-B), a concrete slab (BRW2-C) and a brick mound (BRW2-D). The AA report indicates that the area would have previously supported the former married quarters including a mess hall and smaller sleeping quarters which were built in the 1920s. The site would have also contained the Brickworks Hostel which appears to have been built on the site of the married quarters in the 1940s. This hostel was demolished in the 1970s and the area has remained relatively undisturbed since then.

Historical aerials from 1958 show several structures present at the site during this time. As indicated by the AA, historical aerials suggest that these structures were demolished by 1980.

The site inspection undertaken by GML confirmed the high potential of this area. The area is currently covered with dense grass and shrubs which limited the visibility. Archaeological deposits at this location may provide information about the nature and configuration of the structures, as well as the daily lives and living conditions of the workers who were employed at the brickworks.

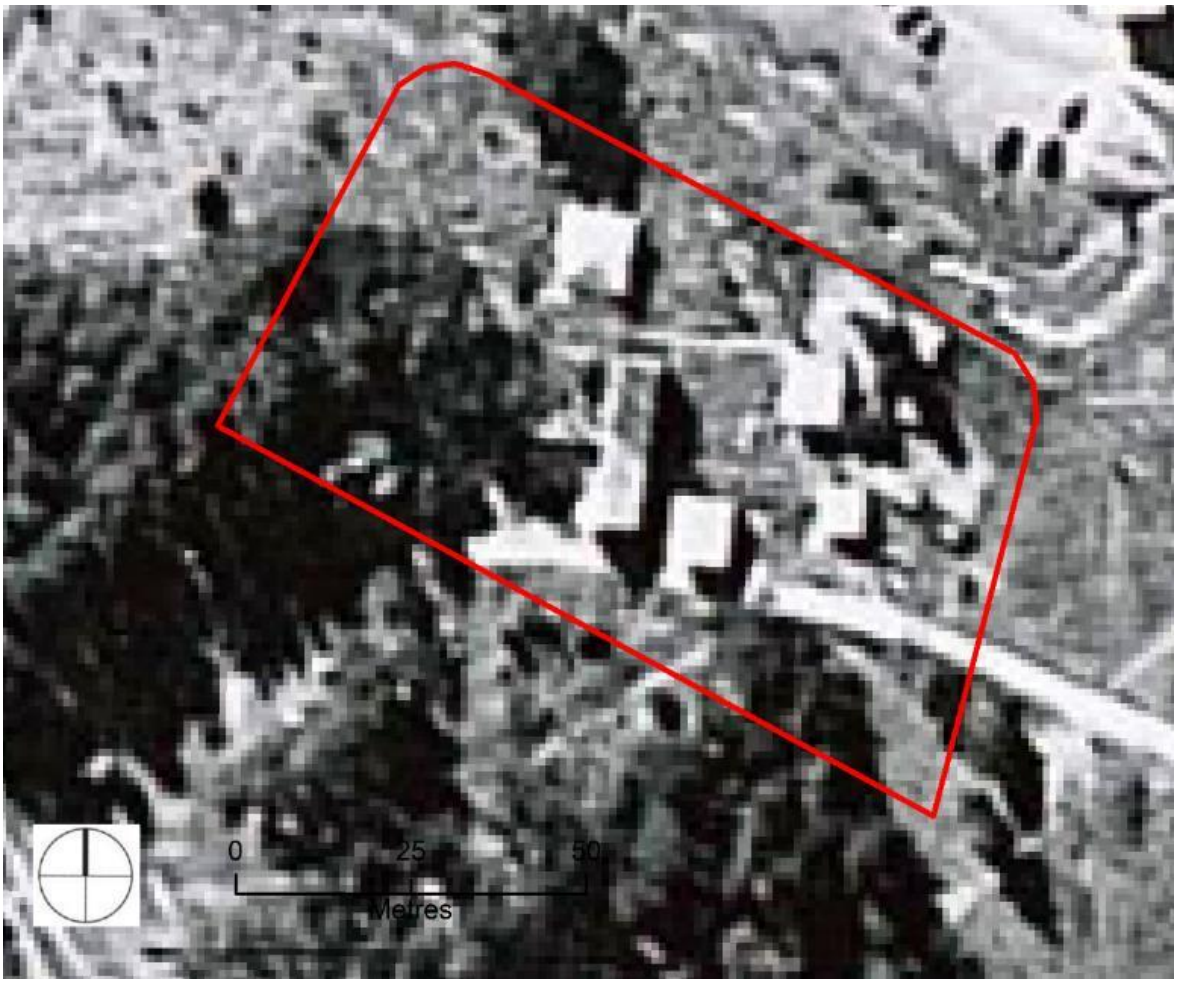


Figure 3.6 Site BRW2 overlaying a 1958 historical aerial. (Source: ACTPLA Plan Room 1958-5-21, Run 7, Print 5061)

BRW3: Area of Postholes and Other Remains

This archaeological site consists of a complex of features relating to various structures and infrastructure to the south of BRW2. The AA describes this site as containing evidence of a modern fringe dweller's camp including a hearth made of brick and concrete which appears to be recently used. Evidence of a camp or rough shelter has also been observed here with features including planks nailed to trees, pallets used for flooring, tin sheets and nylon rope tied around trees. A circular feature defined by postholes was also identified. Early plans indicate that this area was used as an ephemeral brickworks camp. Other features found here include brick and concrete spoil mounds, a rectangular clearing, a drainage line and a slab timber fence or yard post.

Historical aerials from 1950 show two large rectangular structures present in BRW3, south of the brickworks accommodation village identified as BRW2 in the AA. These structures appear to have been demolished by 1958. It is likely that these structures are the Brickworks Hostel built in the 1940s, which were included as BRW2 in the AA, but appear to be situated within BRW3.

The site inspection undertaken by GML confirmed the high potential of this area. Archaeological deposits at this location may provide information about the nature and extent of any structural features in this area, the nature of the various postholes, along with the daily lives and living conditions of the workers who were employed at the brickworks.

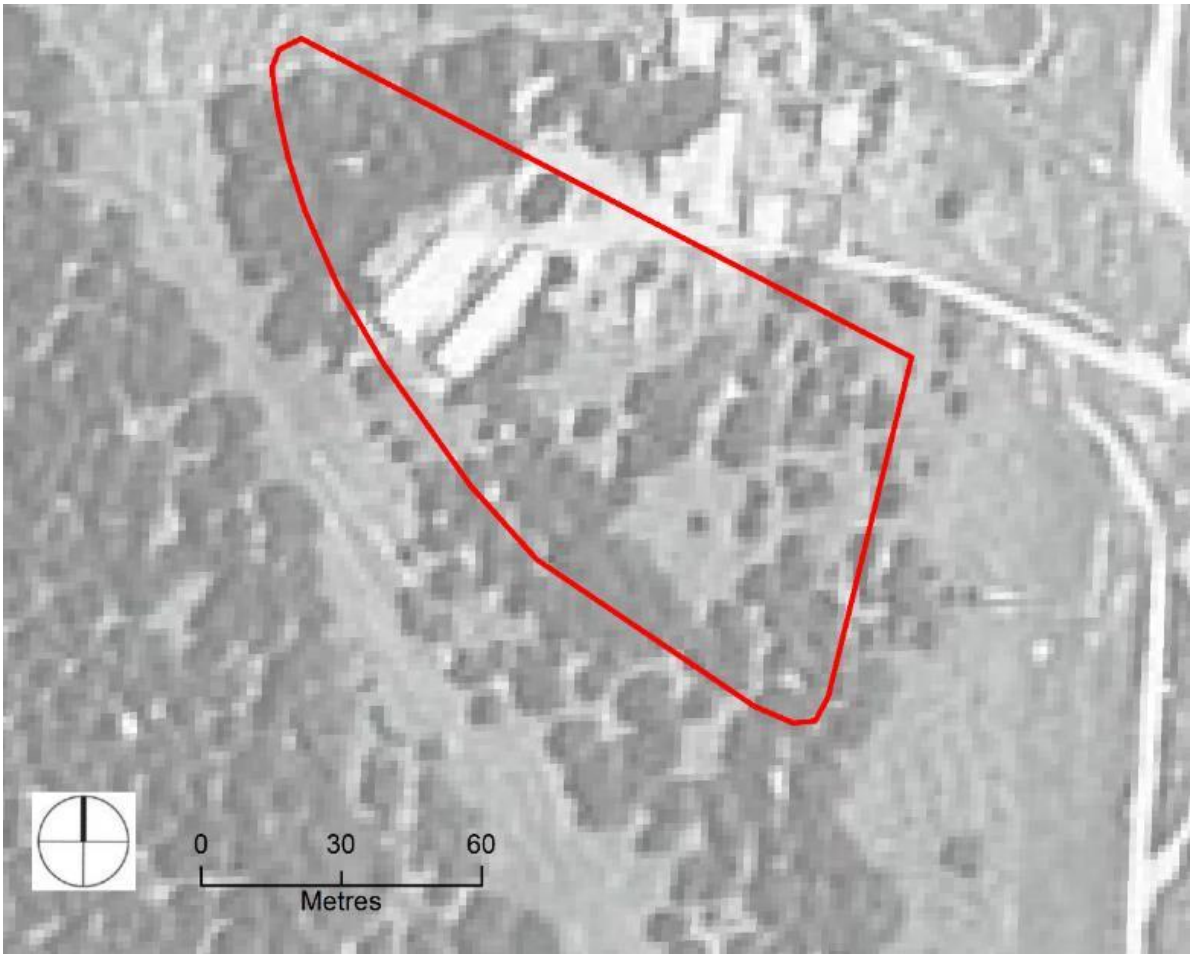


Figure 3.7 Site BRW23 overlaying a 1950 historical aerial. (Source: ACTPLA Plan Room 29-11-1950, Run 2, Print 5101)



Figure 3.8 A 1952 aerial showing the location of the Brickworks Hostel. (Source: ACT Heritage Library)

BRW4: Single Men's Quarters

This site was identified in the AA as the location of the former single men's quarters. The AA described the area as consisting of a fenced yard covering an area of about 80m x 80m. A layer of bitumen was found to cover a good portion of the site, and sits directly above a layer of bedrock. Only a thin layer of topsoil was present in patches throughout the yard. No other structural features were identified; however, fragments of window glass were found in the northern section of the site. The AA speculates that the single men's quarters was likely located within the area where a large square feature appears in 1961–1980 aerials (Figure 3.9). The AA concluded that the area has likely been subjected to significant disturbance, and potential for archaeological remnants is low.

GML inspected the area and concurred with the findings of the AA which found the area to have a low level of archaeological potential. No further investigation in the area is proposed; however, protections for any archaeological finds during works should be developed at later stages in the project.



Figure 3.9 A 1972 aerial showing a large square feature. (Source: ACTPLA Plan Room 24-2-1972, Run 9, Print 047)

BRW5: Clay Feature and Rubble

This site was identiifed in the AA as having a low level of archaeological potential. The AA identified two features at the location of BRW5 and found that these may have been associated with former structures. These features included a clay feature and some brick and concrete rubble. The clay feature consists of a silty clay feature up to 50m in diameter, and 1m to 2m in height. It appears to be a flat topped mound or stockpile of this resource.

The rubble feature is described as a series of depressions scattered throughout the area with brick and concrete rubble. The AA suggests that this feature could be associated with a former structure which has been dumped from another location. GML concurs with the low level of archaeological potential assigned to this site in the AA. No further investigation in the area is proposed; however, protections for any archaeological finds during works should be developed at later stages in the project.

BRW6: Rubble Heap/Refuse Dump

This site was identified in the AA as an area that was used as a quarry prior to being converted into a rubble heap/refuse dump by the 1940s. The AA states that there is some potential for refuse of an industrial nature to remain subsurface in this area. The area was overlaid with concrete by the 1970s, which has since been removed. The AA notes that this may have disturbed any subsurface remains at this location.

GML concurs with the findings of the AA which found the area to have a low level of archaeological potential. No further investigation in the area is proposed; however, protections for any archaeological finds during works should be developed at later stages in the project.

BRW7: Quarry

The former quarry area is designated in the AA as having high archaeological potential; however, following review of previous documents and an inspection of the site, GML considered the archaeological potential of this area to be moderate to low. There were minimal structures present in the quarry area, and the area has been subjected to significant disturbance. The former quarry is a significant landscape in its own right with a number of documented significant geological features. Further investigation should include selective subsurface testing, along with a detailed recording of the landscape.

The AA identified two specific features at the southern end of the quarry—a bricked-over water tank (Figures 3.11–3.13) and a series of circular depressions. While the bricked-over water tank was found during the site inspection, there was no clear evidence of the circular depressions. In addition to those features, GML observed a small rise in the centre of the quarry area which may represent a structure visible in 1972 historical aerials (Figure 3.14).

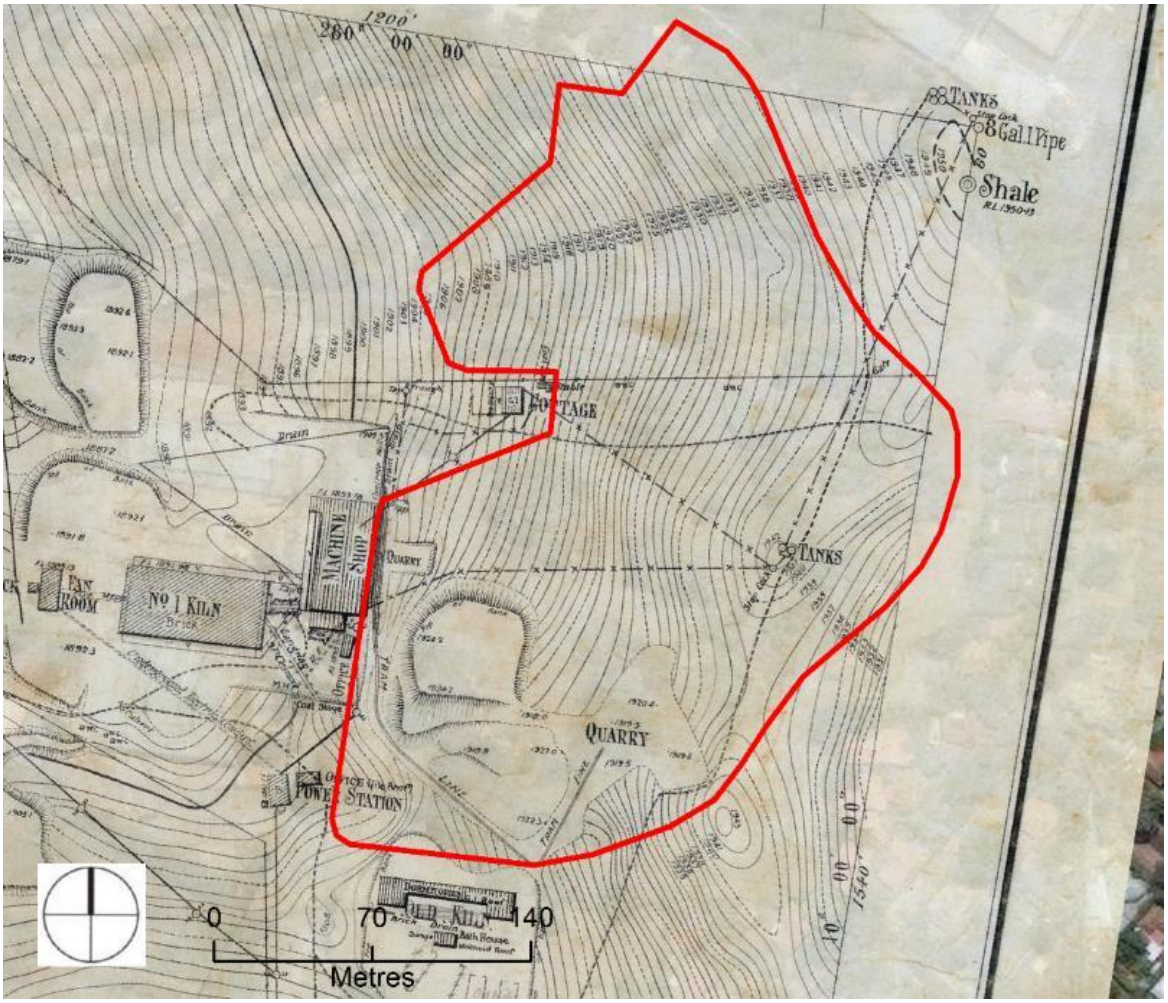


Figure 3.10 A 1916 site plan showing the BRW7 site. (Source: NAA: A6664, L165A, 1916)



Figure 3.11 Detail of the 1916 site plan showing the former tanks at the quarry. (Source: NAA: A6664, L165A, 1916)



Figure 3.12 Bricked-over water tank from AA report. (Source: GML)



Figure 3.13 Water tank during 2020 inspection of the site by GML. (Source: GML)



Figure 3.14 A 1972 aerial showing the location of BRW7 and the former structure. (Source: ACTPLA Plan Room 24-2-1972, Run 9, Print 047)

BRW8: Old Kiln and Dormitories

The BRW8 site was described in the AA as the site of the old kiln complex and dormitories, established in 1913. The dormitory building had been constructed directly to the north of the kilns. The AA states that these structures were likely demolished by the mid-1920s, and the area has undergone further disturbance since the demolition including the construction of a carpark in the area in the 1960s–1970s which involved the laying of concrete. This was removed by 1980.

The AA determined that the likelihood of subsurface features relating to the early kilns and dormitories would be low, and therefore the area of BRW8 was assessed to have low archaeological potential.

GML inspected this area on 15 January 2020 and confirmed that disturbances had occurred to the BRW8 site. A review of historical aerials and maps suggests that to the south of the old kiln and dormitories building was also a brick drain and bath house. While disturbance has occurred to this area, and the AA determined this area to have a low potential for archaeological remains, GML has found that, if present, archaeological features and artefacts could be of high significance. This area is therefore proposed to be tested as part of the methodology outlined in Sections 4 and 5 of this report.



Figure 3.15 A 1916 site plan aerial showing the location of BRW8 and former structures. (Source: NAA: A6664, L165A, 1916)



Figure 3.16 A 1958 aerial showing the location of BRW8. (Source: ACTPLA Plan Room 1958-5-21, Run 7, Print 5061)



Figure 3.17 A 1972 aerial showing the location of BRW8. (Source: ACTPLA Plan Room 24-2-1972, Run 9, Print 047)

BRW9: Cottage, Stables, Coal Store

This site represents a cottage, stables and coal store which were built in 1913 to the northeast of the Brickworks site as part of the first stage of construction of the permanent brickworks. This cottage was demolished by 1947 and the location has likely been heavily disturbed by the introduction of roadways to the east of the kiln and the construction of machinery shops. The AA notes that this area has been heavily trafficked over time. Material discard in this area, if present, may be of a domestic and/or industrial nature. GML inspected the area and concurred with the findings of the AA which found the area to have a low level of archaeological potential. No further investigation in the area is proposed; however, protections for any archaeological finds during works should be developed at later stages in the project.

BRW10: Railway Remnants

The AA described the BRW10 site as consisting of evidence of the brickworks railway, which was constructed in 1923 and largely removed by 1929. Remnants of this railway are largely manifest in the evidence of the railway siding which is still present in the form of cuttings in the landscape.

The AA stated that, while all remnants of the track were removed in the 1920s, there is some limited potential for archaeological evidence that would enhance an understanding of the railway and its operation. Features still present (though unlikely) may include the timber sleepers, iron bolts and metal rails. The AA also notes a low potential for other remains relating to the railway including drainage channels. It was therefore described in the AA as an area of moderate archaeological potential.

GML observed these cuttings during the site inspection undertaken on 15 January 2020; however, based on the known history of the removal of this feature, consider that there is relatively low potential for archaeological material to be located here. That noted, if archaeological features are present, these would likely be of high significance. On that basis, further limited investigation is proposed for this area.

These remnants also constitute a landscape feature that warrant recording.



Figure 3.18 A 1958 aerial showing the location of BRW10. (Source: ACTPLA Plan Room 1958-5-21, Run 7, Print 5061)



Figure 3.19 A 1972 aerial showing the location of BRW10. (Source: ACTPLA Plan Room 24-2-1972, Run 9, Print 047)

BRW11: Railway Siding Extension

The AA describes this site as the former railway siding which extended into the Brickworks site and terminated to the north and south of the original Staffordshire kiln. The area was later covered by a concrete slab for the extrusion plant, but the AA notes that there is still some archaeological potential for remnants of the railway siding to exist. The potential archaeological features may include the railway cutting, timber sleepers, iron bolts and metal rails.

GML inspected the area and noted that the area currently consists of a concrete slab, as well as the remaining fan room structure to the east. GML concurs that there may be potential for archaeological remnants of the former railway siding extension below the existing concrete slab. Further investigation is warranted in this area. Historical aerials demonstrate several changes to the area—including the construction of a large square structure to the south of the fan room by 1972 (since demolished). The area has been largely paved by 1972 and the fan room is the only building present in the area in current aerial photographs.

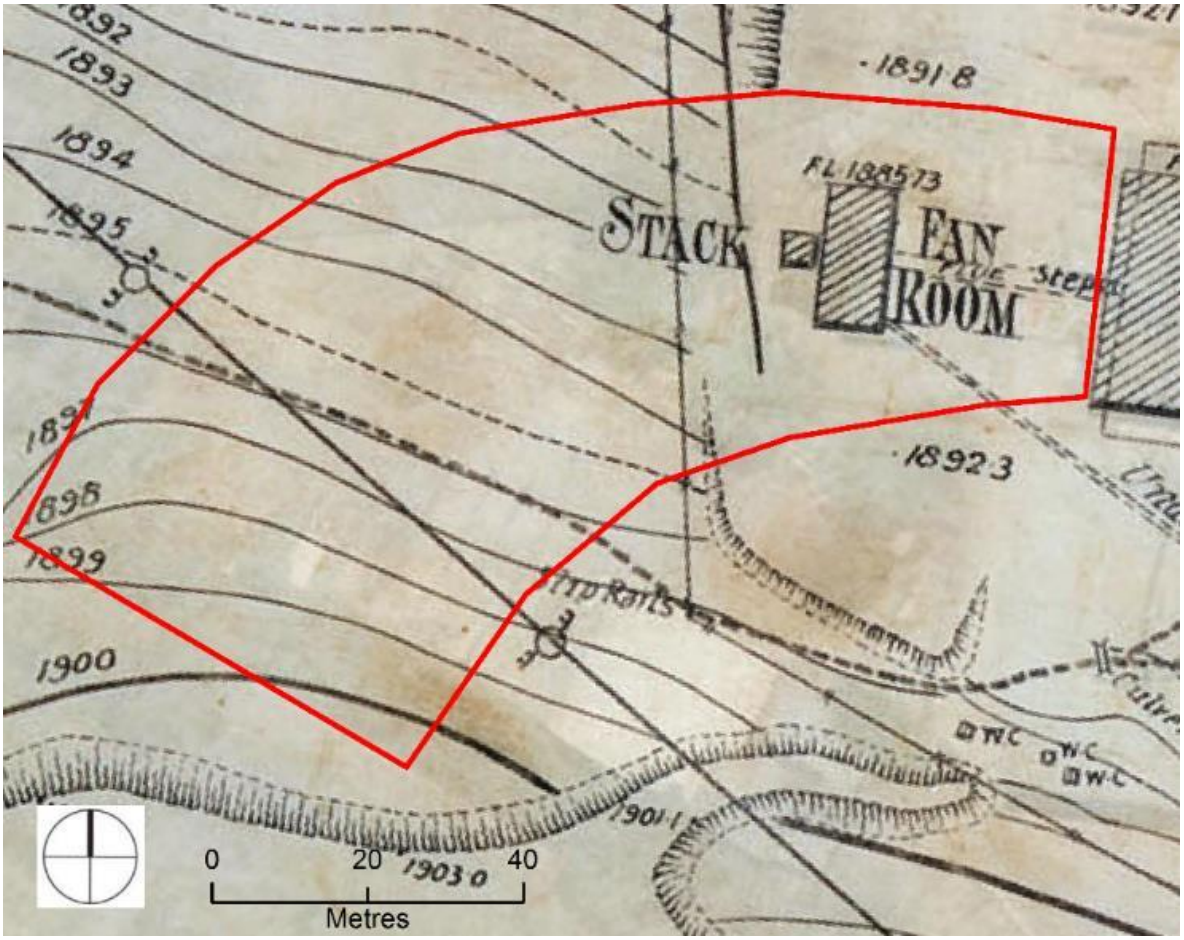


Figure 3.20 A 1916 site map showing the location of BRW11. (Source: NAA: A6664, L165A, 1916)

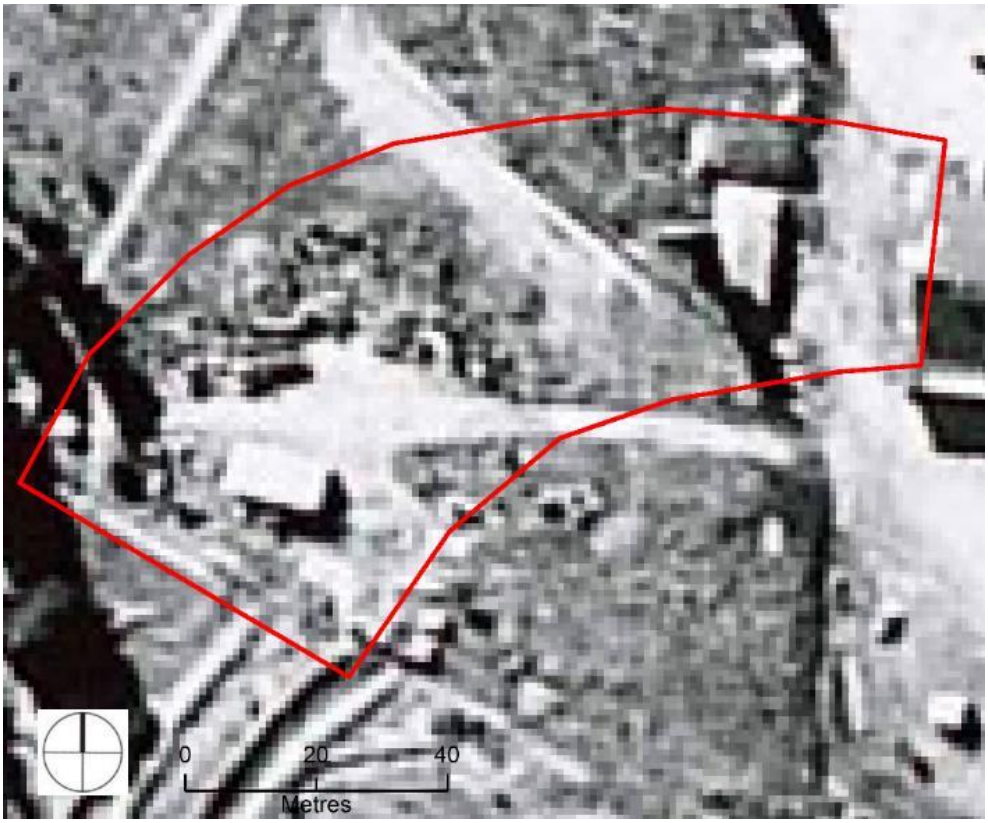


Figure 3.21 A 1958 aerial showing the location of BRW11. (Source: ACT Planning & Land Authority [ACTPLA] Plan Room 1958-5-21, Run 7, Print 5061)



Figure 3.22 A 1972 aerial showing the location of BRW11. (Source: ACTPLA Plan Room 24-2-1972, Run 9, Print 047)



Figure 3.23 A 1980 aerial showing the location of BRW11. (Source: ACTPLA Plan Room 9-2-1980, Run 15, Print 188)



Figure 3.24 A current aerial showing the location of BRW10. (Source: ESRI Basemaps and GML Overlay)

BRW12: Flues/Subsurface Workings

The AA describes this site as consisting of underground flues and workings which connected the kilns to their associated fan stacks. These features were understood at that time to still remain in situ and were unlikely to have been disturbed.

GML observed some evidence of these features during the site inspection undertaken on 15 January 2020. Further investigation to refine the understanding of these features, their depths, extent and nature is warranted.

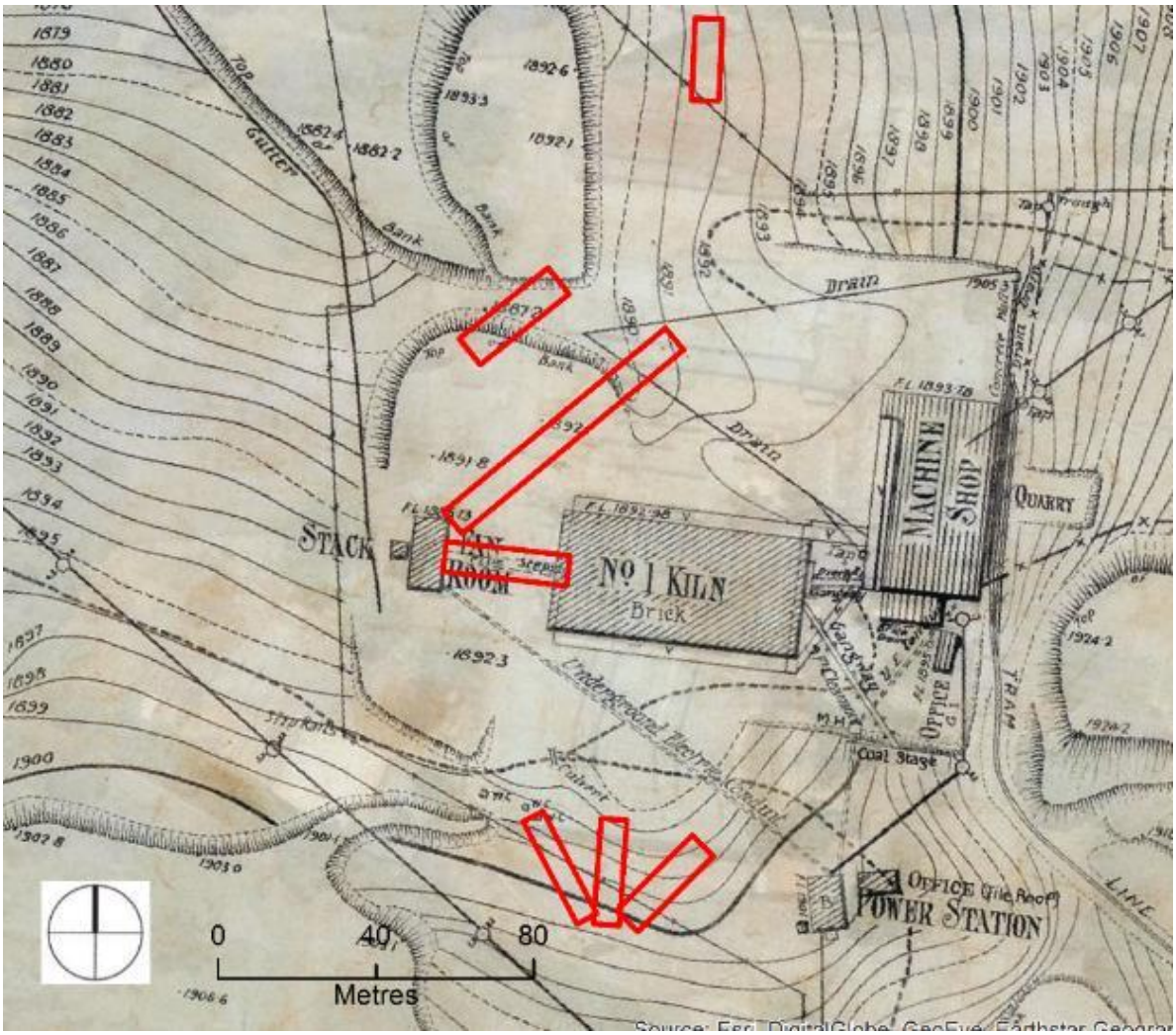


Figure 3.25 A 1916 site plan showing the location of BRW12. (Source: NAA: A6664, L165A, 1916)



Figure 3.26 A current aerial showing the location of BRW12. (Source: ESRI Basemaps and GML Overlay)

3.3 Summary of Archaeological Resources

Table 3.1 provides a summary of archaeological resources identified at the Canberra Brickworks site, including the level of archaeological potential identified at each area of sensitivity identified in the AA, the potential archaeological significance and whether further investigation is required. Figure 3.27 shows the areas relative to the proposed development.

Table 3.1 Summary of Archaeological Resources at Canberra Brickworks.

Area ID	Level of Archaeological Potential (AA)	Level of Archaeological Potential (GML)	Potential Significance	Further Investigation Required?
BRW1	Moderate	Moderate	Low	Yes
BRW2	High	High	High	Yes
BRW3	High	High	High	Yes
BRW4	Low	Low	Moderate	No
BRW5	Low	Low	Low	No
BRW6	Low	Low	Low	No

Area ID	Level of Archaeological Potential (AA)	Level of Archaeological Potential (GML)	Potential Significance	Further Investigation Required?
BRW7	High	Low–moderate	High	Yes
BRW8	Low	Low	High	Yes
BRW9	Low	Low	Low	No
BRW10	Moderate	Moderate	High	Yes
BRW11	Moderate	Moderate	High	Yes
BRW12	High	High	High	Yes

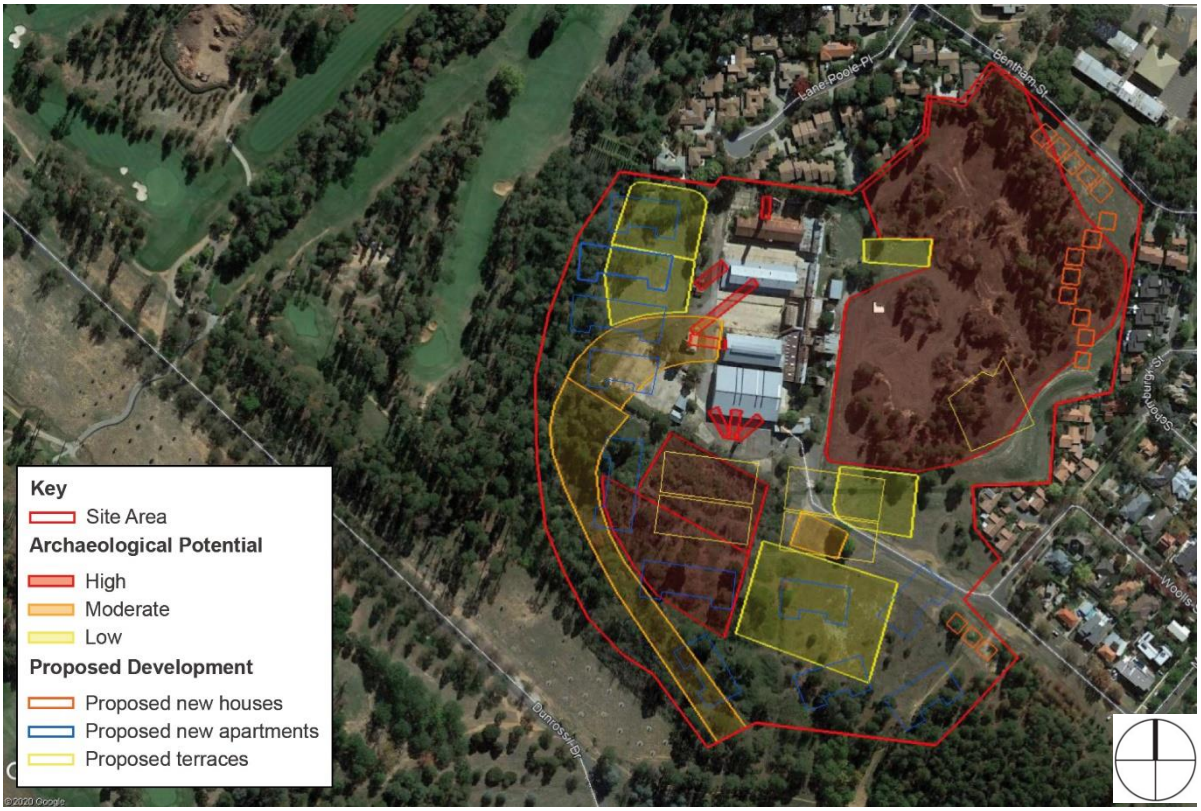


Figure 3.27 Overlay of zones of archaeological potential with proposed development zones from the Masterplan (Source Google Earth, Doma group and GML overlay)

4.0 Research Design

4.1 Overview

The development of a research framework assists in understanding an archaeological site's significance and informs how it should be investigated and managed. The questions that archaeological investigations could address are framed in the context of the site history, physical condition and significance.

The study area's historical archaeology has the potential to answer site specific questions and contribute to a range of broader historical and archaeological research. The development program provides an opportunity to undertake archaeological investigations. The ability to answer the research questions will vary as the scale of archaeological excavation is linked to managing the construction impacts.

4.2 Research Themes

Historical themes assist in linking heritage places to broader patterns and subjects in our national and state histories. Themes provide an organising framework for understanding the connections and relationships between places that may be geographically dispersed. Historical thematic frameworks have been developed at national, state and territory levels for use in heritage assessment and management.

The ACT Heritage Council's *Heritage Assessment Policy*[11] outlines a number of overarching themes relating to the broad historical patterns and evolution of the ACT. These are outlined in Table 4.1 below.

Table 4.1 Themes from the *Heritage Assessment Policy*.

Themes	Sub-themes
The evolution of the natural environment	
Aboriginal life in the area	
Aboriginal associations with place	
European settlement pre-Federal Capital Territory (FCT) (1911)	• Exploration. • Rural settlement.
Canberra as the nation's capital	• Exploring, surveying and mapping. • The transfer of the seat of government. • Feeding and farming the region post 1911. • Developing ACT and regional economies.

Themes	Sub-themes
Canberra as a planned environment	• Griffin's Canberra. • Early federal government landscape and urban planning: – Garden City and City Beautiful; and – notions of the bush capital. • National Capital Development Commission (NCDC) and the Y-Plan. • Self-government and post-NCDC Commonwealth Government landscape and urban planning.
Lodging and educating people and the provision of government housing and schools	

In 2001, the then Australian Heritage Commission developed the Australian Historic Themes Framework. This set of themes is more broadly encompassing but includes themes relating to developing local, regional and national economies, building settlements, towns and cities, working and labour, and developing Australia's cultural life, among many others.

The research framework for excavation at the Canberra Brickworks can be formulated with regard to both of these thematic frameworks.

As the Brickworks site is a historic place that was established after the declaration of the federal capital territory in 1911, and it has previously been assessed having no Aboriginal cultural values, the following themes are central to the framing of the research direction for any historical investigation of the site.

Table 4.2 Themes from the Australian Historic Themes Framework and GML Comment.

ACT Theme	GML Comment
Canberra as the nation's capital: • exploring, surveying and mapping [building / developing]; and • developing ACT and regional economies	The history of the Brickworks is integral to the establishment and building of Canberra. The Brickworks was a key material resource for the construction of public institutions and private houses. It contributed to the economy through reducing more expensive imported materials and provided employment for local people. It was an early example of disagreement over Griffin's plans and contributed the materials for the shaping of Canberra's landscape. Archaeological evidence on site has the potential to shed further light on the processes of the physical development of early Canberra, on the way bricks were manufactured, stored and transported, and about the lifestyles of the people who lived on, and worked at the site.
Canberra as a planned environment: • Griffin's Canberra; and • early federal government landscape and urban planning.	

Australian Theme	Sub Theme	Notes	GML Comment
3 Developing local, regional and national economies	Industry, Mining and Transport	Activities associated with the manufacture, production and distribution of goods. As well as the identification, extraction, processing and distribution of mineral ores. Activities also associated with the moving of goods from one place to another, and systems for the provision of such movements	The study area has the potential for archaeological deposits associated with the manufacture of bricks, such as industrial equipment and quarrying activities. Evidence of the former rail network connecting the Brickworks to the remainder of Canberra may also be present and provide information into the distribution of bricks to the city. Evidence associated with quarrying activities at the Canberra Brickworks site is present, and further information relating to the extraction of materials to produce bricks may be provided through archaeological deposits at the site.
4 Building settlements, towns and cities	Accommodation	Activities associated with the provision of accommodation, and particular types of accommodation—does not include architectural styles (use the theme of Creative Endeavour for such activities)	There were several accommodation phases at the Canberra Brickworks site, such as the married quarters and the Brickworks hostel. Evidence of activities associated with these accommodations may be present in archaeological features and artefacts at the site.
5 Working	Labour	Activities associated with work practices and organised and unorganised labour	The Canberra Brickworks site included accommodations for people working at the site. It employed people who worked at the site manufacturing, producing and distributing bricks. Evidence associated with these labour activities may be present at the site.
8 Developing Australia's cultural life	Domestic life	Activities associated with creating, maintaining, living in and working around houses and institutions	The Canberra Brickworks site included accommodation areas for its workers, such as a married quarters and a later hostel. Earlier dormitories were also present near the 'old kiln' from the earliest phase of the site. These areas may contain evidence of domestic life of people working and living at the Brickworks site.

4.3 Research Questions

The following research questions could be asked of the potential archaeological resources within the study area.

- What is the nature and extent of the archaeological resources within each of the nominated zones of sensitivity (all BRW zones)?
- Is there any remaining archaeological evidence of the early phase operation of the site (BRW1 and 8)? What light can be shed on the operation of the site in its early years from those

remains? Can technological change be determined / mapped / investigated further through those remains?

- Is there any remaining archaeological evidence of the extraction processes used in the quarry? Can we see phases of change in those processes? How likely is the survival of clay extraction processes in this quarry and other quarries?
- What evidence remains of the accommodation structures on site? What was their nature and configuration (BRW2, 3 and 8)?
- Can we find out anything about the people who worked at the site and how they lived (BRW2, 3 and 8)? Is there a material culture difference apparent in the artefacts that show status/living conditions between living quarters? Can phases of occupation be found in the archaeological remains?
- Is there any remaining archaeological evidence of the railway system used to connect the brickworks to Canberra? What can we deduce about its nature and function? Can this information be used to build a picture of the railway and similar railway remains for elsewhere in Canberra such as Old Parliament House (BRW10 and 11)?
- Do the underground flues show evidence of change over time and modification? Do they exhibit signs of 'usewear'—vitrification of the brick surfaces from hot gases? Can they tell us more about the operation of the place than is apparent from the surface remains?

5.0 Methodology

5.1 Overview

The following methodology will guide the archaeological program for preliminary investigations at the Canberra Brickworks site. The aim of the preliminary archaeological investigations is to determine the nature and extent of archaeological deposits present and identify their significance. These investigations will inform a Statement of Heritage Effects (SHE) report in accordance with the ACT Heritage Council's Cultural Heritage Reporting Policy. This SHE will provide an assessment of potential impacts of the proposed works to the archaeological resources identified. It will also provide mitigation strategies to reduce the risk of diminishing the heritage significance of the Canberra Brickworks site and provide recommendations for any future work and/or reporting that will be required. This may include salvage excavation or monitoring of construction works, for example.

5.2 Archaeological Team

Key members of the archaeological team include the GML personnel listed below.

- Martin Rowney (Principal)—responsible for the overall archaeological program and the nominated excavation director;
- Elise Jakeman (Heritage Consultant, Archaeologist)—archaeological excavation team; and
- Lara Tooby (Heritage Consultant, Archaeologist)—archaeological excavation team.

5.3 Overall Methodology

This ARD provides a methodology for the preliminary investigation of archaeological resources at the site. A SHE report will be prepared based on results of the preliminary investigation to assess potential impacts to significant archaeological resources at the site. The SHE report may recommend further works, such as salvage excavation of significant archaeological resources or monitoring of works in areas found to have low archaeological potential or low significance.

This ARD is limited to presenting the methodology and research design for preliminary testing of archaeological resources at the site. The testing process outlined is designed to provide a preliminary understanding of the nature and extent of the archaeological resource without excavating to remove substantial and/or significant archaeological deposits or features.

Various methods will be utilised to confirm the nature, extent and significance of archaeological resources in the study area. These methods have been developed to respond to the varied nature of archaeological features at the site and attempt to further define these with as little impact as possible. These methods will include archaeological survey, detailed contour survey, subsurface survey of flues using remote camera and archaeological test excavation.

A total of eight of the 12 areas of archaeological potential identified in the AA will be subjected to preliminary investigation, as described in Table 5.1 below, and shown in Figure 5.1. The methodologies for investigation are further described by each area of sensitivity below. The areas selected for investigation are based on levels of archaeological potential identified in the AA, results of the site inspection undertaken by GML in January 2020, and the initial development design

documentation. Nominal test trench locations are shown in figure 5.2 relative to the proposed new works.

Table 5.1 Summary of Preliminary Investigation Methods for Archaeological Resources.

Feature ID	Will it be Subject to Preliminary Investigations?	What Type of Preliminary Investigation Will Be Undertaken?
BRW1	Yes	• Detailed archaeological survey and plan of features. • Two archaeological test trenches.
BRW2	Yes	• Vegetation clearance of trees and grasses (may be targeted around proposed test trenches and identified features). • Detailed archaeological survey and plan of remnant visible features. • Archaeological test trenches using machine and hand excavation to reveal structures and deposits.
BRW3	Yes	• Vegetation clearance of trees and grasses (may be targeted around proposed test trenches and identified features). • Detailed archaeological survey and plan of remnant visible features. • Archaeological test trenches using machine and hand excavation to reveal structures and deposits.
BRW4	No	The AA described this area as having low archaeological potential. The recent site inspection undertaken by GML confirmed this finding. No further investigation is required; however, an unanticipated finds protocol will be required for future works within this area.
BRW5	No	This area has been found to have a low potential for archaeological deposits. If deposits are present, it is not likely that they will be of high significance or yield meaningful information.
BRW6	No	This area has been found to have a low potential for archaeological deposits. If deposits are present, it is not likely that they will be of high significance or yield meaningful information.
BRW7	Yes	• Updated detailed targeted archaeological survey and plan of remnant visible features. • Archaeological testing combining machine and hand excavation to reveal tank feature, and other features identified during the updated survey.
BRW8	Yes	• Archaeological test trenches using machine and hand excavation to reveal structures and deposits.
BRW9	No	The AA described this area as having low archaeological potential. The recent site inspection undertaken by GML confirmed this finding. No further investigation is required; however, an unanticipated finds protocol will be required for future works within this area.

Feature ID	Will it be Subject to Preliminary Investigations?	What Type of Preliminary Investigation Will Be Undertaken?
BRW10	Yes	• Vegetation clearance. • A detailed contour survey with a surveyor. • Three archaeological 'test trenches' which will be limited to manual clean-up to identify remnant features. • Potential additional machine trench, if possible, and if deemed necessary. • Further historical research into any features identified and geo-referencing of historical images with the location of any features identified.
BRW11	Yes	• Archaeological test trenches if required to determine the nature and extent of the deposits.
BRW12	Yes	• Subsurface survey with surveyor and/or plumber using GPS and camera within flues to map depth, extent and nature of features. • Archaeological test trenches if required to determine the nature and extent of the deposits.



Figure 5.1 Overview of nominal trench locations (green) relative to zones of archaeological potential. (Source Google Earth with GML overlay)

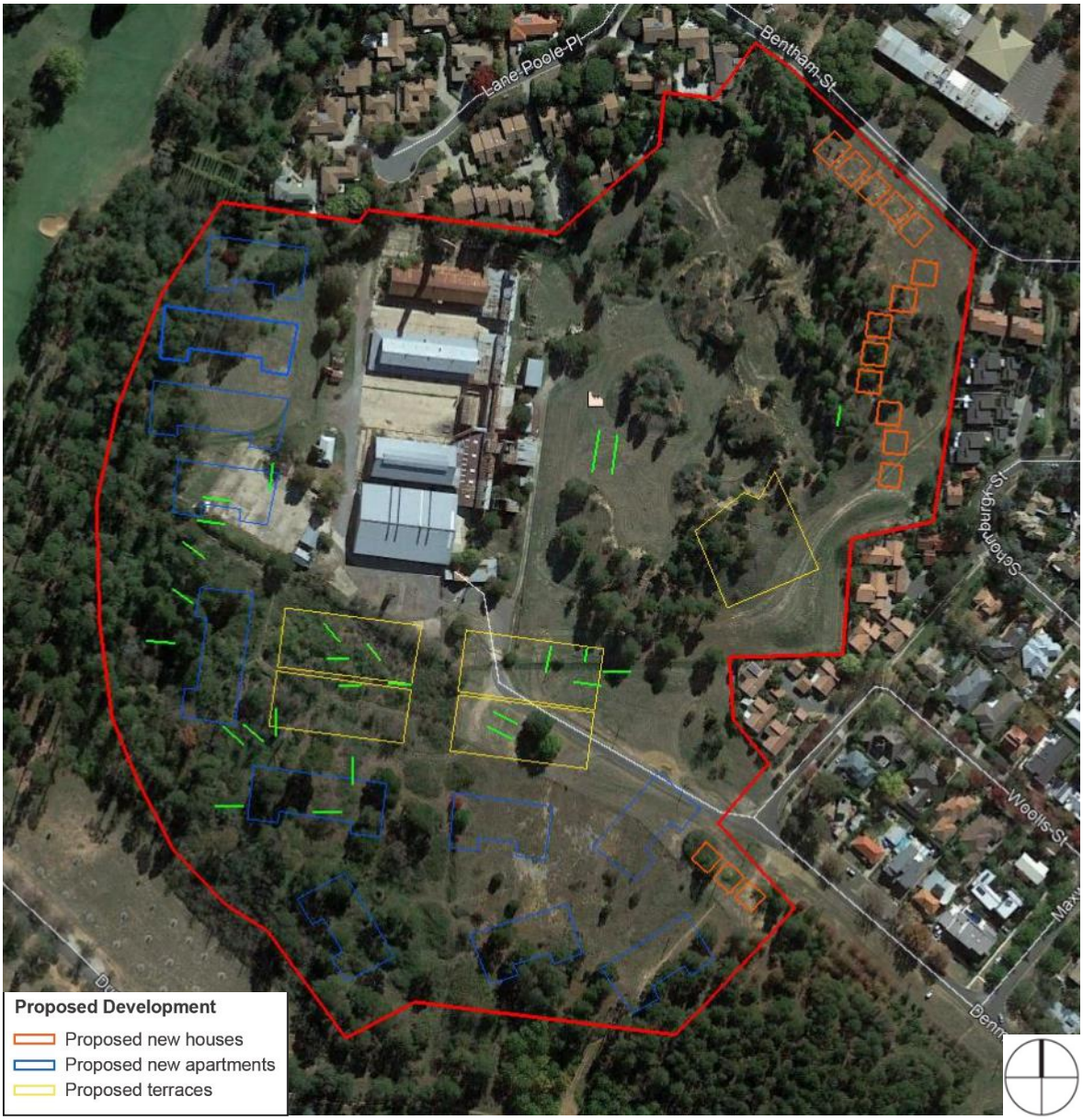


Figure 5.2 Overview of nominal test trench locations (green) relative to the proposed new structure locations as outlined in the Canberra Brickworks Masterplan (Source, Google Earth, Doma ground GML overlay)

5.4 Detailed Methodologies for Archaeological Resources

A detailed description of the methodologies for archaeological investigations at BRW1, BRW2, BRW3, BRW7, BRW8, BRW10, BRW11 and BRW12 is provided below. Where test trenches are nominated for features and areas, all trenches will be excavated in accordance with the methodology provided in Section 5.5 of this report.

BRW1: Building Platform and Concrete Features

This archaeological site consists of several surface features and potential subsurface features including a square concrete feature and a visible line of grass die back. The AA report suggested that this feature had a function with water, either for storage or drainage. Some disturbance from erosion was noted. Preliminary investigations in this area may reveal the function of features in this area and their relationship to the wider Canberra Brickworks site. At present, the development designs propose

to construct several new structures in this area. This would likely result in heavy disturbance to any archaeological features which are present.

Preliminary investigations in this area will involve the steps listed below.

- A detailed archaeological survey and plan of the features. Key points will be located with GPS, and a plan of any features identified will be prepared.
- Following the detailed archaeological survey, two machine test trenches will be excavated to determine the nature and extent of any deposits present in this area. The locations of these trenches are proposed to cross the zone of grass die-back which is the most notable surface expression of the possible location for subsurface features. Each trench will be 20m in length and 1.5m in width.



Figure 5.3 View of proposed test unit locations at BRW1 overlaid on a current aerial. (Source: Google Earth with GML Overlay)

BRW2: Married Quarters and Brickworks Hostel

This archaeological site consists of the brickworks accommodation village which contains a complex of structural features including a brick feature and mound (BRW2-A), a metal spoil heap (BRW2-B), a concrete slab (BRW2-C) and a brick mound (BRW2-D). The AA report indicates that the area would have previously supported the former married quarters including a mess hall and smaller sleeping quarters which were built in the 1920s. The site would have also contained the Brickworks Hostel which appears to have been built on the site of the married quarters in the 1940s. This hostel was demolished in the 1970s and the area has remained relatively undisturbed since then. Archaeological deposits at this location may provide information about the nature and configuration of the structures, the daily lives and living conditions of the workers who were employed at the brickworks. At present, the development designs propose to construct several new structures in this area. This would likely result in heavy disturbance to any archaeological features which are present.

Preliminary investigations in this area will involve the steps outlined below.

- Vegetation clearance of shrubs and grasses. This area is substantially overgrown so vegetation clearance will need to be the first step taken. Clearance could be targeted to areas of proposed test trenches.
- A detailed archaeological survey and plan of visible features. This will include undertaking systematic transects across the area and recording all features identified using GPS. A plan of any features identified will then be prepared.
- Following the detailed archaeological survey, five archaeological test trenches will be excavated to determine the nature and extent of any deposits present in this area. Trenches will be located to target known features from aerial photography but also to test areas of unknown archaeological potential to the southeast. Each trench is proposed to be 15m in length and 1.5m wide. The proposed location of the trenches is shown in Figures 5.4 and 5.5; however, these may be refined following the detailed archaeological survey and planning.



Figure 5.4 View of proposed test unit locations at BRW2 overlaid on a 1958 aerial. (Source: ACTPLA Plan Room 1958-5-21, Run 7, Print 5061)



Figure 5.5 View of proposed test unit locations at BRW2 overlaid on a current aerial. (Source: ESRI Basemaps with GML Overlay)

BRW3: Area of Postholes and Other Remains

This archaeological site consists of a complex of features relating to various structures and infrastructure to the south of BRW2. The site contains evidence of a modern fringe dweller's camp including a hearth made of brick and concrete which appears to be recently used. Evidence of a camp or rough shelter has also been observed here with features including planks nailed to trees, pallets used for flooring, tin sheets and nylon rope tied around trees. A circular feature defined by postholes was also identified. Early plans indicate that this area was used as an ephemeral brickworks camp. Other features found here include brick and concrete spoil mounds, a rectangular clearing, a drainage line and a slab timber fence or yard post.

Historical aerials from 1950 show two large rectangular structures present in BRW3, south of the brickworks accommodation village identified as BRW2 in the AA. These structures appear to have been demolished by 1958. It is likely that these structures are the Brickworks Hostel built in the 1940s, which were included as BRW2 in the AA, but appear to be situated within BRW3.

Archaeological deposits at this location may provide insight into the daily lives and living conditions of workers who were employed at the brickworks. At present, the development designs propose to construct several new structures in this area. This would likely result in heavy disturbance to any archaeological features which are present.

Preliminary investigations in this area will involve the steps outlined below.

- Vegetation clearance of shrubs and grasses. This area is substantially overgrown so vegetation clearance will need to be the first step taken. Clearance could be targeted to areas of proposed test trenches.
- A detailed archaeological survey and plan of visible features. This will include undertaking systematic transects across the area and recording all features identified using GPS. A plan of any features identified will then be prepared.
- Following the detailed archaeological survey, five machine test trenches will be excavated to determine the nature and extent of any deposits present in this area, targeting locations from aerial photographs and early site plans. Each trench is proposed to be 15m in length and 1.5m wide. The location and size of the proposed trenches are shown in Figure 5.3 and 5.4; however, these may be refined following the detailed archaeological survey and planning.



Figure 5.6 View of proposed test unit locations at BRW3 overlaid on a 1950 aerial. (Source: ACTPLA Plan Room 29-11-1950, Run 2, Print 5101)



Figure 5.7 View of proposed test unit locations at BRW3 overlaid on a current aerial. (Source: ESRI Basemaps with GML Overlay)

BRW7: Quarry

As described in Section 3.2, the former quarry area is designated in the AA as having high archaeological potential, yet following review of previous documents and an inspection of the site GML considered the archaeological potential of this area to be low. The main point of interest at BRW7 was the bricked-over water tank as shown in the AA. The circular depressions discussed in the AA did not appear to be of high archaeological potential. At present, the development designs propose to undertake landscaping in the former quarry area. Several structures are proposed to be constructed in the eastern and southeast portion of the area. These would likely result in heavy disturbance to areas where the structures are built, and moderate disturbance to the remainder of the area.

Preliminary investigations in this area will involve the steps outlined below.

- Updated archaeological survey of areas proposed for landscaping works in the new development. Newly identified features will be recorded, as will areas considered for targeted test excavation.
- Planning targeted test excavation (Figure 5.will be undertaken at:
  - the location of the tank identified during the site inspection (one 10m long trench), and previously in the AA; and

- the location of the low relief mound in the centre of the quarry area (two 15m long trenches).



Figure 5.8 View of proposed test unit locations at BRW7 overlaid on a current aerial. (Source: Google Earth with GML Overlay)

BRW8: Old Kiln and Dormitories

While the AA and GML have designated this area as being of low archaeological potential, it is important to confirm this. If any archaeological deposits are present, they would likely be of high significance. Historical site plans indicate that the old kiln was located in this area, as well as a dormitory building, a brick drain and a bath house building. While there has been disturbance to this area, GML proposes to excavate four test trenches, each 15m in length, to confirm the low potential of the site. At present, the development designs propose to construct several new structures in this area. This would likely result in heavy disturbance to any archaeological features which are present.

Preliminary investigations in this area will involve the following steps.

- Archaeological test excavation at the location of the former old kiln, dormitory, brick drain and bath house. The location of this excavation will be refined following the detailed archaeological survey and plan of the site.



Figure 5.9 View of proposed test unit locations at BRW8. (Source: NAA: A6664, L165A, 1916)

BRW10: Railway Remnants

GML has formulated the view that there is relatively low potential for archaeological material to be located in the area of the railway remnants. However, if archaeological features are present, they would likely be of high significance, and therefore confirmation of the archaeological potential of this area is warranted.

The railway remnants survive as a landscape feature that warrants recording.

Preliminary investigations in this area will involve the steps outlined below.

- Vegetation clearance.
- A detailed contour survey undertaken with a qualified surveyor.
- Between two and four archaeological test trenches, which will be limited to manual clean-up to identify remnant features. Nominal trench locations are shown in Figure 5.0. Each trench would be up to15m in length depending upon topography, access and preliminary results.
- Limited additional machine trenches, if possible, and if considered necessary. The location of this trench will be determined following the detailed contour survey and excavation of manual trenches.



Figure 5.10 View of proposed manual test excavation locations at BRW10 overlying a 1958 aerial. (Source: ACTPLA Plan Room 1958-5-21, Run 7, Print 5061)



Figure 5.11 View of proposed manual test excavation locations at BRW10 overlying a current aerial. (Source: ESRI Basemaps with GML Overlay)

BRW11: Railway Siding Extension (To North)

The AA describes this site as the former railway siding which extended into the Brickworks site and terminated to the north and south of the original Staffordshire kiln. The AA notes that potential archaeological features may include the railway cutting, timber sleepers, iron bolts and metal rails.

Archaeological test excavation will be undertaken at the location of the former railway lines and sidings within the existing concrete pad location. Three archaeological test trenches, each 15m in length and 1.5m wide, are proposed to be excavated to identify potential archaeological deposits. The concrete slab surface will be cut in the specific areas of the test excavations to facilitate access without the demolition and removal of large areas of the slab.

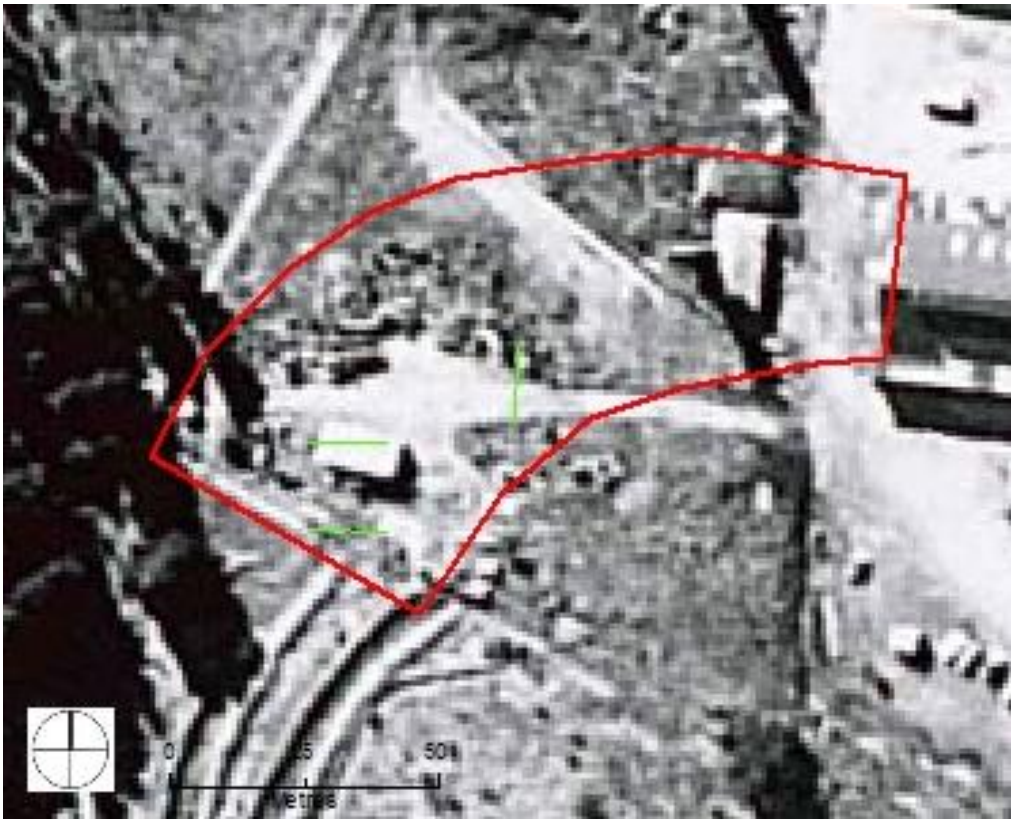


Figure 5.12 View of proposed manual test excavation locations at BRW11 overlying a 1958 aerial. (Source: ACTPLA Plan Room 1958-5-21, Run 7, Print 5061)



Figure 5.13 View of proposed test excavation locations at BRW11 overlying a current aerial. (Source: ESRI Basemaps with GML Overlay)

BRW12: Flues/Subsurface Workings

Preliminary archaeological investigations will aim to confirm the depths and nature of these features. Initial exploratory investigation utilising underground surveys with cameras and GPS units are proposed to determine the depths and nature of these features. This task will involve working with a surveyor to move a GPS and camera unit through the remnant flue structures.

If the depths and nature of these features cannot be confirmed using these less invasive methods, small machine trenches will be excavated at several of the flue structures to determine their depth, nature and extent. The location of these trenches will be determined following results of the initial exploratory investigation, and in consultation with ACT Heritage prior to excavation.

5.5 Archaeological Test Excavation Methodology

The methodology for undertaking archaeological test excavation is outlined in the steps below.

- Test trench locations will be established based on the investigation objectives for each area, and with respect to dial-before-you-dig results and other safety or logistical factors.
- Vegetation clearance will be undertaken as required and will be specified to avoid ground surface disturbance, while affording adequate access for both manual and machine excavations.
- Testing will be undertaken using a combination of mechanical and hand excavation. Modern surface material and fills will be mechanically removed to the top of archaeological layers. Mechanical excavation will be undertaken in nominal 50mm spits and will cease when in situ archaeological features and deposits are encountered.
- Mechanical investigation will use a flat-edged bucket and will aim only to remove modern overburden and reveal archaeological features and deposits.
- Demolition fill from earlier structures will be removed mechanically in 50mm spits were possible. Where this work appears likely to affect buried archaeological deposits mechanical excavation will cease and the remaining fill will be manually excavated to reveal archaeological deposits below.
- Manual excavation will be used to clean and investigate all in situ archaeological features and deposits revealed during the preliminary mechanical excavation work.
- Significant archaeology within trenches will not be removed during the testing program. Small sondages and localised areas will be hand-excavated to confirm the nature of the archaeology, to determine if there are multiple phases and verify archaeological significance. Sondages will be excavated to the start of the remaining undisturbed natural soil profile—the depth necessary to determine the stratigraphy of the archaeological deposits, and their commencement depth.
- The size and extent of detailed manual excavation areas/sondages will be determined in the field and will be confined to within the zone revealed through mechanical excavation. The size and extent of sondages will be determined based on our expectation of maximising information yield from those investigations, in order to understand the nature and extent of the archaeological resource. We would estimate that any substantial area of potentially in situ archaeological deposits would be sampled in a number of locations to a maximum sample of

25% of the in-situ area. Should we consider it necessary to excavate more than that amount we would seek further concurrence from ACT Heritage.

- If, under the circumstances that initial excavation indicates that there may be areas of possible archaeological interest that fall outside of the test trench locations, we would confer with ACT Heritage on expanding the testing program, and would seek an onsite meeting to discuss preliminary results and reasoning for the change in strategy.
- Investigation of archaeological deposits will be undertaken stratigraphically, or in 50mm spits where deposits are thicker than 50mm.
- Recording will be undertaken in accordance with the methodology outlined in Section 5.6. Artefacts recovered will be managed in accordance with the strategy set out in Section 5.7. Samples will be taken in accordance with the strategy set out in Section 5.8.
- Test excavation locations and archaeological features will be surveyed by a surveyor.
- Excavated archaeological deposits will be sample sieved to test for artefacts associated with the running of the Canberra Brickworks and domestic life. Sieving will include 50% of underfloor occupation deposits using a 5mm mesh sieve. If significant numbers of artefacts are found we will increase the sieving to 100% of the sampled occupation deposits. Demolition and construction fills will not be sieved but artefacts will be retrieved during manual excavation.
- Test trenches will be backfilled on completion of the testing program. Any archaeological remains will be protected with geofabric prior to backfilling.

5.6 Recording

The recording of archaeological data will be based on the single context recording system. Phasing and interpretation of the archaeological features in relation to the entire site will also be included in the record sheets and survey.

The following outlines the recording process:

- Test excavation locations, and main findings (features and deposits) will be archaeologically recorded and surveyed.
- Archaeological layers, structural remains, features, deposits and fills will be recorded on context sheets. Recording detail will include:
  - Archaeological deposits and features: nature, extent, stratigraphic relationships, integrity, intrusions, constituents, artefact types and quantities, feature interpretation.
  - Soils: colour, composition, plasticity, compactness, intrusions, pH.
  - Structures: materials type, colour, condition, component type, relationships to other items, interpretation.
- A digital (JPEG file) photographic record of the archaeological program will be made. Significant archaeological remains will be recorded using both JPEG and RAW digital captures. All photographs will include a scale and north arrow.

- Measured drawings detailing the archaeological remains and stratigraphic relationships will be prepared. These will include the location of significant archaeological remains within the overall site.
- A surveyor will take georeferenced survey data to prepare survey drawings and orthophotographs of the archaeological remains including X, Y and Z coordinates for features and deposits. Deposits thicknesses will also be recorded to cross-check against other stratigraphic recording including section drawings and reduced levels taken by the surveyor.
- Registers of contexts, photographs, building material, environmental samples and drawings will be kept.

5.7 Artefact Retrieval Strategy

Artefacts are likely to be retrieved from archaeological test excavations. Artefacts may consist of representations of both domestic life at the site and the running of the brickworks. They may consist of machinery parts, bricks and brick fragments, ceramic and glass sherds or vessels, leather scraps or shoes, buttons, coins, nails and metal objects, animal bone and shell. Artefacts are an important part of the archaeological resource and will inform post-excavation analysis, research and interpretation.

The following general principles apply to the artefact retrieval strategy:

- Artefacts recovered will be collected according to their context. They will be cleaned, dried, bagged by context and temporarily stored at the GML Heritage Office, 2A Mugga Way, Red Hill during the works program. Significant metal and organic artefacts will be kept in appropriate storage conditions.
- All artefacts will be collected from sondages and selected surface areas such that the research potential and significance of the specific archaeological deposits can be determined.
- Context and deposit ‘types’ will be designated as having high, moderate or low research potential based on analyses of artefacts sampled from the testing program.

5.8 Artefact Management

As noted above, artefacts will be cleaned, dried, bagged by context and temporarily stored at the GML Heritage Office, 2A Mugga Way, Red Hill during the works program, and during the analysis and report preparation phases.

At the completion of the analysis, GML will prepare a long-term artefact management strategy based on the significance of the artefacts (including individually significant items and significant artefact types), along with an artefact discard strategy. We will concurrence with this strategy from ACT Heritage prior to its implementation.

5.9 Sample Collection Strategy

Samples will be selectively collected from significant archaeological features and deposits for further analysis, to inform the response to the research questions. Samples will be collected by context and included in the sample register, then bagged and temporarily stored until needed for the post-excavation analysis.

Samples of the following archaeological material may be collected as deemed appropriate to the research objectives for each area:

- Building material samples such as brick, structural timber and mortar. Photographs of dimension stone examples will be taken but physical samples will not be kept.
- Organic material such as wood, seeds or pips and shell. Animal bone may also be sampled depending on the nature or significance of its context.
- Environmental material such as soil with potential for fossil pollens.

5.10 Post-Excavation Analysis

The post-excavation analysis will commence on completion of the fieldwork. It will include:

- All paper archive, digital photographs, survey data, artefacts and samples will be moved and temporarily stored at the GML office for the post-excavation analysis phase.
- Site registers and context sheets will be collated and digitised for analysis, and inclusion in the final report.
- Artefacts will be photographed by context and then sorted into type—ceramic, glass, metal, animal bone, shell, organics, miscellaneous small finds—in preparation for specialist artefact cataloguing and analysis.
- Building material and environmental samples will be selected for analysis. Samples will be selected based on the potential to contribute to further archaeological analysis and research.
- Artefacts will be identified and catalogued by type—ceramic, glass, metal, organics, animal bone and shell, building materials and miscellaneous small finds.
- The data will be entered in a database that reflects current methods for archaeological data recording.
- The artefact assemblage will be analysed, and a succinct artefact analysis will be included in the final report.
- Technical information with detailed descriptions and photographs of archaeological features, deposits and fills, and stratigraphic analysis will be prepared for the final report.
- Detailed site plans and illustrations based on the measured drawings prepared during the fieldwork will be prepared. The plans will be prepared in conjunction with the technical reports and include key context identification, stratigraphic relationships and archaeological phasing.
- Survey data and orthophotographs will be collated to inform the technical reporting and detailed plan preparation.

5.11 Final Report

Following the preliminary investigation, a SHE report will be prepared that will:

- provide a description of the place (including results of the preliminary investigation);

- provide a description of the proposed activity;
- discuss the potential impacts on the heritage significance of the site by the proposed works;
- present a consideration of alternatives if available;
- present mitigation strategies to reduce potential impacts to the heritage significance of the site; and
- provide recommendations to ACT Heritage Council for any future works, investigations and/or reporting requirements, including (as appropriate):
  - further archaeological investigation;
  - salvage excavations;
  - on-site interpretation of the results;
  - presentation, long-term curation and storage of artefacts.

6.0 Conclusions and Recommendations

6.1 Conclusions

- Doma Group is undertaking a project to redevelop the Canberra Brickworks Precinct site. The proposed redevelopment includes new residential areas and associated infrastructure, as well as retail and office spaces which will be accessible to the public. Several historical structures at the site will be retained and adapted into these new facilities.
- An AA of the site was previously prepared by Navin Officer in 2016. This report identified 12 areas of archaeological sensitivity and recommended that areas of moderate and high archaeological potential be subjected to an archaeological testing program prior to any works or development in these areas (BRW1–BRW12).
- Based on a review of the AA and an inspection of the site, GML determined that eight of the 12 areas of archaeological potential identified in the AA should be subjected to further archaeological testing (BRW1, BRW2, BRW3, BRW7, BRW8, BRW10, BRW11 and BRW12). These are all areas of moderate and high archaeological potential, as outlined in the AA, with the addition of BRW8 which GML proposed to test due to the potential significance of deposits in this location.
- Following preliminary investigations, a SHE report will be prepared and will assess the potential impacts of the proposed development to archaeological resources. The SHE report will include mitigation measures to reduce potential impacts to archaeological resources and recommendations for any further works or reporting requirements.
- Impacts to historical archaeological remains require appropriate approval under the ACT *Heritage Act 2004*.
- This research design and methodology provides the framework for preliminary archaeological investigations of the study area. It will support the application for an Excavation Permit under Section 61E of the *Heritage Act 2004*.

6.2 Recommendations

- This ARD should be submitted with an Excavation Permit application under Section 61E of the *Heritage Act 2004*.
- The preliminary archaeological excavations should be undertaken in accordance with the research design and methodology presented in this report and any conditions imposed by the ACT Heritage Council.
- Post-excavation analysis and reporting should be undertaken on completion of the fieldwork. A SHE report should be prepared and submitted to the ACT Heritage Council.

7.0 Endnotes

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3 Gillespie, L 1984, *Aborigines of the Canberra Region*, L Gillespie, Campbell, ACT, p 29.

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6 Rowe, DJ 1997, *Building a national image: the architecture of John Smith Murdoch, Australia's first Commonwealth Government architect*, Ph.D. (Arch) thesis, School of Architecture and Building, Deakin University, pp 139–140.

7 Rowe, DJ 1997, *Building a national image: the architecture of John Smith Murdoch, Australia's first Commonwealth Government architect*, Ph.D. (Arch) thesis, School of Architecture and Building, Deakin University, p 157.

8 National Archives of Australia, Series A110/FC 1913/1055, in Ian Carnell, 'Canberra's Cornerstone', *Canberra Historical Journal*, No. 5, March 1990, cited by Lester Firth Associates, 1986, Section 2.2.1.

9 ACT Heritage Council 2013, Yarralumla Brickworks Railway Remnants', pp 6–7.

10 ACT Heritage Council 2013, 'Yarralumla Brickworks Railway Remnants', viewed 4 July 2017 <http://www.environment.act.gov.au/__data/assets/pdf_file/0011/348680/249.pdf>, p 7.

11 ACT Government, *Heritage Assessment Policy*, February 2015, pp 5–6.

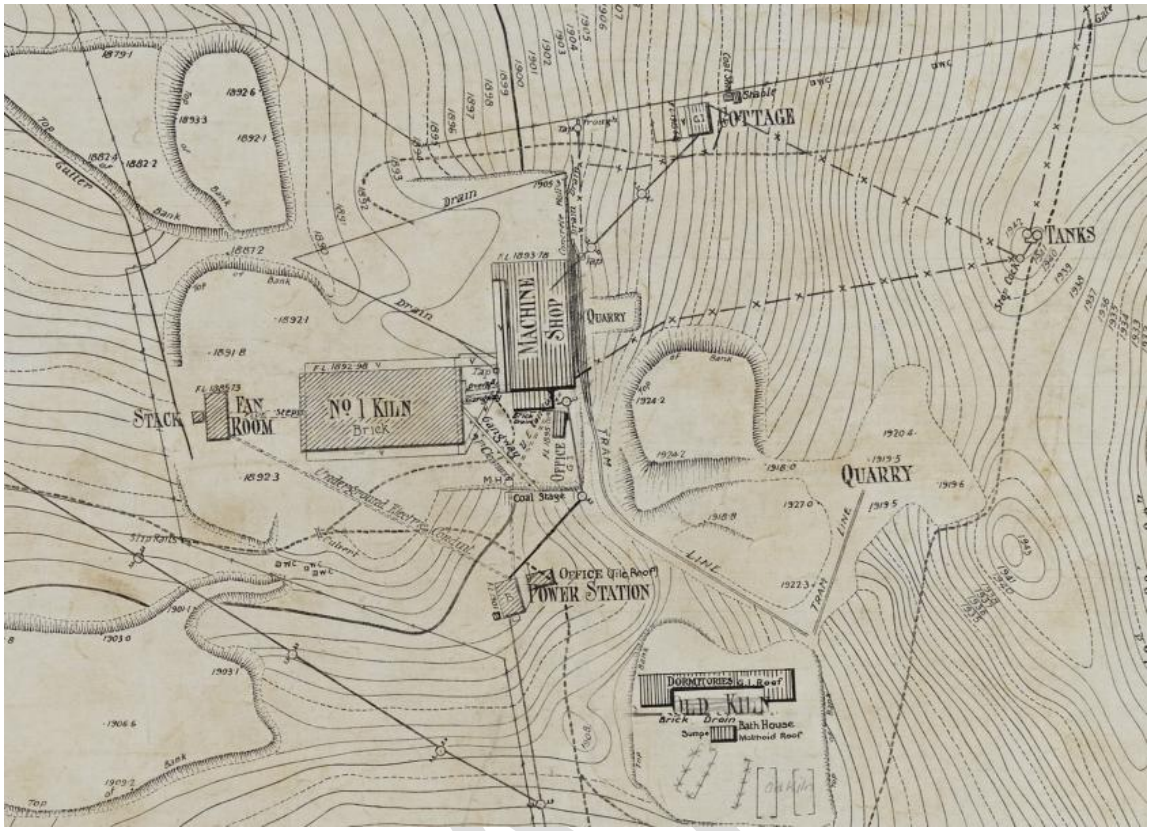
8.0 Appendices

Appendix A

Archaeological Assessment

Appendix D

Navin Officer Heritage Consultants, Archaeological Assessment of the Canberra Brickworks and Environs, Denman Street, Yarralumla, South Canberra, prepared for Land Development Agency, September 2016



ARCHAEOLOGICAL ASSESSMENT

CANBERRA BRICKWORKS & ENVIRONS

Denman Street, Yarralumla,

South Canberra

Prepared for

Land Development Agency

September 2016

Navin Officer Heritage Consultants Pty Ltd

with

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1.0 EXECUTIVE SUMMARY

This archaeological assessment for the former Canberra Brickworks (Block 1, Section 102) and its environs (Blocks 7 and 20, Section 102) has been prepared for the Land Development Agency (LDA) to inform any future works within the three blocks in Yarralumla. The Canberra Brickworks site is not designated land (areas specified in the National Capital Plan as having 'special characteristics of the National Capital') and is subject to the provisions of the Territory Plan. The Canberra Brickworks and associated Railway Remnants are also included in the ACT Heritage Register and are protected under the *Heritage Act* 2004.

The Commonwealth Government established the Canberra Brickworks in order to support the development of Canberra as the new Federal Capital. The project was announced in 1910 and work began on the development of the complex in 1913. The brickworks supplied materials for the construction of buildings in Canberra in the early period of the capital's development. Bricks and other specialty lines were produced at the site from this time until the closure of the complex in 1976. Production capacity at the site varied in response to fluctuations in demand for bricks and the brickworks was expanded in a number of key phases, notably in the 1920s and the 1950s.

Following closure of the plant, the site was adapted for a range of uses (of varying duration) but other than for the subdivision of land and associated residential development on the perimeter of the site, relatively little physical change has occurred since this time. The surviving complex includes brick manufacturing infrastructure including kilns, stacks and ancillary buildings, with a quarry to the east. Part of the complex is occupied by a timber recycling company.

This Archaeological Assessment has been prepared in response to Policy 15 of the Canberra Brickworks Conservation Management Plan by Lovell Chen, dated April 2010, which states that:

> A predictive archaeological assessment should be undertaken for the study area and abutting sites. This study should identify the relative potential for sub-surface remains on the site and their likely nature and significance. Depending on the outcome of such a study, an Archaeological Management Plan should be prepared prior to any development or disturbance of the site.

As such, the purpose of this document has been to:

- Identify areas of historical archaeological sensitivity at the study area with potential sub-surface features
- consider the likely nature and potential of the sub-surface remains
- provide guidance on the management of any archaeological remains

Areas of potential archaeological sensitivity

Twelve sites of potential archaeological significance were identified during the preparation of this report, with varying levels of potential (low, moderate, high).

The principal areas of archaeological potential include:

BRW1: Building platform and concrete features

BRW2: Married quarters and Brickworks Hostel

BRW3: Area of postholes and other remains

BRW4: Single men's quarters

BRW5: Clay feature and rubble

BRW6: Rubble heap/refuse dump

BRW7: Quarry

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BRW8: Old kiln and dormitories

BRW9: Cottage, stables, coal store

BRW10: Railway remnants

BRW11: Railway siding extension (to north)

BRW12: Flues/subsurface workings

Other works

Prior to the completion of this report, a Statement of Heritage Effects (SHE) was granted by ACT Heritage for Phase 2 contamination and geotechnical testing. The LDA undertook sub-surface testing, which was overseen by NOHC. This work took place within the identified areas of high, medium and low archaeological potential. A summary of results is included at Appendix B.

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2.0 Introduction

This Archaeological Assessment for the former Canberra Brickworks (Block 1, Section 102) and its environs (Blocks 7 and 20, Section 102) has been prepared for the Land Development Agency (LDA). The purpose of the document is to:

- Identify areas of historical archaeological sensitivity at the study area with potential sub-surface features
- consider the likely nature and potential of the sub-surface remains
- provide guidance on the management of any archaeological remains

The Cultural Heritage Reporting Policy prepared by the ACT Heritage Council (dated 1 July 2015) has been referenced in the preparation of this document.[1] An assessment of significance and assessment of potential impacts are included as an appendix to this report (Appendix A).

This report does not address Aboriginal archaeology. The Aboriginal archaeological potential of the study area was considered as part of an Aboriginal Cultural Heritage Assessment (Stage 1) in August 2014. The assessment, prepared by Navin Officer Heritage Consultants Pty Ltd (NOHC), concludes that the brickworks and its environs contain no known Aboriginal places or objects and is of low Aboriginal archaeological potential. Further, any archaeological deposits would have been disturbed as a consequence of past land use practices.[2] As an outcome of the Cultural Heritage Assessment, no statutory implications regarding cultural heritage apply to the study area. The Cultural Heritage Assessment was approved by the ACT Heritage Council on 11 September 2014.[3]

Canberra Brickworks CMP

This Assessment has been prepared in response to Policy 15 of the Canberra Brickworks Conservation Management Plan by Lovell Chen, dated April 2010. The policy is as follows:

> A predictive archaeological assessment should be undertaken for the study area and abutting sites. This study should identify the relative potential for sub-surface remains on the site and their likely nature and significance. Depending on the outcome of such a study, an Archaeological Management Plan should be prepared prior to any development or disturbance of the site.

The CMP provides an assessment of the site's heritage values, and sets out policies to guide the conservation and management of those values. It was endorsed by the ACT Heritage Council on 20 May 2010. The CMP notes that archaeological remnants are likely to survive at the site and comments that, '[these artefacts are unlikely] to be of a level of significance that … would warrant retention in situ, or … preclude development on the site'.[4] Subsurface artefacts located at the site would however have the potential to enhance an understanding of the history and operation of the site.

Canberra Brickworks Railway Remnants

While the Canberra Brickworks CMP has regard for issues of setting and curtilage, it does not provide a detailed analysis of land adjacent to the former brickworks, including the Canberra Brickworks Railway Remnants, which is the subject of a separate entry in the ACT Heritage Register. The registered area for the railway remnants extends south from the brickworks and forms part of Block 7, Section 102, Yarralumla (Figure 1).

2.1 Study area

The study area for this archaeological assessment includes Blocks 1, 7 and 20 Section 102 in Yarralumla. The total area is approximately 16ha. There is an elevated ridge to the south and east of the study area, and lower ground to the north and west. A water course originally ran to the north-west of the site. The study site is located approximately 5km west of the Parliamentary Triangle. It is bounded to the north and east by low density residential development (Woolls, Schomburgk and Bentham streets, and

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Lane-Poole Place). To the west, the site is bordered by Territory land (Block 1, Section 127), and to the south by Block 3 Section 94 (Figure 1). Access to the study area is from Denman Street only.

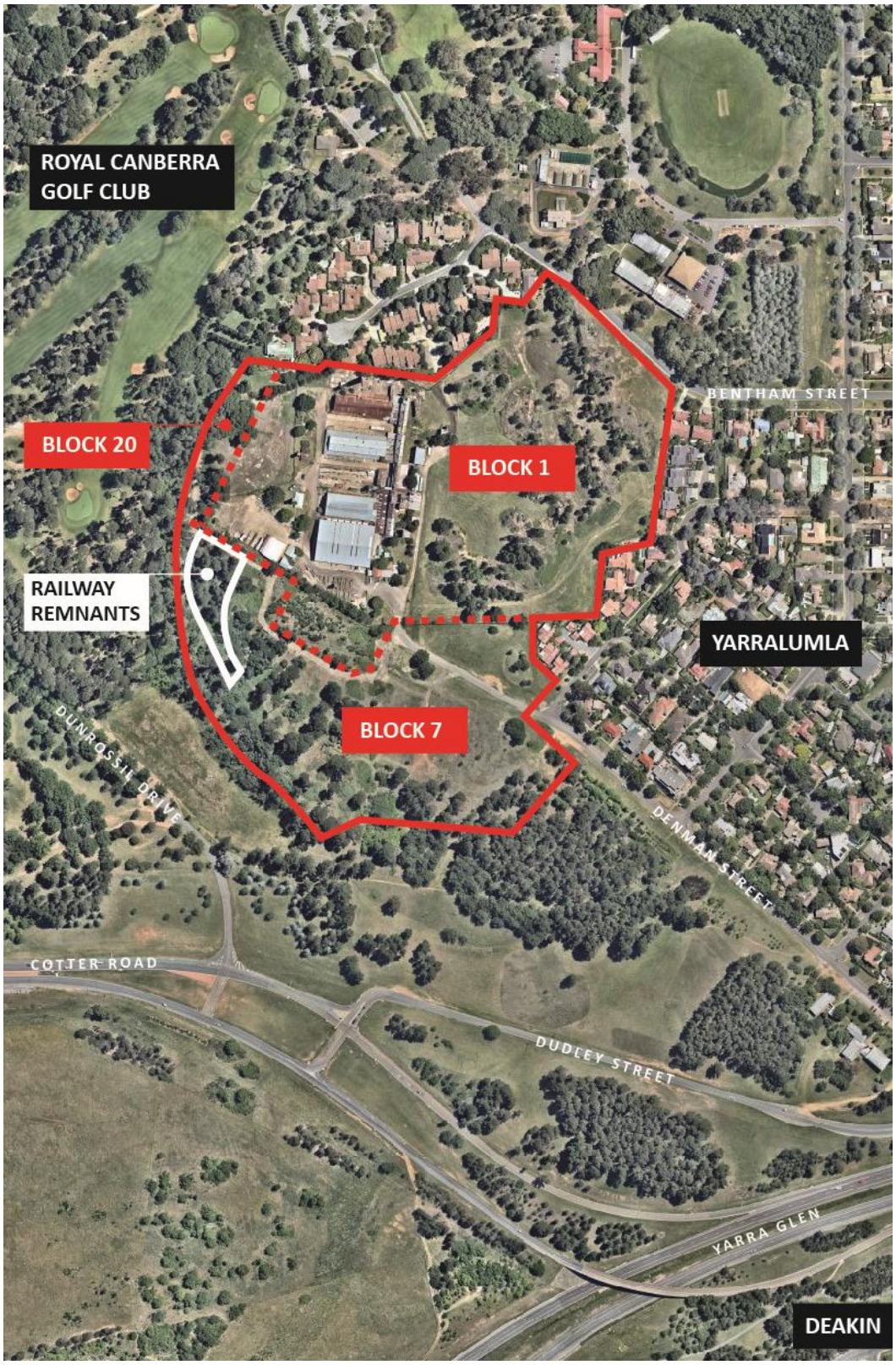


Figure 1 Aerial photograph of the study area (solid red line) and environs, 20 November 2015: Block 1 is the registered extent of the Canberra Brickworks
Source: www.nearmap.com (base photograph), accessed 16 December 2015

3.0 Project description

The nature of future works within the study area is yet to be determined. Based on criteria and land uses defined in the current Territorry Plan and Yarralumla Precinct Map and Code, the study area could be subject to future commercial and/or residential development..

4.0 Statutory context

The *Australian Capital Territory (Planning and Land Management) Act* 1988 established the National Capital Planning Authority, which was required to prepare a National Capital Plan (NCP). The Act also required the preparation of a Territory Plan, which was not to be inconsistent with the NCP. The Territory Plan is the document that informs and guides planning and development in the ACT, with the exception of 'Designated Areas' (an area specified in the NCP as having 'the special characteristics of the National Capital'). The study area is not designated land and as such is subject to the provisions of the Territory Plan. However, land to the south, north and west (Sections 103, 113, 119 and 123) is designated, and forms part of the National Capital Open Space system.

Development approval processes within the ACT can be summarised as follows:

- Work carried out on National Land in Designated Areas is subject to the approval of the National Capital Authority (NCA);
- Work carried out on Territory Land in Designated Areas is generally subject to approval by the NCA but Territory requirements may also apply to development where the Territory is the approving Authority;
- Work carried out on National Land outside of Designated Areas must be in accordance with a Development Control Plan (if applicable) agreed by the NCA that reflects the requirements of the Territory Plan; and
- Work carried out on Territory Land outside Designated Areas is subject to the Territory Plan and Territory Approval processes.

4.1 *Heritage Act 2004* (ACT)

The Canberra Brickworks (Section 102, Block 1) and the Brickworks Railway Remnants (Section 102, Block 7 – part) are included in the ACT Heritage Register and are protected under the *Heritage Act* 2004. This Act provides for the protection, management and conservation of heritage places and objects in the ACT. Under the Act, the ACT Heritage Council is to be responsible for the Heritage Register and the heritage registration process.

Under s.74 of the *Heritage Act*, it is an offence to engage in conduct that diminishes the heritage significance of a place or object. An object is defined as 'a natural or manufactured object, but does not include a building or any other man-made structure' and a place is defined as 'a site, precinct or parcel of land; a building or structure; or part of a building or structure; the curtilage, or setting, of a building or structure, or part of a building or structure; an object or feature historically associated with, and located at, the place'.[5]

Under the Act, penalties apply where other works diminish the heritage significance of a registered or nominated place or object or damages an Aboriginal place or object. The reporting and offence provisions of the Act apply irrespective of land status, or whether the site is listed in the Heritage Register or not.

The only provisions for legally sanctioned disturbance to a place or object, or the diminution of the heritage value of a Heritage Place or Object is to conform to one of the exceptions listed in s76 of the Act (see also Section 13.0).[6] According to this section, the offence provisions of the Act (s74 and s75) do not apply if conduct is engaged in accordance with the following:

(i) a heritage guideline;

(ii) a heritage direction;

(iii) a heritage agreement;

(iv) a conservation management plan approved by the council;

(v) development approval under the Planning and Development Act 2007, chapter 7;

(vi) an excavation permit;

(vii) a statement of heritage effect approved by the council.

4.2 Elements of significance

The features associated with the brickworks are divided between two schedules – elements of exceptional significance, and elements of moderate significance (ACT Heritage Register Item 20068, Figure 2).

Schedule 1 Elements of Exceptional Significance

1) Kiln - Staffordshire (1915)
2) Fan House for Staffordshire Kiln (1915)
3) Kiln - Hardy-Patent (1927)
4) Fan House for Hardy Patent Kiln (1953)
5) Kiln - Hardy-Patent (1953)
6) Kilns - Downdraft a, b, c (1963)
7) Chimney Stacks for Staffordshire Kiln (1915)
8) Chimney Stack for Hardy Patent Kiln (1927)
9) Chimney Stack for Hardy Patent Kiln (1953)
10) Chimney Stack for Downdraft Kiln (1963)
11) Quarry
12) Geological features A, B, C, D

Schedule 2 Elements of Moderate Significance

13) Office (1916)
14) Power House (1915)
15) Machine Bay for Staffordshire and Downdraft Kilns (1955)
16) Machine Bay for Hardy-Patent (1955)
17) Machine Bay for Hardy-Patent (1955)
18) Workshop (1955)
19) Large Crusher House (1955)
20) Primary Crusher House (1955)
21) Small Crusher House

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22) Elevator Conveyor (1955)

23) Remains of the Brickworks Accommodation Village

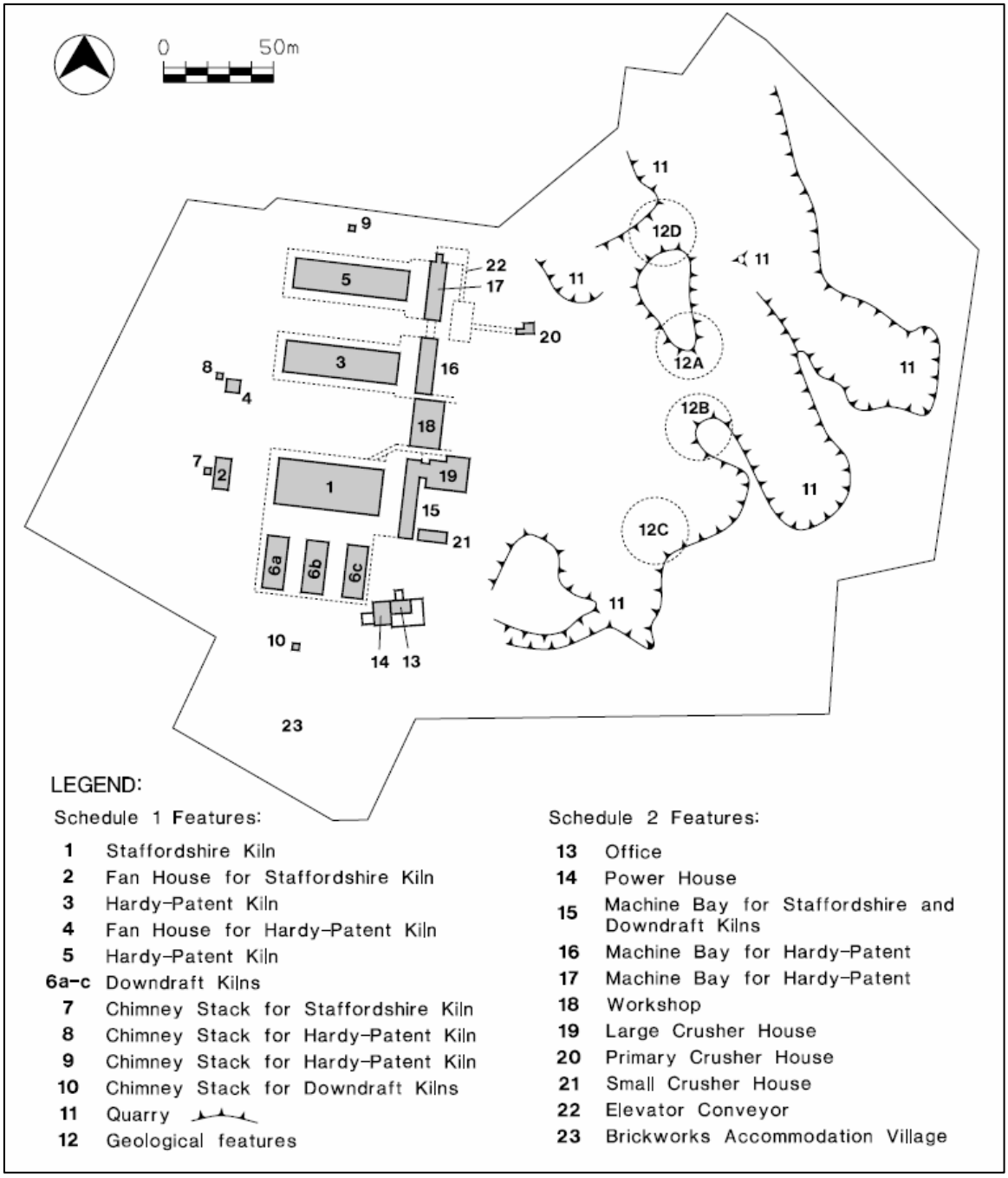


Figure 2 Canberra Brickworks significant features
Source: ACT Heritage Register

5.0 Environmental context

The Canberra brickworks is located within two distinct geological regions: the Deakin Volcanics, which consists of Rhyodacitic ignimbrite and minor volcaniclastic and argillacrous sediments; and the Yarralumla Formation, which consists of calcareous and tuffaceous mudstone and siltstone with minor limestone, calc-silicate hornfels and quartz sandstone.[7]

The area is situated on the Williamsdale soil landscape, characterised by undulating rises with elevation between the highest and lowest points locally being below 10% in natural terrain. The soil landscape consists of moderately deep, moderately well-drained Yellow Chromosols, Red Kandosols and Brown Kandosols. There are elevated ridges to the south and east of the study area, and lower ground to the north and west. A former watercourse ran through the brickworks site in the north-west, at which point alluvial soils are present. The brickworks is located on a minor local topographic high, with a sloping ground surface outside the study area to the south and south-west heading towards Yarralumla Creek, a tributary of the Molonglo River. Topography and drainage in some areas of the study area have been significantly modified due to the brickworks itself, the associated quarry and road infrastructure.[8]

The study area is largely dominated by exotic vegetation. The areas of tree plantings contain an exotic understorey. The areas of exotic pasture surrounding the entrance road to the study area are dominated by Chilean needlegrass, a noxious weed. The predominant tree species within the study area is *Pinus radiata* (weed species), *Pinus ponderosa*, *Pinus sylvestris* and *Ulmus procera* and various tree and shrub weed species. A number of planted trees are located along the eastern boundary and a copse of oak trees is located on the south-east corner of Block 7. Generally the landscape is unmanaged, and weed species (trees, blackberry shrubs and grasses) are prevalent.[9]

6.0 Social context

Investigation of the social context of the brickworks site has not been undertaken for this current assessment. However, a study was undertaken in late 2010 with past employees or their family members to explore their memories and experience of the Brickworks. This study revealed an attachment for people who have worked at the site during its operational life as a brickworks.

Unsurprisingly, given its scale, heritage values and location, the brickworks is a place which has been the focus of major interest for the local community concentrating largely on the issue of potential future development. Significant community sentiment and interest and consultation workshops have taken place with the LDA to provide an opportunity for residents to express opinions regarding the future use and development of the site.

7.0 Archaeological context

The Aboriginal archaeological potential of the study area was considered as part of a Cultural Heritage Assessment undertaken by Navin Officer Heritage Consultants (NOHC) in August 2014. As noted, this report concluded that the brickworks and its environs contained no known Aboriginal places or objects, and any potential deposits would have been disturbed as a consequence of the extensive land use.

No previous historical archaeological assessments of the study area came to light during the preparation of this report.

Site visits undertaken for this Archaeological Assessment, and previously, suggest that there is some above-ground evidence of archaeological features within the study area. This is described in detail in Section 11.3. Some evidence for potential archaeological features is also visible in the form of the landscape. The quarry itself is a highly intact feature and the brickworks railway, which operated between 1923 and 1927, remains partly evident in the form of cuttings in the landscape that follow the original alignment of the siding. Self-seeded vegetation has reclaimed much of this area in recent years. Evidence of man-made intervention is also apparent in the refuse dump to the west of the brickworks.

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8.0 Research design and methodology

Historical research

Historical research using primary and secondary sources formed a significant component of this assessment of archaeological potential. The principal objective of this research was to establish and document the historic development of built form at the study area.

The 2010 CMP prepared by Lovell Chen was a key reference. It is based upon a range of sources, including survey and site plans and historic photography. This report is also informed by the following primary sources:

- Photographic collection, National Library of Australia
- Photographic collection, ACT Heritage Library
- Aerial photography, ACT Planning and Land Authority

Additional research was also undertaken using secondary sources and online databases including published histories, the Canberra Heritage Register, and Nearmap aerial photography.

The historical development of the Canberra Brickworks is presented in this report in four key phases:

- Establishment (1913-1920)
- Reactivation (1920s-1930s)
- Expansion (1940-1970s)
- Closure and Redevelopment (1970s – current)

Archaeological fieldwork

Archaeological fieldwork was conducted to examine the presence and extent of physical features at the site, including their location and potential purpose; confirm the location and archaeological potential of any previously identified features; identify any areas of archaeological potential not recognised through historical research; and where possible, use the results of the above examinations and analyses to identify the potential for these areas to yield further information.

Research questions which were posed included:

- Are there identifiable remains and features that would provide information on the course of the development and use of the study area; and
- Are there areas of archaeological potential, with no surface remains, within the study area that may be able to provide information on its development and use?

A predictive archaeological model was also developed to indicate the types of potential archaeological features, and likely areas of subsurface remains. This model is outlined in Section 11.1.

Site visit

Three site visits were undertaken throughout the duration of this study.

Lovell Chen undertook an inspection on 24 November 2015, to 'ground truth' the outcomes of the historical research and identify any archaeological evidence relating to historic land use. The site visit was undertaken by Adam Mornement, Senior Associate, and he was accompanied by a staff member from the Land Development Agency. The survey covered the quarry, and land to the west and south of the kilns including remnants of the railway siding extending into Block 7.

The focus of this visit was on six locations which had been identified as being of archaeological potential during the review of historical documentary material. Lovell Chen established that one of the locations had been developed, and confirmed that archaeological evidence of previous land use remained

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possible at the other five locations. Underground flues linking the kilns to their respective fan houses and chimney stacks were not inspected during this visit. However, documentary and above-ground evidence (in the form of the kilns, stacks and fan houses) suggests that these flues survive.

A second investigation was undertaken by Travis Gottschutzke and Dr Rebecca Parkes of NOHC in the afternoon of 20 May 2016. This involved a walk over of the area to the south of the brickworks itself, and the quarry. Staff were accompanied by three officers from the Land Development Agency (LDA). The inspection was an opportunity to familiarise NOHC staff with the nature of the brickworks site.

Following this investigation, a detailed survey of sites within the brickworks area was undertaken by Travis Gottschutzke and Julia Maskell (NOHC) on 9 June 2016. Over the course of the survey, contributions were sought from other NOHC staff (Dr. Rebecca Parkes and Dr. Antony Barham).

8.1 Limitations

Access to the entire study area was limited due to a number of factors. The centre of the precinct, the brickworks, is a partially active environment, licensed by the Territory to a joinery business involving processing and recycling of reclaimed timber. Access to this zone was therefore restricted to short windows of time during staff breaks. Fortunately, the built environment of this part of the precinct has been sufficiently analysed in the 2010 CMP, and visible archaeological remains were predicted to be minimal in these areas.

Historical research has largely relied on material in the 2010 CMP, which in turn relied in part on material from the 1986 Lester Firth Associates' *Conservation Management Plan*, with additional research undertaken by Lovell Chen where required. While there is clearly scope to undertake further historical research in relation to the study area, it was considered that sufficient research had been undertaken to inform the analysis and assessment of this report.

9.0 Related reports

The Canberra brickworks site, as well as the surrounding environs, has been the subject of a number of previous studies. These include:

- Lester Firth Associates Pty Ltd, *Old Canberra Brickworks Conservation Plan,* 1986
- National Capital Development Commission, *Canberra Brickworks, South Canberra, Policy Plan*, October 1988
- Connell Wagner Pty Ltd, *The Old Canberra Brickworks and Environs Development Control Plan*, February 2001
- Susan Conroy & Munns Sly Architects, *The Yarralumla Brickworks & Environs Planning Review*, March 2005
- Lovell Chen, *Canberra Brickworks Conservation Management Plan*, April 2010
- Navin Officer Heritage Consultants, *Canberra Brickworks, Yarralumla ACT Aboriginal Cultural Heritage Assessment (Stage 1)*, August 2014

10.0 Historical background and analysis

The following historical overview of the former Canberra Brickworks is derived largely from the CMP prepared by Lovell Chen in 2010. Full reference details are contained in the CMP. The results of any additional research are referenced below.

10.1 Pre-brickworks

In 1910, King O'Malley announced Government plans for the construction of a brickworks to serve the Federal Capital. Various experiments on shale in the region were carried out in early 1911. One potential site was Frederick Campbell's Yarralumla property. Samples from the site were sent for testing and reports concluded that samples from Yarralumla produced bricks of excellent quality. Yarralumla was thus chosen and Frederick Campbell agreed to the acquisition of approximately 38 acres (15ha) of his land holding. The area was gazetted on 27 July 1912, and development of the site began in 1913.

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The map at Figure 3 shows the location of the study area prior to the development of the Federal Capital.

10.1.1 Analysis and conclusion

There is unlikely to be any archaeological features or deposits relating to this period.

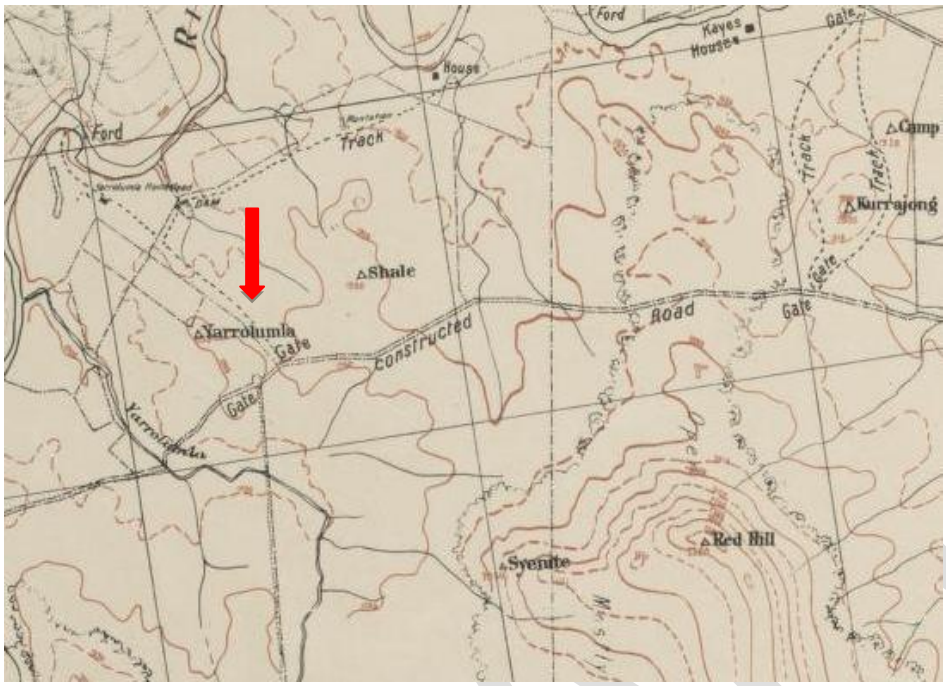


Figure 3 Map of Federal Capital, 1912: the approximate location of the former Canberra Brickworks is indicated
Source: National Library of Australia

10.2 Establishment (1913-1920)

A temporary brick making plant was operational by 19 June 1913. This comprised a grinding pan, brick making machine and elevator made by Geo. Foster and Sons, Sydney, and a portable steam engine. By August 1913, four open kilns were in use at the temporary plant, with plans for a fifth. During this period, workers were accommodated in two camps of tents – one for married couples, the other for single men. The camps were located on Banks Street, near the present Forestry School. This area has been developed for housing.

The first stage of the permanent brickworks, which included a Staffordshire kiln, was approved on 1 December 1913 by P T Owen, the Director-General of Works. It was proposed to use this kiln to produce bricks for the construction of two further kilns. In September 1915, the brickwork for a 20-chamber Staffordshire kiln was nearing completion. This kiln, together with crushing, processing equipment and brick presses was ready for production by early 1916.

A Survey Plan of the site (Figure 4), dated 20 December 1916, shows the layout of the permanent brickworks. A small galvanised iron office building is located close to the 'Machine Shop', and a galvanised iron 'Cottage' with associated coal store and stable is located to the north-east of the site. Other features include a coal stage, a concrete retaining wall separating the quarry pit and the working areas, water storage tanks on a high knoll, a remote powder depot, three detached WCs south of the kiln, an elevated gangway connecting the coal stage to the kiln and overhead electrical connections linking the power station to the fan room, machine shop and the cottage. The Staffordshire kiln was connected to the fan house and stack by means of flues and underground workings. A tram line is indicated linking the quarry to the machine shop – these tram lines could be relocated as the quarry face advanced.

The plan also provides details about the temporary brickworks. The temporary 'Old Kiln' area, shown in outline on the plan, comprises four kilns located to the south-east of the permanent brickworks. There is also a 'Dormitories' building located to the immediate north.

The plan indicates that the land to the immediate north of the Staffordshire kiln and associated fan room was on a rise, and a gutter was developed to the west of this to allow water to flow from the nearby creek to the site. This land later became a rubble heap and refuse dump.

The land to the north-west, west and south of the brickworks was established in 1914 as a designed landscape 'Westbourne Woods' (Figure 5). This land, together with Weston Park and the Yarralumla Nursery, was nursery and arboretum to test the suitability of plantings throughout Canberra.

The commitments of World War I, and consequent restrictions on the works program for Canberra, together with a coal strike, saw the brickworks close in December 1916.

10.2.1 Analysis and conclusion

All structures relating to the temporary brickworks have been demolished.

Elements of the permanent brickworks, as indicated on the 1916 survey plan, that survive include the power station, Staffordshire kiln, the fan room, stack and the concrete retaining wall. It is assumed that the underground workings connecting the kiln to the fan house and stack also survive as intact subsurface remains. Other elements from this period have been demolished. As was the case for the cottage, associated coal store and the office building close to the machine shop, the majority of the demolished buildings are likely to have been constructed of sheet metal.

Archaeological deposits pertaining to built form from this era are expected to comprise footings and machinery remnants. The material discard is expected to be items of an industrial nature. As can be seen from the survey plan (1916), most of the development in this period was located on the flat land to the west of the quarry pit. This area has been heavily disturbed as a result of the expansion of the brickworks, and it is unlikely that archaeological remains will be uncovered here.

The site of the temporary kilns to the south-east of the power station is the most likely location for archaeological deposits dating to this era. This area has not subsequently been developed, although part of it was covered with a concrete slab (see Section 10.4).

The cottage to the north-east may also yield some archaeological remains, although this site is likely to have been disturbed by quarrying activities. The location of the cottage and outbuildings has been heavily trafficked over time, being located on a key route between the quarry pit and kilns and in close proximity to the primary crusher house and the elevator/conveyor. Archaeological deposits or features relating to this area may include timber post holes and/or domestic discard.

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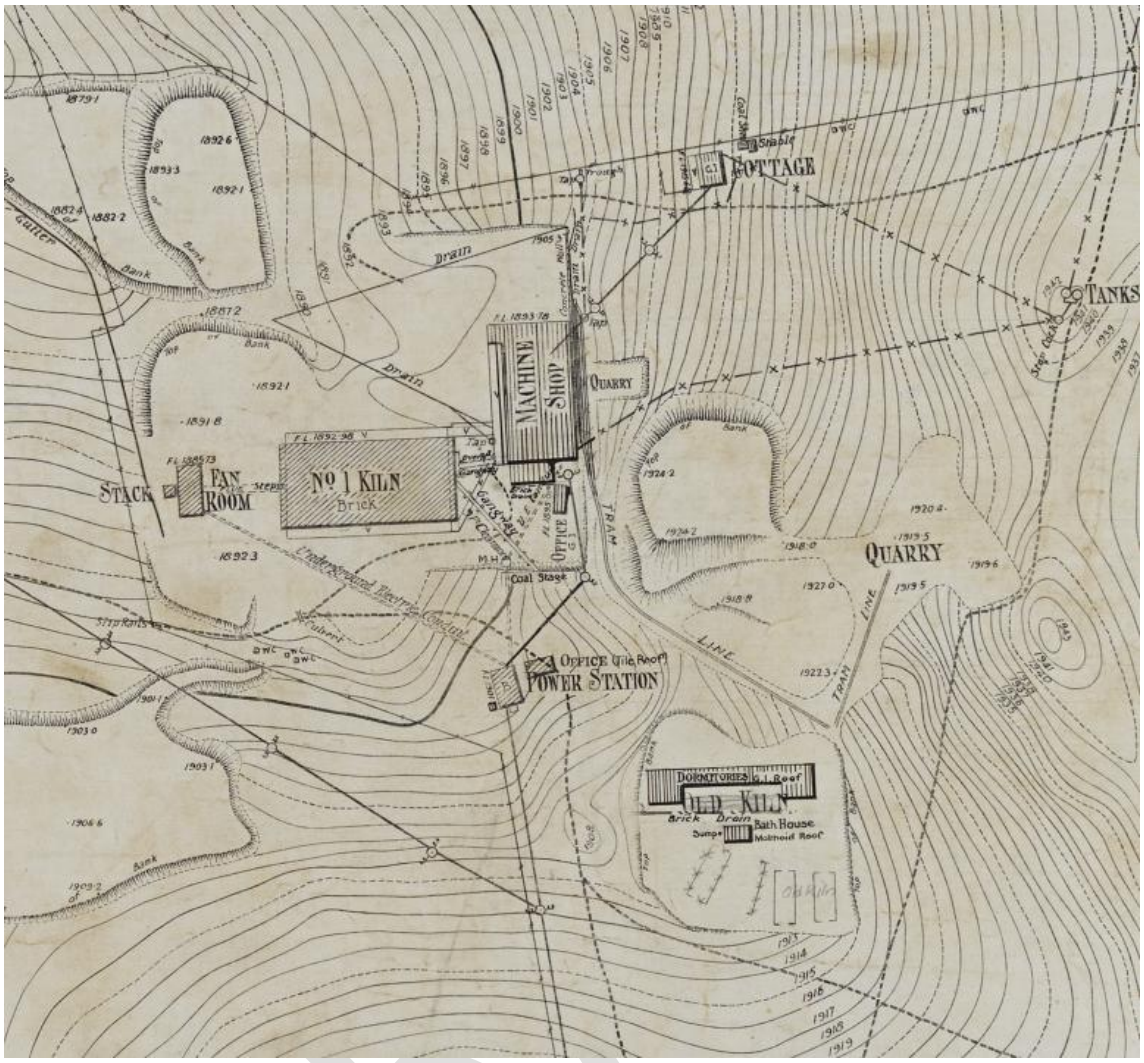


Figure 4 Contour and detail survey of Brick Yards, Canberra, 1916. North is at top
Source: National Archives of Canberra

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Figure 5 Detail of Plan of City and Environs, 1918 showing the Brickworks (indicated) in relation to Westbourne Woods
Source: National Library of Australia

10.3 Reactivation (1920s – 1930s)

The Canberra Brickworks re-opened in 1921 to meet the demands of a developing city. By the end of 1923, 5,000,000 bricks and 50,000 tiles had been produced at the plant.

Bricks were initially transported from the brickworks to construction sites in the emerging city centre by traction engine. However, the machines were able to make only two daily round trips. To speed the process a light railway was constructed. This led from the south-west of the brickworks site, before aligning with the present Denman Street and heading east to the construction sites. The 'branch lines' of the light railway were removed prior to the opening of the Provisional Parliament Building in May 1927 and the remaining sections of the railway were removed in 1929. From the late 1920s, bricks were transported by truck. The only remaining evidence of the light rail network is the formation between Denman Street and the west side of the brickworks (the Canberra Brickworks Railway Remnants).

To cope with increased demand during the 1920s, two 'temporary' downdraught kilns and an associated stack were constructed at the brickworks in October 1925. These were oriented east-west and located to the south of the Staffordshire kiln. They were replaced in the 1960s by three kilns that survive today. In 1926 the existing machine shed was also expanded by two bays.

A 1926 site plan of the brickworks (Figure 6) indicates the changes that occurred following the re-opening of the site after World War I. The old dormitory block and iron cottage with associated stable are still present, but the temporary kilns have been demolished by this stage. The machine shop has

been expanded to the north and a new kiln constructed to the north of the Staffordshire kiln. The location of the two downdraught kilns is also outlined. There was an amusement hall, possibly associated with the Brickworks Camp, to the east of the quarry pit. The quarry itself has altered in shape significantly from the earlier 1916 plan and the tramways follow a different alignment. The plan also provides an indication of the arrangement of the railway siding, just prior to its closure the following year.

Further development took place in 1927. A Hardy patent kiln was built, located to the north of and parallel to the Staffordshire kiln. Today, this kiln has its own fan house and stack, presumably with underground flues, but a 1927 site plan showing the proposed location of this kiln, suggests that it may originally have been supported by the fan house and stack of the Staffordshire kiln. This kiln remains today, albeit in extensively modified form. A 'Scotch' kiln was also in operation to the north of the Staffordshire kiln, and the original section of the present office building was constructed. Single men's quarters were constructed on the south side of Denman Street, close to the entrance to the study area – the location of these quarters is not recorded in historic plans or photographs – and new married quarters were located to the south of the brickworks in the same year. These married quarters can be seen in Figure 7 and Figure 8. They comprised a large two storey building (mess hall) and a number of simple single storey sleeping quarters. The photographs suggest that they were of timber construction.

By the end of the 1920s, the brickworks comprised:

- Staffordshire kiln, fan house and stack
- Hardy patent kiln, fan house and stack
- Two downdraught kilns
- Machine shed
- Amusement hall
- Cottage and associated stables/coal store
- Power house (brick)
- Office (brick)
- Accommodation units to south west and south
- Railway siding remnants

The works closed in February 1931 as a result of the 1929 Depression before reopening again in 1935. However, World War II diverted peace time activity to works associated with the war effort, and the brickworks closed once again. In April 1942 staff were laid off and a caretaker retained to issue bricks for essential works.

10.3.1 Analysis and conclusion

The reactivation phase saw the expansion of the brickworks to something close to its present dimensions. The industrial buildings built during this period were generally constructed of brick with corrugated sheet metal roofs. It is anticipated that accommodation buildings of this era were constructed of timber.

The only buildings that survive from this period were those associated with the industrial workings of the brickworks itself. All accommodation, including the sheet metal cottage, the original dormitories, the single men's camp and the married quarters have been demolished, as has the amusement hall.

The form and location of the single men's quarters constructed to the south of Denman Street, close to the site entrance, is not known. As noted, it is probable that the building (or buildings) were of timber construction. The land to the south of Denman Street, close to the entrance, has not subsequently been

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developed. Archaeological deposits relating to these quarters may include post holes and underfloor refuse deposits. Any material discard is expected to be of a domestic nature.

The married quarters, south of the brickworks, were replaced with a hostel in 1945. As a result, there is limited potential for archaeological deposits relating to the 1920s married quarters. Any deposits are likely to be of a domestic nature.

There are unlikely to be any remains of the quarry pit tramways. These were of an ephemeral nature, being readily relocatable. The floor of the quarry pit has also been modified through quarrying operations, and (in the 1970s) through the adaptation of the pit to a landscaped park and model railway.

Evidence of the railway siding remains in the form of cuttings in the landscape that follow the original alignment of the siding. The potential for subsurface remains relating to the railway, including drainage channels, is low, but cannot be discounted. The railway siding extended right to the brickworks and, although part of this area was later covered with the slab of the extrusion plant, there is potential for the evidence of tracks extending to the north and south of the Staffordshire kiln. Potential archaeological features related to the railway may include timber sleepers, iron bolts and metal rails.

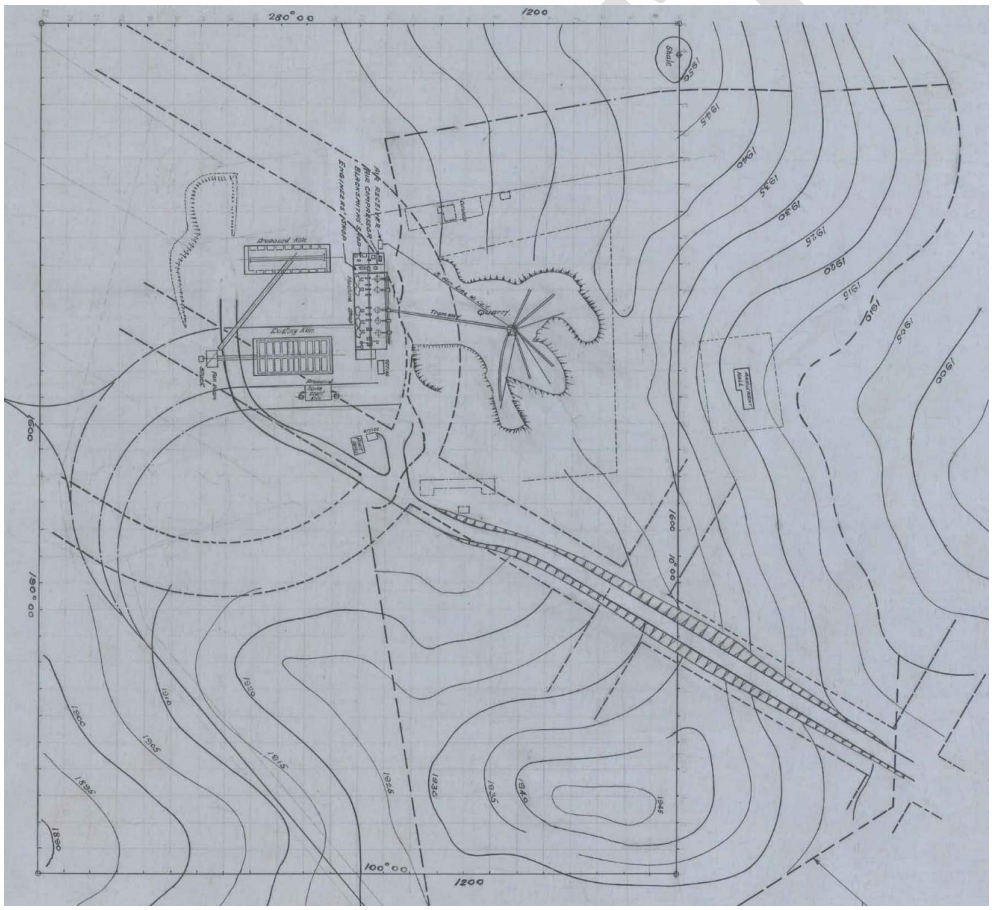


Figure 6 Canberra Brickworks site plan, 1926. North is at top
Source: National Archives of Australia



Figure 7 View of Brickworks, 1929 with married quarters to the left of the image
Source: National Archives of Australia



Figure 8 Brickworks looking south to married quarters buildings, 1929
Source: National Archives of Australia

10.4 Expansion (1940s – 1960s)

With the end of World War II in sight, the Canberra Brickworks reopened in September 1944, with production on a limited scale. From the late-1940s and into the 1950s output was stepped up to provide material to address the post-war housing shortage, resulting in a major expansion and redevelopment of the brickworks.

Among the first post-war construction projects was the replacement of the married quarters at the south-west of the site, built during the 1920s. The new 'Brickworks Hostel' was ready for occupation in 1945 and was located on the site of, and in close proximity, to the former married quarters. The hostel was demolished c.1970.

The expansion of the brickworks in the 1950s saw a change in the process of brick making and in the machinery required for production. While the major brick kilns on the site were retained, other early plant and buildings were replaced. The early machine shop, adjacent to the Staffordshire kiln, was replaced with a series of brick press buildings and a workshop. The brickworks was also equipped with a series of new crushers and hoppers, an elevator and a 'Pan Building'; and a sequence of conveyor belts. The two 'temporary' downdraught kilns that had been built c. 1925 were demolished to make way for three new downdraught kilns. These were constructed on the site of the former 'temporary' kilns in 1960-63.

Westbourne Woods, which surrounded the Brickworks also witnessed change during this period. To solve problems of tree damage as a result of drought, a golf course within the Woods was proposed in 1945. From 1949-1954, fairways were cleared and grassed and in 1962 the Royal Canberra Golf Club was granted a lease that included most of Westbourne Woods.[10] The land to the north-west and west of the brickworks has thus retained a designed landscape character since 1914, with no evidence of development.

This phase of development of the brickworks is reasonably well documented. A site plan dated 1947 (Figure 9) shows the layout of the site at the time, which is substantiated by a 1950 aerial photograph (Figure 10). A 1961 aerial shows further development that took place during this period (Figure 12).

The cottage to the north-west of the quarry pit had been demolished by 1947, with the introduction of roadways to the east side of the machinery shops and kilns likely to have disturbed any material related to the building. A new house had been constructed directly to the north of the brickworks, with an associated garage. As noted above, the Brickworks Hostel replaced the former married quarters in 1945. This new accommodation comprised two buildings with rectangular footprints to the south-west of this area, and a number of smaller buildings to the north and north-east (Figure 11). The amusement hall was extant in 1950 and an explosives store had been erected to the west of the railway siding.

The 1961 aerial shows development to the east and south-east of the brickworks. Residential development to the north-east was also progressing at this stage.

The 1961 aerial also demonstrates the extensive remodelling of the brickworks during the 1950s. A new kiln, constructed c.1953, is located to the north of the older kilns and in close proximity to the residence, presumably with its own sub-surface flue connections; a clay storage shed had been erected to the east of the brickworks; and the machine shop had been remodelled into a series of smaller buildings. The Brickworks Hostel was extant, although it appears to have been modified by this time. A large square expanse is also evident to the south of Denman Street. It is possible this was used as a brick stacking or storage area for the brickworks.

10.4.1 Analysis and conclusion

This period saw the major expansion and redevelopment of the Brickworks, with a mix of residential and industrial buildings being constructed, which generally replaced earlier structures.

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The residence to the north of the brickworks was demolished by the 1970s, with the area later incorporated into the Lane Poole Place development (see Section 10.5). This site now lies outside the study area.

The principal site of archaeological potential relating to this era is the former Brickworks Hostel (built 1945, demolished c. 1970). Footings and concrete slabs were not visible during the first study area visit (due to the extent of vegetation). However, above-ground evidence of built form in this location was visible during the survey conducted by NOHC in June 2016 (Figure 13). Any material discard in proximity to the former hostel is likely to be of a domestic nature.

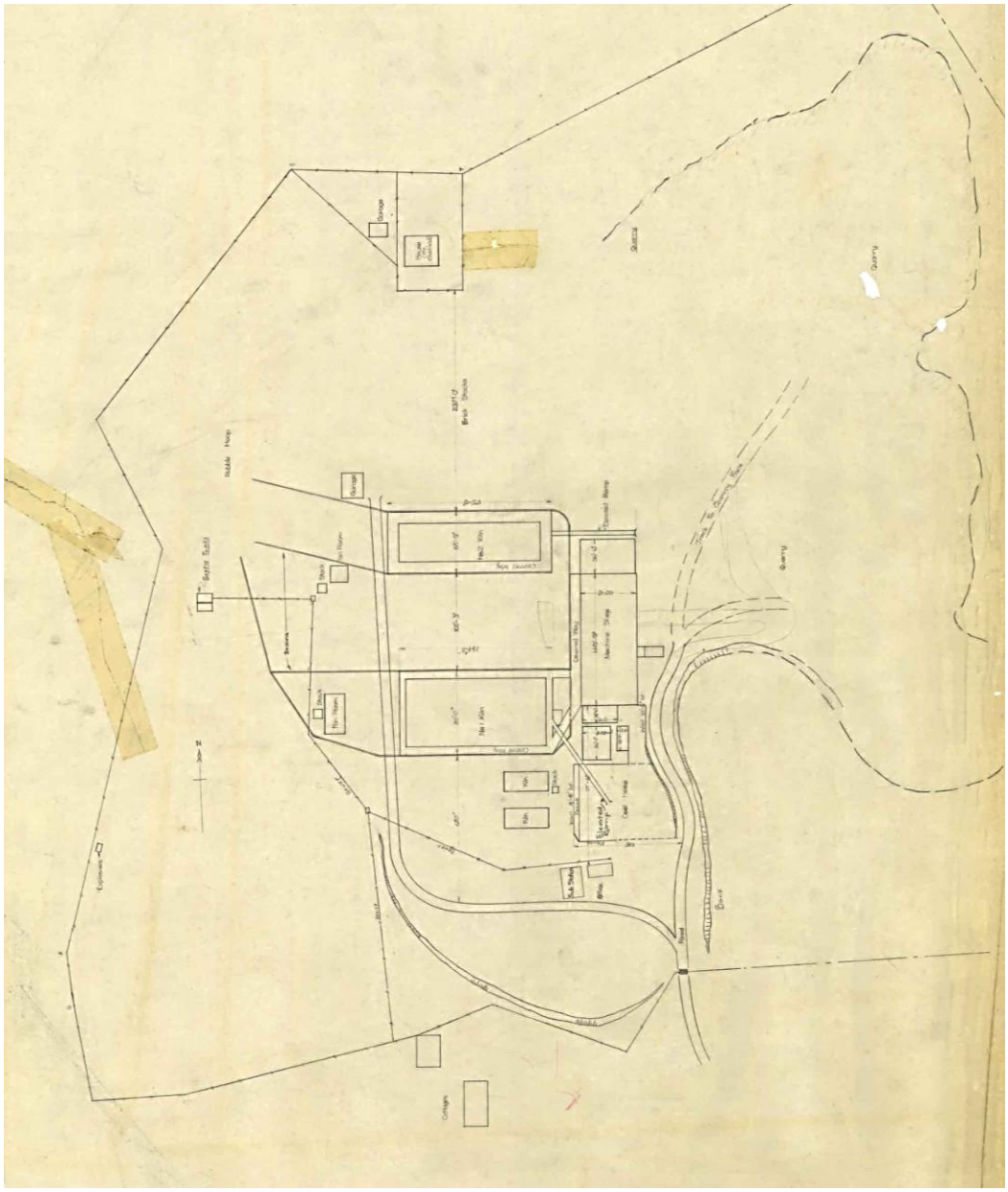


Figure 9 Brickworks site plan, 1947. North is at top
Source: National Archives of Australia



Figure 10 Aerial view of the Brickworks site, 1950
Source: ACTPLA



Figure 11 Aerial view of Yarralumla looking east, with the Brickworks at the lower left showing the Brickworks Hostel (indicated), 1952
Source: ACT Library

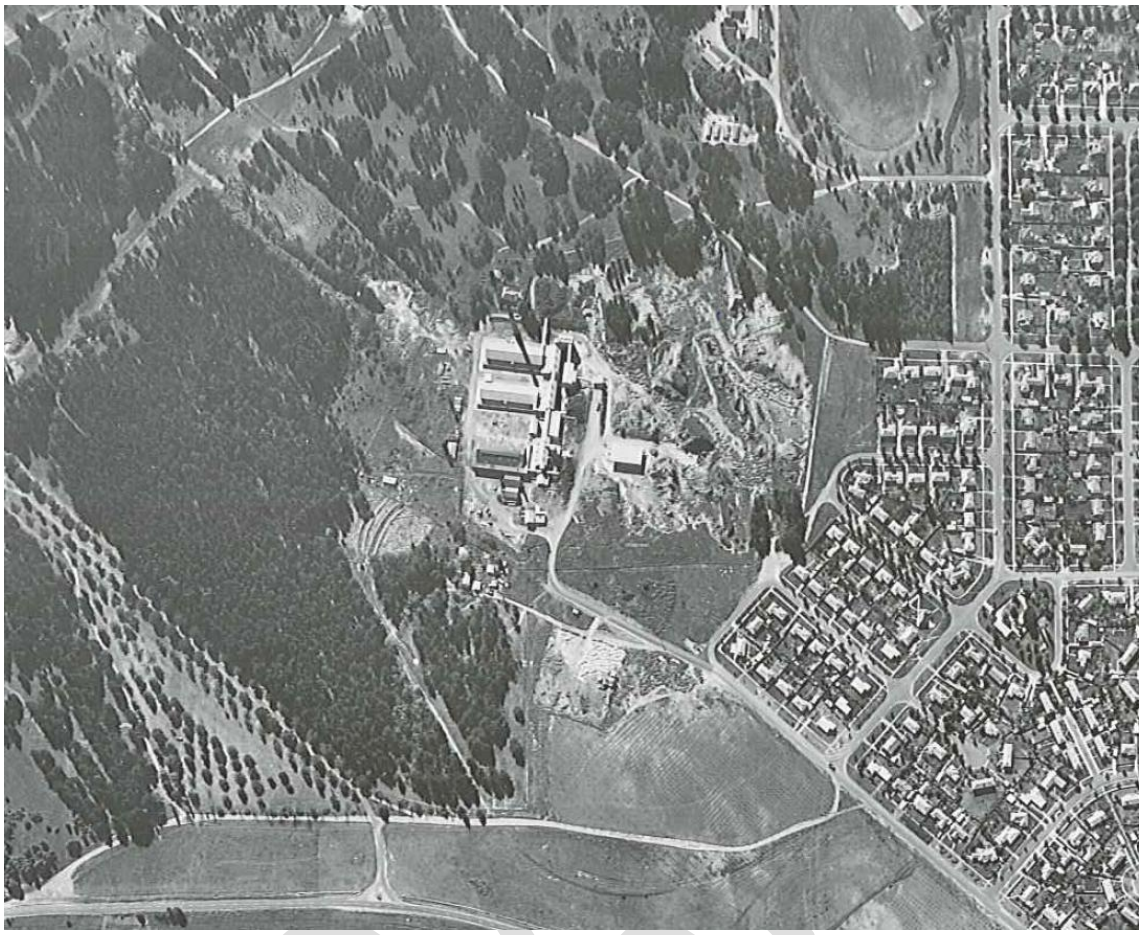


Figure 12 Aerial view of the brickworks site, 1961: note the square fenced area to the south of Denman Street
Source: ACTPLA



Figure 13 Walls/footings of the former Brickworks Hostel, 2010

10.5 Closure and redevelopment (1970s – current)

In 1967, the ACT Health Services Branch inspected the Brickworks Hostel and reported that the buildings were in a state of disrepair. Late in 1970 it was reported that the hostel was to be demolished. The 1972 aerial photograph (Figure 14) shows the site of the hostel as cleared land. The amusement hall had also been demolished by this time, although the associated landscaping (trees) survived. Further residential development had occurred to the north-east and east of the study area and to the north, the Royal Canberra Golf Course had been established.

The three downdraught kilns built in the 1960s can be seen to the south of the Staffordshire kiln, with a large square extrusion plant to its west – part of this large concrete slab was located on top of the rail sidings that extended to the north and south of the Staffordshire kiln. A comparison of the 1960s and 1970s aerial shows that new structures were constructed to the immediate east of the kilns, the latest iteration of development in this location. The c. 1940s residence to the north of the brickworks had been demolished by this time. This area has since been developed as part of the Lane Poole Place housing complex. The area of the old kilns and dormitories had been partly covered by a concrete slab for a car park by the 1970s.

By 1973, the Canberra Brickworks was considered to be in need of extensive modernisation and proposals were prepared by Commonwealth Brickworks Pty Ltd for upgrading. These proposals were rejected on environmental grounds and a new site for a brickworks was released at Mitchell, north of Canberra. The kilns at the Canberra Brickworks were unloaded for the last time in August 1976.

Also in 1976, local developer and businessman Alan Marr (A R Marr Pty Ltd) made a proposal to the NCDC to develop the brickworks and adjacent land as a tourist, recreation and retail destination, with associated housing to the east and north of the study area. Under Marr's scheme, the quarry was to be landscaped to include picnic areas, walking trails and a miniature railway (Figure 15). Marr succeeded in having the land re-zoned, and redevelopment works on the quarry commenced towards the end of 1978. This involved land fill and the creation of a reflection lake. The redeveloped brickworks was opened to the public as a tourist attraction in July 1979. A 1980 aerial photograph shows the study area at this time (Figure 16).

Marr also held an option to develop up to 212 townhouses on parts of the brickworks site. In 1980 the first stage, comprising 20 houses on the eastern side of the study area (along Woolls and Schomburgk Street), was commenced. Work on 45 houses to the north-west of the study area (now Lane Poole Place) began the following year. At this time, the railway remnants were not recognised or registered as a heritage site.

A R Marr Pty Ltd was placed in provisional liquidation in January 1980, and in 1984 the Commonwealth Government accepted the surrender of the lease for the brickworks from the lessee, A R Marr Pty, and paid $1.1 million for its interests.[11]

10.5.1 Analysis

This phase relates to the use of the study area after it ceased operations as a brickworks. The post-operational phase of the Canberra Brickworks makes a limited contribution to the identified values of the place. There are no sites of archaeological potential related to this phase.

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Figure 14 Aerial view of the Brickworks site, 1972: note the demolition of the Brickworks Hostel (indicated)
Source: ACTPLA

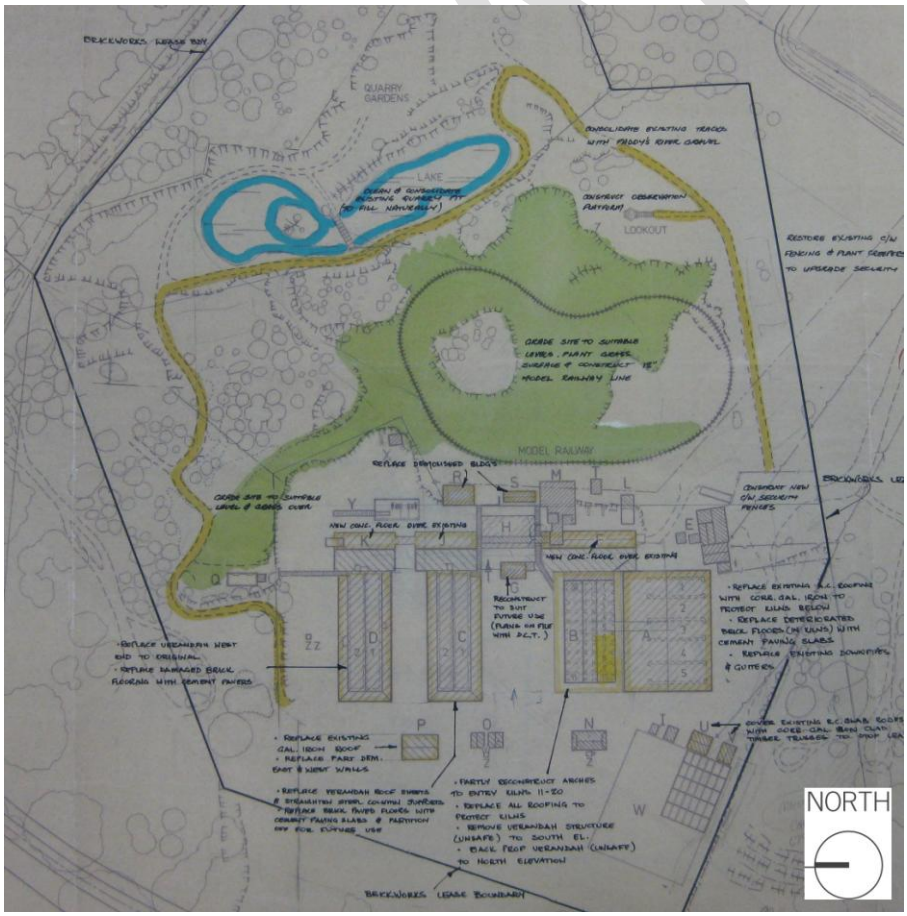


Figure 15 The A R Marr proposal for the Canberra Brickworks, c. 1977
Source: ACT Heritage Library



Figure 16 Aerial view of the brickworks site, 1980

11.0 Physical investigations

The historical analysis identified five areas of potential archaeological sensitivity within the study area. Physical investigations undertaken by NOHC confirmed these areas and also identified a further seven archaeological sites. All twelve sites are discussed below.

11.1 Predictive archaeological model

The core function of brick making in an industrial complex such as the Canberra Brickworks requires a network of interrelated sites and features that include domestic as well as industrial elements. Working from the core to the periphery, archaeological sites and features of heritage significance that may occur within the study area were predicted to include:

- Remains of the brickwork making process including kilns, flues, chimney stacks, conveyors, fan houses and raw material stockpiles;
- Remains of former dwellings including worker's camps, dormitories, houses and huts and associated infrastructure such as drainage;
- Remains of other buildings and structures such as stores, tanks for liquid storage (both above and underground), offices and workshops;
- Old fence lines, such as post and rail fencing; these may occur along inter- and outer-site boundaries;
- Transport infrastructure such as road and railway sites and features;

- Vegetation defining location of sites and features either as introduced plantings or clearings with vegetated borders

Structures of historical interest and heritage significance may be standing, ruined, buried, abandoned or still in use.

11.2 Survey coverage and visibility variables

The effectiveness of archaeological field survey is, to a large degree, related to the obtrusiveness of the sites being looked for and the quality of ground surface visibility. Ground surface visibility is a measure of the bare ground visible to the archaeologist during the survey. There are two main variables used to assess ground surface visibility - the frequency of exposure encountered by the surveyor, and the quality of visibility within those exposures. The predominant factors affecting the quality of ground surface visibility within an exposure are the extent of vegetation and ground litter, the depth and origin of exposure, the extent of recent sedimentary deposition, and the level of visual interference from surface gravels.

Visibility variables were estimated for all areas of survey within the study area. These estimates provide a measure with which to gauge the effectiveness of the survey and level of sampling conducted. They can also be used to gauge the number and type of sites that may not have been detected by the survey.

Visibility across the Canberra Brickworks site was of mixed quality. Vegetation growth and leaf litter across sites was the single largest contributing factor to poor visibility. Growth was either in the form of high growing grasses and weeds, or clusters of bushes and young trees, which at times impeded access as well as visibility. Visibility was low at those sites which have not been maintained (e.g. BRW6 and BRW2), and high at those which have been manicured (e.g. quarry and BRW1).

The built environment which forms the core of the complex was also a key contributor to poor visibility. It is assumed that any archaeology that may have survived the later construction of kilns and other structures in the precinct has been disturbed.

Overall, visibility was moderate, and the survey was able to obtain a comprehensive recording of archaeological sites and features. The individual sites have been described below.

11.3 Surface features

Twelve archaeological sites were identified within the brickworks site during the archaeological investigations. These sites comprised surface features and are described in detail below.

11.3.1 BRW1: Possible building platform and concrete features

A platform and a number of features including concrete and spoil are located on the south side of Denman Street, approximately 25m from the entrance to the brickworks. A vehicular track runs north-east to south-west on the western extremity of the site, and a fence line consisting of star pickets/pine posts and wire netting combined with barbed wire delineates the southern extremity. A small grove of trees are situated at the eastern end of the site. The site measures approximately 20m x 15m.

At the western end of the site there is a square concrete feature, approximately 1m x 1m, with an exposed top (Figure 17). This feature suggests a function associated with water, either for storage or drainage. Approximately 5m to the east of this square concrete feature is a visible line of grass die back, which suggests the presence of subsurface features. This line extends from north to south across the building platform that comprises the bulk of this site (Figure 18).

Site conditions are poor to fair. Two depressions identified within the platform suggest erosion or disturbance has occurred, while the in situ concrete features suggest a level of intactness. Visibility of this area was good, with only some low grass.

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Figure 17 View of BRW1 concrete feature, looking north
Source: NOHC



Figure 18 View looking north across BRW1, showing line of grass die off (centre left)
Source: NOHC

11.3.2 BRW2: Married quarters and Brickworks Hostel

This site is within an area that has been designated through historical records as the brickworks accommodation village.

A complex of structural features is located south of the brickworks fence line, and approximately 40m west of BRW1. The area is approximately 80m x 35m and extends southwards up a gentle slope to a road cutting that transects the southern portion of the site on an east-west alignment. A less formal vehicular track is situated along the same alignment as the more formal road, immediately to the south.

Site visibility was generally poor in this area with thick groves of blackberry bushes to the east, which also spread intermittently towards the west. This was interspersed with moderately dense patches of small saplings/trees, with dense grass throughout. A limited area had enhanced visibility due to a cleared path which ran through parts of the site and around a number of features. Occasional sawn off medium sized tree stumps were visible throughout the site.

The site is defined by a number of highly visible mounds of spoil and a platform. These mounds of spoil, if related to former structures on the site, suggest heavy disturbance and a poor to fair condition across the site generally. Various items of artefactual material are scattered throughout the area, such as sheets of tin, brick and tile fragments, concrete and bottle fragments. Some of the material is relatively modern, including old car parts and even a bicycle frame, suggesting dumping of rubbish not necessarily associated with the site.

Descriptions of identified individual features are provided below:

BRW2-A: Brick Feature and Mound

Situated at the western end of BRW2 and approximately 15m north of the road cutting, is a large mound of brick and concrete rubble covered in grassed topsoil atop a large rectangular brick feature. It measures approximately 6m x 2m, and up to 1 metre in height.

This brick feature is a substantial structural element of a former building and remains in situ unlike many of the other elements at this site. At the northern end of this structural feature is a large concrete lined drain or water trap, with remains of an iron grate (Figure 19). Brickwork around this feature, particularly the southern portion, shows signs of having been covered in tar or bitumen. Along the western side of the feature is a rectangular stall that is reminiscent of a fireplace or hearth recess (Figure 19). A piece of iron flue or furnace was identified as part of the spoil on this site, along with what appears to be a crumpled washtub (Figure 21). The bricks show a combination of different stamps and frog marks on their surface, including the early “CANBERRA C’WEALTH” stamp.

Slabs of brick and concrete are located around the feature, which are suggestive of walls or flooring remains, sheets of tin, iron girders and rods. A linear mound of rubble extends easterly from this main structural feature and is made up of cemented brick segments and other structural detritus.

This feature appears to correspond with the brickworks mess hall which was depicted in images from at least 1929.

BRW2-B: Metal spoil heap

A spoil made up largely of metal remains including tin, iron girders and rods, galvanized and non-galvanized pipes is situated approximately 15m east of BRW2-A (Figure 22). There is some brick material within this spoil, including what appears to be an in situ brick footing. There is also the occasional plank of milled timber. The northern side of this mound is bordered by a blackberry bush cluster.

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Figure 19 Detail of drain at northern end of BRW2-A
Source: NOHC



Figure 20 Detail of brick stall at BRW2-A
Source: NOHC



Figure 21 View looking wast across BRW2; note the washtub and brick stall to the west and rubble to the north
Source: NOHC



Figure 22 View looking east across BRW2-B
Source: NOHC

BRW2-C: Concrete slab

A concrete slab approximately 4m x 6m is located just south of the southern fence line of the brickworks at the western end of the site (Figure 23). The rendering is coloured red and has the remains of four toilet fittings running down the centre of the slab. The toilet bowls have been removed from the platform, although fragments of broken bowl and earthenware plumbing pipe exist around the slab (Figure 24). The alignment of the toilets suggest that the stalls were accessible from the northern side of the slab. A possible step or entrance way extends from the northern part of the slab in the centre. A stamped feature is evident in the north east corner of the slab suggesting a small closet, room or feature for what appears to be an ablutions block. The slab appears to be on the same alignment as BRW2-A, which is just further south. This structural feature appears to correspond with the brickworks ablution block which is depicted in images of this area from at least 1929. The ablution block suggests that it was more to do with the brickworks than it was to do with the accommodation of employees.

BRW2-D: Brick mound

Positioned just east of BRW2-C is a small mound made up largely of brick and brick fragments, along with rendered red brick (Figure 25). There are also segments or clusters of concrete blocks with broken red tile as aggregate. There is also the occasional piece of tin sheeting. It is possible, due to the red rendered brick, that this mound is a spoil heap for structural remains from BRW2-C.

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Figure 23 The concrete slab at
Source: NOHC



Figure 24 Remnant of one of the toilet fitting
Source: NOHC



Figure 25 Looking south-west towards BRW2-D
Source: NOHC

11.3.3 BRW3: Area of postholes and other remains

A complex of features that relate to various structures and infrastructure are located to the south of BRW2. This site covers approximately 100m x 50m. Visibility was fair to good due to patchiness of vegetation ranging from dense to light.

At the western extremity of the site is evidence of a modern "fringe dwellers" camp, with a hearth constructed of brick and concrete remains from structural features such as those encountered at BRW2. The hearth had been in recent use as evidenced by the condition of the fire remains within and the rubbish surrounding this feature. Evidence for a camp or rough shelter was also observed, with various planks nailed to trees and pallets repurposed for flooring or other means amongst a grove of young trees. Sheets of tin were also present and nylon rope tied around trunks in strategic places possibly for the use of attaching a tarpaulin or other such item for shelter purposes. Within the grove of saplings a circular feature with a diameter of approximately 10m was defined by postholes surrounding a large pallet like item in the centre (Figure 26). It is unclear whether the postholes predate the modern fringe camp. Early maps and plans suggest that this area to the west was originally a more ephemeral brickworks camp and then later into the twentieth century the location for dormitories or hostel like accommodation.

In proximity to the hearth and camp are mounds of structural spoil, consisting of brick and concrete, iron rods and metal sheeting, bottles and tin cans. To the east of the modern camp, and almost directly south from BRW2, a rectangular clearing was encountered. At the top of the slope to the south of the clearing a drainage line has been excavated, which runs approximately on an east-west alignment (Figure 27). No other structural features or remains were identified within this clearing between the drainage line and the northern border of the site. However, a slab timber fence or yard post is located at the northern end. The post itself appears to be early in origin, but has had modifications made to it by the addition of another slab bolted to the upright, and use of galvanized wire and nails, as opposed to non-galvanized iron nuts and bolts for other modifications (Figure 28). No other posts or holes were

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identified in the immediate vicinity. This clearing could have been the location of one of the hostels or dormitories.



Figure 26 Circle of post holes (indicated by pink flags), looking north
Source: NOHC



Figure 27 Drainage line at BRW3, looking west
Source: NOHC



Figure 28 Detail of slab post at BRW3
Source: NOHC

11.3.4 BRW4: Single men's quarters

A fenced yard area measuring approximately 80m x 80m is located to the south of BRW1. Defined by a star picket fence line with wire netting along the bottom portion and barbed wire on the upper portion, the yard is accessed by gates at the northern end from Denman Street and a gate in the south-west corner. Visibility was very good as the area is relatively clear of vegetation, with the exception of a light covering of low growing grass across parts, and the occasional low growing shrub and small tree. The yard rises up a gentle slope to the south. A layer of bitumen such as that used for road surfaces covers a good portion of the site (Figure 29) and this sits directly above a layer of bedrock, with only a thin layer of topsoil present in patches throughout the yard. No structural features were identified, although fragments of window glass were found near the northern entrance to the site (Figure 30). The condition of this area is good.

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Figure 29 Asphalted area at BRW4, looking east
Source: NOHC



Figure 30 Window glass at BRW4
Source: NOHC

11.3.5 BRW5: Clay feature and rubble

To the immediate west of the brickworks kilns is a silty clay feature up to 50m in diameter and 1 to 2m high, which appears to be a flat topped mound or stockpile of this resource (Figure 31). It is possible that it is a feature that has been created from earthworks in this area, however it does not sit on the same horizon as other surrounding features, such as the brickworks kilns. The location of this site is close to the former creek that fed into the precinct from its north-west corner. The silty clay material is different to any of the top soils and sediments around the rest of the precinct. Visibility of this area was good and the condition of this feature is good.

To the west of the mound is a series of depressions scattered throughout with brick and concrete rubble (Figure 32). These depressions are located between the mound to the east, and the railway remnants to the west. They could be associated with a former structure in the vicinity or rubble that has been

dumped from another location. An aerial image from 1950 (Figure 33) shows that a rectangular structure was once located in this vicinity. The overall condition of this element is generally fair and visibility is good.



Figure 31 Clay mound feature at BRW5, looking west
Source: NOHC

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Figure 32 Rubble and depressions at BRW5
Source: NOHC

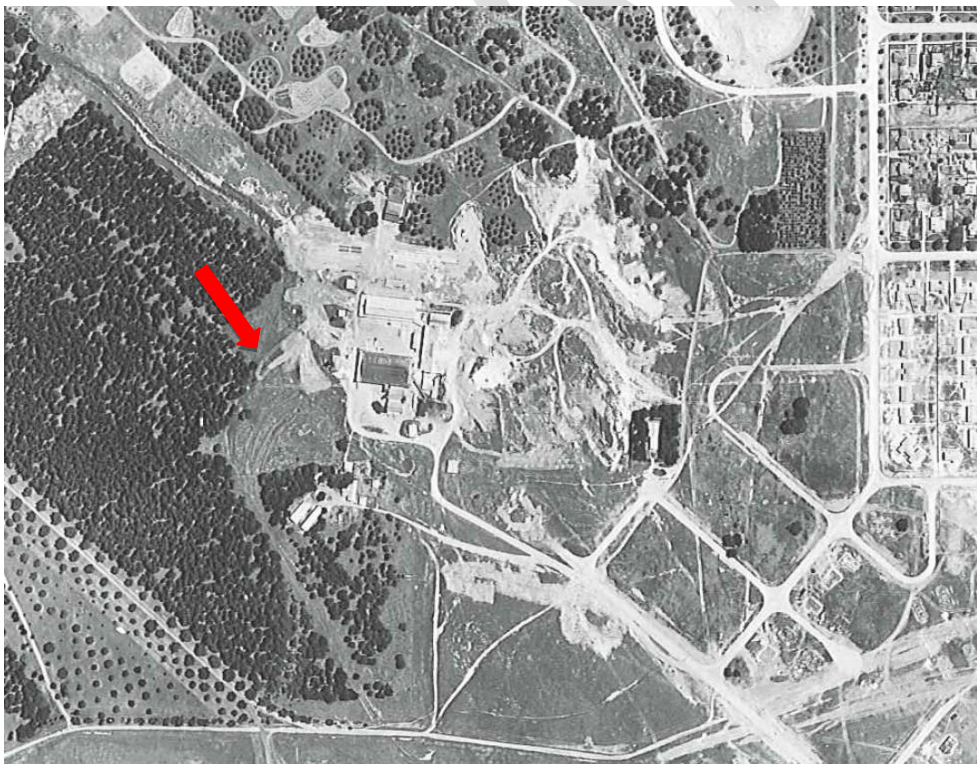


Figure 33 Aerial photograph of the Brickworks, 1950; the rectangular feature is indicated
Source: ACTPLA

11.3.6 BRW6: Rubble heap/refuse dump

This site is located at the north-west section of the precinct and consists of a mix of brick and concrete rubble located within a depression at the base of trees (Figure 34). The remains could be associated with a former structure in the vicinity or rubble that has been dumped from another location. An aerial photograph from the 1960s shows that a rectangular structure was once located in this vicinity. Visibility was poor in this area due to high growing vegetation in the form of grasses and weeds. Condition is fair.



Figure 34 Brick and concrete rubble surrounding trees at BRW6, looking north
Source: NOHC

11.3.7 BRW7: Quarry

The brickworks quarry is a large site located to the east of the brickworks buildings. Visibility is generally good across the quarry zone with features and elements able to be clearly identified through the low growing and manicured grass coverage.

Further east and up an incline, there are a number of depressions amongst a grove of pines along the edge of the quarry cliff (Figure 35). These depressions are uniform in size, approximately 1m in diameter and appear to be in a sequence. The historic aerial dating to 1950 (Figure 33) shows a series of circular features similar to these depressions extending west to east up the slope in a double row. The function or purpose of these depressions is unknown. On the eastern side of the quarry zone to the north is an example of an in ground circular tank that has been back filled with brick rubble, approximately 3 metres in diameter (Figure 36). This tank does not resemble the depressions in the south of the quarry in scale and known purpose.

At various locations along the quarry wall, particularly the eastern side, brick rubble has been back-filled against the face (Figure 37). This is either an example of disposing of seconds and damaged bricks, or to provide something of a retaining wall for the cliff face. The exactness of the placement suggests the latter.

A number of features and elements exist within the quarry floor itself. Starting at the south end of the quarry floor, a raised embankment of earth runs along the eastern contour of the quarry wall. This

feature belongs to a much later use of the brickworks as a tourist destination in the form of a model railway.

In the middle of the quarry floor are two mounds that have been covered with topsoil and grassy vegetation. Aerial imagery from the 1960s (Figure 38) shows a structure in the form of a large shelter or shed in the same location. These mounds could be evidence of this structure and its contents. This also confirms that there is likely to be intact subsurface material beneath these mounds dating to the original quarrying.

Along the north eastern edge of the quarry, the floor has been further excavated to create a pond or lake. This excavation dates to the time the brickworks precinct was a tourism facility. The quarry face to the west of this pond or lake in the north, shows stratigraphy that depicts a disposal event that has subsequently been capped by spoil from either the excavation of the pond/lake or from other areas. A layer of brick, concrete, glass, and iron exists along with a line of charcoal and burnt material approximately a metre below the surface (Figure 39).

The condition of the quarry is very good and its level of intactness is the highest standard when compared with other archaeological sites within the precinct.



Figure 35 Depression on south side of quarry edge
Source: NOHC



Figure 36 Tank at north-eastern edge of quarry, looking south
Source: NOHC



Figure 37 Rubble backfill along north-eastern edge of quarry face, looking east
Source: NOHC

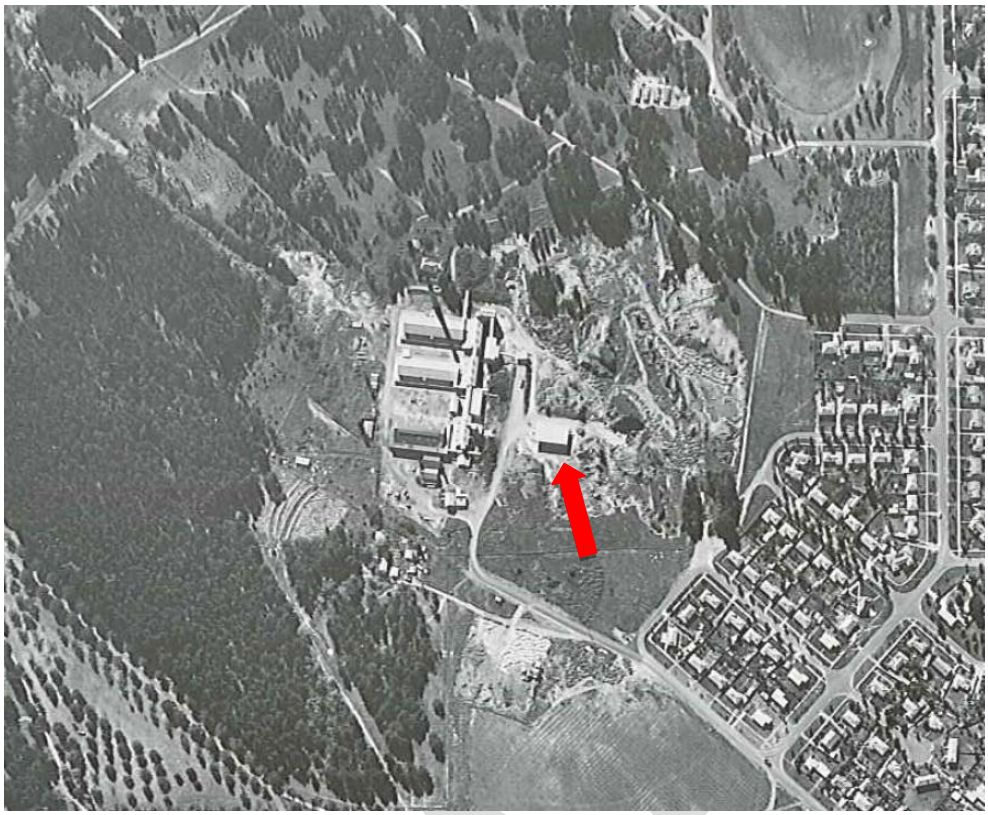


Figure 38 Aerial photograph of the Brickworks, 1961; the shelter is indicated
Source: ACTPLA



Figure 39 Quarry face showing layer of rubble and charcoal at northern end of quarry
Source: NOHC

11.3.8 BRW8: Old kiln and dormitories

The temporary brickworks was established in 1913. By August of that year, four open kilns were in use. This 'Old Kiln' area was located to the south-east of the permanent brickworks and a dormitories building was also located to the immediate north of the temporary kilns. These structures are likely to have been demolished by the mid-1920s.

Analysis of site plans and aerial photography demonstrates that this area has undergone some disturbance since the demolition of the temporary kilns and dormitory. Buildings can be seen in aerial images from the 1950s and car parking was introduced in the vicinity in the 1960s-70s, which involved the laying of concrete. This was removed by 1980. Along with the vehicular track that exists now, there are also occasional fragments of in situ concrete slab that are possibly associated with structures postdating the early kilns. The condition is assessed as poor to fair and likelihood of subsurface features for early kilns is low.

Archaeological deposits pertaining to built form from this era would be expected to comprise footings and machinery remnants. Material discard would be expected to be items of an industrial nature with the potential for some domestic material related to the dormitories (Figure 40).

11.3.9 BRW9: Cottage, stables, coal store

A cottage, with associated stable and coal store, was built c. 1913 to the north-east of the brickworks as part of the first stage of construction of the permanent brickworks. This cottage was demolished by 1947. The location of the cottage and outbuildings has been heavily trafficked over time, being located on a key route between the quarry pit and kilns and in close proximity to the primary crusher house and the elevator/conveyor. The site of the cottage and its outbuildings is therefore likely to have been disturbed by the introduction of roadways to the east of the kiln and machinery shops as a result of successive remodelling of the brickworks.

Material discard would generally be expected to be of a domestic nature, though there may be some industrial materials related to the stables and coal store. There may also be evidence of timber post holes or footings.



Figure 40 Location of the old kiln and dormitories looking east
Source: Lovell Chen

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11.3.10 BRW10: Railway remnants

The brickworks railway operated between 1923 and 1927, and all tracks had been removed by 1929. Evidence of the railway siding, in the form of cuttings in the landscape located to the south-west of the brickworks, could be seen in aerial views of the site well into the 1970s and are still evident (Figure 41 and Figure 42). Self-seeded vegetation has since reclaimed much of the area. Although all remnants of the track were removed in the 1920s, and a period of 90 years has elapsed since then, there is some limited potential for archaeological evidence that would enhance an understanding of the railway and its operation.

The potential for subsurface remains relating to the railway, including drainage channels, is low, but cannot be discounted. Potential archaeological features related to the railway may include the railway cutting, timber sleepers, iron bolts and metal rails.



Figure 41 Cutting in landscape showing the original alignment of the brickworks railway
Source: Lovell Chen



Figure 42 Cutting in landscape showing the original alignment of the brickworks railway
Source: Lovell Chen

11.3.11 BRW11: Railway siding (extension to the north)

The railway siding extended into the brickworks site and terminated to the north and south of the original Staffordshire kiln. Aerials indicate that part of this land was later covered by the concrete slab for the extrusion plant, however there is some potential for archaeological evidence.

There is some potential for the evidence of tracks extending to the north and south of the Staffordshire kiln. Potential archaeological features related to the railway may include the railway cutting, timber sleepers, iron bolts and metal rails.

11.3.12 BRW12: Flues/subsurface workings

Underground flues and workings connected the kilns to their associated fan stacks. These are understood to still remain in situ and are unlikely to have been disturbed.



Figure 43 View looking east over the extrusion plant, part of the northern extension to the railway reserve
Source: Lovell Chen

12.0 Findings

Based on the research and archaeological investigations conducted for this report, 12 areas of archaeological potential have been identified (Figure 44):

BRW1: Building platform and concrete features

BRW2: Married quarters and Brickworks Hostel

BRW3: Area of postholes and other remains

BRW4: Single men's quarters

BRW5: Clay feature and rubble

BRW6: Rubble heap/refuse dump

BRW7: Quarry

BRW8: Old kiln and dormitories

BRW9: Cottage, stables, coal store

BRW10: Railway remnants

BRW11: Railway siding extension (to north)

BRW12: Flues/subsurface workings

The archaeological potential of each area is discussed below.

Area	Comment	Archaeological potential
BRW1 Building platform and concrete features	This feature suggests a function associated with water, either for storage or drainage. The bulk of the feature remains below ground. Site condition is poor to fair, with two depressions within the platform suggesting a level of erosion or disturbance. Even so, the in situ features of concrete, including the square feature and the platform remnants, suggest a level of intactness.	Moderate archaeological potential
BRW2 Married quarters and Brickworks Hostel	The married quarters, comprising a mess hall and a number of smaller sleeping quarters, was built to the south-west of the brickworks in the 1920s. This was replaced in the 1940s by the Brickworks Hostel, at least part of which appears to have been built on the site of the married quarters. The hostel was demolished in the 1970s. This area has remained undisturbed since the demolition of the hostel, and above-ground footings/physical evidence were located at the site in 2010 and 2016. Finds have the potential to inform an understanding of the daily lives and living conditions of the workers who were employed at the brickworks.	High archaeological potential.
BRW3 Area of postholes and other remains	Early maps and plans suggest that this area to the west was originally a more ephemeral brickworks camp and then later into the twentieth century the location for dormitories or hostel like accommodation. Condition of site is good.	High archaeological potential

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Area	Comment	Archaeological potential
BRW4 Single men's quarters	The single men's quarters was located on the south side of Denman Street in close proximity to the entrance of the brickworks site. While the exact location has not been determined, it is possible that it was in the same location as the square expanse identified in the 1961 - 1980 aerials. If so, there is limited potential for archaeological remains as the site has been relatively disturbed.	Low archaeological potential
BRW5 Clay feature and rubble	Clay feature: It is possible that it has been a feature created from earthworks in this area, however, it does not sit on the same horizon as other features surrounding, such as the Brickworks kilns themselves. The condition of this feature is good. Rubble: The remains could be associated with a former structure in the vicinity or rubble that has been dumped from another location. An aerial image from 1950 shows that a rectangular structure stood in this vicinity. The overall condition of this element is generally fair	Low archaeological potential
BRW6 Rubble heap/refuse dump (including clay feature)	The land to the west of the kilns was quarried before being converted into a rubble heap/refuse dump by the 1940s. The man-made modification of this area is discernible in the aerial photography of the site. The use of this area as a rubble heap/rubbish dump means that there is potential for some refuse of an industrial nature to remain sub-surface. This area was overlaid with concrete by the 1970s, which has since been removed. It is possible that these works disturbed any sub-surface remains.	Low archaeological potential
BRW7 Quarry	In 1910, King O'Malley announced Government plans for the construction of a brickworks to serve the Federal Capital. In July 1912, the area at Yarralumla was gazetted and development of the site began in 1913. A detail survey plan of 1916 shows the early configuration of the quarry to the east of the brickworks buildings. Unsurprisingly, this area developed and changed throughout the operation of the site. The condition of the quarry site today ranges from poor to fair and comprises fragments of in situ concrete slab and a number of depressions along the edge of the quarry cliff.	High archaeological potential
BRW8 Old kiln and	The temporary brickworks was established in 1913. By August of that year, four open kilns were in use. This 'Old Kiln' area was located to the south-east of	Low archaeological potential.

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Area	Comment	Archaeological potential
dormitories	the permanent brickworks and a dormitories building was also located to the immediate north of the temporary kilns. These structures are likely to have been demolished by the mid-1920s. Analysis of site plans and aerial photography demonstrates that this area has remained relatively undisturbed since the demolition of the temporary kilns and dormitory. Some car parking was introduced in the vicinity in the 1960s-70s, which involved the laying of concrete. This was removed by 1980. The area is located in close proximity to the main access road leading to the brickworks, and as a result, there may have been some disturbance through vehicle movement. No other land disturbance appears to have occurred here.	
BRW9 Cottage, stables, coal store	A cottage, with associated stable and coal store, was built c. 1913 to the north-east of the brickworks as part of the first stage of construction of the permanent brickworks. This cottage was demolished by 1947. The site of the cottage and its outbuildings is likely to have been disturbed by the introduction of roadways to the east of the kiln and machinery shops as a result of successive remodelling of the brickworks.	Low archaeological potential
BRW10 Railway remnants	The brickworks railway operated between 1923 and 1927, and all tracks had been removed by 1929. Evidence of the railway siding, in the form of cuttings in the landscape located to the south-west of the brickworks, could be seen in aerial views of the site well into the 1970s. Self-seeded vegetation has since reclaimed much of the area. Although all remnants of the track were removed in the 1920s, and a period of 90 years has elapsed since then, there is some limited potential for archaeological evidence that would enhance an understanding of the railway and its operation.	Moderate archaeological potential
BRW11 Railway siding extension (to north)	The railway siding extended into the brickworks site and terminated to the north and south of the original Staffordshire kiln. Aerials indicate that part of this land was later covered by the concrete slab for the extrusion plant, however there is some potential for archaeological evidence.	Moderate archaeological potential
BRW12 Flues/subsurface workings	Underground flues and workings connected the kilns to their associated fan stacks. These are understood to still remain in situ and are unlikely to have been disturbed.	High archaeological potential

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AREAS OF ARCHAEOLOGICAL POTENTIAL

SITE	NAME
BRW1	Building platform and concrete features
BRW2	Married quarters and Brickworks Hostel
BRW3	Area of postholes and other remains
BRW4	Single men's quarters
BRW5	Clay feature and rubble
BRW6	Rubble heap/refuse dump
BRW7	Quarry
BRW8	Old kiln and dormitories
BRW9	Cottage, stables, coal store
BRW10	Railway remnants
BRW11	Railway siding extension (to north)
BRW12	Flues/subsurface workings

LEVELS OF ARCHAEOLOGICAL POTENTIAL

- high
- moderate
- low
- study area

Figure 44 Areas of archaeological potential at the study area: the Canberra Brickworks and environs is indicated by the solid red line

13.0 Next steps

This report has identified areas where historical archaeological remains may be present at the study area and satisfies the conditions of Policy 15, as outlined in the Canberra Brickworks Conservation Management Plan (2010).

In order to manage the potential archaeological sensitivity of the site, and the consequent possibility of archaeological remains being disturbed during future sub-surface works within the study area, archaeological management protocols are recommended. This is in accordance with the *Heritage Act 2004,* which states that, under Section 74 it is an offence to engage in conduct that diminishes the heritage significance of a place or object. Section 76 provides exceptions to Section 74 where the person engages in conduct in accordance with a number of listed processes. This includes obtaining an Excavation Permit, which must be approved by ACT Heritage. While different methods of archaeological management are proposed according to their level of archaeological potential, one Excavation Permit will be required which will cover all archaeological works, including monitoring. This Excavation Permit will set out the proposed archaeological methods (outlined below) for when the archaeological material is encountered and these methods are to be agreed by ACT Heritage.

Areas of moderate-high potential

Areas of moderate to high archaeological potential comprise those parts of the study area which have not been subject to extensive and intensive demolition, site preparation and construction works which have occurred elsewhere within the site during the development of the Brickworks. It is recommended that, prior to any works or development in these areas, a programme of subsurface archaeological testing be implemented for the purposes of determining the actual archaeological values of these areas. As well as identifying the actual level of archaeological sensitivity, testing will also assist in defining the extent of areas which may require further investigation after the completion of the testing programme. As mentioned above, an Excavation Permit will be required for these works.

There are two potential outcomes of the testing programme:

- Areas of moderate to high archaeological significance are identified which will require further investigation through controlled open area excavation
- The actual values of the zone or parts thereof of the area are determined to be of low archaeological significance

In the case of the first outcome consultation and negotiation with ACT Heritage will determine the extent of the area to be subject to detailed manual excavation.

In the second case, areas determined to be of low archaeological significance may either not be subject to further investigation or may be incorporated within the area subject to monitoring (see below).

Areas of low archaeological potential

Areas of low archaeological potential within the site have been subject to significant disturbance through the extensive development and remodelling of the Brickworks site during its operation. No archaeological testing programme is recommended for these areas. Rather a programme of monitoring is recommended for the purposes of providing an assessment of the actual archaeological values of these areas. As mentioned above, an Excavation Permit will be required for these works.

Where the monitoring programme reveals that no or a low potential for historical archaeological remains exists it is recommended that the monitoring programme be replaced by a watching brief, whereby a suitably qualified archaeologist will attend the site as and when archaeological materials are encountered for the purposes of documentation and assessment. This, or a similar, protocol will be agreed upon in consultation with ACT Heritage during the application and approval of the Excavation Permit.

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In the event that the monitoring programme identifies that the archaeological potential of these areas is greater than first predicted or where isolated pockets of relatively intact archaeological materials area present these occurrences will be dealt with as per the requirements outlined above for areas of moderate to high potential.

It is recommended that any works to the railway siding area, whether archaeological or future development, are minimal and do not alter the legibility of the modified landscape as it remains evident today. It is noted however that this area falls with a bushfire prone area, and for bushfire management reasons, removal of some vegetation may be necessary to allow for land management.

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1 ACT Heritage Council, Cultural Heritage Reporting Policy, 1 July 2015, accessed via www.environment.act.gov.au, 6 January 2016.

2 Navin Officer Heritage Consultants Pty Ltd, Canberra Brickworks, Yarralumla, ACT, Stage 1: Aboriginal Cultural Heritage Assessment, 14 August 2014, Executive Summary.

3 ACT Heritage Council, Heritage Advice to Navin Officer Heritage Consultants, 10 September 2014.

4 Lovell Chen, Canberra Brickworks Conservation Management Plan, April 2010, p. 240.

5 ACT Heritage Council, *Heritage Act 2004*, p.6.

6 ACT Heritage Council, *Cultural Heritage Reporting Policy*, July 2015, p.8.

7 SMEC, *Preliminary Geotechnical Site Investigation for the Canberra Brickworks,* prepared for Land Development Agency, 2013.

8 SMEC, *Preliminary Geotechnical Site Investigation for the Canberra Brickworks,* prepared for Land Development Agency, 2013.

9 AECOM, *Stage 1 Ste Investigation Report for Canberra Brickworks Precinct,* prepared for Land Development Agency, 2016.

10 ACT Heritage Council, *Heritage (Decision about Registration for Westbourne Woods, Yarralumla) Notice 2011*, p.5.

11 Lester Firth Associates Pty Ltd, Old Canberra Brickworks Conservation Plan, June 1986, Section 2.1.5.

Appendix E

GML Heritage, Canberra Brickworks Precinct—Contamination Testing Archaeological Monitoring, March 2021

Canberra Brickworks Precinct

Archaeological Monitoring for Environmental Testing

Doma Group (Doma) engaged GML Heritage Pty Ltd (GML) to provide archaeological monitoring for environmental testing undertaken by Agon Environmental Pty Ltd (Agon Environmental) at the Canberra Brickworks Precinct (the Precinct or the Brickworks). The monitoring occurred during 16–18 and 25 February 2021.

The works occurred across several areas of archaeological potential identified in the 2016 Archaeological Assessment (AA) prepared by Navin Officer Heritage Consultants Pty Ltd (NOHC). Three of these areas had been selected for focused archaeological investigation, and therefore required monitoring during the environmental testing. These were (Figure 1):

- Brickworks (BRW) 3—Area of postholes and other remains;
- BRW7—Quarry; and
- BRW11—Railway siding extension.

The following report summarises the archaeological observations made during the monitoring.

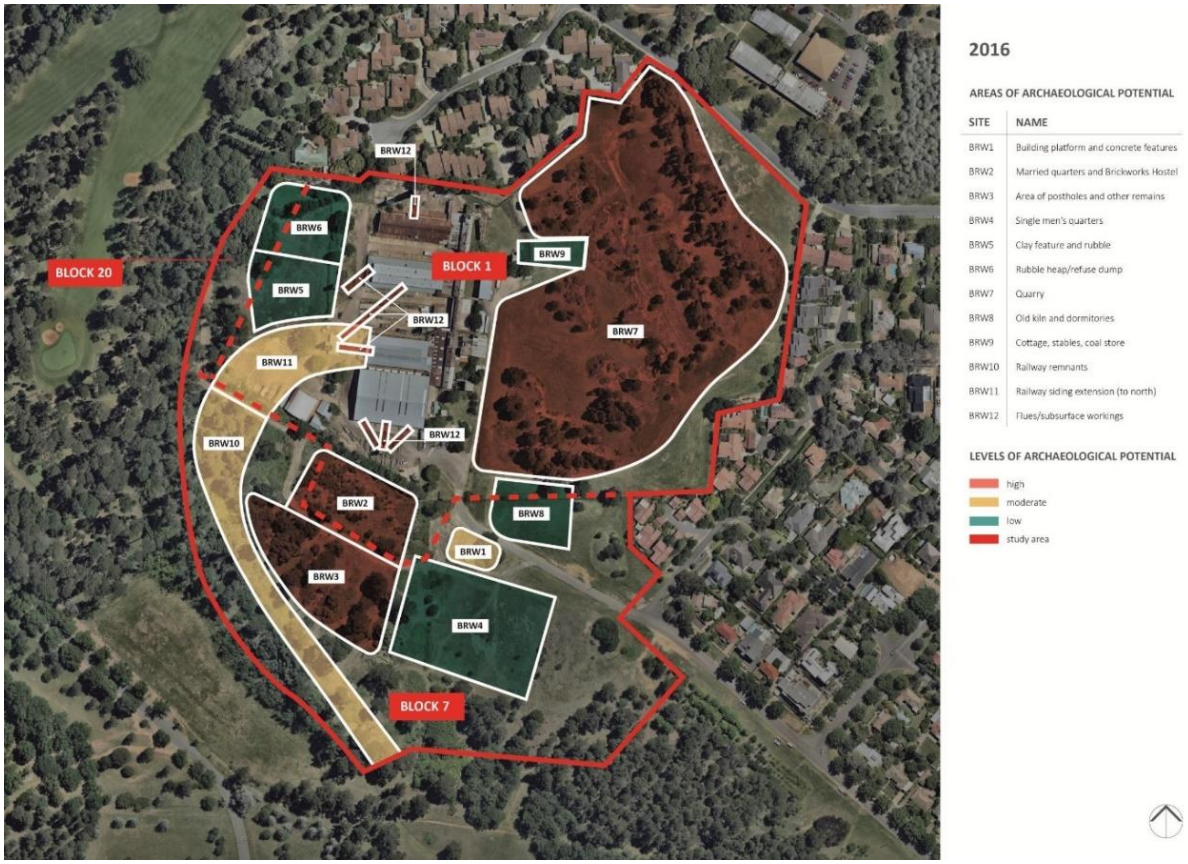


Figure 1 Areas of archaeological potential. (Source: NOHC, 2016)

Excavation process

The test pits (TP) were excavated mechanically. This primarily occurred with a toothed bucket in BRW7, although a flat-edged bucked was used in BRW3 and 11. Each TP was excavated until:

- bedrock or natural basal clay horizons were reached;
- the soil matrix collapsed; or
- the maximum reach of the excavator machine was exceeded.

A total of 34 TPs were monitored for archaeological remains (Figure 2). This comprised two TPs in BRW3, 28 TPs in BRW7, and four TPs in BRW11. Excavation was halted in three TPs due to the presence of in situ archaeological features that warranted detailed investigation during the focused archaeological investigations.

Table 1 Summary of results.

Area	BRW3	BRW7	BRW11
Natural soils only	2	13	0
Archaeological deposits—Low significance	0	14	3
Archaeological deposits—Required further investigation	0	1	2
Total	**2**	**28**	**4**

Artefacts identified during the excavation were recorded on site where possible. Examples were collected for further assessment if they were diagnostic and yielded important contextual information, and were easily transportable.

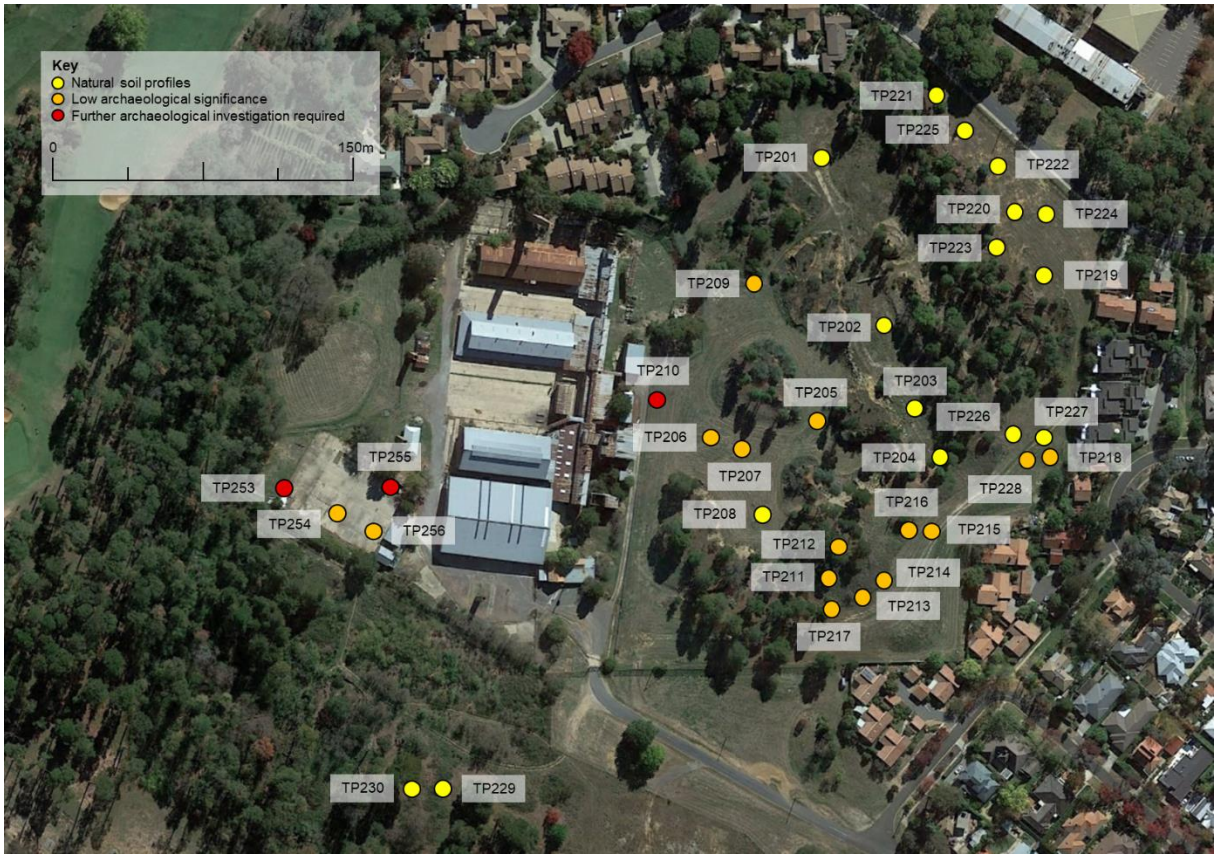


Figure 2 TPs subject to archaeological monitoring. (Source: Google Earth, with GML overlay 2021)

Conclusion

The following observations were made during the monitoring:

- BRW3—No archaeological deposits or features were identified in this area during monitoring.
- BRW7—Vast quantities of brick rubble and general waste deposits were located throughout the entire quarry. These were particularly concentrated and deep along the eastern ridge, where rubble deposits greater than 7 metres were identified. The brick contained within the deposits predominantly comprised 'CB' frogged bricks, indicating they dumped during or immediately following the post-war (1944–1976) production period of the Brickworks. No evidence of any mining activities or structures were identified during the monitoring.
- BRW11—Archaeological evidence primarily comprised of contaminated natural soils or fills pressed into natural. A 'basin' for a machine and several drainage features likely associated with the 1970s extrusion plant was identified, as was a metal surface possibly associated with the 1920s railway siding extension.

The following table details the observations made for each TP.

Table 2 Observations made during archaeological monitoring.

TP	Description		Photograph
BRW2			
229	*Total depth*	1 metre	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soils, no archaeological deposits identified	
230	*Total depth*	1 metre	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soils, no archaeological deposits identified	
BRW7			
201	*Total depth*	0.2 metres	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Located within the 'reflection lake' created in c1978 by A R Marr Pty Ltd. Any pre-existing archaeological deposits would have been removed when the lake was excavated	

TP	Description		Photograph
202	*Total depth*	0.2 metres	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Located within the 'reflection lake' created in c1978 by A R Marr Pty Ltd. Any pre-existing archaeological deposits would have been removed when the lake was excavated	
203	*Total depth*	0.2 metres	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Located within the 'reflection lake' created in c1978 by A R Marr Pty Ltd. Any pre-existing archaeological deposits would have been removed when the lake was excavated	
204	*Total depth*	0.7 metres	
	Archaeological deposit/s	1. Crushed granite lens, approx. 0.25 metres below ground surface, 0.02 metres deep	
	Artefacts	Nil	
	Interpretation	Probable intentional dump of materials, potentially as by-product during mining process	

TP	Description		Photograph
205	*Total depth*	4.5 metres	 
	Archaeological deposit/s	1. Friable fill, <15% brick rubble ('CB' frog), immediately below ground surface, approx. 0.3 metres deep 2. Yellow clayey deposit, approx. 0.31 metres below ground surface, approx. 0.05 metres deep 3. Crushed granite deposit, approx. 0.36 metres below ground surface, approx. 0.02–0.05 metres deep 4. Slag/ash deposit, approx. 0.41 metres below ground surface, approx. 0.02–0.2 metres deep 5. Friable fill, <10% brick rubble ('CB' frog), approx. 0.6 metres below ground surface, approx. 3.5 metres deep	
	Artefacts	Misc. metal sheet (likely similar to sheet and railway track identified in TP212)	
	Interpretation	Intentional sequential dump of materials, lack of artefactual inclusions indicates little about purpose, however, presence of 'CB' frogs indicates post-war date for deposition	
206	*Total depth*	2.5 metres	 
	Archaeological deposit/s	1. Friable fill, <5% brick rubble ('CB' frog), immediately below ground surface, approx. 0.7 metres deep 2. Some lenses of clayey material within fill, no clear stratification	
	Artefacts	Misc. metal sheet, industrial spring	
	Interpretation	Intentional sequential dump of materials, lack of artefactual inclusions indicates little about date of deposition or purpose	

TP	Description		Photograph
207	*Total depth*	2.2 metres	   
	Archaeological deposit/s	1. Friable fill, <10% brick rubble ('CB' frog), immediately below ground surface, approx. 0.5 metres deep 2. Slag/ash deposit, approx. 0.5 metres below ground surface, approx. 0.05–0.2 metres deep 3. Yellow clayey deposit, approx. 0.52 metres below ground surface, approx. 0.05–0.2 metres deep 4. Friable fill, <5% brick rubble ('CB' frog), approx. 0.72 metres below ground surface, approx. 0.15 metres deep 5. Crushed granite deposit, approx. 0.87 metres below ground surface, approx. 0.3 metres deep	
	Artefacts	Misc. metal, barrel collar, misc. machinery	
	Interpretation	Intentional sequential dump of waste materials inclusive of rubbish, likely collected from other areas of the site and dumped within a 'vacant' space	

TP	Description		Photograph
208	*Total depth*	1.1 metres	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soils, no archaeological deposits identified	
209	*Total depth*	4 metres	
	Archaeological deposit/s	1. Friable fill, 40% brick rubble (predominantly 'CB' frog, some air bricks), immediately below ground surface, approx. 0.4 metres deep 2. Yellow clayey/ash deposit, <20% brick (predominantly 'CB' frog, some air bricks), approx. 0.4 metres below ground surface, approx. 0.3 metres deep 3. Slag/ash deposit, approx. 0.7 metres below ground surface, approx. 0.4 metres deep 4. Friable fill, 85% brick rubble (predominantly 'CB' frog, some air bricks), approx. 1.1m below ground surface, approx. 3m deep	
	Artefacts	Misc. metal (incl. sheets, cable, strips), leather, string, mining tools, misc. glass, auger machine, c late 1960s/early 1970s 'Tooheys' beer cans, c1960 'Fanta' bottle, unknown date 'Bega Yogurt' lid, misc. plastic	
	Interpretation	Intentional sequential dump of waste materials inclusive of rubbish, likely collected from other areas of the site and dumped within a 'vacant' space	

TP	Description		Photograph
			
			
			
210	*Total depth*	0.5 metres	
	Archaeological deposit/s	1. Friable fill, immediately below ground surface, approx. 0.2 metres deep 2. Light brown deposit, approx. 0.2 metres below ground surface, approx. 0.05 metres deep 3. Charcoal deposit, approx. 0.25 metres below ground surface, depth unknown	
	Artefacts	Nil	
	Interpretation	TP closed due to identification of potentially in situ railway track. Reopened during archaeological investigations as Test Trench 1	

TP	Description		Photograph
211	*Total depth*	3 metres	
	Archaeological deposit/s	1. Friable fill, immediately below ground surface approx. 0.6 metres deep 2. Crushed granite deposit, approx. 0.6 metres below ground surface, approx. 0.2 metres deep 3. Yellow clayey deposit, approx. 0.8 metres below ground surface, approx. 0.05 metres deep 4. Slag/ash deposit, 40% brick rubble ('CB' frog) approx. 0.85 metres below ground surface, approx. 800mm deep	
	Artefacts	Nil	
	Interpretation	Deposit of waste brick material, likely collected from other areas of the site and dumped within a 'vacant' space	
212	*Total depth*	5 metres	
	Archaeological deposit/s	1. Friable fill, <10% brick rubble ('CB' frog), immediately below ground surface, approx. 5 metres deep	
	Artefacts	Railway track (including attachment plate), misc. metal pipe	
	Interpretation	Intentional dump of materials, presence of 'CB' frogs indicates post-war date for deposition	 

TP	Description		Photograph
			
213	*Total depth*	4 metres	
	Archaeological deposit/s	1. Friable fill, <5% brick rubble ('CB' frog), immediately below ground surface, approx. 4 metres deep	
	Artefacts	Nil	
	Interpretation	Intentional sequential dump of materials, lack of artefactual inclusions indicates little about purpose, however, presence of 'CB' frogs indicates post-war date for deposition	

TP	Description		Photograph
214	*Total depth*	7 metres	
	Archaeological deposit/s	1. Friable fill, <5% brick rubble (‘CB’ frog), immediately below ground surface, approx. 3 metres deep 2. Crushed granite deposit, approx. 3 metres below ground surface, approx. 0.3 metres deep 3. Friable fill, 10% brick rubble (‘CB’ frog), approx. 3.3 metres below ground surface, approx. 1 metre deep 4. Crushed granite deposit, approx. 4.3 metres below ground surface, approx. 0.3 metres deep 5. Friable fill, 25% brick rubble (‘CB’ frog, one ‘Canberra C’wealth’ frog), approx. 4.6 metres below ground surface, depth unknown due to excavator machine exceeding reach	
	Artefacts	Mortared ‘CB’ frog brick block, English bond, 8 courses, identified at approx. 6.5 metres deep	
	Interpretation	Deposit of waste brick material, likely collected from other areas of the site and dumped within a ‘vacant’ space	

TP	Description		Photograph
215	*Total depth*	1 metre	
	Archaeological deposit/s	1. Friable fill, <10% brick rubble ('CB' frog), immediately below ground surface, approx. 0.6 metres deep	
	Artefacts	Misc. glass	
	Interpretation	Deposit of waste material, likely collected from other areas of the site and dumped within a 'vacant' space	
216	*Total depth*	5 metres	
	Archaeological deposit/s	1. Friable fill, <5% brick rubble ('CB frog'), immediately below ground surface, approx. 1.5 metres deep 2. Friable fill, 10% brick rubble ('CB frog'), approx. 1.5 metres below ground surface, approx. 1.5 metres deep 3. Friable fill, 15% brick rubble (predominantly 'CB' frog, some 'Canberra' frog), approx. 3 metres below ground surface, approx. 2 metres deep	
	Artefacts	Misc. machinery piece, railway track, timber pieces	
	Interpretation	Deposit of waste material, likely collected from other areas of the site and dumped within a 'vacant' space	

TP	Description		Photograph
			
217	*Total depth*	5 metres	
	Archaeological deposit/s	1. Friable fill, 70% brick rubble ('CB' frog), immediately below ground surface, approx. 5 metres deep	
	Artefacts	c1934–1948 'Hellier's Cordial' bottle, misc. metal sheets, 'CB' frogged brick with slag attachment, misc. metal collar	
	Interpretation	Deposit of waste brick material, likely collected from other areas of the site and dumped within a 'vacant' space	

TP	Description	Photograph
		
		

TP	Description		Photograph
218	*Total depth*	3 metres	
	Archaeological deposit/s	1. Friable fill, 80% brick rubble (predominantly air bricks, some 'CB' frogs), located immediately below ground surface, approx. 3 metres deep	
	Artefacts	Misc. machinery parts (cogs, gear box, piston), mining tools, misc. metal sheets, waffle maker	
	Interpretation	Deposit of waste brick material, likely collected from other areas of the site and dumped within a 'vacant' space	

TP	Description		Photograph
219	*Total depth*	0.2 metres	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soil, no archaeological deposits identified	
220	*Total depth*	1 metre	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soil, no archaeological deposits identified	
221	*Total depth*	0.2 metres	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soil, no archaeological deposits identified	
222	*Total depth*	0.2 metres	–
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soil, no archaeological deposits identified	
223	*Total depth*	1 metre	–
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soil, no archaeological deposits identified	

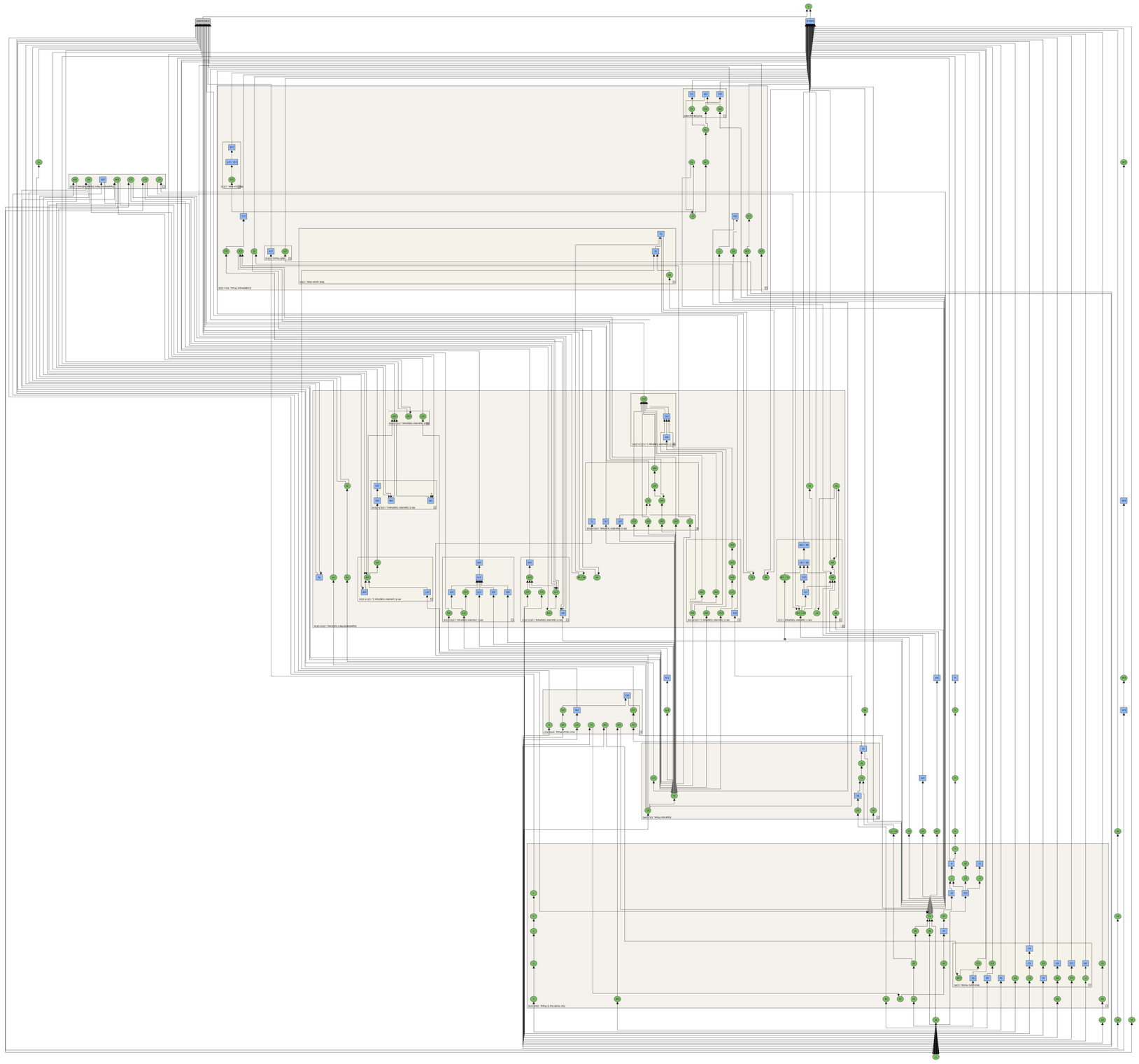
TP	Description		Photograph
224	*Total depth*	1 metre	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soil, no archaeological deposits identified	
225	*Total depth*	1 metre	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soil, no archaeological deposits identified	
226	*Total depth*	1 metre	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soil, no archaeological deposits identified	
227	*Total depth*	0.3 metres	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soil, no archaeological deposits identified	

TP	Description		Photograph
228	*Total depth*	2.5 metres	
	Archaeological deposit/s	1. Loose fill, <10% brick rubble ('CB' frog), immediately below ground surface, approx. 0.2 metres deep 2. Loose fill, 75% brick rubble ('CB' frog), approx. 0.2 metres below ground surface, 0.5–1.1 metres deep	
	Artefacts	Leather piece	
	Interpretation	Deposit 1 was located within a 'cut' feature. The cut was unlikely to be natural due to a lack of clear soil horizons. However, other brick deposits on the eastern edge of the quarry have been dumped on the natural landform without modification to the land surface. This suggests that the cut may have been created during another event—such as quarrying, which would result in an irregular cut edge—and later utilised during the brick dumping event. The bricks were likely collected from other areas of the site and dumped within a 'vacant' space	
BRW11			
253	*Total depth*	0.2 metres	
	Archaeological deposit/s	Nil	
	Artefacts	Brick rubble and unidentified metal object pressed into natural soil	
	Interpretation	TP closed due to identification of brick rubble and metal object (potentially in situ railway track). Reopened during archaeological investigations as Test Trench 4	
254	*Total depth*	0.2 metres	
	Archaeological deposit/s	3. Compact dark brownish clayey deposit, immediately below the ground surface, approx. 0.1 metres deep	
	Artefacts	Nil	
	Interpretation	Localised fill pressed into natural soil, lack of artefactual inclusions indicates little about date of deposition or purpose	

TP	Description		Photograph
255	*Total depth*	0.35 metres	
	Archaeological deposit/s	1. Friable greyish silt, 85% crushed shale, located immediately below ground surface, depth not fully excavated 2. Cast concrete 'basin' 3. Drainage feature at eastern end	
	Artefacts	Nil	
	Interpretation	TP closed due to identification of 'basin' and drainage feature. Reopened during archaeological investigations as Test Trench 3	
256	*Total depth*	0.2 metres	
	Archaeological deposit/s	Nil	
	Artefacts	Nil	
	Interpretation	Natural soil, discoloured through contamination processes, no archaeological deposits identified	

Appendix F

Records made during March–April and July–August 2021 archaeological test excavations



General information									Harris Matrix						Interpretation		
BRW	EU	Context	Type	Loc.	Description	Dim.	Asso.	Sig.	Above	Below	Cuts	Fills	Cut By	Filled By	Date	Phase	Interpretation
BRW7	TT1	1	Deposit	Entire extent	Moderately compact mid orangey brown sandy clay with red and yellow mottling	7.6m long, 2.1m wide, 0.15m deep	-	Nil	2, 5	Topsoil	-	-	-	-	Post 1944	Post World War II Phase, 1944-1976	Intentional dump of materials, lack of artefactual inclusions indicates little about purpose
BRW7	TT1	2	Deposit	Entire extent	Varyingly compact from moderately to well black material (possibly coal) with <1% gravel (subangular, <2cm) and <5% coal (<3cm) inclusions. Layers visible within the matrix	7.6m long, 2.1m wide, 0.5m deep	-	Low	3	1, 5	-	-	-	-	Unknown	Post World War II Phase, 1944-1976	Differentiation in layers within matrix indicates the material was dumped in multiple stages, probably with the material originating from the same or highly similar sources (eg waste material from heating kilns). A piece of broken railway track originating from 3 partially intrudes 2. Due to this, 2 unlikely remained exposed for an extended period of time
BRW7	TT1	3	Deposit	Sondage	Varyingly compact from moderately to well with pockets of friable mid orangey brown sandy clay with cream mottling and 15% shale (0.6 x 0.7m max) and brick fragment inclusions	7.6m long, 2.1m wide, 0.4m deep	-	Low	4	2	-	-	-	-	Post 1944	Post World War II Phase, 1944-1976	Dump of waste or broken railway tracks and mixed clay material
BRW7	TT1	4	Deposit	Northern extent of sondage	Friable mid reddish grey sandy clay 'slush' with <5% gravel and brick fragment inclusions	Unknown	-	Nil	Unexcavated	3	-	-	-	-	Unknown	Post World War II Phase, 1944-1976	Slushy' composition of matrix suggests waste or byproduct from brick manufacture or a failed mixture that was disposed of before firing
BRW7	TT1	5	Deposit	Northern extent	Very compact mid yellowish orange clay lens	0.176m long, width unknown, 0.1m deep	-	Nil	2	1	-	-	-	-	Unknown	Post World War II Phase, 1944-1976	Probably not waste or byproduct material due to high quality and limited extent, purpose unknown
BRW7	TT2	6	Deposit	Entire extent	Loosely compact light brown sandy clay with 80% brick (10% entire, 90% fragmented) inclusions	2.5m long, 2.7m wide, 1.7m deep	-	Low	Unexcavated	Topsoil	-	-	-	-	c1970s	Post Closure Phase, 1976-2017	Bricks predominantly of air type, indicating later date of deposition. Same as geotech TU218

General information								Harris Matrix							Interpretation		
BRW11	TT3 West	7	Fill	Eastern extent	Friable dark brown clayey sand with 1% brick rubble, 1% sandstone cobbles, and <1% charcoal and timber fragment inclusions	2.2m long, 0.95m wide, 0.55m deep	-	Nil	-	219	-	8	20	-	Unknown	Post World War II Phase, 1944-1976	Fill for 8. Not a rubbish deposit due to low concentrations of artefactual inclusions, purpose unknown
BRW11	TT3 West	8	Cut	Eastern extent	Linear in plan from N to S, sharp break of top, vertical sides, sharp break of base, and regular base. Amorphous concrete defining base and surface edge of cut on W extent. E extent defined by 18 and 20	2.2m long, 0.95m wide, 0.55m deep	-	Nil	Unexcavated		12, Natural	-	-	7	Unknown	Post World War II Phase, 1944-1976	Cut for 7. Purpose of deposition of amorphous concrete within pit unclear, particularly as no formed sides were present and the surface deposit was placed within the cut. Possibly used as delineating feature, but unknown
BRW11	TT3 West	9	Void	Southern extent	Voided. Initially thought to be cut, actually natural depression	-	-	-	-	-	-	-	-	-	-	-	-
BRW11	TT3 West	10	Void	Southern extent	Voided. Initially thought to be fill, actually rubble inclusions within 12	-	-	-	-	-	-	-	-	-	-	-	-
BRW11	TT3 West	11	Void	Eastern extent	Voided. Initially thought to be deposit, actually group of sandstone inclusions within 7	-	-	-	-	-	-	-	-	-	-	-	-
BRW11	TT3 South, TT3 West	12	Deposit	Southern extent of 3 South, western extent of 3 West	Very compact mid yellowish brown sandy clay with red, yellow, and black mottling and <1% charcoal and <1% brick rubble inclusions	3 South 3.7m long, 2.2m wide, 0.2m deep. 3 West 1.85m long, 2.2m wide, 0.35m deep	-	Nil	13, Natural	219	-	-	-	-	Post 1944	Post World War II Phase, 1944-1976	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW11	TT3 South	13	Fill	Sondage	Very compact dark blackish brown sandy clay with yellow and red mottling and 5% charcoal and <5% brick rubble inclusions	2.6m long, width unknown, 0.53m deep	14, 15	Nil	14, 15	12	-	16	-	-	Unknown	Unknown	Part of fill sequence for 16, associated with 14 and 15. Not a rubbish deposit due to low concentrations of artefactual inclusions. May be waste or byproduct material

General information							Harris Matrix								Interpretation		
BRW11	TT3 South	14	Fill	Sondage	Compact mid brownish yellow silty clay with minor mottling. Lens in 16 fills	1.2m long, width unknown, 0.05m deep	13, 15	Nil	15	13	-	16	-	-	Unknown	Unknown	Part of fill sequence for 16, associated with 13 and 15. Not a rubbish deposit due to low concentrations of artefactual inclusions. May be redeposited natural due to similar colour, however restricted spread
BRW11	TT3 South	15	Fill	Sondage	Friable mid greyish white clayey sand with white and black mottling and 30% charcoal inclusions	1.7m long, width unknown, 0.05m deep	13, 14	Nil	-	13, 14	-	16	-	-	Unknown	Unknown	Part of fill sequence for 16, associated with 13 and 15. Not a rubbish deposit due to low concentrations of artefactual inclusions. Proportion of sand too high compared to ash (despite charcoal), so unlikely to be directly associated with burning
BRW11	TT3 South	16	Cut	Sondage	Shape in plan not excavated, sharp break of top, concave side (south), gentle break of base, level base. Northern extent abuts 18 and 20. 19 at abutment	2.6m long, width unknown, 0.53m deep	-	Nil	-	-	Natural	-	-	13, 14, 15	Unknown	Unknown	Cut for 13, 14, and 15. Unknown if predating or associated with 18 and 20 due to unclear termination of cut and obscuring by 19. Not for rubbish deposition, purpose unknown
BRW11	TT5, TT6	17	Fill	Entire extent	Compact mid greyish brown clay with brown sand lenses and 10% brick fragment inclusions	8.7m long, 9.5m wide, 0.3m deep	-	Low	-	219	-	22	-	-	c1971	Post World War II Phase, 1944-1976	Fill for 22. Deposited following levelling of natural by 22, probably to support pouring of concrete slab for extrusion pad

General information								Harris Matrix								Interpretation	
BRW11	TT3 Centre	18	Structure	Entire extent	Machine footings. 3 cast concrete 'basins'. Whole structure rectangular in plan E to W, individual basins rectangular in plan N to S. Sharp break of top, sloped N and S edges at 120 D angle, sharp break of base, level base. 2 iron bolts present on dividing walls between W and C basin, and C and E basin. Rectangular metal frame and pipe located in NE corner	Whole structure 5.15m long, 3.25m wide at top, 1.4m wide at base, 0.6m deep. W basin 1m long, 2.2m wide, 0.6m deep. C basin 1.9m long, 2.2m wide, 0.6m deep. E basin 1.5m long, 2.2m wide, 0.6m deep. Dividing wall between W and C basin 0.3m wide, between C and E basin 0.27m wide. Border around basins 0.15m wide. Iron bolts 0.75m from internal edge at N and S	-	Low	-	Topsoil	-	20	-	W and C basin 21, E basin 21, 23, 24	c1971	Post World War II Phase, 1944-1976	Size and form indicates sizeable machine that required ventilation at base. Exact machine type unknown, likely related to activities occurring on extrusion pad
BRW11	TT3 South	19	Structure	Northern extent of sondage	3 courses of 'CB' frogged bricks at interface of 16 and 20	Length unknown, 0.1m wide, 0.43m deep	-	Nil	-	18	-	20	-	-	Post 1944	Post World War II Phase, 1944-1976	Has obscured interaction between 18, 20, and 16. Unlikely to be part of fill sequence of 16, unless 19 was deposited first and then followed by 13, 14, and 15. If associated with 20, may have lined cut and provided support during installation of 18
BRW11	TT3 Centre	20	Cut	Entire extent	Characteristics imperceptible due to 18 and surrounding concrete slab	Dimensions unknown	-	Low	-	-	7, 13, 14, 15, 16, Natural	-	-	18, 19	c1971	Post World War II Phase, 1944-1976	Cut for 18. May include 19, but unknown
BRW11	TT3 Centre	21	Fill	Entire extent	Friable bluish grey silty clay with 85% shale fragments (approx 0.15m, highly varied) and 5% brick fragments and other gravel inclusions	5.15m long, 3.25m wide at top, 1.4m wide at base, W and C basin 0.6m deep, E basin 0.05m deep in NE corner and 0.1m deep elsewhere	23, 24	Low	23	Topsoil	-	18	-	-	c1976	Post Closure Phase, 1976-2017	Fill for 18. Deposited following removal of machine to level surface of 18

General information											Harris Matrix					Interpretation	
BRW11	TT5, TT6	22	Cut	Entire extent	Shape in plan not observed, shape in section not discernible, base not discernible, level base	8.7m long, 9.5m wide, 0.3m deep	-	Low	-	-	Natural	-	-	17	c1971	Post World War II Phase, 1944-1976	Cut for 17. Natural levelled by cut, probably to support pouring of concrete slab for extrusion pad
BRW11	TT3 Centre	23	Fill	E basin	Very compact light blueish grey sandy clay with 30% shale and gravel inclusions. Rectangular metal frame and pipe within N extent	1.5m long, 2.2m wide, 0.2 to 0.42m deep	21, 24	Nil	24	21	-	18	-	-	c1971	Post World War II Phase, 1944-1976	Fill for 18. Unclear why different deposits in E basin, may have been deposited during use of machine footings, rather than following removal of machine to level surface of 18. This is supported by location beneath in situ rectangular metal frame and pipe
BRW11	TT3 Centre	24	Fill	E basin	Moderately compact mid greenish grey clay with thin layer of organics present within matrix. Material had petrol smell	1.5m long, 2.2m wide, 0.08 to 0.3m deep	21, 23	Nil	-	23	-	18	-	-	c1971	Post World War II Phase, 1944-1976	Fill for 18. Unclear why different deposits in E basin, may have been deposited during use of machine footings, rather than following removal of machine to level surface of 18. This is supported by location beneath in situ rectangular metal frame and pipe, the smell of petrol, and the layer of organics within the matrix
BRW11	TT4	25	Deposit	W extent adjacent to W edge of concrete slab	Friable light to dark brown silty sand with <5% brick rubble and <10% gravel inclusions	4.6m long, 0.8m wide, 0.12m deep	-	Nil	Natural	Topsoil	-	-	-	-	Unknown	Unknown	Rubbish deposit located at W edge of concrete slab. Included linear arrangements of nails and considerable quantities of timber waste pieces and glass
BRW11	TT4	26	Deposit	Beneath concrete slab	Moderately compact mid yellowish brown to brownish yellow sandy clay with 80% brick rubble	3.5m long, width unknown, 0.15m deep	-	Nil	Natural	27	-	-	-	-	c1971	Post World War II Phase, 1944-1976	Waste deposit of misfired bricks pressed into natural. May have been used to level the area and support pouring of concrete slab
BRW11	TT4	27	Deposit	Beneath concrete slab	Loosely compact light grey gravel (<0.01m, subangular)	2.7m long, 2.5m wide, 0.05m deep	-	Low	26	219	-	-	-	-	c1971	Post World War II Phase, 1944-1976	Gravel deposit to level area and support pouring of concrete slab
BRW8	TT7, TT8	28	Deposit	W and C extent of 7, C extent of 8	Compact yellowish brown sandy clay mottled with red and yellow and <10% brick rubble inclusions	9m long, width unknown, 0.3m deep	-	Nil	29	Topsoil	-	-	-	-	c early 1960s	Post World War II Phase, 1944-1976	No clear associations with other deposits, artefactual inclusions indicates little about purpose

General information											Harris Matrix					Interpretation	
BRW8	TT7, TT8	29	Fill	W and C extent of 7, C extent of 8	Friable reddish brown clayey sand with pockets of pink decomposed brick and 80% brick rubble (90% 'Canberra' frog, 10% unfrogged) and <1% charcoal inclusions	4.3m long, 4m wide, 0.8m deep	-	Low	-	28	-	30	-	-	c1930s	Expansion Phase, 1921-1942	Fill for 30. Dump of waste and misfired bricks. Likely associated with cleaning of the site prior to either of the closures in 1931 or 1942
BRW8	TT7, TT8	30	Cut	W and C extent of 7, C extent of 8	Shape in plan not fully exposed, irregular at E end, gradual break of top, irregular sloped sides, gradual break of base, level base	4.3m long, 4m wide, 0.8m deep	-	Low	-	-	31, 33, Natural	-	-	29	c1930s	Expansion Phase, 1921-1942	Cut for 29. Pit cut for the dumping of waste and misfired bricks. Has cut and completely removed 31 and 33 in TT7
BRW8	TT7, TT8, TT9, TT10	31	Fill	W and C extent of 7, C extent of 8, S and C extent of 9, N extent of 10 North	Varying characteristics. Completely removed by 30 in TT7. Friable mid reddish brown silty sand with <1% brick rubble inclusions in TT8. Friable mottled orange and yellow silty clay with <1% brick rubble inclusions in TT9. Friable reddish/greyish brown silty sand with <5% brick rubble inclusions in TT10 North	Length unknown, 0.9m wide, depth unknown	-	Low	32	36	-	33	30	-	Pre 1930s	Expansion Phase, 1921-1942	Fill for 33. Matrix comprised of excavated materials redeposited in cut, hence varying characteristics
BRW8	TT7, TT8, TT9, TT10	32	Structure	W and C extent of 7, C extent of 8, S and C extent of 9, N extent of 10 North	Ferrous water pipe	Length unknown, 0.1m diameter, 1.2m deep in TT7	-	Low	-	31	-	33	-	-	Pre 1930s	Expansion Phase, 1921-1942	Pipe in 33. Aligned in SE to NW direction towards downdraught kilns, may still be active

General information											Harris Matrix				Interpretation	
BRW8	TT7, TT8, TT9, TT10	33	Cut	W and C extent of 7, C extent of 8, S and C extent of 9, N extent of 10 North	Linear in plan from SE to NW, sharp break of top, vertical sides, break of base and base not exposed	Length unknown, 0.9m wide, depth unknown	-	Low	-	-	38, 41, 42, Natural	-	30	31, 32	Pre 1930s	Expansion Phase, 1921-1942	Cut for 31 and 32. Transects multiple contexts in TT9 and TT10, cut by 30 in TT7
BRW8	TT9, OA1	34	Deposit	S and C extent	Friable mid brown clayey sand with pockets of pink decomposed brick and 50% brick rubble inclusions	4.5m long, width unknown, 0.3m deep	-	Low	35	Topsoil	-	-	-	-	c late 1950s	Post World War II Phase, 1944-1976	Deposit of high quantities of brick rubble. Mixture of brick frog types suggests dumping of waste material from multiple locations, possibly during cleaning event, possibly during construction works for the failed Tunnel Kiln and Hardy Patent Kiln 2
BRW8	TT9, OA1	35	Deposit	C extent sloping S	Very compact yellow crushed granite gravels (0.01 to 0.05m)	-	68, same as 41, 83	Nil	36, 39	34	-	-	-	-	Unknown	Post World War II Phase, 1944-1976	Redeposited material similar to 41, but in localised, sloping deposit. Stratigraphic location above 41 indicates a later deposition date, possibly as part of reshaping or closing the carpark
BRW8	TT9, OA1	36	Deposit	S and C extent	Compact dark greyish brown sandy clay with 20% brick rubble and 10% slag inclusions	4.4m long, width unknown, 0.1 to 0.2m deep	37	Nil	31	34, 35	-	-	-	-	Pre c1960s	Unknown	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW8	TT9, OA1	37	Deposit	C extent	Friable light grey ash and charcoal with 20% gravel (<0.01m) inclusions. Lens within 36	0.3m long, width unknown, 0.05m deep	Similar to 38, 40, 68, 82	Nil	36	36	-	-	-	-	Unknown	Unknown	Lens within 36. Part of the same dumping event, just an inclusion of different materials
BRW8	TT9, OA1	38	Deposit	S extent	Friable mid grey ash and charcoal with 10% gravel inclusions	0.7m long, width unknown, 0.04m deep	Similar to 37, 40, 68, 82	Nil	Natural	-	-	-	-	33	-	Unknown	Unknown	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW8	TT9, OA1	39	Deposit	N extent sloping S	Friable yellowish blue ashy clay with 20% brick rubble and 15% gravel (0.01m) inclusions	1.8m long, width unknown, 0.1 to 0.6m deep	Same as 113	-	41	Topsoil	-	-	-	-	-	-	See 113

General information									Harris Matrix						Interpretation		
BRW8	TT9, OA1	40	Deposit	N extent sloping S	Friable blue ashy clay with 15% gravel (0.03m) inclusions	1.5m long, width unknown, 0.1 to 0.3m deep	Similar to 37, 38, 39, 68, 82	Nil	41	Topsoil	-	-	-	-	Post c1960s	Post World War II Phase, 1944-1976	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW8	TT9, TT10 North, TT30, OA1, OA2	41	Deposit	N extent	Very compact yellow crushed granite gravels (0.01 to 0.03m)	2.9m long, width unknown, 0.1m deep	Same as 35, 83	Low	42	Topsoil, 39, 40, 68, 129, 151	-	-	33	-	c1960s	Post World War II Phase, 1944-1976	Compact and level layer of gravel deposited to create a carpark surface. Overlays a large proportion of the remaining 1913 kilns and the area of the 1916 dormitories
BRW8	TT9, OA1	42	Deposit	N extent	Compact dark yellowish brown sandy clay with yellow mottling and 15% brick fragment and 5% charcoal inclusions	3m long, width unknown, 0.1 to 0.15m deep	-	Nil	Natural	41	-	-	33	-	Pre 1930s	Expansion Phase, 1921-1942	Cut by 33 indicating date, but lack of artefactual inclusions indicates little about purpose
BRW8	TT10 North, OA1	43	Deposit	S extent	Very compact mid brownish grey silty clay	1.3m long, 0.72m wide, depth unexcavated	-	Nil	44, Natural	41	-	-	-	-	Unknown	Establishment Phase, 1911-1920	Pressed into natural between 50 and 115. No clear associations with either brick production or accommodation activities
BRW8	TT10 North, OA1	44	Deposit	S extent	Very compact brown silty clay with red, white, and pink mottling and 30% shale (0.04 x 0.06m) inclusions	0.87m long, 0.7m wide, depth unexcavated	-	Low	Unexcavated	41, 43	-	-	-	-	c1913	Experimental Plant Subphase, c1913-1916	Matrix is indicative of burning, likely as a result of the brick firing process. No evidence of associated kiln structure
BRW8	TT10 North, OA1	45	Deposit	S extent	Moderately friable dark blackish brown silty clay with 10% shale (0.04 x 0.03m) inclusions. Lens in 46	0.4m long, 0.5m wide, depth unexcavated	-	Low	46	46	-	-	-	-	c1913	Experimental Plant Subphase, c1913-1916	Matrix is indicative of burning, likely as a result of the brick firing process. No evidence of associated kiln structure
BRW8	TT10 North, OA1	46	Deposit	S extent	Extremely compact to moderately friable mid orange to mid orangey red silty sand with pockets of pink decomposed brick	1.2m long, 1.4m wide, depth unexcavated	May be same as 52	Low	Unexcavated	41	-	-	51	-	c1913	Experimental Plant Subphase, c1913-1916	Matrix is indicative of burning, likely as a result of the brick firing process. No evidence of associated kiln structure
BRW8	TT10 North	47	Void	S extent	Voided. Same as 46	-	-	-	-	-	-	-	-	-	-	-	-

General information										Harris Matrix						Interpretation	
BRW8	TT10 North	48	Void	S extent	Voided. Same as 46	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	TT10 North, TT30, OA1	49	Fill	S extent of 10 North, N extent of 30	Moderately compacted mid greyish brown clayey silt with some mottling	32.34m long, 0.75m wide, 0.11m deep	-	Moderate	-	41	-	50	-	-	c1916	Establishment Phase, 1911-1920	Fill for 50. Unknown whether natural accumulation of material during use of 50 or later deposit of material. If associated with 115, would expect high proportion of burnt materials within fill. If material deposited following demolition of 1916 dormitories and decomissioning of 50, would expect high proportion of demolition materials within fill. Composition may suggest natural accumulation prior to demolition of surrounding structures
BRW8	TT10 North, TT30, OA1	50	Structure	S extent of 10 North, N extent of 30	Brick-lined drain. 'Simple' frog bricks. Base laid in stretcher bone, 3 courses wide (short width). Sides laid perpendicular to base at 160 D, 1 course wide (long length). Mortar present on surface of many bricks, indicates feature was once fully finished with mortar	32.34m long, 0.75m wide, 0.11m deep	-	High	-	-	-	51	148, 151	49	c1916	Establishment Phase, 1911-1920	Brick-lined drain. Depicted on 1916 plan between dormitories and bath house. Does not appear to be associated with 132
BRW8	TT10 North, TT30, OA1	51	Cut	S extent of 10 North, N extent of 30	Characteristics imperceptible due to 50	Dimensions unknown	-	High	-	-	46, 52, 56, Natural	-	148, 151	50	c1916	Establishment Phase, 1911-1920	Cut for 50. Located between 46 and 56, so may have been cut into deposits associated with 115 during construction of dormitories or been a feature associated with use of 115. Former is more likely, as 49 contains few materials that can be attributed to brick production

General information									Harris Matrix						Interpretation	
BRW8	TT10 North, OA1	52	Deposit	C extent	Very compact to moderately friable mid orange to mid orangey red silty sand with pockets of pink decomposed brick	2.4m long	May be same as 46	Low	Natural	41	-	-	51	-	c1913	Experimental Plant Subphase, c1913-1916	Matrix is indicative of burning, likely as a result of the brick firing process. No evidence of associated kiln structure
BRW8	TT10 North, OA1	53	Deposit	C extent	Moderately compact pinkish clayey silt with 80% gravel and 10% charcoal inclusions	1.3m long, 0.3m wide, 0.08m deep	-	Low	69, Natural	41, 58	-	-	-	-	c1913	Experimental Plant Subphase, c1913-1916	Matrix is indicative of burning, likely as a result of the brick firing process. No evidence of associated kiln structure
BRW8	TT10 North, OA1	54	Void	C extent	Voided. Same as 56	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	TT10 North, OA1	55	Void	C extent	Voided. Same as 56	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	TT10 North, OA1	56	Deposit	C extent	Compact reddish brown sandy clay with 10% brick rubble, 2% charcoal, and 2% gravel (<0.01m) inclusions	8m long, 1m wide, 0.1m deep	-	Low	Natural	41	-	-	-	-	c1913	Experimental Plant Subphase, c1913-1916	Matrix is indicative of burning, likely as a result of the brick firing process. No evidence of associated kiln structure
BRW8	TT10 North, OA1	57	Deposit	C extent	Friable light grey ash and charcoal	1.2m long, 0.8m wide, 0.01m deep	-	Low	Natural	53	-	-	-	-	c1913	Kiln A Operation Subphase, c1913	Incidental ash deposit that has accumulated in the external space around Kiln A
BRW8	TT10 North, OA1	58	Deposit	C extent	Friable dark grey ash and charcoal	1.2m long, 0.7m wide, 0.03m deep	-	Low	53	41	-	-	-	-	c1913	Kiln A Operation Subphase, c1913	Incidental ash deposit that has accumulated in the external space around Kiln A
BRW8	TT10 North, OA1	59	Void	C extent	Voided. Same as 56	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	TT10 North, OA1	60	Void	C extent	Voided. Same as 56	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	TT10 North, OA1	61	Void	C extent	Voided. Same as 62	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	TT10 North, OA1	62	Deposit	N extent	Compact brownish yellow sandy clay with mottling	1.2m long, 0.8m wide, 0.03m deep	Same as 142 and associated group	Nil	63	41, 68	-	-	-	-	-	-	See 142

General information									Harris Matrix							Interpretation	
BRW8	TT10 North, OA1	63	Deposit	N extent	Friable pinkish clayey sand with 60% brick rubble	-	69, 137, 138, 139, 140, 141, 142	High	70	41, 62, 67	-	-	-	-		Kiln A Operation Subphase, c1913	Upper internal floor surface of Kiln A. Likely a natural build up of materials that occurs during the brick firing process
BRW8	TT10 North, OA1	64	Void	N extent	Voided. Number not required	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	TT10 North, OA1	65	Structure	N extent	Coursed brick structure. 3 courses high, 3 courses long, 3 courses wide with space in the middle for 64	0.83m long, 0.34m wide, 0.24m high	Same as 137 and associated group	-	-	-	-	66	-	71	-	-	See 137
BRW8	TT10 North, OA1	66	Cut	N extent	Shape in plan imperceptible, sharp break of top, vertical sides, sharp break of base, level base	0.4m long, 0.35m wide, 0.24m deep	Same as 138 and associated group	-	-	-	63	-	-	65	-	-	See 138
BRW8	TT10 North, OA1	67	Deposit	N extent	Very compact pink sandy clay	1m long, 0.4m wide, depth unexcavated	-	Low	63	41	-	-	-	-	c1920	Experimental Plant Closure Subphase, c1920	Appears to be capping 63, may be representative of demolished components of 137
BRW8	TT10 North, OA1	68	Deposit	N extent	Friable blue ash. Lens in 35	2m long, width unknown, 0.1m deep	Similar to 37, 38, 40, 82	Nil	41	35	-	-	-	-	Unknown	Post World War II Phase, 1944-1976	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW8	TT10 North, OA1	69	Natural	N extent	Compact dark blackish brown natural clay	Min 0.9m long, width unknown, 0.25m deep	63, 137, 138, 139, 140, 141, 142	High	Natural	53, 140	-	-	138	-	c1913	Kiln A Operation Subphase, c1913	Colour indicative of heat exposure. Located in internal space of Kiln A, below firing floor, where heat generated within Kiln A has caused change in colour
BRW8	TT10 North, OA1	70	Deposit	N extent	Moderately compact dark brownish black silty clay	3.5m long, width unknown, 0.4m deep	-	Low	Natural	63	-	-	-	-	Unknown	Experimental Plant Subphase, c1913-1916	Matrix is indicative of burning, likely as a result of the brick firing process. No evidence of associated kiln structure
BRW8	TT10 North, OA1	71	Deposit	N extent	Friable pink and white sand with inclusions of some cemented matrix	0.7m long, 0.1m wide, 0.2m deep	Same as 139 and associated group	-	-	41	-	65	-	-	-	-	See 139

General information									Harris Matrix						Interpretation	
BRW8	TT11, OA2	72	Structure	E extent	Brick footings. 'Simple' brick frogs. 1 course, arranged in shiner and rowlock bond, generally set in groups of 3. Mirrored 'fireboxes' on E and W edges. No mortar, bonded with natural clay matrix. Aligned N to S	4.1m long, 2.1m wide, depth unexcavated	166, 167, 169, 223	High	Unexcavated	81	-	-	-	-	c1913	Kiln D Operation Subphase, c1913-1916	External E wall for Kiln D. Construction method characteristic of a downdraught kiln / Scotch kiln. Likely unaltered from original construction, no apparent changes made to structure or internal space
BRW8	TT11, OA2	73	Deposit	C extent	Extremely compact to friable light orange to mid reddish orange silty clay with ash lenses throughout	2.45m long, 1.4m wide, depth unexcavated	-	Low	78	81	-	-	-	-	Unknown	Experimental Plant Subphase, c1913-1916	Matrix is indicative of burning, likely as a result of the brick firing process. No evidence of associated kiln structure
BRW8	TT11, OA2	74	Deposit	C extent	Extremely compact mid brownish red to light cream silty clay	0.6m long, 1.4m wide, depth unexcavated	75	Low	Unexcavated	81	-	-	-	-	Unknown	Experimental Plant Subphase, c1913-1916	Matrix is indicative of burning, likely as a result of the brick firing process. No evidence of associated kiln structure
BRW8	TT11, OA2	75	Structure	C extent	4 groups of in situ coursed bricks amongst 76. Group 1 (see 181), 1 course of 5 bricks, original bond pattern not discernible. Group 2 (see 196), at least 2 courses of bricks, 15 visible in upper course, random bond. Group 3, 1 course of 6 bricks, original bond pattern not discernible. Group 4 (see 198), 1 course of 11 bricks, original bond pattern not discernible	Group 1, 0.55m long, 0.31m wide, 0.08m deep. Group 2, 1m long, 0.57m wide, depth unexcavated. Group 3, 0.20m long, 0.45m wide, 0.08m deep. Group 4, 0.4m long, 0.52m wide, 0.08m deep	Same as 181, 196, 198 and associated groups	-	Unexcavated	76, 80, 81	-	-	-	-	-	-	See 181, 196, 198

General information									Harris Matrix						Interpretation	
BRW8	TT11, OA2	76	Deposit	E extent	Moderately to loosely compact mid reddish brown decomposed brick and 80% brick rubble	12.9m long, 1.2m wide, 1.1 (E) to 0.3m (W) deep	80, 222	Moderate	75, 77, 80	81, Topsoil	-	-	-	-	c1930s	Expansion Phase, 1921-1942	Rubble accumulated above 1913 kiln complex. Artefacts located in 172 dated to 1930s, suggesting they originated from married quarters. 'Vacant' area above abandoned experimental complex likely seen as appropriate location for dump of demolished materials
BRW8	TT11, OA2	77	Deposit	C extent	Very compact mid reddish brown to mid reddish orange silty clay with light cream mottling and charcoal inclusions	12.55m long, 1.2m wide, depth unexcavated	-	Low	Unexcavated	76	-	-	-	-	c1913	Establishment Phase, 1911-1920	Built up between Kiln D and Kiln E. May be incidental accumulation of trample and other external space material, rather than purposeful deposition
BRW8	TT11, OA2	78	Deposit	E extent	Friable ash, slag, coal, and charcoal matrix	1.9m long, 0.8m wide, 0.04 to 0.15m deep	-	Nil	79	73, 81	-	-	-	-	Unknown	Experimental Plant Subphase, c1913-1916	Matrix is indicative of burning, likely as a result of the brick firing process. No evidence of associated kiln structure
BRW8	TT11, OA2	79	Structure	C extent	Comprised of 10 primarily dislocated bricks situated in single coursing, some remnant bond between bricks. Space between bricks filled with loosely compact brown clay and brick fragments deposited during demolition event	0.8m long, 0.6m wide, 0.08m deep	Same as 189 and associated group	-	Unexcavated	78	-	-	-	-		-	See 189
BRW8	TT11, OA2	80	Deposit	C extent	Extremely friable dark brown decomposed brick with brick rubble	3.1m long, 1.2m wide, 0.15m deep	76	Low	75	76, 81	-	-	-	-	c1925	Experimental Plant Closure Subphase, c1920	Rubble accumulated following demolition of 1913 kiln complex. Likely happened during single demolition event
BRW8	TT11, OA2	81	Deposit	Entire extent	Varying compaction from friable to well compact mid reddish brown clayey sand with 20% brick rubble	17m long, 1.2m wide, 0.15 to 0.6m deep	-	Low	72, 73, 74, 75, 76, 78, 80	Topsoil	-	-	-	-	Unknown	Expansion Phase, 1921-1942	Rubble accumulated following demolition of 1913 kiln complex. Likely happened during single demolition event
BRW1	TT12	82	Deposit	C extent	Moderately friable mid blueish grey with 30% ash and charcoal mottling. Lens in 83	1.9m long, 1.2m wide, 0.06 to 0.08m deep	Similar to 37, 38, 40, 68	Nil	Natural	83	-	-	-	-	Unknown	Post World War II Phase, 1944-1976	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose

General information									Harris Matrix					Interpretation		
BRW1	TT12	83	Deposit	C extent	Compact yellow crushed granite with cream mottling	4.1m long, 1.2m wide, 0.05 to 0.1m deep	Same as 35, 41	Low	82	Topsoil, 87	-	-	-	-	c1960s	Post World War II Phase, 1944-1976	Compact and level layer of gravel deposited to create a carpark surface
BRW1	TT13	84	Deposit	C extent	Compact light brownish grey sandy silt with 10% brick rubble inclusions	9.6m long, 1.2m wide, 0.1 to 0.12m deep	-	Nil	86	85, Topsoil	-	-	-	-	Unknown	Unknown	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW1	TT12, TT13	85	Deposit	W extent	Moderately compact crushed shale and sand	7.8m long, 1.2m wide, 0.15 to 0.25m deep	-	Nil	84	Topsoil	-	-	-	-	Unknown	Unknown	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW1	TT13	86	Deposit	C extent	Moderately compact mid pinkish clay with crushed shale. Lens in 84	2.8m long, 1.2m wide, 0.16 to 0.4m deep	-	Nil	Natural	84	-	-	-	-	Unknown	Unknown	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW1	TT12	87	Deposit	C extent	Compact mid pinkish yellow mottled silty clay	0.9m long, 1.2m wide, 0.1m deep	-	Nil	83	Topsoil	-	-	-	-	Unknown	Post World War II Phase, 1944-1976	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW2	TT14	88	Structure	S extent	Ferrous water pipe, aligned N to S	0.4m long, 0.08m diameter	-	Low	-	90	-	89	-	-	Unknown	Post World War II Phase, 1944-1976	Pipe in 89. In vicinity of married quarters and Brickworks hostel, would have provided services for these structures
BRW2	TT14	89	Cut	S extent	Shape in plan not observed, shape in section not discernible, base not discernible	0.4m long, 0.04m wide, depth unknown	-	Low	-	-	Natural	-	-	88	Unknown	Post World War II Phase, 1944-1976	Cut for 88
BRW2	TT14	90	Deposit	S extent	Friable brownish grey sandy silt with 40% brick rubble and 20% charcoal inclusions	6.4m long, 1.2m wide, 0.25m deep	-	Nil	90	Topsoil	-	-	-	-	Unknown	Post World War II Phase, 1944-1976	Dump of waste materials
BRW2	TT15	91	Fill	C extent	Loosely compacted mid reddish brown silty clay	1.6m long, width not discernible, depth not discernible	-	Low	-	Topsoil	-	93	-	-	Unknown	Post World War II Phase, 1944-1976	Fill for 93
BRW2	TT15	92	Structure	C extent	Ferrous water pipe, aligned NE to SW	1.6m long, 0.12m diameter	-	Low	-	91	-	93	-	-	Unknown	Post World War II Phase, 1944-1976	Pipe in 93. In vicinity of amenities block for Brickworks hostel, would have provided services for these structures

General information								Harris Matrix							Interpretation	
BRW2	TT15	93	Cut	C extent	Shape in plan not observed, shape in section not discernible, base not discernible	1.6m long, width not discernible, depth not discernible	-	Low	-	-	Natural	-	-	91, 92	Unknown	Post World War II Phase, 1944-1976	Cut for 91, 92
BRW2	TT17	94	Structure	C extent	Several drainage features. Inclusive of ferrous water pipe, three drain mouths, and possible grease trap	-	-	Low	Natural	Topsoil	-	-	-	-	Unknown	Post World War II Phase, 1944-1976	Various drainage services for the Brickworks hostel mess hall
BRW2	-	95	Structure	-	Brick strip footings cut into ground. Combination of 'simple', 'Canberra Cwealth', and 'Canberra' brick frogs. Bonded with mortar. N footings stretcher bond. C footings alternating header/stretcher bond. S footings alternating 1 header/2 stretcher bond. Rubble fill within wall spaces	N footings 1.35m long, 0.35m wide, 1 course high. C footings 1.54m long, 2.4m wide, 1 to 11 courses high. S footings 1.92m long, 0.11m wide, 4 courses high	-	Moderate	Natural	Topsoil	-	-	-	-	c1945	Post World War II Phase, 1944-1976	Footings and partial walls for the Brickworks hostel mess hall. Complete layout of building unknown due to partial demolition. The use of a combination of brick frogs and differing bond patterns may be indicative of several phases of construction or alteration, or, alternatively, the reuse of materials from the demolished married quarters
BRW2	TT18	96	Surface	S and W extent	Asphalt surface. Aligned with 97 and 98	Patchy, approx 5.3m long, 0.7m wide, 0.02m deep	97, 98	Moderate	Natural	Topsoil	-	-	-	-	c1945	Post World War II Phase, 1944-1976	Unlikely to be road for vehicular traffic based on thin, friable construction. Probably functioned as pedestrian footpath adjacent to accommodation buildings

General information									Harris Matrix						Interpretation	
BRW2	TT18	97	Structure	W extent	Brick strip footings cut into ground. Arranged in 3-sided rectangle (E, S, W), amorphous concrete completes 4th side (N). Mortar remnants between and partially covering bricks. Alternating 1 stretcher/2 stretcher pair bond base course, header bond as upper course	1.85m long, 1.4m wide, 2 courses high	96, 98, 99	Moderate	-	Topsoil	-	100	-	-	c1945	Post World War II Phase, 1944-1976	Footings for the Brickworks hostel mess hall. Complete layout of building unknown due to extensive demolition
BRW2	TT18	98	Structure	SE extent	Brick strip footings cut into ground. Combination of 'Canberra Cwealth' and 'blank' brick frogs. Single line of header bond, approximately aligned with S footing of 97	3.6m long, 0.07m wide, 1 course high	96, 97, 99	Moderate	-	Topsoil	-	101	-	-	c1945	Post World War II Phase, 1944-1976	Footings for Brickworks hostel meat safe
BRW2	TT18	99	Structure	C extent	5 concrete upright stumps aligned E to W with 97 and 98. Concrete formed around 2 rebar rods, some Fe ant caps present	Total structure 5.5m long, uprights spaced 1.5m apart. Upright 1 (E) and 2 0.1m long, 0.1m wide, 0.3m high. Upright 3 only rebar present. Upright 4 0.1m long, 0.1m wide, 0.09m high. Upright 5 (W) only rebar present	96, 97, 98	Moderate	-	Topsoil	-	102	-	-	c1945	Post World War II Phase, 1944-1976	Footings for Brickworks hostel meat safe. A row of concrete stumps installed to support a superstructure, such as a floor or verandah
BRW2	TT18	100	Cut	W extent	Shape in plan not observed, shape in section not discernible, base not discernible	Length not discernible, width not discernible, depth not discernible	101, 102	Moderate	-	-	Natural	-	-	97	c1945	Post World War II Phase, 1944-1976	Cut for 97
BRW2	TT18	101	Cut	NE extent	Shape in plan not observed, shape in section not discernible, base not discernible	Length not discernible, width not discernible, depth not discernible	100, 102	Low	-	-	Natural	-	-	98	c1945	Post World War II Phase, 1944-1976	Cut for 98

General information											Harris Matrix					Interpretation	
BRW2	TT18	102	Cut	C extent	Shape in plan not observed, shape in section not discernible, base not discernible	Length not discernible, width not discernible, depth not discernible	100, 101	Moderate	-	-	Natural	-	-	99	c1945	Post World War II Phase, 1944-1976	Cut for 99
BRW10	TT25	103	Structure	E extent	Ferrous water pipe, aligned N to S	12.6m long, 0.1m diameter	-	Low	104	Topsoil	-	105	-	-	Post 1930	Unknown	Water pipe. Aligned in direction of married quarters and Brickworks hostel, would have provided services for these structures
BRW10	TT25	104	Fill	E extent	Mid reddish brown clay located under and beside 103. Highly irregular shape	12.6m long, 0.2m wide max, 0.02m deep	-	Low	-	103	-	105	-	-	Post 1930	Unknown	Contained within 105. May be fill deposited during installation of 103, but only visible beneath 103. Hence, not main fill but perhaps deposited to support installation. May also be staining from weathering of 103 due to highly irregular shape
BRW10	TT25	105	Cut	E extent	Shape in plan not observed, shape in section not discernible, base not discernible	12.6m long, width not discernible, depth not discernible	-	Low	-	-	106, Natural	-	-	103, 104	Post 1930	Unknown	Cut for 103, 104
BRW10	TT25	106	Deposit	C extent	Loosely compacted brownish grey sandy silt with 65% brick inclusions	1.3m long, 1.2m wide, 0.2m deep	-	Nil	Natural	Topsoil	-	-	105	-	Post 1930	Unknown	Small dump of bricks, no clear associations with other deposits
BRW3	TT28	107	Void	E extent	Voided. Floating brick footing, likely demolished and redeposited from elsewhere	-	-	-	-	-	-	-	-	-	-	-	-
BRW3	TT29	108	Deposit	C extent	Friable ash in centre, dark yellowish brown on edges of deposit with 85% charcoal inclusions	1.65m long, 1.5m wide, depth unexcavated	-	Low	109, Natural	Topsoil	-	-	-	-	Unknown	Post Closure Phase, 1976-2017	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW3	TT29	109	Surface	W extent	Asphalt surface, badly degraded. Aligned with 111	Patchy, approx 3.4m long, 1m wide, 0.01m deep	110	Moderate	110	108, Topsoil	-	-	-	-	c1945	Post World War II Phase, 1944-1976	Unlikely to be road for vehicular traffic based on thin, friable construction. Probably functioned as pedestrian footpath adjacent to accommodation buildings

General information									Harris Matrix							Interpretation	
BRW3	TT29	110	Deposit	W extent	Loosely compact light brownish yellow sand	3.4m long, 1m wide, 0.02m deep	109	Low	Natural	109	-	-	-	-	c1945	Post World War II Phase, 1944-1976	Base for 109
BRW3	TT29	111	Structure	E extent	5 brick detached piers. Each footing comprises 4 bricks arranged in faux basketweave bond, centre obscured by mortar. 2 courses. 4 pads aligned N to S, S-most pad askew	Total structure 7m long, footings spaced approx 1.5m apart. Footings 1 (N), 2, 3 0.35m long, 0.35m wide. Footing 4 0.24m long, 0.24m wide. Footing 5 (S) 0.35m long, 0.35m wide	-	Moderate	-	Topsoil	-	112	-	-	c1945	Post World War II Phase, 1944-1976	Footings for Brickworks hostel sleeping hut. A row of brick detached piers installed to support a superstructure, such as a floor. Complete layout of building unknown due to partial demolition and obscuring vegetation
BRW3	TT29	112	Cut	E extent	Shape in plan not observed, shape in section not discernible, base not discernible	Length not discernible, width not discernible, depth not discernible	-	Moderate	-	-	Natural	-	-	111	c1945	Post World War II Phase, 1944-1976	Cut for 111
BRW8	TT10 North, TT31, TT32, OA1	113	Deposit		Loosely compacted light whiteish grey ash with 20% charcoal (0.01 to 0.05m)	4.7m long, 1.2m wide, depth unexcavated	129	Nil	Unexcavated	114, Topsoil	-	-	33	-	Unknown	Post Closure Phase, 1976-2017	Representative of large dump of burnt material. Association with 129 suggests this likely occurred at the close of the facility, and the open space of the 1960s carpark provided an easily defined space for the deposition of debris
BRW8	TT10 North, TT31, TT32, OA1	114	Deposit	N extent	Loosely compacted mid reddish brown sandy clay with 45% crushed brick (0.24 to 0.12m) rubble	-	129	Nil	113, Unexcavated	Topsoil	-	-	33	-	Unknown	Post Closure Phase, 1976-2017	Brick rubble deposit. Association with 129 suggests this likely occurred at the close of the facility, and the open space of the 1960s carpark provided an easily defined space for the deposition of debris

General information									Harris Matrix						Interpretation	
BRW8	TT10 South, OA2	115	Structure	N extent	Brick footings. 'Simple' brick frogs. 2 courses, predominantly arranged in header bond, but with variation. Upper course forms 'fireboxes'. No mortar, bonded with natural clay matrix. Aligned NE to SW	-	164	High	119, 210	41, 117, 118, 123	-	-	-	-	c1913	Kiln B Operation Subphase, c1913-1916	External E wall for Kiln B. Construction method characteristic of Scotch kiln. Likely unaltered from original construction, no apparent changes made to structure or internal space
BRW8	TT10 South, OA2	116	Void	-	Voided. Initially interpreted as cut for 115, but 115 actually laid on levelled natural rather than cut into natural	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	TT10 South, OA2	117	Deposit	W extent	Very compact mid whiteish yellow sandy clay	-	-	Low	115, 164	Topsoil	-	-	-	-	c1920	Experimental Plant Closure Subphase, c1920	Deposited between 'fireboxes' of 115. Likely deposited when kiln was closed to level the space
BRW8	TT10 South, OA2	118	Deposit	W extent	Friable mid reddish orange clayey sand and <5% crushed brick (<0.01m) inclusions	-	115, 119, 164	High	115, 119	123	-	-	-	-	c1913	Kiln B Operation Subphase, c1913-1916	Upper internal floor surface of Kiln B. Similar in nature to 173, 174 in Kiln C and 203, 204 in Kiln D. However, no evidence of earlier phase subsurface flue identified, as in the instances of Kilns 4 and 5. Likely a natural build up of materials that occurs during the brick firing process
BRW8	TT10 South, OA2	119	Natural	W extent	Extremely compact baked mid orangey red natural clay	-	115, 118, 164	High	120	115, 118, 121, 122	-	-	-	-	c1913	Kiln B Operation Subphase, c1913-1916	Lower internal floor surface of Kiln B. Natural soil horizon that has been levelled and used as a floor surface for 115, 164, the use of which has baked the surrounding natural soil
BRW8	TT10 South, OA2	120	Natural	W extent	Compact dark brownish black natural clay	Length unknown, width unknown, 0.4m deep	-	Moderate	-	119	-	-	-	-	c1913	Kiln B Operation Subphase, c1913-1916	Colour indicative of heat exposure. Located in internal space of Kiln B, capped by 119

General information									Harris Matrix						Interpretation	
BRW8	TT10 South, OA2	121	Deposit	NW extent	Friable yellowish white ash deposit with <5% subangular gravel (<0.03m) inclusions	0.2m long, 0.15m wide, 0.03m deep	122	Low	119	Topsoil	-	-	-	-	c1913	Kiln B Operation Subphase, c1913-1916	Incidental ash deposit that has accumulated in the internal space of Kiln B
BRW8	TT10 South, OA2	122	Deposit	NW extent	Friable greyish white ash deposit with <1% charcoal inclusions	1.2m long, 0.6m wide, 0.05m deep	121	Low	119	Topsoil	-	-	-	-	c1913	Kiln B Operation Subphase, c1913-1916	Incidental ash deposit that has accumulated in the internal space of Kiln B
BRW8	TT10 South, OA2	123	Deposit	NW extent	Loosely compacted greyish brown sandy silt with <5% charcoal (0.08-0.05m) inclusions	-	-	Low	115, 118, 164	Topsoil	-	-	-	-	Unknown	Experimental Plant Closure Subphase, c1920	Deposited across 115 and 164. Likely from when kiln was closed to level the space
BRW8	OA1	124	Structure	S extent	Brick and concrete footing. Comprised of 7 'simple' frogged bricks in stretcher bond, 6 with cast concrete slope adhered to W edges	Total structure 1.8m long, 0.58m wide	125	Low	Unexcavated	Topsoil	-	-	-	-	c1916	Establishment Phase, 1911-1920	W external wall of bath house associated with contemporary dormitories. Internal space of building obscured by extant tree
BRW8	OA1	125	Deposit	S extent	Loosely compact crushed brick rubble (<0.1m)	1.05m long, 0.52m wide, 0.1m deep	124	Low	Natural	Topsoil	-	-	-	-	c1920	Establishment Phase, 1911-1920	Rubble accumulated following demolition of bath house. Likely happened during single demolition event
BRW8	OA1	126	Deposit	S extent	Friable dark greyish black ash with charcoal (<0.05m) inclusions. Not consistent across spread, patchy	2.6m long, max 1.58m width, 0.05m deep	-	Nil	Unexcavated	Topsoil	-	-	-	-	Unknown	Establishment Phase, 1911-1920	Unlikely to be associated with demolition of the bathhouse. Possibly an incidental accumulation of ash, but source unknown
BRW8	OA1	127	Fill	E extent	Moderately compact dark reddish brown clayey silt with yellow clay mottling	14.7m long, 0.06m wide, 0.12m deep	-	Low	-	-	-	132	-	-	Unknown	Establishment Phase, 1911-1920	Accumulated fill within 132. Silty composition of fill would indicate slow accumulation of materials over an extended period of function, however, general homogeneity of deposit is not indicative of successive deposition events. No artefactual material within fill, meaning no indication of what services the drain was serving (eg draining for domestic or occupational activities)

General information								Harris Matrix							Interpretation	
BRW8	OA1	128	Deposit	N extent	Compact mid reddish brown sandy clay with 85% yellow shale (0.1-0.25m) inclusions	Min 2.03m long, min 2.45m wide, 0.15-0.33m deep	-	Nil	129	Topsoil	-	-	-	-	Unknown	Post World War II Phase, 1944-1976	Redeposited natural material, likely obtained from the quarry. Probably deposited as a 'capping' surface for 129
BRW8	OA1	129	Deposit	N extent	Loosely compacted mid reddish brown clayey sand with 60% brick rubble (0.05-0.24m) inclusions	-	114	Low	41	128	-	-	-	-	c 1970s	Post Closure Phase, 1976-2017	Brick rubble deposit. Presence of mortar and portions of brick ('CB' frog and air bricks) remaining in English bond course suggest that the remains of one or a number of demolished buildings were removed from another area of the Brickworks and dumped. This likely occurred at the close of the facility, and the open space of the 1960s carpark provided an easily defined space for the deposition of debris
BRW8	OA1	130	Cut	E extent	Linear in plan from NW to SE, sharp break of top, vertical sides, sharp break of base, level base	14.7m long, 0.3m wide, 0.25m high	-	Moderate	-	-	Natural	-	-	131, 132	c1916	Establishment Phase, 1911-1920	Cut for 132
BRW8	OA1	131	Fill	E extent	Extremely compact dark yellowish brown silty clay with yellow mottling. Almost indistinguishable from surrounding natural	-	-	Nil	132	157	-	130	-	-	c1916	Establishment Phase, 1911-1920	Fill for 130, covering 132

General information									Harris Matrix						Interpretation	
BRW8	OA1	132	Structure	E extent	Brick box drain. 'Simple' brick frog. Constructed using three bricks set in an upside-down U (two bricks laid parallel on sides approx 0.08m apart, cavity capped by brick laid on side perpendicular to lower course). Base of drain not lined, rests on natural. Sloppy construction, many bricks crooked or not completely aligned. Aligned NW to SE	14.7m long, 0.24m wide, 0.2m high	133	Moderate	-	131	-	130	-	127	c1916	Establishment Phase, 1911-1920	Box drain within footprint of 1916 dormitories. Laid at an angle beneath the building, extending from centre of building to SE corner. Some gaps in the construction may have led to surface drains, although this cannot be confirmed. Amorphous conclusion to each end of drain, unsure of source/destination of drained materials. Does not appear to be associated with 50
BRW8	OA1	133	Deposit	N extent	Compact brownish orange silty clay with <1% charcoal (<0.01m) and approx 15% brick rubble (0.12-0.05m) inclusions	2.4m long, 1.8m wide, 0.15m deep	132	Nil	Natural	136	-	-	-	-	Unknown	Establishment Phase, 1911-1920	Distribution of deposit suggests 'spill' from NW end of 132, potentially within cut that removed the NW portion of 132. Compaction and content of baked clay suggested not a discharge of materials from 132. Sectioning identified no cut, and quantities of brick rubble that appeared to be dislocated remains of 132. Purpose unknown
BRW8	OA1	134	Deposit	E extent	Loosely compact greyish white decomposed mortar. Not single uniform deposit, pockets of varying compaction, depth, and matrix composition	5.6m long, 3.3m wide, 0.06m deep	-	Nil	160, 162, Natural	135	-	-	-	-	Unknown	Establishment Phase, 1911-1920	Probably associated with demolition of the 1916 dormitories. Initially appeared as consistent, solid mortar deposit that may have been associated with a brick footing or pier, but the lack of defined edges and varying characteristics is more indicative of remnants from demolition
BRW8	OA1	135	Deposit	E extent	Compact black crushed charcoal deposit	6.2m long, 7.5m wide, 0.07 to 0.02m deep	Possibly same as 156	Nil	134	157	-	-	-	-	Unknown	Establishment Phase, 1911-1920	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose

General information									Harris Matrix							Interpretation	
BRW8	OA1	136	Deposit	C extent	Compact black crushed charcoal deposit	2.4m long, 1.8m wide, 0.02m deep	Possibly same as 156	Nil	133	41	-	-	-	-	Unknown	Establishment Phase, 1911-1920	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW8	OA1	137	Structure	W extent	5 brick footings, 3 of which display the complete arrangement. 'Simple' brick frog. Elongated rectangles, sides arranged in stretcher bond, ends closed with a single perpendicular brick. Between 2 to 3 courses high. Extensive damage caused by demolition	Total structure 7.5m long, 3m wide. Spacing between footings 1m. Individual complete arrangement 3m long, 0.32m wide, 2 to 3 courses high, 0.08m central cavity between sides	Same as 65, associated with 63, 69, 138, 139, 140, 141, 142, 221	High	-	41, 156	-	138	141, 145	139, 221	c1913	Kiln A Operation Subphase, c1913	Structural component for Kiln A. Central cavity unlikely to have supported further structural elements (eg posts). May have served as simplistic flues, which conveyed air from within the centre of the kiln to the outside. If so, although 141, 142 was originally interpreted as a cut disturbing central extents of the footings, the distribution of intense heat through this location may suggest the cut/fill feature is actually indicative of demolition. This demolition may not be part of the closure of the kiln, but due to its use ie as a clamp kiln
BRW8	OA1	138	Cut	W extent	5 cuts. Rectangular in plan, sharp break of top, vertical sides, sharp break of base, level base	3m long, 0.35m wide, max 0.26m deep	Same as 66, associated with 63, 69, 137, 139, 140, 141, 142	High	-	-	69, Natural	-	141	137	c1913	Kiln A Operation Subphase, c1913	Cut for 137
BRW8	OA1	139	Fill	W extent	Friable mid orangey red sand with white ash and approx 25% crushed brick (<0.01m) inclusions	Some cavities of 137	Same as 71, associated with 137, 138, 140, 141, 142, 221	High	-	41	-	137	141	-	c1913	Kiln A Operation Subphase, c1913	Fill within some cavity spaces of 137. Likely deposited following demolition of the structure, rather than as part of the funtional use
BRW8	OA1	140	Natural	W extent	Extremely compact baked mid orangey red natural clay	Min 8m long, min 4m wide	63, 69, 137, 138, 139, 141, 142	High	69	41, 156	-	-	145	-	c1913	Kiln A Operation Subphase, c1913	Lower internal floor surface of Kiln A. Natural soil horizon that has been levelled and used as a floor surface for 137, the use of which has baked the surrounding natural soil

General information											Harris Matrix					Interpretation	
BRW8	OA1	141	Cut	W extent	Irregular linear in plan, gradual break of top, sloped sides, concave break of base, level base. Aligned E to W	6m long, 1.8m wide, 0.18m deep	63, 69, 137, 138, 139, 140, 142	High	-	-	140	-	-	142	c1913	Kiln A Operation Subphase, c1913	Originally interpreted as cut for 142, which has removed the central portions of 137. Based on distribution of intense heat at base of cut, may actually be a slumping of demolition rubble within the internal space of 137
BRW8	OA1	142	Fill	W extent	Compact greyish brown sandy clay with yellow clay mottling and <40% brick rubble (<0.20m) inclusions	6m long, 1.8m wide, 0.18m deep	Same as 62, associated with 63, 69, 137, 138, 139, 140, 141	High	-	41, 156	-	141	-	-	c1913	Kiln A Operation Subphase, c1913	Fill for 141
BRW8	OA1	143	Structure	W extent	Brick structure. Highly disturbed, no indication of original arrangement apparent. Single course. Not part of 137	0.5m long, 0.35m wide, 0.08m deep	-	Nil	-	41	-	144	-	-	Pre c1960s	Unknown	Differs in appearance to 137, indicating it is not part of the same arrangement/designed for the same purpose. Location within 142 may suggest it is part of Kiln A, but it may also be a structural component for a later feature cut into the earlier kiln
BRW8	OA1	144	Cut	W extent	Shape in plan not discernible, not excavated	Length not discernible, width not discernible, depth unknown	-	Nil	-	-	140	-	-	143	Pre c1960s	Unknown	Cut for 143
BRW8	OA1	145	Cut	W extent	U shaped in plan with straight N and E edges and curved W edge, S edge outside of trench. Break of top, sides, break of base, and base not investigated	3.3m long, min 1.8m long, depth unknown	-	Nil	-	-	Natural, 137, 140	-	-	146	Pre c1960s	Unknown	Cut for 146
BRW8	OA1	146	Fill	W extent	Compacted dark blackish brown silty clay	3.3m long, min 1.8m long, depth unknown	-	Nil	-	Topsoil, 41	-	145	-	-	Pre c1960s	Unknown	Fill for 145. No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose

General information								Harris Matrix							Interpretation		
BRW8	OA1	147	Fill	W extent	Loosely compacted mid greyish brown clayey sand mottled with yellow clay and 20% brick rubble (0.24 to 0.05m) and 10% shale (0.18 to 0.03m) inclusions	1m long, min 1.2m wide, depth unknown	-	Nil	-	Topsoil	-	148	-	-	Unknown	Post Closure Phase, 1976-2017	Fill for 148. No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW8	OA1	148	Cut	W extent	Shape in plan not observed, shape in section not discernible, base not discernible	1m long, min 1.2m wide, depth unknown	-	Nil	-	-	Natural, 50	-	-	147	Unknown	Post Closure Phase, 1976-2017	Cut for 147
BRW8	OA1	149	Fill	W extent	Loosely compacted mid brownish red sandy silt	Min 1.4m long, 0.15m wide, 0.12m deep	-	Nil	150	Topsoil	-	151	-	-	Unknown	Post Closure Phase, 1976-2017	Fill for 150 and 151
BRW8	OA1	150	Structure	W extent	Telecommunications cable	Min 1.4m long, 0.02 diameter	-	Nil	-	149	-	151	-	-	Unknown	Post Closure Phase, 1976-2017	Telstra cable in 151
BRW8	OA1	151	Cut	W extent	Linear in plan, sharp break of top, vertical sides, sharp break of base, level base	Min 1.4m long, 0.15m wide, 0.12m deep	-	Nil	-	-	41, 50	-	-	149, 150	Unknown	Post Closure Phase, 1976-2017	Cut for 149 and 150. Gouges left in 50 by three-toothed machine used to excavate 151
BRW8	OA1	152	Void	E extent	Initially thought to be fill for 153	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	OA1	153	Void	E extent	Initially thought to be cut that has removed E end of 50. E end of 50 actually natural end, not cut	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	OA1	154	Cut	W extent	Circular in plan. Break of top, sides, break of base, and base not investigated	0.38m long, 0.36m wide, depth unknown	-	Nil	-	-	140	-	-	155	Pre c1960s	Establishment Phase, 1911-1920	Cut for 155
BRW8	OA1	155	Fill	W extent	Loosely compacted dark blackish brown silt with high proportion of decomposed organic (rotted timber) material	0.38m long, 0.36m wide, depth unknown	-	Nil	-	41	-	154	-	-	Pre c1960s	Establishment Phase, 1911-1920	Fill for 154. Posthole between two E-most footings in 137. Although spatially associated with 137, more likely to be actually associated with 1916 dormitories. However, absence of other structural evidence for the dormitories in proximity to 154/155 means this is not possible to determine

General information									Harris Matrix						Interpretation	
BRW8	OA1	156	Deposit	W extent	Compact black crushed charcoal deposit	4m long, min 1.5m wide, 0.01-0.02m deep	Possibly same as 135, 136	Nil	133, 140	41, 157	-	-	-	-	Unknown	Establishment Phase, 1911-1920	Probably incidental deposit associated with the storage or transportation of fuel for Kiln A, but similarity with 135, 136 would indicate a deposit too widespread to be incidental
BRW8	OA1	157	Deposit	E extent	Compact mid yellowish brown sandy clay with <1% charcoal, <10% brick rubble (<0.1m), and <5% shale (<0.15m) inclusions	-	-	Nil	156, 131	41	-	-	-	-	Pre c1960s	Establishment Phase, 1911-1920	No clear associations with other deposits, lack of artefactual inclusions indicates little about purpose
BRW8	OA1	158	Fill	E extent	Rectangular timber post and decomposed organics	0.42m long, 0.47m wide, depth unknown	132, 160, 161, 162, 163	Moderate	-	41	-	159	-	-	c1916	Establishment Phase, 1911-1920	Fill for 159. Timber post and posthole aligned with 132, 160, 161, 162, 163. Likely structural support for 1916 dormitories
BRW8	OA1	159	Cut	E extent	Circular in plan, two 'simple' brick frogs embedded in wall, gradual break in top. Sides, break of base, and base unknown	0.42m long, 0.47m wide, depth unknown	132, 160, 161, 162, 163	Moderate	-	-	157	-	-	158	c1916	Establishment Phase, 1911-1920	Cut for 158
BRW8	OA1	160	Fill	E extent	Loosely compacted decomposed organics with 25% subrounded gravels (0.03-0.01m). Ring of mortar around upper limit of fill, likely from interface with 134	0.3m long, 0.3m wide, depth unknown	132, 158, 159, 162, 163	Moderate	-	134	-	161	-	-	c1916	Establishment Phase, 1911-1920	Fill for 159. Timber post and posthole aligned with 132, 158, 159, 162, 163. Likely structural support for 1916 dormitories
BRW8	OA1	161	Cut	E extent	Circular in plan, gentle break of top. Sides, break of base, and base unknown	0.3m long, 0.3m wide, depth unknown	132, 158, 159, 162, 163	Moderate	-	-	Natural	-	-	160	c1916	Establishment Phase, 1911-1920	Cut for 160
BRW8	OA1	162	Fill	E extent	Square timber post and decomposed organics	0.19m long, 0.15m wide, min 0.2m deep	132, 158, 159, 160, 161	Moderate	-	134	-	163	-	-	c1916	Establishment Phase, 1911-1920	Fill for 159. Timber post and posthole aligned with 132, 158, 159, 160, 161. Likely structural support for 1916 dormitories
BRW8	OA1	163	Cut	E extent	Square in plan, sharp break of top, vertical sides. Break of base and base unknown	0.19m long, 0.15m wide, min 0.2m deep	132, 158, 159, 160, 161	Moderate	-	-	Natural	-	-	162	c1916	Establishment Phase, 1911-1920	Cut for 162

General information										Harris Matrix						Interpretation	
BRW8	OA2	164	Structure	W extent	4 brick footings. 'Simple' brick frogs. Complete arrangement 4 bricks in stretcher bond on E extent, 3 sets of 3 bricks in stretcher bond in C extent, single brick perpendicular at W extent. Single course. No mortar, bonded with natural soil matrix. Aligned NE to SW. Some demolition damage	Total structure 4.9m long, 1.1m wide, 0.08m deep. Spacing between footings 1.1m for 3 S-most footings, 0.9m between N-most footings. Complete arrangement 1.1m long, 0.45m wide, 0.08m high	115	High	Natural	41, 117, 123	-	-	-	-	c1913	Kiln B Operation Subphase, c1913-1916	External W wall for Kiln B. Construction method characteristic of Scotch kiln. Likely unaltered from original construction, no apparent changes made to structure or internal space
BRW8	OA2	165	Void	W extent	Voided. Initially interpreted as cut for 164, but 164 was actually laid on levelled natural rather than cut into natural	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	OA2	166	Structure	C E extent	Brick footing. 'Simple' brick frogs. 3 partial rows of bricks set in groups of 3. Laid on side. Single course. No mortar, bonded with natural soil matrix. Oriented E to W. Extensive demolition damage	0.9m long, 0.7m wide, 0.12m high	72, 167, 169	High	Unexcavated	76	-	-	-	-	c1913	Kiln D Operation Subphase, c1913-1916	External N wall for Kiln D. Construction method characteristic of a downdraught kiln / Scotch kiln.
BRW8	OA2	167	Structure	C E extent	Brick footing. 'Simple' brick frogs. 2 vertical rows and 2 horizontal rows, visually similar to 75 but highly fragmented. Laid on side. Single course. No mortar, bonded with natural soil matrix. Oriented N to S. Extensive demolition damage	1.74m long, 0.76m wide, 0.12m high	72, 166, 168, 169	High	Unexcavated	76	-	-	-	-	c1913	Kiln D Operation Subphase, c1913-1916	External E wall for Kiln D. Construction method characteristic of a downdraught kiln / Scotch kiln. Probably originally formed mirror 'fireboxes' to 75

General information							Harris Matrix								Interpretation	
BRW8	OA2	168	Fill	C E extent	Loosely compact mid reddish brown silty sand with 70% brick rubble (0.24-0.05m)	-	72, 166, 167, 169	High	-	76	-	169	-	-	c1914	Kiln D Operation Subphase 2, c1914-1916	Rubble fill of 169. Associated with the demolition of elements of Kiln D in preparation for a second phase of use
BRW8	OA2	169	Structure	C E extent	Brick-lined subsurface flue. 'Simple' brick frogs. Regular coursing on outer curve, predominantly header bond, 5 courses. Regular coursing on inner curve, predominantly header bond but with more stretchers to accommodate curve, 6 courses. No mortar, bonded with natural soil matrix. Curve extends from S to NE. Ends damaged by demolition, but curve remains intact. Brick lining may have extended both into kiln and through passage to chimney (not identified)	2.47m long, 0.7m wide, 0.4m high	72, 166, 167, 168, 170, 192, 193	High	-	-	-	170	-	168	c1913	Kiln D Operation Subphase 1, c1913-c1914	Subsurface flue for phase 1 of Kiln D. Constructed to aid temperature control during firing process. Removed at some stage during life of kiln to adapt the structure for firing without flue-based temperature control
BRW8	OA2	170	Cut	C E extent	Shape in plan imperceptible, sharp break of top, vertical sides, concave break of base, concave base. Where present within kiln space, base is 'stepped' where brick lining was likely situated before being removed	-	72, 75, 166, 167, 168, 169, 192, 193	High	-	-	Natural	-	-	168, 169, 203, 212, 213, 214, 215, 216	c1913	Kiln D Operation Subphase 1, c1913-c1914	Cut for 169, subsurface flue. Converges with 193 at far NE corner of excavation
BRW8	OA2	171	Deposit	C E extent	Loosely compacted light whiteish grey ash with 20% charcoal (0.01 to 0.05m)	0.4m long, 0.3m wide, 0.12m deep	0.92m long, 0.32m wide, 0.12m deep	High	202	76	-	-	-	-	c1913	Kiln D Operation Subphase, c1913-1916	Remains of burnt fuel in 'firebox' of 72, Kiln D

General information									Harris Matrix						Interpretation	
BRW8	OA2	172	Deposit	C E extent	Moderately to loosely compact mid reddish brown decomposed brick and 80% brick rubble	Imperceptible, concentration of artefacts within 76	76	High	-	Lens in 76	-	-	-	-	c1930s	Expansion Phase, 1921-1942	Concentration of artefacts within 76. Primarily domestic (inclusive of electrical fittings, door fixtures, medicine bottles, etc), indicating dump from the demolition of a dwelling somewhere else on site
BRW8	OA2	173	Deposit	C W extent	Friable mid reddish orange clayey sand with <5% crushed brick (<0.05m) rubble and light greyish white to mid blueish grey ash lenses throughout	10.9m long, 0.1-0.05m deep	174, 179, 180, 181	High	174, 224	76	-	-	176	-	c1912	Kiln C Operation Subphase, c1913-1916	Upper internal floor surface of Kiln C. Similar nature to 118, 119 in Kiln B and 203, 204 in Kiln D. However, no evidence of Phase 1 subsurface flue identified, as in the instances of Kilns 4 and 5
BRW8	OA2	174	Natural	C W extent	Extremely compact baked mid reddish orange natural clay across deposit	10.9m long, depth unknown	173, 179, 180, 181	High	225	173, 179, 180, 181, 224	-	-	176	-	c1913	Kiln C Operation Subphase, c1913-1916	Lower firing floor of Kiln C. Natural soil horizon that has been levelled and used as a floor surface for 179, 180, 181, the use of which has baked the surrounding natural soil
BRW8	OA2	175	Fill	C W extent	Compact dark brownish grey sandy clay mottled with mid yellow and orange clay and <1% charcoal (<0.01m) with <1% crushed brick (<0.04m) rubble inclusions	depth unknown	-	Low	-	76	-	176	-	-	Unknown	Unknown	Fill for 176. Unexcavated, purposed unknown, but following closure and demolition of early kilns
BRW8	OA2	176	Cut	C W extent	Linear in plan. Break of top, sides, break of base, base unknown. Aligned NE to SW	-	-	Low	-	-	173, 174	-	-	175	Unknown	Unknown	Cut for 175
BRW8	OA2	177	Void	-	Repeated number	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	OA2	178	Void	-	Repeated number	-	-	-	-	-	-	-	-	-	-	-	-

General information									Harris Matrix						Interpretation	
BRW8	OA2	179	Structure	C W extent	Brick footing. 'Simple' brick frogs. 3 rows of bricks, single course where placed on sides and 2 courses where placed on faces. Upper course missing on N extent. Bricks placed on faces on W-most two rows and on N and S extent of E row. The E row is placed on sides. Largely regular coursing throughout. No mortar, bonded with natural soil matric. Aligned N to S	2.55m long, 0.71m long, 0.12m high	180, 181	High	174	76	-	-	-	-	c1913	Kiln C Operation Subphase, c1913-1916	External E wall for Kiln C. Complete footing design unknown, does not appear to share 'firebox' design of 75, 180, 195
BRW8	OA2	180	Structure	C W extent	4 brick footings. 'Simple' brick frogs. Complete arrangement 3 bricks in header bond on N and S extents, 5 bricks in header bond on W extent. Only N-most footing retains mostly complete arrangement, others damaged by demolition. C N box missing S return and single brick from W side. C S box only 3 bricks on W side S-most box only 5 bricks on W side. No mortar, bonded with natural soil matric. Aligned N to S	Total structure. Spacing between N and C N footings 0.5m. Complete arrangement 0.95m long, 0.53m wide, 0.08m high	179, 181	High	174	76	-	-	-	-	c1913	Kiln C Operation Subphase, c1913-1916	External E wall for Kiln C. 'Firebox' arrangement

General information									Harris Matrix						Interpretation		
BRW8	OA2	181	Structure	C W extent	Brick footings. 'Simple' brick frogs. Single row of 7 bricks, header bond. No mortar, bonded with natural soil matric. Aligned N to S	0.8m long, 0.22m wide, 0.08m high	179, 180	High	174	76	-	-	-	-	c1913	Kiln C Operation Subphase, c1913-1916	External W wall for Kiln C
BRW8	OA2	182	Void	C W extent	Voided. Representative of 173, 174	-	-	-	-	-	-	-	-	-	-	-	-
BRW8	OA2	183	Deposit	C E extent	Friable to loosely compact, mid orangey red clayey sand with 25% white ash inclusions and ash lenses	0.92m long, 0.32m wide, 0.12m deep	-	High	204	76	-	-	-	-	c1913	Kiln D Operation Subphase, c1913-1916	Remains of burnt fuel in 'firebox' of 72, Kiln D
BRW8	OA2	184	Deposit	C E extent	Loosely compact mid reddish brown silty sand with 35% black charcoal and white ash inclusions	0.92m long, 0.32m wide, 0.05m deep	-	High	187	186	-	-	-	-	c1913	Kiln D Operation Subphase, c1913-1916	Remains of burnt fuel in 'firebox' of 72, Kiln D
BRW8	OA2	185	Deposit	C E extent	Compact reddish brown silty sand with 25% white ash and 70% crushed brick rubble and shale inclusions	0.92m long, 0.32m wide, 0.12m deep	-	High	204	76	-	-	-	-	c1913	Kiln D Operation Subphase, c1913-1916	Remains of burnt fuel in 'firebox' of 72, Kiln D
BRW8	OA2	186	Deposit	C E extent	Moderately compact crushed charcoal (<0.03m)	0.92m long, 0.32m wide, 0.02m deep	-	High	184	76	-	-	-	-	c1913	Kiln D Operation Subphase, c1913-1916	Remains of burnt fuel in 'firebox' of 72, Kiln D
BRW8	OA2	187	Deposit	C E extent	Friable light greyish white ash	0.92m long, 0.32m wide, 0.02m deep	-	High	188	184	-	-	-	-	c1913	Kiln D Operation Subphase, c1913-1916	Remains of burnt fuel in 'firebox' of 72, Kiln D
BRW8	OA2	188	Deposit	C E extent	Compact reddish purple baked clay with <5% white ash inclusions, likely from interface with above deposit	0.92m long, 0.32m wide, 0.03m deep	-	High	204	187	-	-	-	-	c1913-1916	Kiln D Operation Subphase, c1913-1916	Remains of burnt fuel in 'firebox' of 72, Kiln D

General information									Harris Matrix						Interpretation	
BRW8	OA2	189	Deposit	E extent	Brick rubble layer, full and fragmentary. Mostly 'simple' brick frogs, some 'blank' frogs. Generally level, 50% angled, although not formally laid in any defined configuration. Soil matrix comprised of loosely compact mid reddish brown clayey sand	3.35m long, 1.6m wide, 0.16m deep	-	Moderate	190	78	-	-	-	-	Unknown	Experimental Plant Closure Subphase, c1920	Rubble resulting from the demolition of Kiln E. Rubble piled into interior space of kiln and approximately levelled, although purpose of this action is unknown
BRW8	OA2	190	Deposit	E extent	Very compact baked mid greyish orange sandy clay mottled with charcoal and <1% subangular gravels (<0.0.5m)	-	197, 198	High	191, Natural	189, 194, 198	-	-	-	-	c1914	Kiln E Operation Subphase 2, c1914-1916	Phase 2 firing floor of Kiln E. Deposited following the dismantling of the subsurface flue. Built up around Phase 1 structures 195, 196. Provides base for Phase 2 structures 197, 198
BRW8	OA2	191	Fill	E extent	Friable mid greyish red clayey sand. Variable % of brick rubble inclusions - 80% within internal space of kiln, largely whole 'simple' brick frogs, 50% in external space N of kiln, largely crushed brick (<0.15m) rubble. Cavities within fill	0.86m wide, 0.6m deep	-	Moderate	-	190	-	192	-	-	c1914	Kiln E Operation Subphase 2, c1914-1916	Fill for 193. Rubble from demolition of 192 following dismantling of the subsurface flue
BRW8	OA2	192	Structure	E extent	Brick-lined subsurface flue. 'Simple' brick frogs. Very little structure remaining, a number of bricks stacked neatly against 193, but 191 matrix makes identification unclear	0.55m long, 0.86m wide, 0.16m high	169, 170	High	-	-	-	193	-	191	c1913	Kiln E Operation Subphase 1, c1913-c1914	Subsurface flue for phase 1 of Kiln D. Constructed to aid temperature control during firing process. Removed at some stage during life of kiln to adapt the structure for firing without flue-based temperature control

General information											Harris Matrix					Interpretation	
BRW8	OA2	193	Cut	E extent	Linear in plan, regular parallel sides, sharp break of top, vertical sides, sharp break of base, level base. Appears to widen within internal space of kiln	0.86m wide, 0.6m deep	169, 170	High	-	-	Natural	-	-	191, 192	c1913	Kiln E Operation Subphase 1, c1913-c1914	Cut for 192, subsurface flue. Converges with 170 at far NE corner of excavation
BRW8	OA2	194	Deposit	E extent	Loosely to moderately compact dark black crushed coal (<0.03m) with black ash and <1% crushed brick (<0.02m) rubble	0.2-0.02m deep	195, 196	High	190, 195, 196	76	-	-	-	-	Unknown	Experimental Plant Closure Subphase, c1920	Deposit of crushed coal distributed within internal space of Kiln E. Unknown whether the deposit is associated with the operation of the kiln or its closing, where waste materials were spread through the internal space. The latter is the most likely
BRW8	OA2	195	Structure	E extent	7 brick footings. 'Simple' brick frogs. Complete arrangement 2 bricks in header bond on N and S extents, 4 bricks in header bond on W extent. Only S-most footings retains complete arrangement, others damaged by demolition. The second from S-most footings has different arrangement to other footings, with three bricks in stretcher bond. No mortar, bonded with natural soil matrix. Aligned N to S	Spacing between footings 0.95m. Complete arrangement 0.81m long, 0.46m wide, 0.08m high	196	High	199	194	-	-	-	-	c1913	Kiln E Operation Subphase 1, c1913-c1914	External E wall for Kiln E. 'Firebox' arrangement

General information									Harris Matrix						Interpretation	
BRW8	OA2	196	Structure	E extent	5 brick footings. A sixth footing has been completely removed from the alignment. 'Simple' brick frogs. No indications of complete arrangement remain, but almost certainly same as 195. No mortar, bonded with natural soil matrix. Aligned N to S	Spacing between footings 0.95m	195	High	199	194	-	-	-	-	c1913	Kiln E Operation Subphase 1, c1913-c1914	External W wall for Kiln E. 'Firebox' arrangement. Damage likely caused during demolition rather than alterations for Phase 2, although the addition of 198 would suggest some adjustments were made to the internal structure of the kiln. The basic footprint of the kiln may not have been altered between phases
BRW8	OA2	197	Structure	E extent	Brick footings. No identifiable structure pattern or coursing due to extensive demolition and dislocation. 2 courses where bricks are laid on faces, but majority of upper course missing. Single course where bricks laid on sides. No mortar, bonded with natural soil matrix	-	198	High	190	76	-	-	-	-	c1914	Kiln E Operation Subphase 2, c1914-1916	Structural component for Kiln E. Part of Phase 2, as apparently 'blocks' 196. Appears to form external NW corner, but due to demolition damage this cannot be confirmed
BRW8	OA2	198	Structure	E extent	Brick footings. Single course, 2 outer rows laid in stretcher bond, inner row laid in header bond. No mortar, bonded with natural soil matrix. Aligned E to W. Raised above 196 at level that would be equal to an upper course	-	197	High	190	76	-	-	-	-	c1914	Kiln E Operation Subphase 2, c1914-1916	Internal structural component for Kiln E. The location within the internal space formed by 195, 196 indicates that alterations were made to the internal layout of the kiln following the dismantling of the subsurface flue. This may have been to further control temperature and air flow through the kiln
BRW8	OA2	199	Natural	E extent	Extremely compact baked light orange natural clay. Blueish discolouration present in localised areas	-	195, 196	High	-	190	-	-	193	-	c1913	Kiln E Operation Subphase, c1913-1916	Firing floor of Kiln E. Natural soil horizon that has been levelled and used as a floor surface for 195, 196, the use of which has baked the surrounding natural soil

General information									Harris Matrix						Interpretation	
BRW8	OA2	200	Deposit	E extent	Friable light greyish white ash mottled with charcoal	Length variable, width variable, 0.02m deep	195, 196	Low	Unexcavated	194	-	-	-	-	c1913	Kiln E Operation Subphase, c1913-1916	Distributed throughout Kiln E, but largely concentrated around 195, 196. Remains of burnt fuel
BRW8	OA2	201	Deposit	C W extent	Friable mid blueish grey ash mottled with white ash and charcoal	Length variable, width variable, 0.02m deep	180	Low	Unexcavated	76	-	-	-	-	c1913-1915	Kiln C Operation Subphase, c1913-1916	Concentrated around 180. Remains of burnt fuel
BRW8	OA2	202	Deposit	C E extent	Very compact mid greyish brown clayey sand with <1% brick rubble inclusions	Min 3.77m long, min 9.5m wide, 0.1m deep	Similar to 49	Low	184, Unexcavated	76	-	-	-	-	c1913	Establishment Phase, 1911-1920	Built up around N features of Kiln D. May be incidental accumulation of trample and other external space material, rather than purposeful deposition
BRW8	OA2	203	Deposit	C E extent	Friable mid greyish orange clayey sand mottled with charcoal and <1% crushed brick (>0.03m) rubble. Where it is fill for 170, brick rubble increases to 60%	0.1 deep on internal surface of kiln to 0.5m deep in 170	168	High	204, 208	76	-	170	-	-	c1914	Kiln D Operation Subphase 2, c1914-1916	Phase 2 firing floor of Kiln D. Similar in nature to 173, 174 in Kiln C. Deposited following the dismantling of subsurface flue 169, as used as partial fill for 170 within internal space of kiln
BRW8	OA2	204	Natural	C E extent	Extremely compact baked mid yellowish to mid reddish orange natural clay	-	72, 167, 169, 170, 223	High	Unexcavated	203, 208	-	-	170	-	c1913	Kiln D Operation Subphase 1, c1913-c1914	Phase 1 firing floor of Kiln D. Natural soil horizon that have been levelled and used as a floor surface for a downdraught kiln, the use of which has baked the surrounding natural soil
BRW8	OA2	205	Deposit	C E extent	Friable dark brownish black ash and sandy clay deposit with white ash mottling and <1% sugangular gravel (<0.01m) inclusions. Generally patchy and inconsistent	1.54m long, 1.1m wide, 0.02-0.01m deep	-	Low	202	76	-	-	-	-	c1913	Kiln D Operation Subphase, c1913-1916	Incidental ash deposit that has accumulated in the external area N of Kiln D, between 166 and 169
BRW8	OA2	206	Deposit	C E extent	Friable light greyish white ash mottled with charcoal	Length variable, width variable, 0.02m deep	-	Low	204	203	-	-	-	-	c1914	Kiln D Operation Subphase 2, c1914-1916	Distributed throughout Kiln D. Remains of burnt fuel

General information								Harris Matrix						Interpretation		
BRW8	OA2	207	Deposit	E extent	Friable light greyish white ash with 85% crushed charcoal (<0.02m) inclusions. Generally patchy and inconsistent	3.93m long, 2.45m wide, 0.05m deep	-	Low	Unexcavated	76	-	-	-	-	c1913	Kiln E Operation Subphase, c1913-1916	Incidental ash deposit that has accumulated in the external area NW of Kiln E. Likely as a result of emptying and/or re-filling the kiln, rather than a purposeful dumping location for waste ash
BRW8	OA2	208	Deposit	C E extent	4 distinct lines of discolouration within 204. N line compact mottled dark greenish grey to mid yellowish grey to mid reddish orange sandy clay, gradiating from ornage to greenish grey W to E, <10% white ash inclusions. C N line compact mottled dark greenish grey to mid yellowish grey to mid reddish orange sandy clay, gradiating from orange to greenish grey W to E, <25% white ash inclusions. C S line compact mottled mid yellowish grey to mid reddish orange sandy clay, gradiates from orange to yellow W to E, 15% white ash inclusions. S line compact mottled mid reddish grey to light greyish yellow to mid reddish orange sandy clay, gradiates from orange to red W to E, 45% white ash inclusions	0.32m wide, depth unknown	-	Moderate	204	203	-	-	-	-	c1914	Kiln D Operation Subphase 2, c1914-1916	Likely the result of differential heat distribution through the internal space of Kiln D during firing process, probably from the laying or insertion of fuel through the fireboxes 72, 67
BRW8	OA2	209	Void	C E extent	Initially thought to be cuts for cross-flues extending from 170. Found to not be cuts	-	-	-	-	-	-	-	-	-	-	-	-

General information										Harris Matrix						Interpretation	
BRW8	OA2	210	Fill	N W extent	Friable mid to dark greyish brown sandy clay with <10% crushed brick rubble inclusions. High degree of bioturbation from tree roots, particularly in C E end where a tree bole / remnant timber post was present	0.72m long, 0.38m wide, 0.19m deep	-	Low	-	115, topsoil	-	211	-	-	c1913	Establishment Phase, 1911-1920	Fill for 211. Possibly functional for 115, but unknown
BRW8	OA2	211	Cut	N W extent	Linear in plan, sharp break of top, vertical sides, sharp break of base, level base	0.72m long, 0.38m wide, 0.19m deep	-	Low	-	-	Natural	-	-	210	c1913	Establishment Phase, 1911-1920	Cut for 210
BRW8	OA2	212	Fill	N E extent	Loosely compact dark brownish black crushed coal (<0.05m) with <5% crushed brick (<0.1m) rubble inclusions	3.8m long, 0.8m wide, 0.05m deep	168, 203, 213, 214, 215, 216	Low	213	76	-	170	-	-	Unknown	Kiln D Operation Subphase 2, c1914-1916	Part of fill sequence for 170 E of 169, associated with 213, 214, 215, 216. Deposited following dismantling of 169 at transition of Kiln D to Phase 2. All fills in sequence likely deposited in single event
BRW8	OA2	213	Fill	N E extent	Loosely compact mid reddish brown sandy clay with <25% brick rubble (<0.15m) inclusions	3.8m long, 0.8m wide, 0.2m deep	168, 203, 212, 214, 215, 216	Low	214	212	-	170	-	-	Unknown	Kiln D Operation Subphase 2, c1914-1916	Part of fill sequence for 170 E of 169, associated with 212, 214, 215, 216. Deposited following dismantling of 169 at transition of Kiln D to Phase 2. All fills in sequence likely deposited in single event
BRW8	OA2	214	Fill	N E extent	Compact dark brownish black crushed coal with <1% burnt timber inclusions	0.8m wide, 0.01m deep	168, 203, 212, 213, 215, 216	Low	215	213	-	170	-	-	Unknown	Kiln D Operation Subphase 2, c1914-1916	Part of fill sequence for 170 E of 169, associated with 212, 213, 215, 216. Deposited following dismantling of 169 at transition of Kiln D to Phase 2. All fills in sequence likely deposited in single event
BRW8	OA2	215	Fill	N E extent	Single layer of textiles, possibly bitumen-coated felt	0.75m long, 0.8m wide, 0.01m deep	168, 203, 212, 213, 214, 216	Low	216	214	-	170	-	-	Unknown	Kiln D Operation Subphase 2, c1914-1916	Part of fill sequence for 170 E of 169, associated with 212, 213, 214, 216. Deposited following dismantling of 169 at transition of Kiln D to Phase 2. All fills in sequence likely deposited in single event

General information										Harris Matrix						Interpretation	
BRW8	OA2	216	Fill	N E extent	Loosely compact mid reddish brown sandy clay with <25% brick rubble (<0.15m) inclusions	0.8m wide, 0.22m deep	168, 203, 212, 213, 214, 215	Low	-	215	-	170	-	-	Unknown	Kiln D Operation Subphase 2, c1914-1916	Part of fill sequence for 170 E of 169, associated with 212, 213, 214, 215. Deposited following dismantling of 169 at transition of Kiln D to Phase 2. All fills in sequence likely deposited in single event
BRW8	OA2	217	Deposit	C E extent	Compact mid mottled greenish brown to reddish brown sandy clay with <1% charcoal and orange clay inclusions. Some areas of blueish / greenish discolouration	3.95m long, 1.05m wide, depth unknown	167	Low	Unexcavated	167, 203	-	-	-	-	c1913	Kiln D Operation Subphase, c1913-1916	Base for 167. Unsure of purpose or reason for location, all other kiln structures placed on baked natural clay. The discolouration is similar to that observed in TT4, determined to be caused by leaking oil. Presumably Kiln D was powered by timber or coal (supported by presence of 209), not oil, meaning the source of the discolouration is unknown
BRW8	OA2	218	Structure	C W extent	Decomposed brick footings. Number of bricks indiscernible, 3 groups present. Single course, header bond. Aligned N to S	-	-	Low	174	173	-	-	-	-	c1913	Kiln C Operation Subphase, c1913-1916	Decomposed brick footings. Set slightly E of 181 but in same alignment. Purposed unknown
BRW11	TT3, 4, 5, 6	219	Structure	Entire extent	Concrete slab	-	-	Low	7, 12, 17, 27	-	-	-	-	-	1971	Post World War II Phase, 1944-1976	Concrete slab for extrusion plant
BRW8	OA2	220	Deposit	W extent	Moderately compact mid greyish yellow sand	-	-	Low	115	41	-	-	-	-	c1920	Experimental Plant Closure Subphase, c1920	Deposited above partially demolished remains of Kiln B
BRW8	OA1	221	Fill	W extent	Friable mid orangey red sand with white ash, slag, and approx 25% crushed brick (<0.01m) inclusions	Some cavities of 137	Associated with 137, 138, 139, 140, 141, 142	High	-	41	-	137	141	-	c1913	Kiln A Operation Subphase, c1913	Fill within some cavity spaces of 137. Likely deposited following demolition of the structure, rather than as part of the funtional use
BRW8	OA2	222	Void	E extent	Same as 172	-	-	-	-	-	-	-	-	-	-	-	-

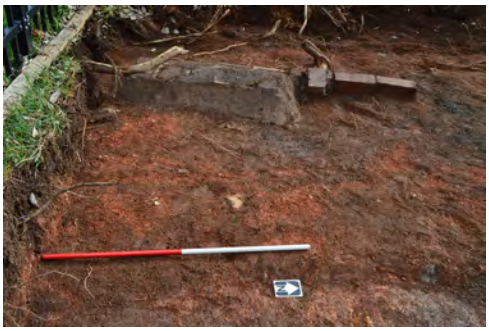
General information							Harris Matrix							Interpretation	
BRW8	OA2	223	Structure	C E extent	Brick footings. 'Simple' brick frogs. 2 courses, largely patternless mixture of header and stretcher bond. No mortar, bonded with natural clay matrix. Aligned N to S	72, 166, 167, 169	High	Unexcavated	81	-	-	-	-	c1914	Kiln D Operation Subphase 2, c1914-1916	Additions made to the northwestern and central western aspect of 72. Part of conversion of Kiln D from downdraught to Scotch kiln, exact purpose unclear
BRW8	OA2	224	Deposit	C W extent	Patches of mid to dark blueish / greenish / black discolouration present in localised areas in linear alignments in 174	173, 174	Moderate	174	173	-	-	-	-	c1913-1915	Kiln C Operation Subphase, c1913-1916	Staning in 174. The discolouration is similar to that observed in TT4, determined to be caused by leaking oil. Presumably Kiln C was powered by timber or coal, not oil, meaning the source of the discolouration is unknown
BRW8	OA2	225	Natural	C W extent	Compact dark brownish black natural clay	-	173, 174, 179, 180, 181	High	-	174	-	-	-	-	c1913	Kiln C Operation Subphase, c1913-1916	Colour indicative of heat exposure. Located in internal space of Kiln C, below firing floor, where heat generated within Kiln C has caused change in colour


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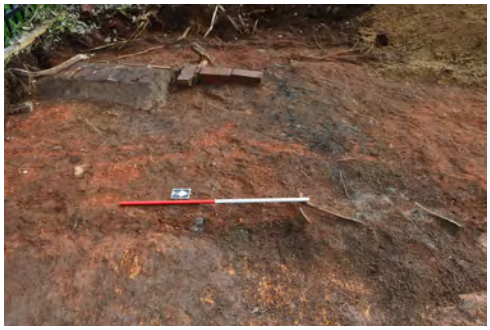

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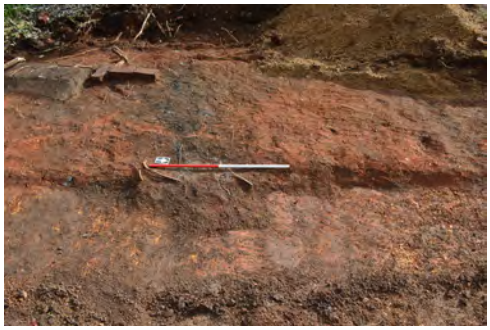

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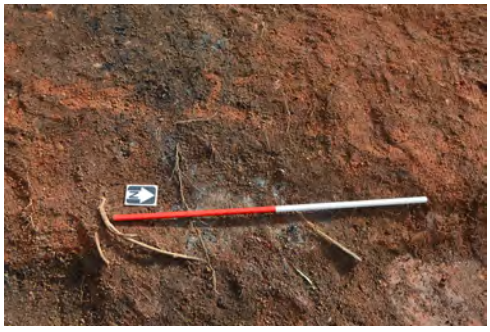

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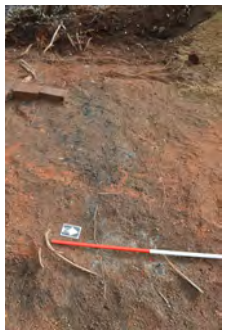

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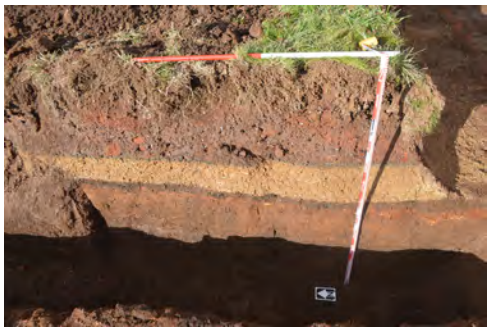
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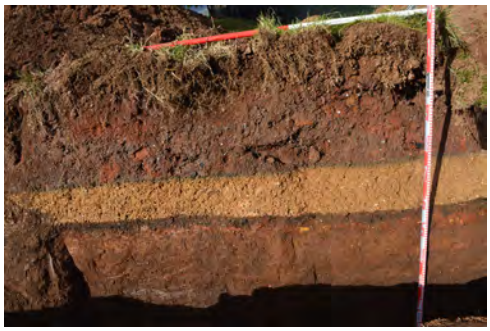
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DSC_0980



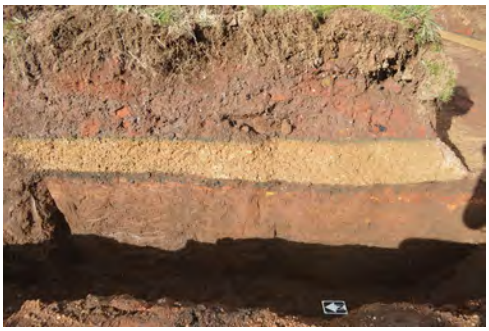
DSC_0981



DSC_0982



DSC_0983



DSC_0984



DSC_0985



DSC_0986



DSC_0987



DSC_0988



DSC_0989



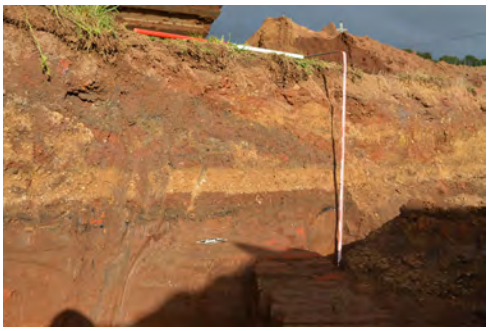
DSC_0990



DSC_0991



DSC_0992



DSC_0993



DSC_0994



DSC_0995



DSC_0996



DSC_0997



DSC_0998



DSC_0999



DSC_1000



DSC_1001



DSC_1002



DSC_1003



DSC_1004



DSC_1005



DSC_1006



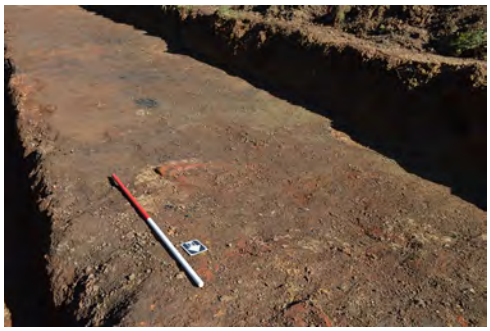
DSC_1007



DSC_1008



DSC_1009



DSC_1010



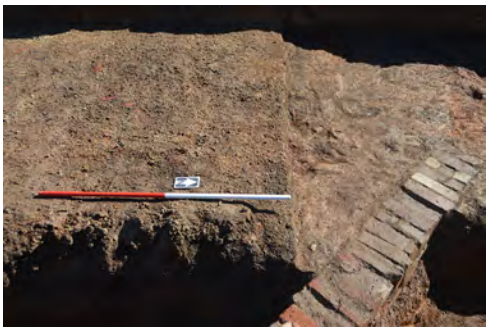
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DSC_1012



DSC_1013



DSC_1014



DSC_0001



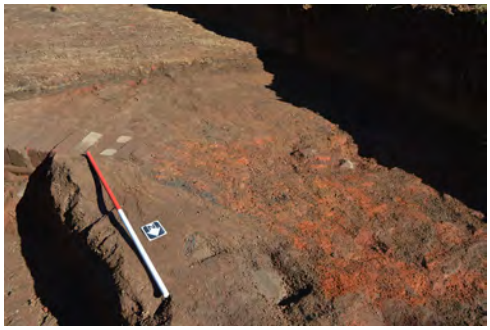
DSC_0002



DSC_0003



DSC_0004



DSC_0005



DSC_0006



DSC_0007



DSC_0008



DSC_0009



DSC_0010



DSC_0011



DSC_0012



DSC_0013


DSC_0014

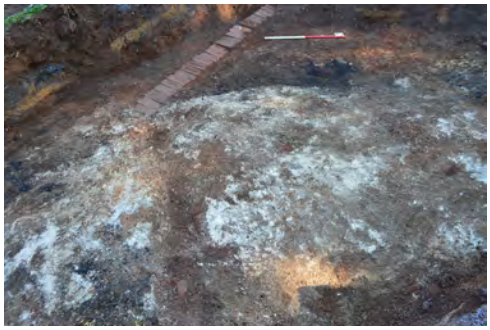

DSC_0015


DSC_0016


DSC_0017

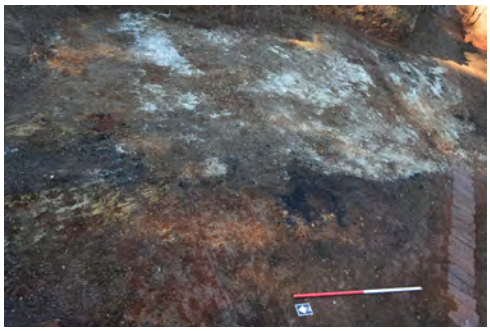

DSC_0018


DSC_0019


DSC_0020


DSC_0021


DSC_0022


DSC_0023


DSC_0024


DSC_0025


DSC_0026


DSC_0027


DSC_0028



DSC_0029



DSC_0030



DSC_0031



DSC_0032



DSC_0033



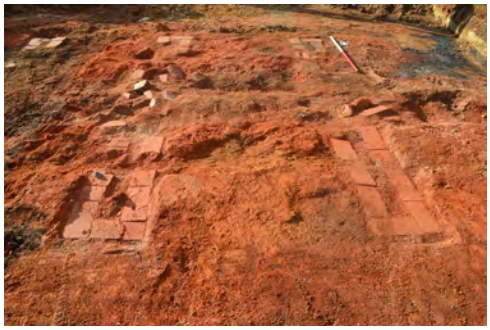
DSC_0034



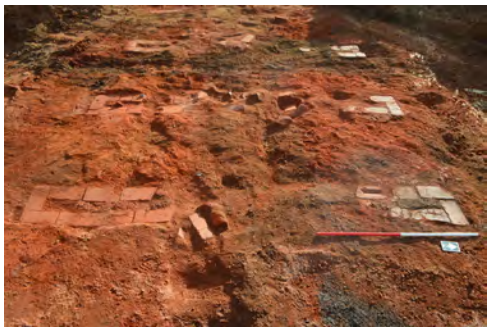
DSC_0035



DSC_0036



DSC_0037



DSC_0038



DSC_0039



DSC_0040



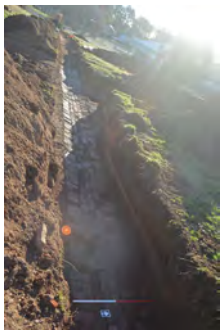
DSC_0041



DSC_0042



DSC_0043


DSC_0044


DSC_0045


DSC_0046


DSC_0047


DSC_0048


DSC_0049


DSC_0050


DSC_0051


DSC_0052


DSC_0053


DSC_0054


DSC_0055


DSC_0056


DSC_0057


DSC_0058



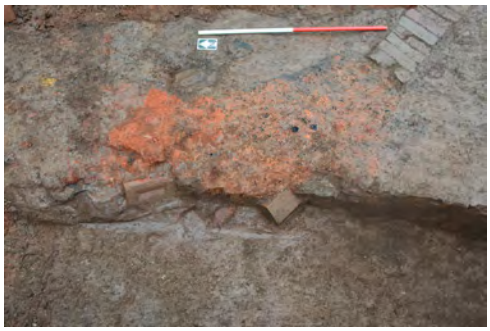
DSC_0059



DSC_0060



DSC_0061



DSC_0062



DSC_0063



DSC_0064



DSC_0065



DSC_0066



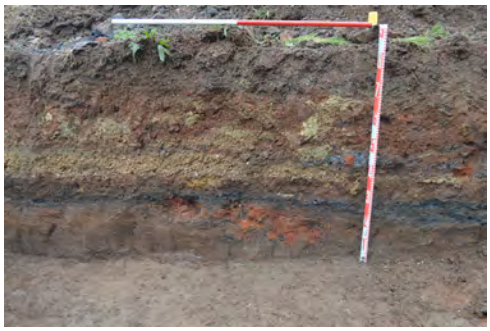
DSC_0067



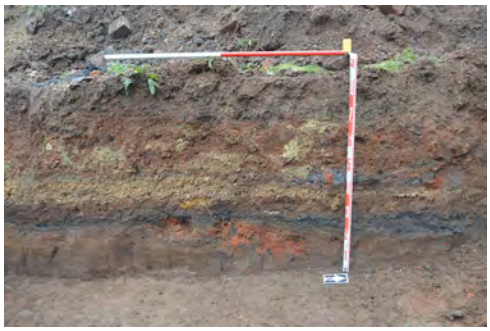
DSC_0068



DSC_0069



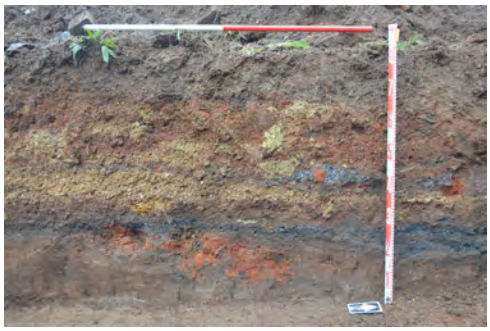
DSC_0070



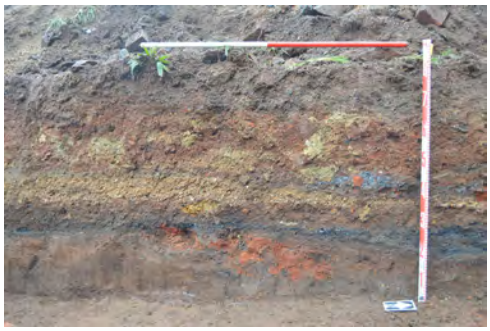
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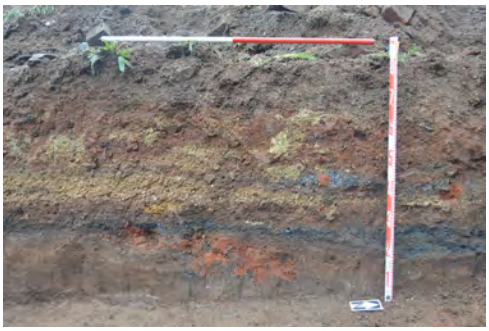
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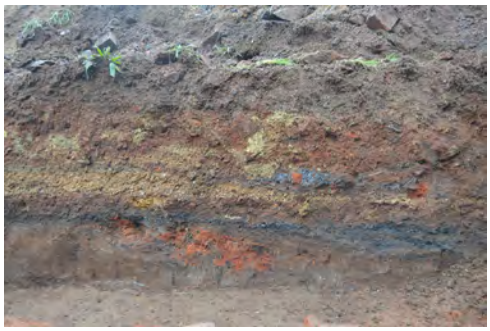
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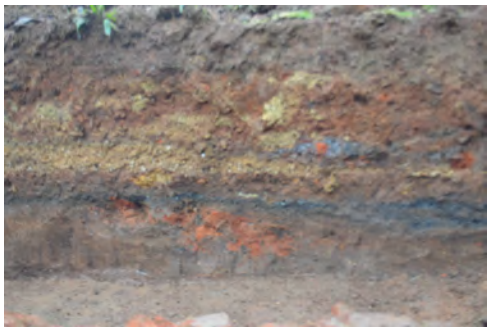
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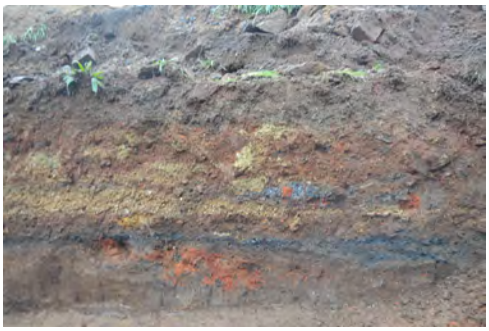
DSC_0075



DSC_0076



DSC_0077



DSC_0078



DSC_0079



DSC_0080



DSC_0081



DSC_0082



DSC_0083



DSC_0084



DSC_0085



DSC_0086



DSC_0087



DSC_0088


DSC_0089


DSC_0090


DSC_0091


DSC_0092


DSC_0093


DSC_0094


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DSC_0096


DSC_0097

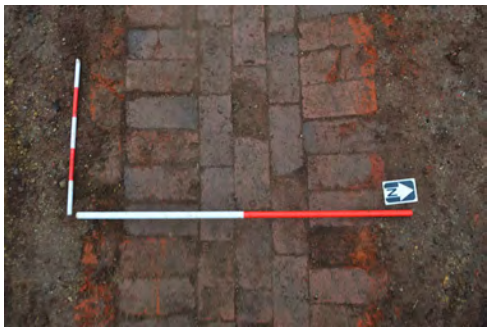

DSC_0098


DSC_0099


DSC_0100

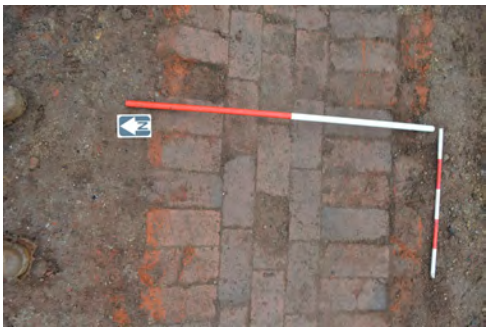

DSC_0101


DSC_0102


DSC_0103



DSC_0104



DSC_0105



DSC_0106



DSC_0107



DSC_0108



DSC_0109



DSC_0110



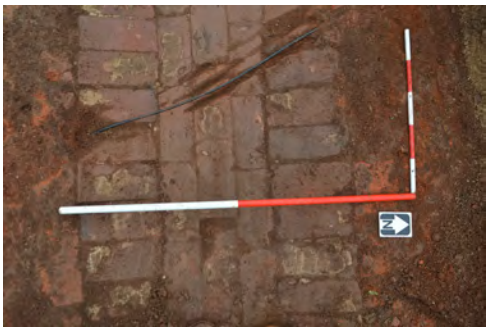
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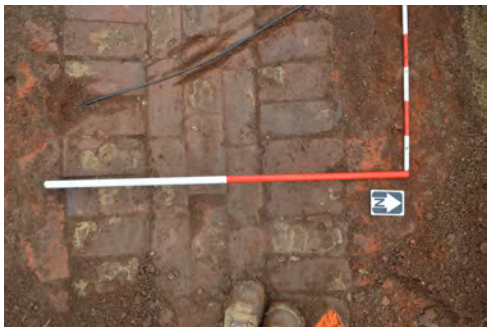
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DSC_0113



DSC_0114



DSC_0115



DSC_0116



DSC_0117



DSC_0118



DSC_0119



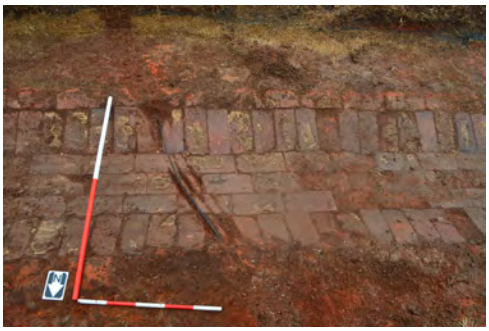
DSC_0120



DSC_0121



DSC_0122



DSC_0123



DSC_0124



DSC_0125



DSC_0126



DSC_0127



DSC_0128



DSC_0129



DSC_0130



DSC_0131



DSC_0132



DSC_0133


DSC_0134


DSC_0135


DSC_0136


DSC_0137


DSC_0138


DSC_0139


DSC_0140


DSC_0141


DSC_0142


DSC_0143


DSC_0144


DSC_0145


DSC_0146


DSC_0147


DSC_0148



DSC_0149



DSC_0150



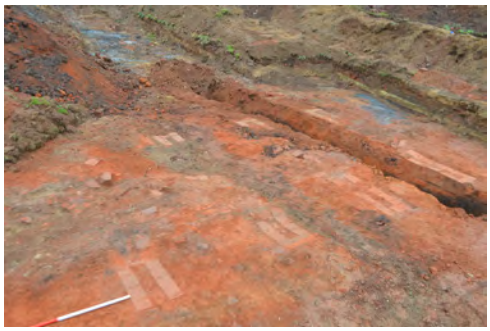
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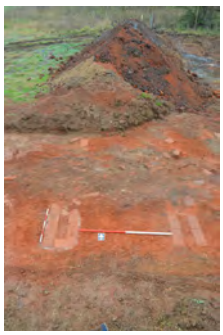
DSC_0152



DSC_0153



DSC_0154



DSC_0155



DSC_0156



DSC_0157



DSC_0158



DSC_0159



DSC_0160



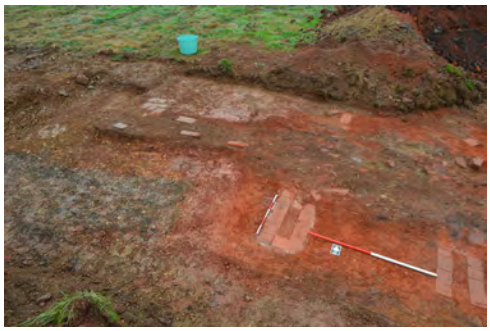
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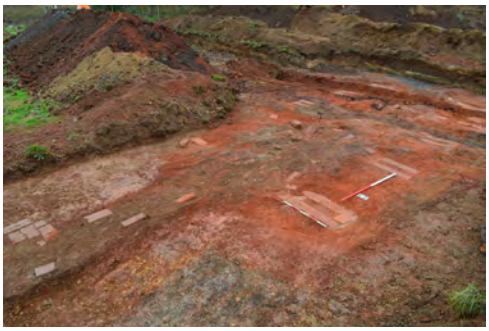
DSC_0162



DSC_0163



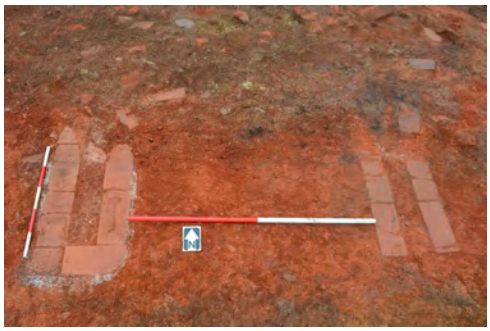
DSC_0164



DSC_0165



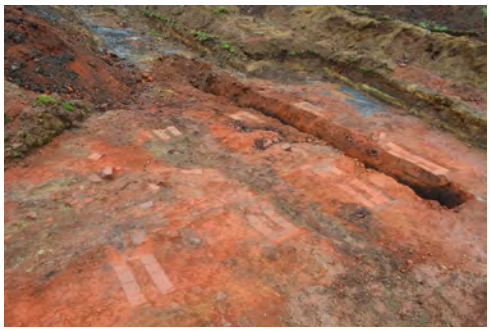
DSC_0166



DSC_0167



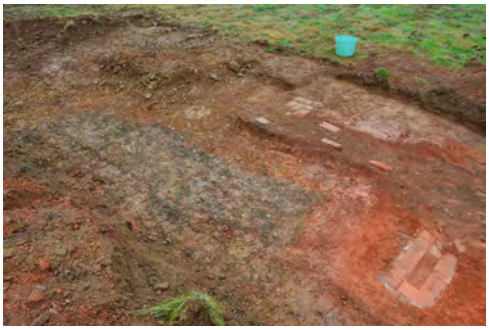
DSC_0168



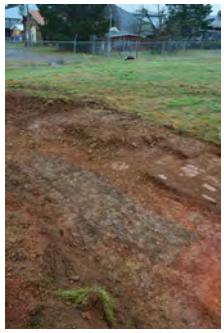
DSC_0169



DSC_0170



DSC_0171



DSC_0172



DSC_0173



DSC_0174



DSC_0175



DSC_0176



DSC_0177



DSC_0178


DSC_0179


DSC_0180

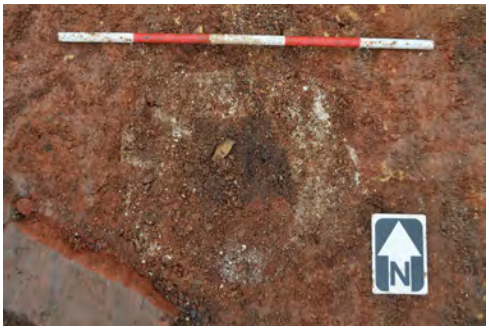

DSC_0181

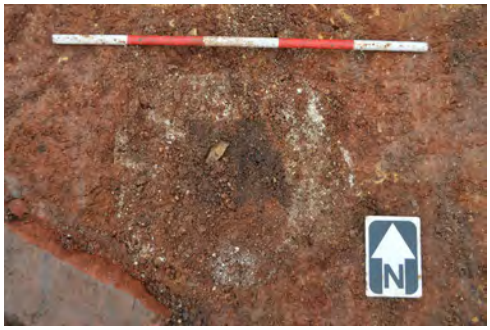

DSC_0182


DSC_0183

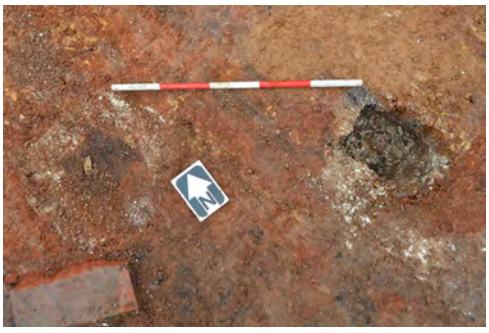

DSC_0184


DSC_0185


DSC_0186


DSC_0187


DSC_0188


DSC_0189


DSC_0190

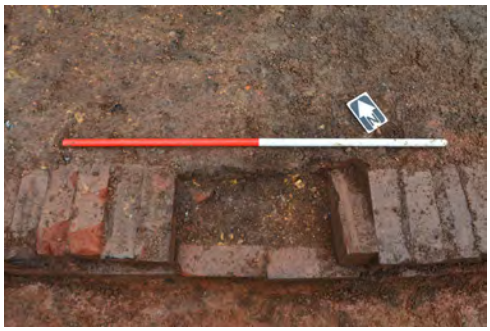

DSC_0191


DSC_0192


DSC_0193


DSC_0194


DSC_0195


DSC_0196

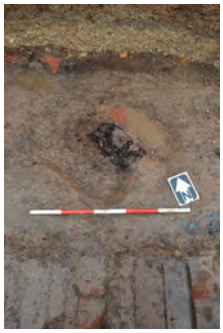

DSC_0197


DSC_0198


DSC_0199


DSC_0200


DSC_0201


DSC_0202


DSC_0203


DSC_0204


DSC_0205


DSC_0206

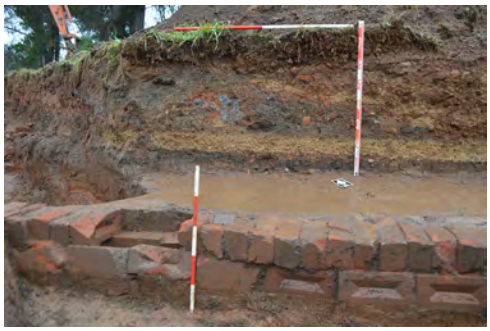

DSC_0207


DSC_0208


DSC_0209

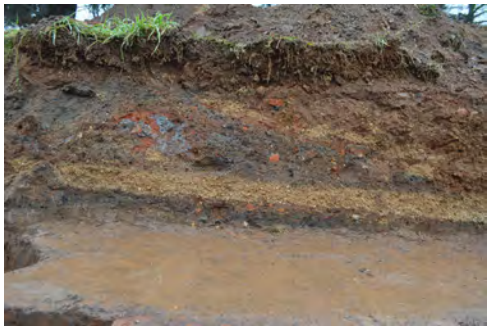

DSC_0210


DSC_0211


DSC_0212


DSC_0213


DSC_0214


DSC_0215


DSC_0216


DSC_0217

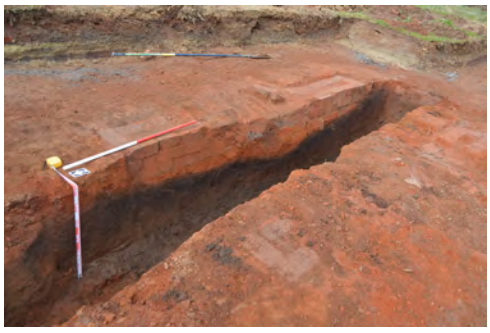

DSC_0218


DSC_0219


DSC_0220


DSC_0221


DSC_0222


DSC_0223



DSC_0224



DSC_0225



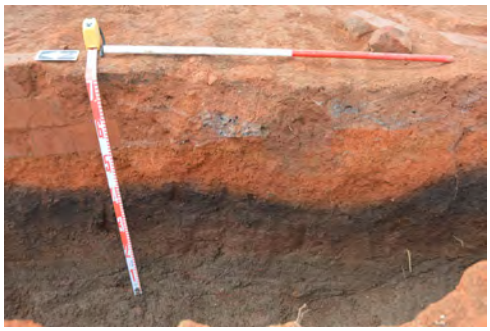
DSC_0226



DSC_0227



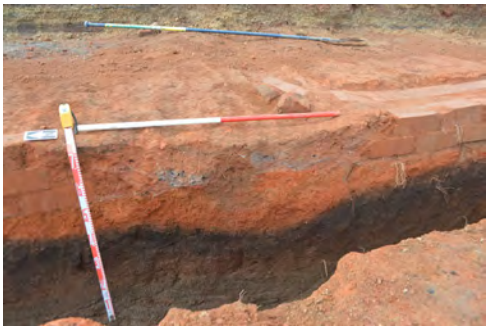
DSC_0228



DSC_0229



DSC_0230



DSC_0231



DSC_0232



DSC_0233



DSC_0234



DSC_0235



DSC_0236



DSC_0237



DSC_0238



DSC_0239



DSC_0240



DSC_0241



DSC_0242



DSC_0243



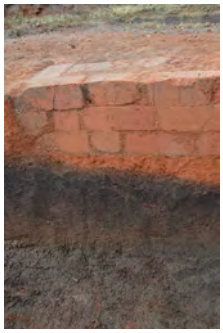
DSC_0244



DSC_0245



DSC_0246



DSC_0247



DSC_0248



DSC_0249



DSC_0250



DSC_0251



DSC_0252



DSC_0253



DSC_0254



DSC_0255



DSC_0256



DSC_0257



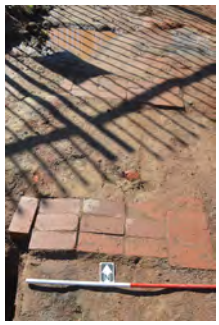
DSC_0258



DSC_0259



DSC_0260



DSC_0261



DSC_0262



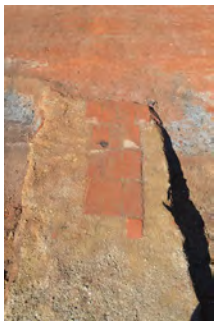
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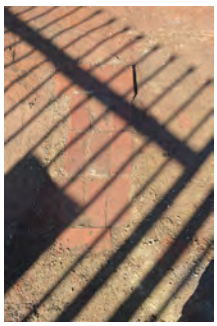

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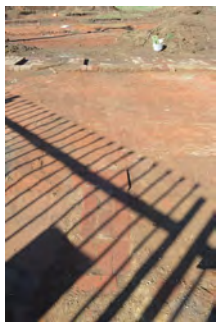

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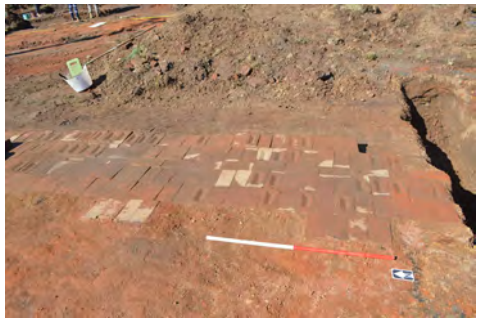

DSC_0271


DSC_0272


DSC_0273


DSC_0274


DSC_0275


DSC_0276


DSC_0277


DSC_0278


DSC_0279


DSC_0280



DSC_0281



DSC_0282



DSC_0283



DSC_0284



DSC_0285



DSC_0286



DSC_0287



DSC_0288



DSC_0289



DSC_0290



DSC_0291



DSC_0292



DSC_0293



DSC_0294



DSC_0295



DSC_0296



DSC_0297



DSC_0298



DSC_0299



DSC_0300



DSC_0301



DSC_0302



DSC_0303



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DSC_0308



DSC_0309



DSC_0310



DSC_0311



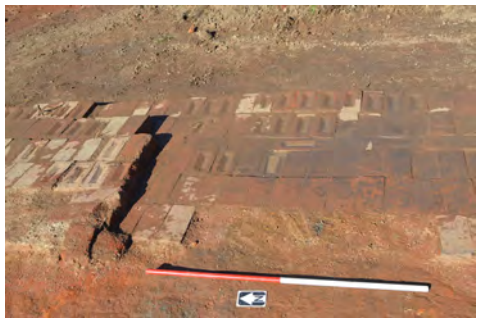
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DSC_0314



DSC_0315



DSC_0316



DSC_0317



DSC_0318



DSC_0319



DSC_0320



DSC_0321



DSC_0322



DSC_0323



DSC_0324



DSC_0325



DSC_0326



DSC_0327



DSC_0328



DSC_0329



DSC_0330



DSC_0331



DSC_0332



DSC_0333



DSC_0334



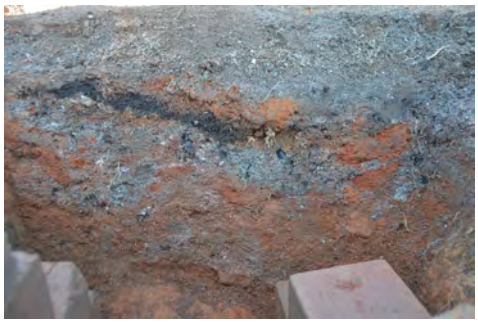
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DSC_0337



DSC_0338



DSC_0339



DSC_0340



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DSC_0342



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DSC_0346



DSC_0347



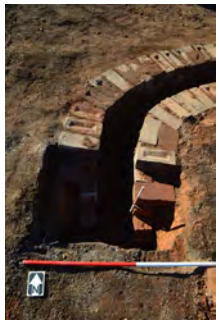
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DSC_0349



DSC_0350



DSC_0351



DSC_0352



DSC_0353



DSC_0354



DSC_0355



DSC_0356



DSC_0357



DSC_0358



DSC_0359



DSC_0360



DSC_0361



DSC_0362



DSC_0363



DSC_0364



DSC_0365



DSC_0366



DSC_0367



DSC_0368



DSC_0369



DSC_0370



DSC_0371



DSC_0372



DSC_0373



DSC_0374



DSC_0375



DSC_0376



DSC_0377



DSC_0378



DSC_0379



DSC_0380



DSC_0381



DSC_0382



DSC_0383



DSC_0384



DSC_0385



DSC_0386



DSC_0387



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DSC_0390



DSC_0391



DSC_0392



DSC_0393



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DSC_0398



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DSC_0402



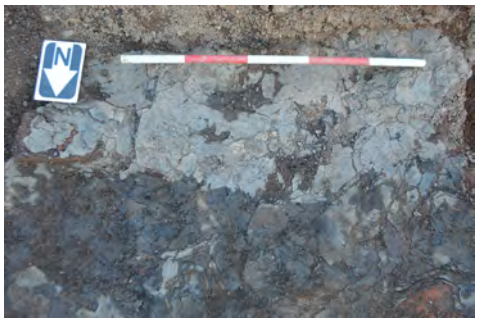
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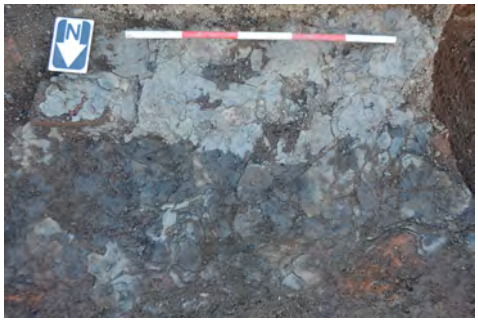
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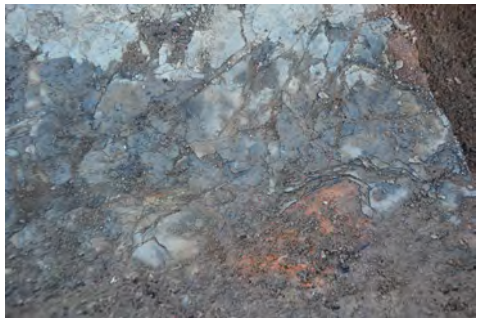
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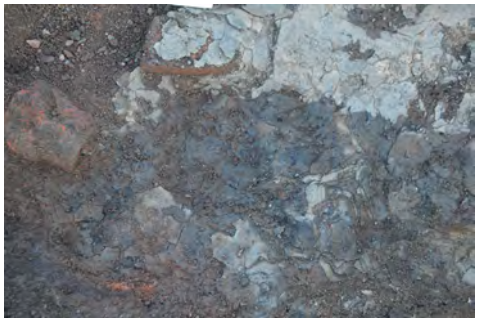
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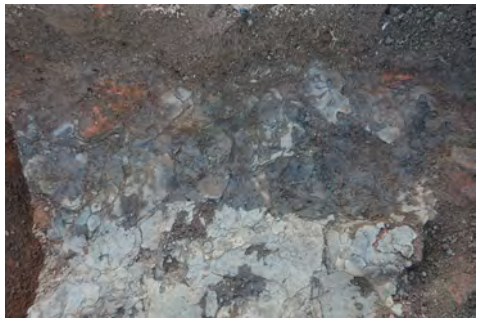
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DSC_0409



DSC_0410



DSC_0411



DSC_0412



DSC_0413



DSC_0414



DSC_0415



DSC_0416



DSC_0417



DSC_0418



DSC_0419



DSC_0420



DSC_0421



DSC_0422



DSC_0423



DSC_0424



DSC_0425



DSC_0426



DSC_0427



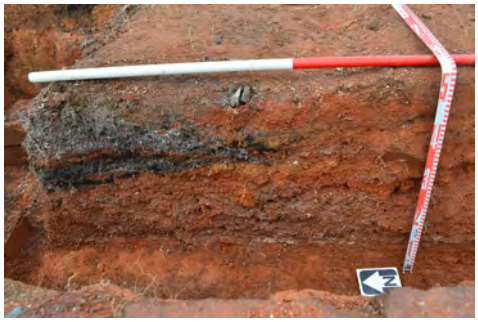
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DSC_0429



DSC_0430



DSC_0431



DSC_0432



DSC_0433



DSC_0434



DSC_0435



DSC_0436



DSC_0437



DSC_0438



DSC_0439



DSC_0440



DSC_0441



DSC_0442



DSC_0443



DSC_0444



DSC_0445



DSC_0446



DSC_0447



DSC_0448



DSC_0449



DSC_0450



DSC_0451



DSC_0452



DSC_0453



DSC_0454



DSC_0455



DSC_0456



DSC_0457



DSC_0458



DSC_0459



DSC_0460



DSC_0461



DSC_0462



DSC_0463



DSC_0464



DSC_0465



DSC_0466



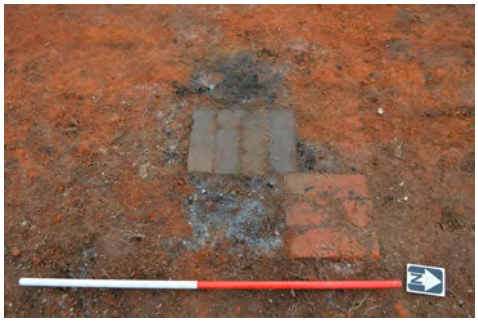
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DSC_0468



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DSC_0470



DSC_0471



DSC_0472



DSC_0473



DSC_0474



DSC_0475



DSC_0476



DSC_0477



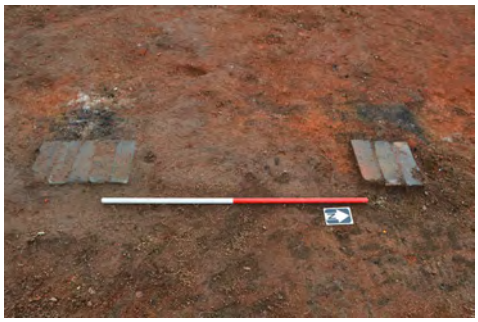
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DSC_0481



DSC_0482



DSC_0483



DSC_0484



DSC_0485



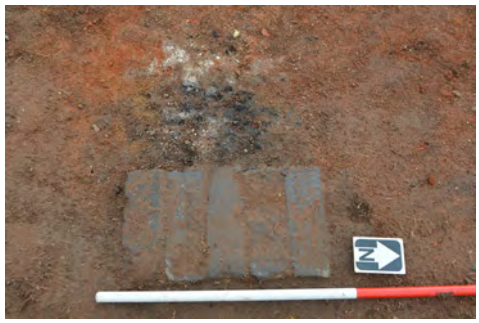
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DSC_0487



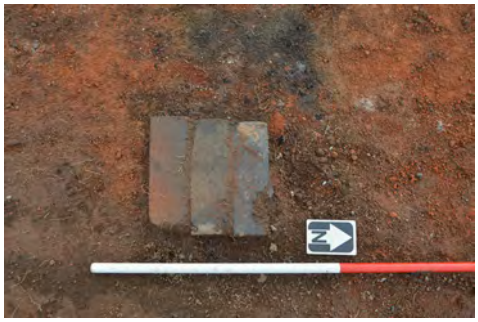
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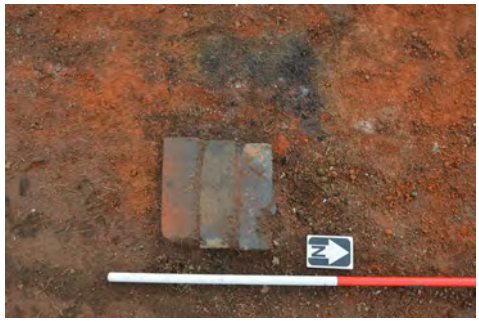
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DSC_0490



DSC_0491



DSC_0492



DSC_0493



DSC_0494



DSC_0495



DSC_0496



DSC_0497



DSC_0498



DSC_0499



DSC_0500



DSC_0501



DSC_0502



DSC_0503



DSC_0504



DSC_0505



DSC_0506



DSC_0507



DSC_0508



DSC_0509



DSC_0510



DSC_0511



DSC_0512



DSC_0513



DSC_0514



DSC_0515



DSC_0516



DSC_0517



DSC_0518



DSC_0519



DSC_0520



DSC_0521



DSC_0522



DSC_0523



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DSC_0526



DSC_0527



DSC_0528



DSC_0529



DSC_0530



DSC_0531



DSC_0532



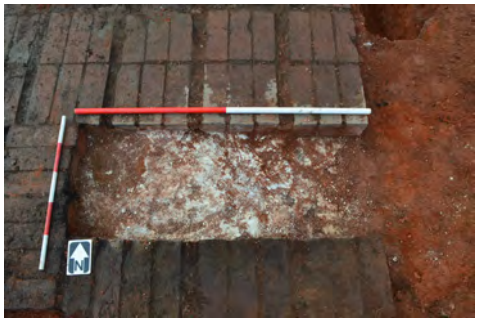
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DSC_0534



DSC_0535



DSC_0536



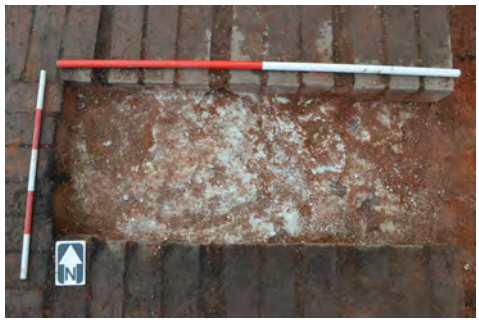
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DSC_0538



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DSC_0540



DSC_0541



DSC_0542



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DSC_0544



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DSC_0546



DSC_0547



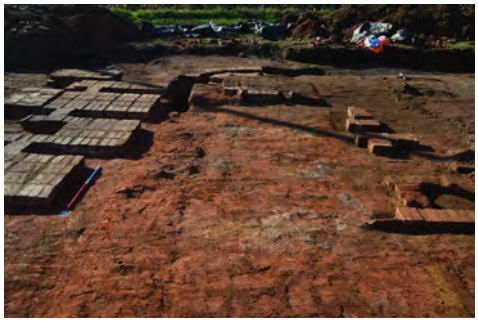
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DSC_0549



DSC_0550



DSC_0551



DSC_0552



DSC_0553



DSC_0554



DSC_0555



DSC_0556



DSC_0557



DSC_0558



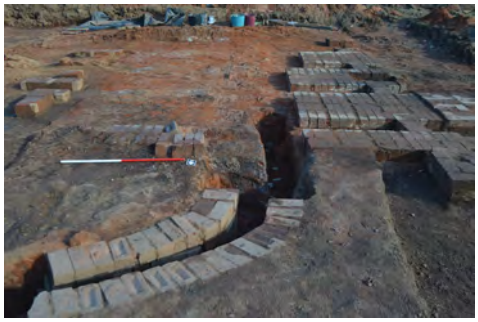
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DSC_0560



DSC_0561



DSC_0562



DSC_0563



DSC_0564



DSC_0565



DSC_0566



DSC_0567



DSC_0568



DSC_0569



DSC_0570



DSC_0571



DSC_0572



DSC_0573



DSC_0574



DSC_0575



DSC_0576



DSC_0577



DSC_0578



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DSC_0580



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DSC_0582



DSC_0583



DSC_0584



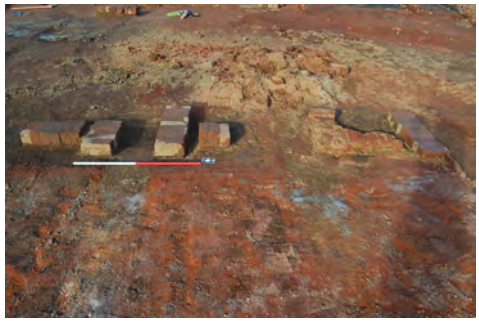
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DSC_0586



DSC_0587



DSC_0588



DSC_0589



DSC_0590



DSC_0591



DSC_0592



DSC_0593



DSC_0594



DSC_0595



DSC_0596



DSC_0597



DSC_0598



DSC_0599



DSC_0600



DSC_0601



DSC_0602



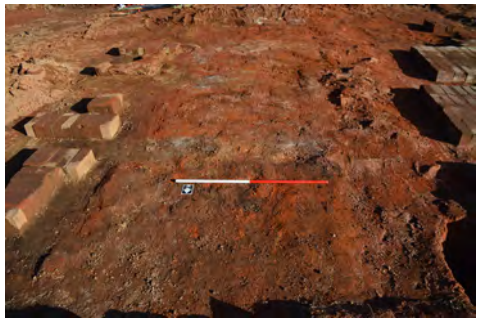
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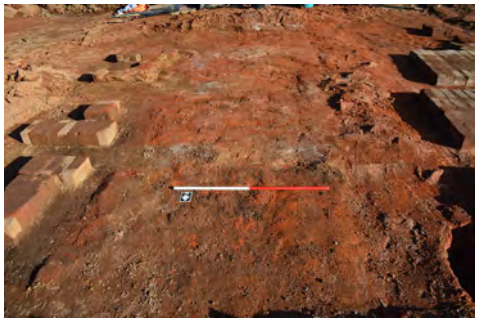
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DSC_0605



DSC_0606



DSC_0607



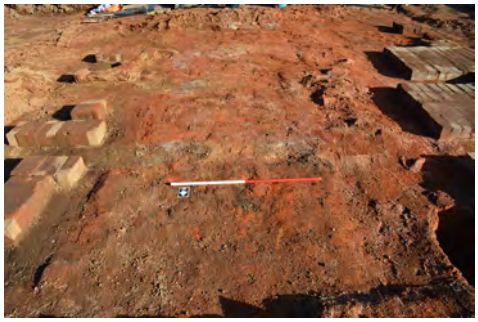
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DSC_0610



DSC_0611



DSC_0612



DSC_0613



DSC_0614



DSC_0615



DSC_0616



DSC_0617



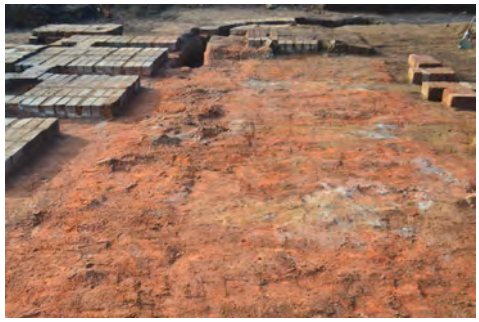
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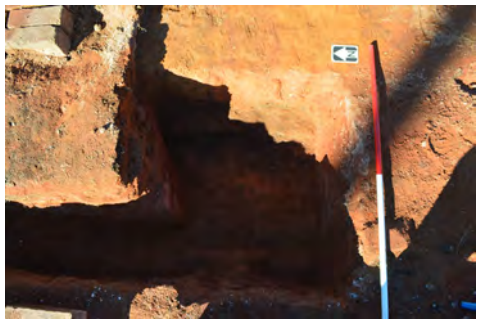
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DSC_0622



DSC_0623



DSC_0624



DSC_0625



DSC_0626



DSC_0627



DSC_0628



DSC_0629



DSC_0630



DSC_0631



DSC_0632



DSC_0633



DSC_0634



DSC_0635



DSC_0636



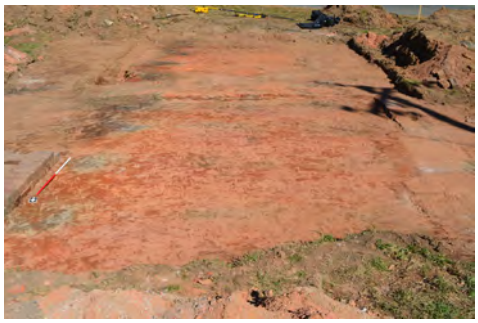
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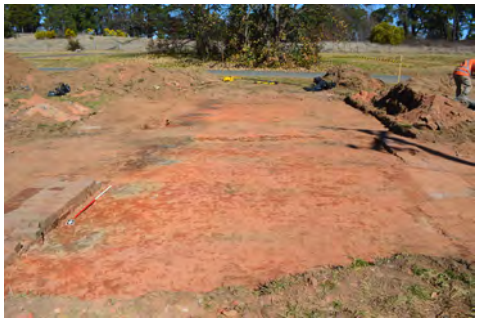
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DSC_0639



DSC_0644



DSC_0645



DSC_0646



DSC_0647



DSC_0648



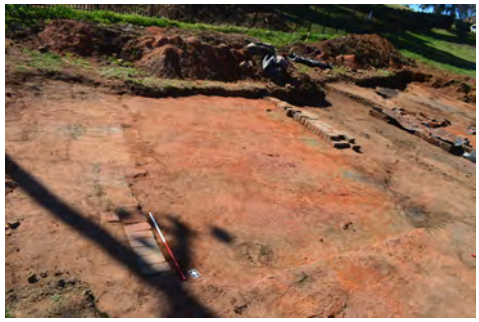
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DSC_0650



DSC_0651



DSC_0652



DSC_0653



DSC_0654



DSC_0655



DSC_0656



DSC_0657



DSC_0658



DSC_0659


DSC_0837


DSC_0838


DSC_0839


DSC_0840


DSC_0841


DSC_0842


DSC_0843


DSC_0844

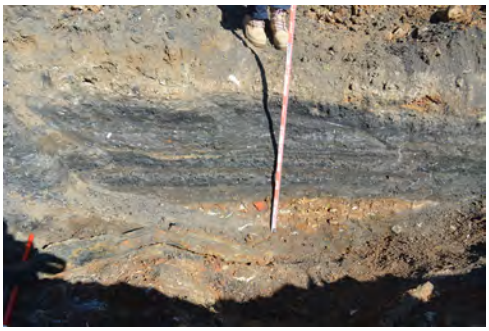

DSC_0845

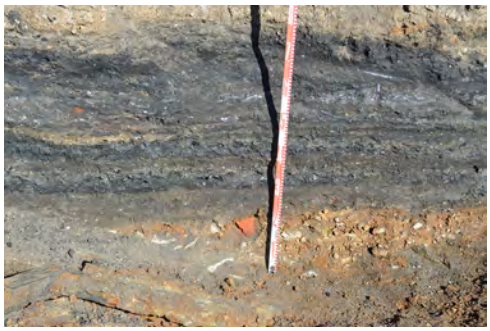

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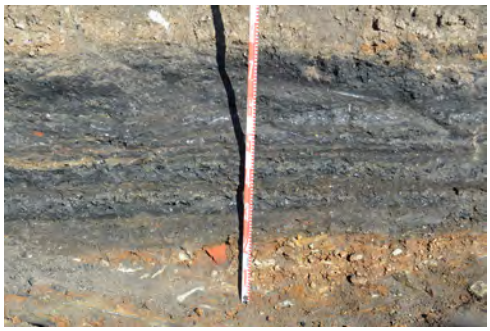

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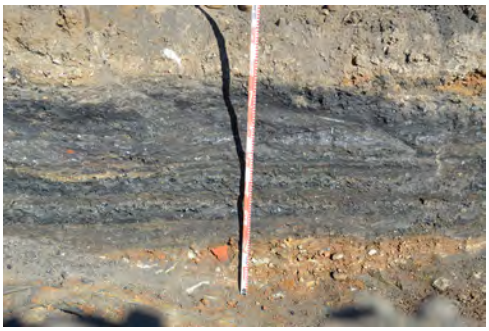

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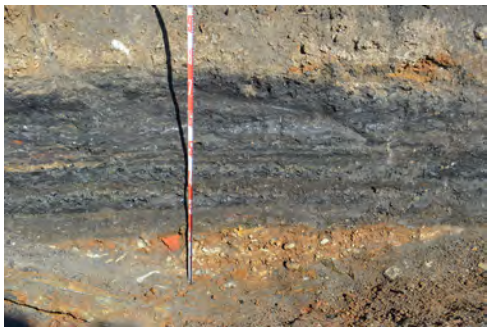

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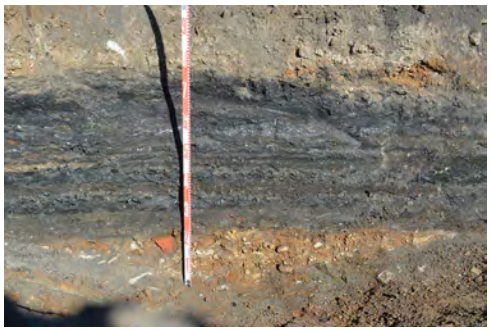

DSC_0850


DSC_0851


DSC_0852


DSC_0853


DSC_0854

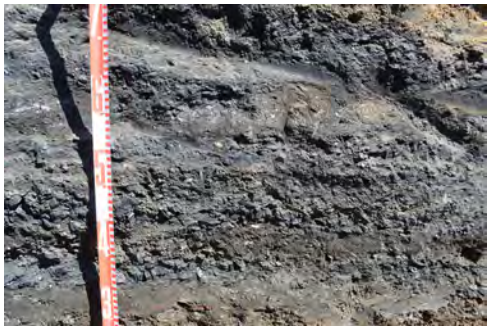

DSC_0855


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DSC_0857

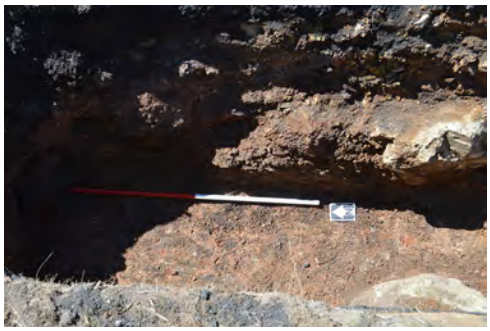

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DSC_0860


DSC_0861


DSC_0862


DSC_0863

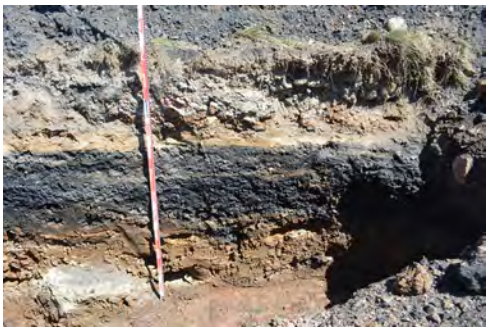

DSC_0864


DSC_0865

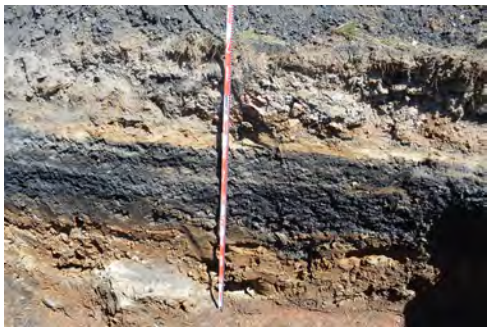

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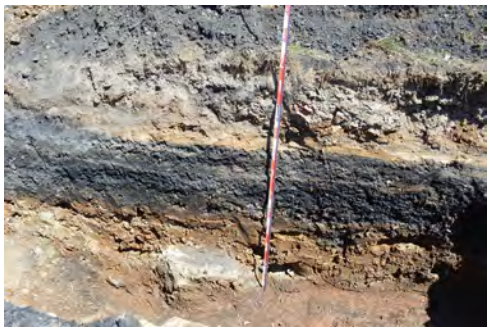
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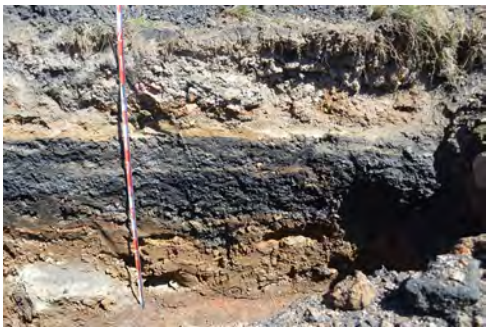
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DSC_0869



DSC_0870



DSC_0871



DSC_0872



DSC_0873



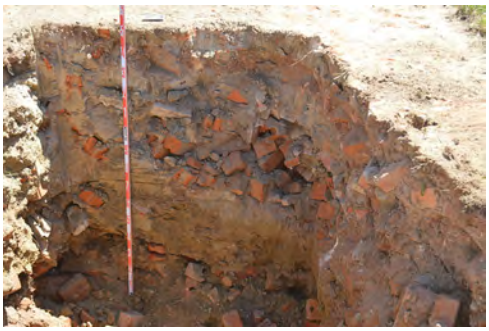
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DSC_0875



DSC_0876



DSC_0877



DSC_0878



DSC_0879



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DSC_0885


DSC_0886


DSC_0887

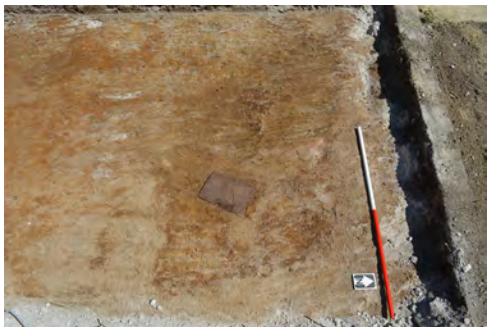

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DSC_0889


DSC_0890

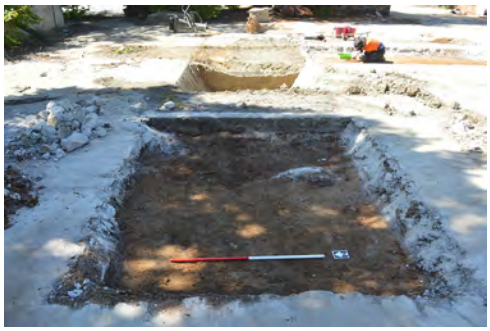

DSC_0891


DSC_0892


DSC_0893

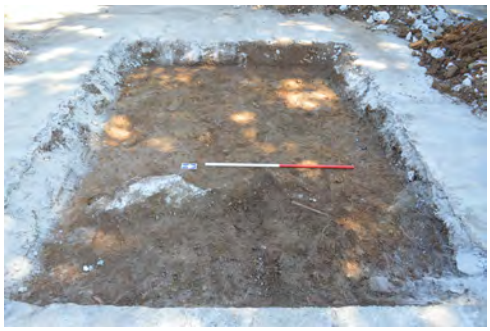

DSC_0894


DSC_0895


DSC_0896


DSC_0897


DSC_0898


DSC_0899


DSC_0900


DSC_0901


DSC_0901


DSC_0902


DSC_0902


DSC_0903

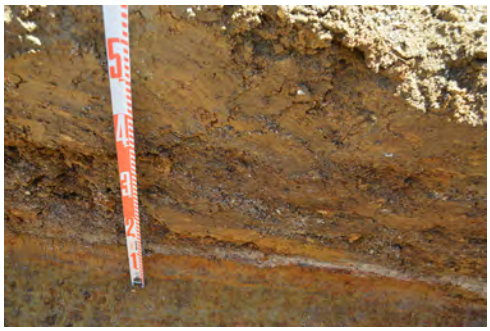

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DSC_0904

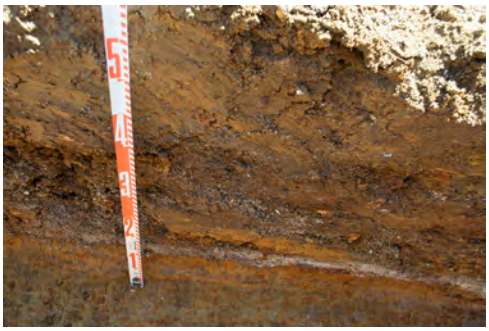

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DSC_0905

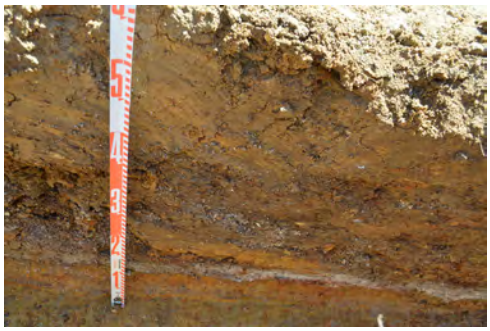

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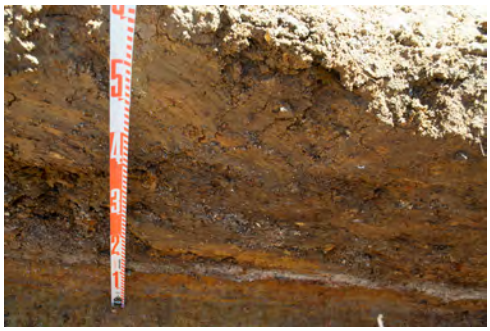
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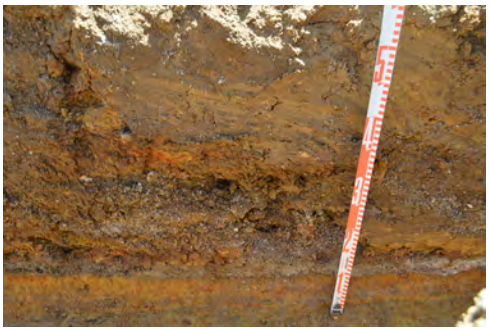
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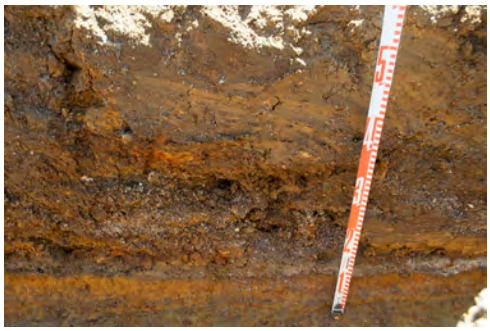
DSC_0907



DSC_0907



DSC_0908



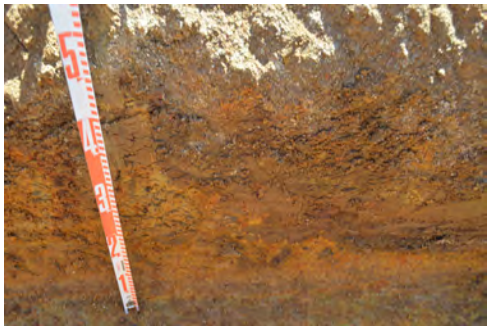
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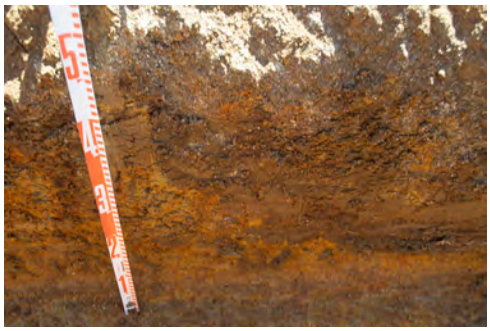
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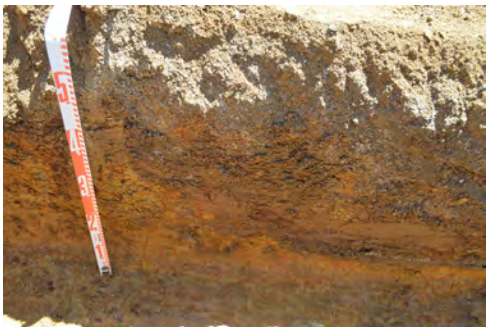
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DSC_0910



DSC_0910



DSC_0911



DSC_0911



DSC_0912



DSC_0912



DSC_0913



DSC_0913



DSC_0914



DSC_0914



DSC_0915



DSC_0915



DSC_0916



DSC_0916



DSC_0917



DSC_0917



DSC_0918



DSC_0918



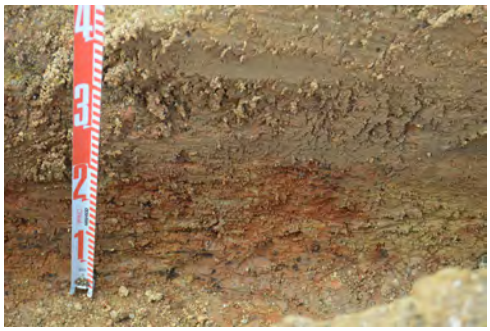
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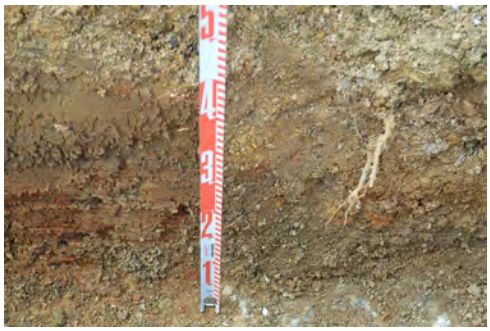
DSC_0919



DSC_0920



DSC_0921



DSC_0922



DSC_0923



DSC_0924



DSC_0925



DSC_0926



DSC_0927



DSC_0928



DSC_0929



DSC_0930



DSC_0931



DSC_0932



DSC_0933



DSC_0934



DSC_0948



DSC_0949



DSC_0950



DSC_0951



DSC_0952



DSC_0953



DSC_0954



DSC_0955



DSC_0956



DSC_0957



DSC_0958



DSC_0959



DSC_0960



DSC_0961



DSC_0962



DSC_0963



DSC_0964



DSC_0965



DSC_0966



DSC_0967



DSC_0968



DSC_0969



DSC_0970



DSC_0971



DSC_0972



DSC_0973



DSC_0974



DSC_0975



DSC_0976



DSC_0977



DSC_0978



DSC_0979


DSC_0980


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DSC_0988


DSC_0989


DSC_0013


DSC_0014

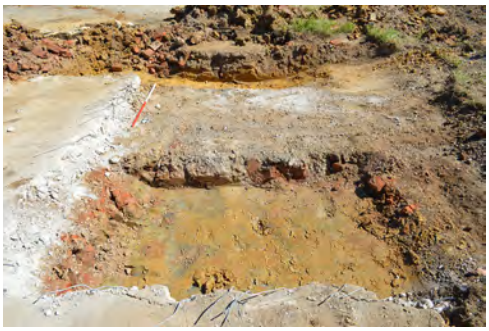

DSC_0015


DSC_0996


DSC_0997


DSC_0998

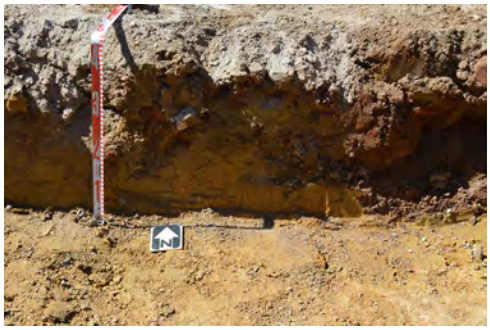

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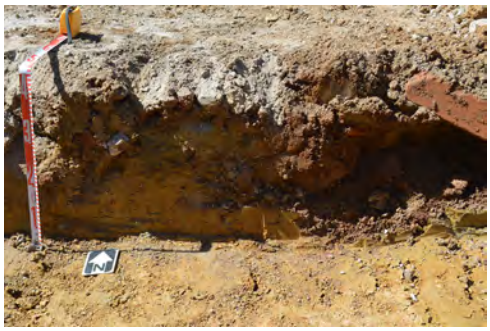

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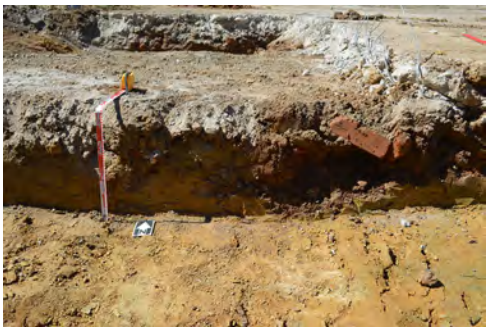

DSC_1001


DSC_0001


DSC_0002


DSC_0003

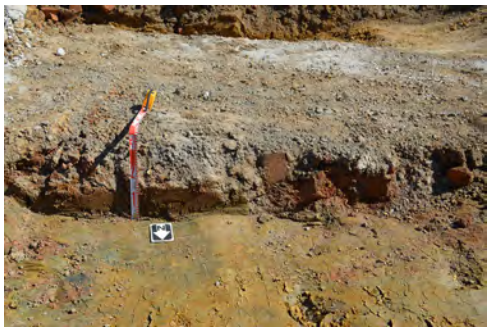

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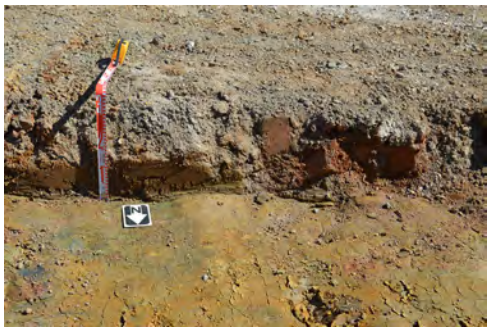

DSC_0005


DSC_0006

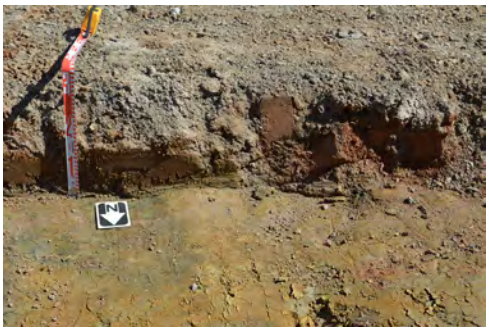

DSC_0007


DSC_0008

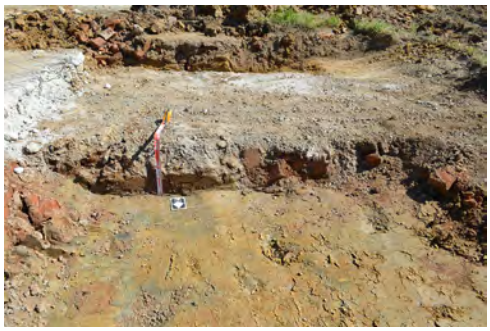

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DSC_0010



DSC_0011



DSC_0012



DSC_0935



DSC_0936



DSC_0937



DSC_0938



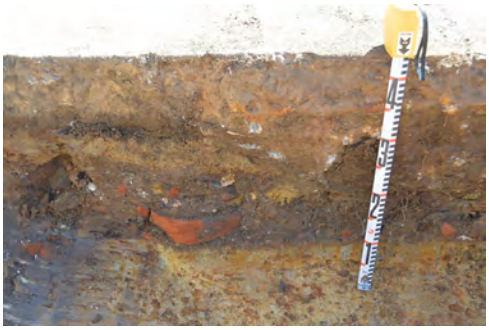
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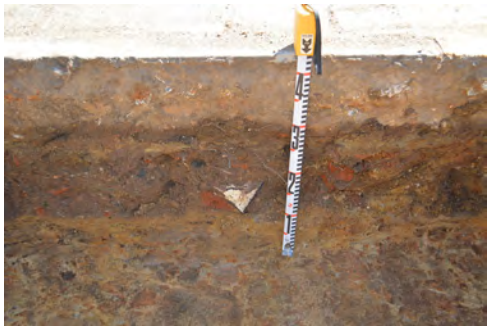
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DSC_0941



DSC_0942



DSC_0943



DSC_0944



DSC_0945



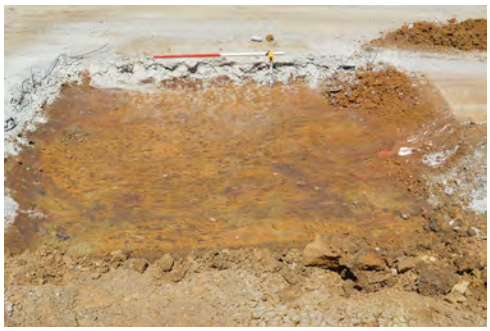
DSC_0946



DSC_0947



DSC_0990



DSC_0991



DSC_0992



DSC_0993



DSC_0994



DSC_0995


DSC_0016


DSC_0017


DSC_0018


DSC_0019


DSC_0020


DSC_0021


DSC_0022


DSC_0023


DSC_0024


DSC_0025


DSC_0026


DSC_0027


DSC_0028


DSC_0029


DSC_0030



DSC_0031



DSC_0032



DSC_0033



DSC_0034



DSC_0035



DSC_0036



DSC_0037



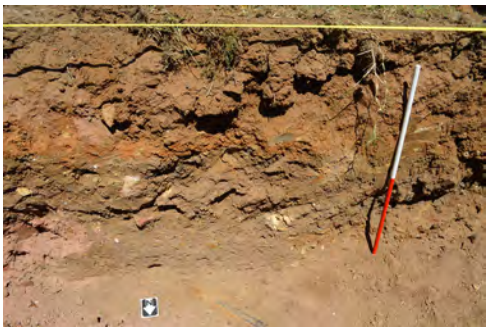
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DSC_0039



DSC_0040



DSC_0047



DSC_0048



DSC_0051



DSC_0052



DSC_0055



DSC_0057



DSC_0058



DSC_0061



DSC_0062



DSC_0041



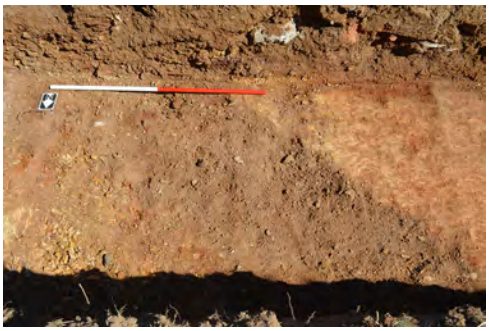
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DSC_0043



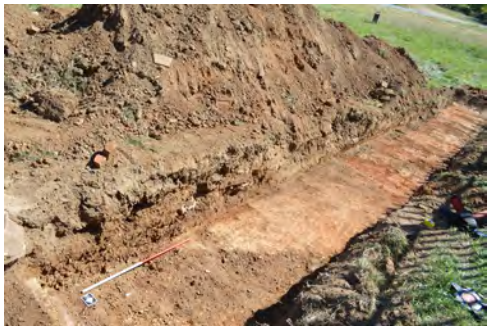
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DSC_0065



DSC_0066



DSC_0069



DSC_0070



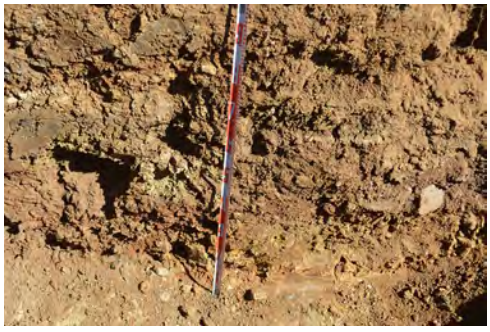
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DSC_0074



DSC_0075



DSC_0076



DSC_0077


DSC_0078


DSC_0079


DSC_0080


DSC_0081


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DSC_0083


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DSC_0086


DSC_0087


DSC_0088


DSC_0089


DSC_0090


DSC_0091


DSC_0092


DSC_0093


DSC_0094


DSC_0095


DSC_0096


DSC_0097


DSC_0098


DSC_0099


DSC_0100


DSC_0101


DSC_0102


DSC_0103


DSC_0104


DSC_0105


DSC_0106


DSC_0107



DSC_0108



DSC_0109



DSC_0110



DSC_0111



DSC_0112



DSC_0113



DSC_0114



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DSC_0116



DSC_0117



DSC_0118



DSC_0119



DSC_0121



DSC_0122



DSC_0123



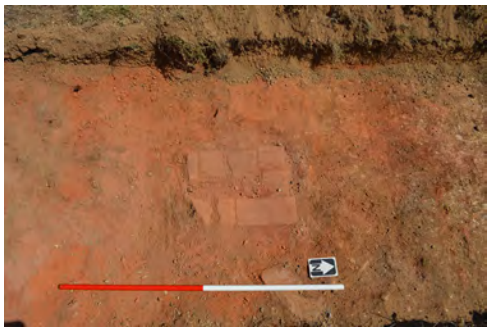
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DSC_0125



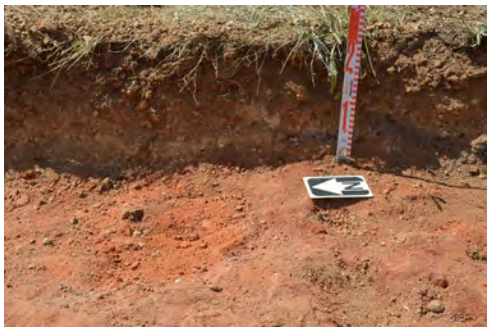
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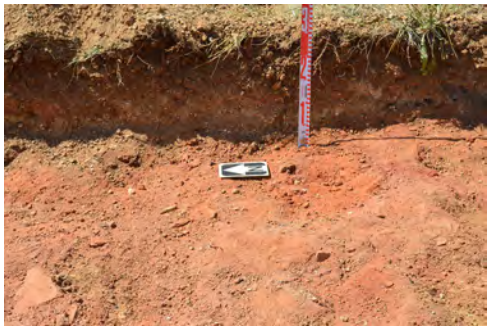
DSC_0127



DSC_0128



DSC_0129



DSC_0130



DSC_0131



DSC_0132



DSC_0133



DSC_0134



DSC_0135



DSC_0136



DSC_0137



DSC_0138


DSC_0139


DSC_0140


DSC_0141


DSC_0142


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DSC_0144


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DSC_0146


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DSC_0169


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DSC_0180



DSC_0181



DSC_0182



DSC_0183



DSC_0183



DSC_0184



DSC_0185



DSC_0186



DSC_0187



DSC_0188



DSC_0189



DSC_0190



DSC_0609



DSC_0610



DSC_0611



DSC_0612


DSC_0613


DSC_0614


DSC_0615


DSC_0616


DSC_0617

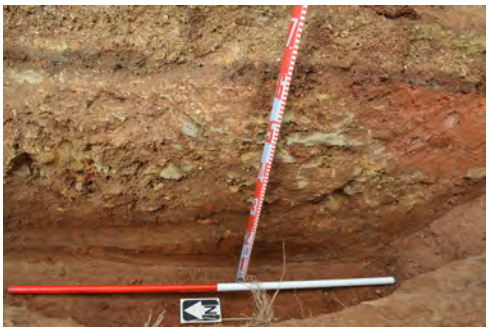

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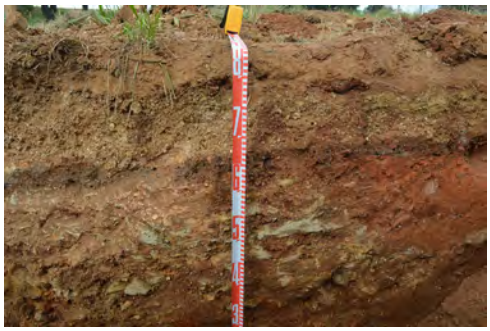

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DSC_0620


DSC_0621


DSC_0622

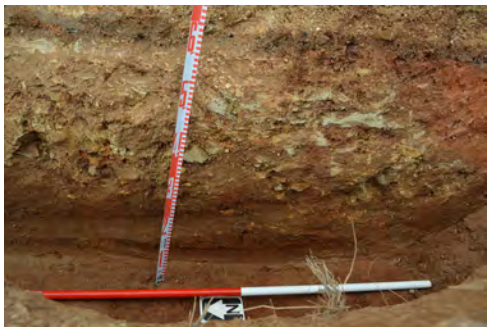

DSC_0623


DSC_0624


DSC_0625


DSC_0626


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DSC_0639


DSC_0640


DSC_0641


DSC_0642


DSC_0643

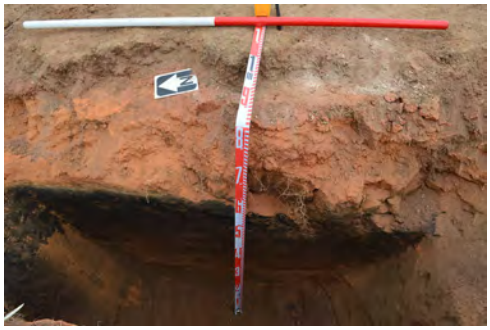

DSC_0644


DSC_0672


DSC_0673


DSC_0674


DSC_0675


DSC_0676


DSC_0677


DSC_0678


DSC_0679


DSC_0680


DSC_0681


DSC_0682


DSC_0683


DSC_0684


DSC_0685


DSC_0686


DSC_0687


DSC_0688


DSC_0689


DSC_0690


DSC_0691


DSC_0692


DSC_0693


DSC_0694


DSC_0695


DSC_0696


DSC_0697


DSC_0698


DSC_0699


DSC_0191


DSC_0192


DSC_0193


DSC_0194


DSC_0195


DSC_0196

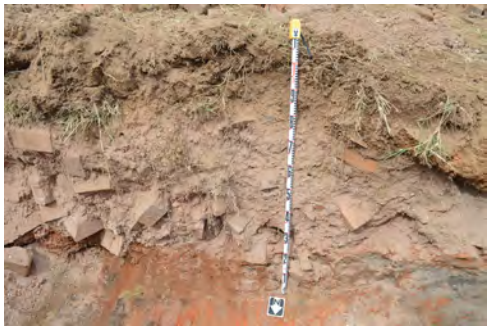

DSC_0197


DSC_0198

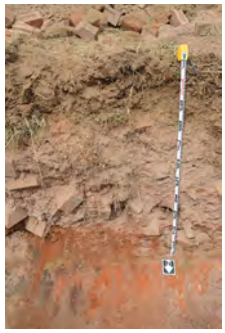

DSC_0199


DSC_0200


DSC_0201


DSC_0202


DSC_0203


DSC_0204


DSC_0205



DSC_0206



DSC_0207



DSC_0208



DSC_0209



DSC_0210



DSC_0211



DSC_0212



DSC_0213



DSC_0214



DSC_0215



DSC_0216



DSC_0217



DSC_0218



DSC_0219



DSC_0220


DSC_0221


DSC_0222


DSC_0223


DSC_0224

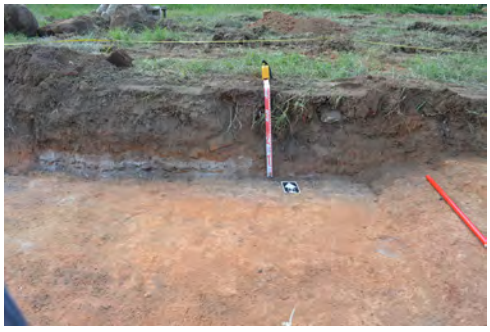

DSC_0225


DSC_0226


DSC_0227


DSC_0228


DSC_0229


DSC_0230


DSC_0231


DSC_0232


DSC_0233


DSC_0234


DSC_0235



DSC_0236



DSC_0237



DSC_0238



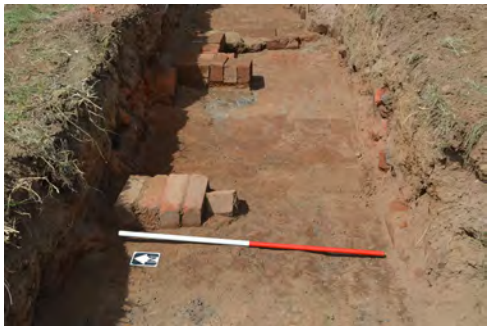
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DSC_0242



DSC_0243



DSC_0244



DSC_0245



DSC_0246



DSC_0247



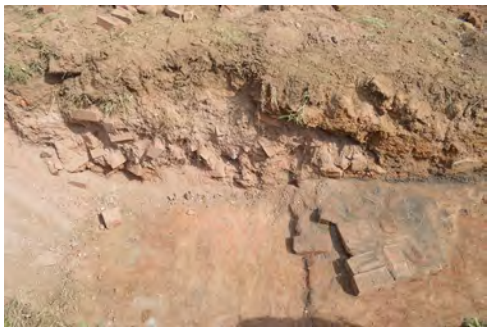
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DSC_0249



DSC_0250

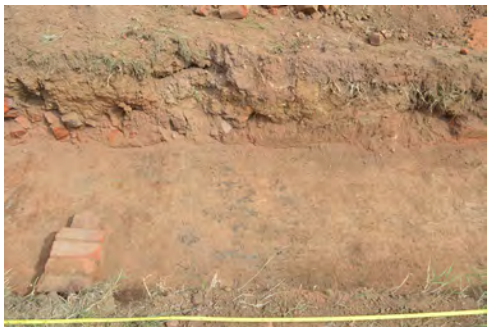

DSC_0251

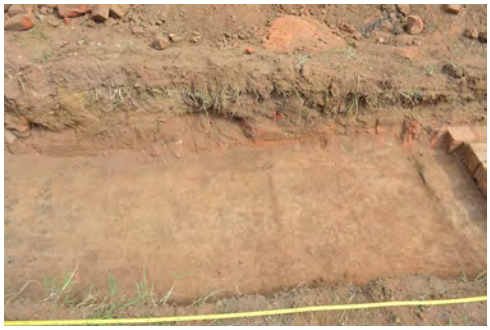

DSC_0252


DSC_0253


DSC_0254


DSC_0255


DSC_0256


DSC_0257


DSC_0258


DSC_0259


DSC_0260


DSC_0261


DSC_0262


DSC_0263


DSC_0264


DSC_0265



DSC_0266



DSC_0267



DSC_0268



DSC_0269



DSC_0270



DSC_0271



DSC_0272



DSC_0273


DSC_0274


DSC_0275


DSC_0276


DSC_0277


DSC_0278


DSC_0279


DSC_0280


DSC_0281


DSC_0282


DSC_0283


DSC_0284


DSC_0285


DSC_0286


DSC_0287


DSC_0288


DSC_0289


DSC_0291


DSC_0296


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DSC_0290


DSC_0292


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DSC_0294


DSC_0295


DSC_0297

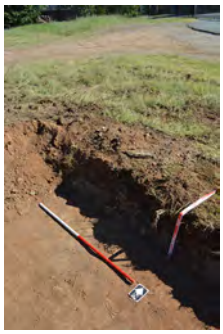

DSC_0298


DSC_0299


DSC_0300


DSC_0301


DSC_0302



DSC_0303



DSC_0305



DSC_0306



DSC_0307



DSC_0308



DSC_0309



DSC_0310



DSC_0311



DSC_0312



DSC_0313



DSC_0314



DSC_0315



DSC_0316


DSC_0317


DSC_0317


DSC_0318


DSC_0318


DSC_0319


DSC_0319


DSC_0320


DSC_0320


DSC_0321


DSC_0321


DSC_0322


DSC_0322


DSC_0323


DSC_0323


DSC_0324


DSC_0324


DSC_0325


DSC_0325


DSC_0326


DSC_0326


DSC_0327


DSC_0327


DSC_0328


DSC_0328


DSC_0329


DSC_0329


DSC_0330


DSC_0330


DSC_0331


DSC_0331



DSC_0332



DSC_0332



DSC_0333



DSC_0333



DSC_0334



DSC_0334



DSC_0335



DSC_0335



DSC_0336



DSC_0336



DSC_0337



DSC_0338



DSC_0339



DSC_0340



DSC_0341



DSC_0342



DSC_0343



DSC_0344



DSC_0345



DSC_0346



DSC_0347



DSC_0348



DSC_0349



DSC_0388



DSC_0389



DSC_0390



DSC_0391



DSC_0392



DSC_0393



DSC_0394



DSC_0395



DSC_0396



DSC_0397



DSC_0398



DSC_0399



DSC_0400



DSC_0401



DSC_0402



DSC_0403


DSC_0350


DSC_0351


DSC_0352


DSC_0353


DSC_0354


DSC_0355


DSC_0356


DSC_0357


DSC_0358


DSC_0359


DSC_0360


DSC_0361


DSC_0362


DSC_0363


DSC_0364


DSC_0365


DSC_0366


DSC_0367


DSC_0368


DSC_0369


DSC_0370


DSC_0371


DSC_0372

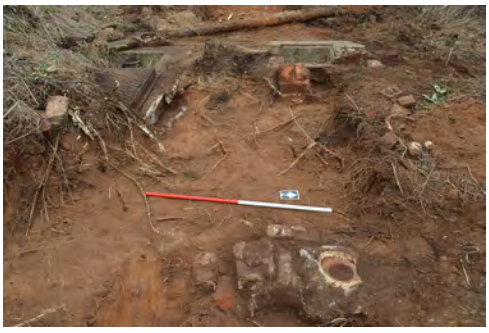

DSC_0373


DSC_0374


DSC_0375


DSC_0376


DSC_0377


DSC_0378


DSC_0379



DSC_0380



DSC_0381



DSC_0382



DSC_0383



DSC_0384



DSC_0385



DSC_0386



DSC_0387


DSC_0404


DSC_0405

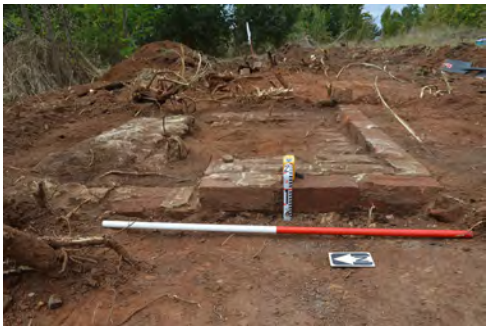

DSC_0406


DSC_0407


DSC_0408


DSC_0409


DSC_0410


DSC_0411


DSC_0412


DSC_0413


DSC_0414


DSC_0415


DSC_0416


DSC_0417


DSC_0418



DSC_0419



DSC_0420



DSC_0421



DSC_0422



DSC_0423



DSC_0424



DSC_0425



DSC_0426



DSC_0427



DSC_0428



DSC_0429



DSC_0430



DSC_0431



DSC_0432



DSC_0433


DSC_0434


DSC_0435


DSC_0436


DSC_0437


DSC_0438


DSC_0439


DSC_0440


DSC_0441


DSC_0442


DSC_0455


DSC_0456


DSC_0457


DSC_0458


DSC_0459


DSC_0460



DSC_0461



DSC_0462



DSC_0449



DSC_0450



DSC_0451



DSC_0452



DSC_0453



DSC_0454



DSC_0443



DSC_0444



DSC_0445



DSC_0446



DSC_0447



DSC_0448



DSC_0463



DSC_0464



DSC_0465



DSC_0466



DSC_0467



DSC_0468



DSC_0469



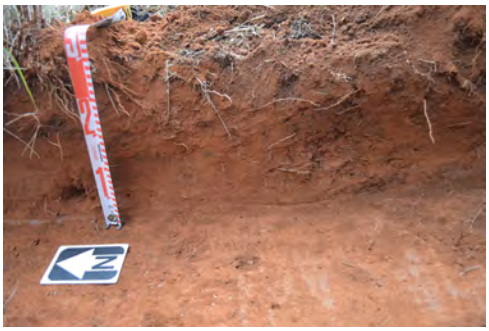
DSC_0470



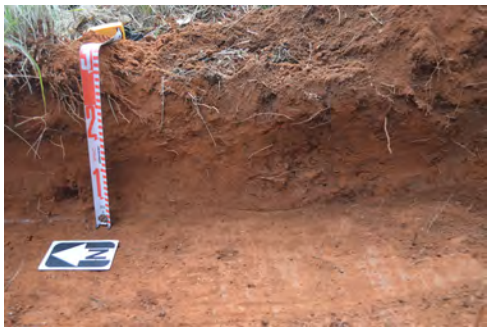
DSC_0471



DSC_0472



DSC_0473



DSC_0474



DSC_0475



DSC_0476



DSC_0477



DSC_0478



DSC_0479



DSC_0480



DSC_0481



DSC_0482



DSC_0483



DSC_0484



DSC_0485



DSC_0486



DSC_0487

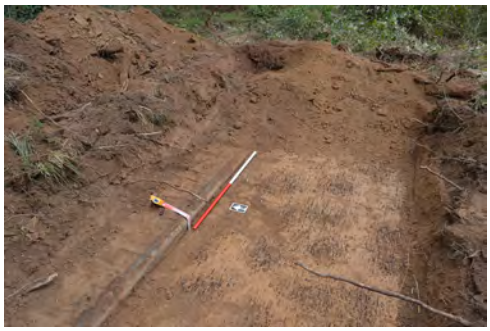

DSC_0488


DSC_0489


DSC_0490


DSC_0491

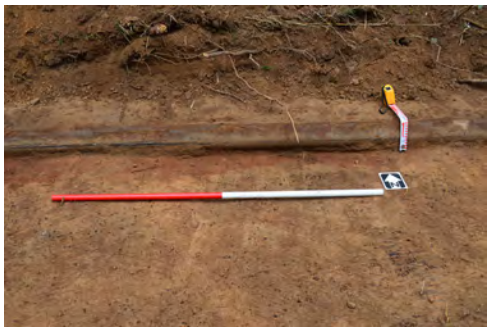

DSC_0492


DSC_0493


DSC_0494


DSC_0495


DSC_0496


DSC_0497


DSC_0498


DSC_0499


DSC_0500


DSC_0501


DSC_0502


DSC_0503


DSC_0504


DSC_0505


DSC_0506


DSC_0507


DSC_0508


DSC_0509


DSC_0510


DSC_0511


DSC_0512

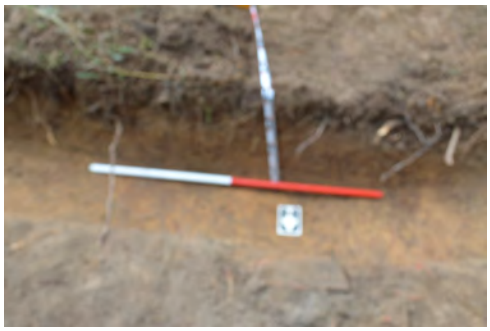

DSC_0513


DSC_0514


DSC_0515


DSC_0516


DSC_0517



DSC_0518



DSC_0519



DSC_0520



DSC_0521



DSC_0522



DSC_0532



DSC_0533



DSC_0534



DSC_0535



DSC_0536



DSC_0537



DSC_0538



DSC_0539



DSC_0540



DSC_0541



DSC_0542



DSC_0543



DSC_0544



DSC_0545



DSC_0546



DSC_0547



DSC_0548



DSC_0549



DSC_0550



DSC_0551



DSC_0552



DSC_0523



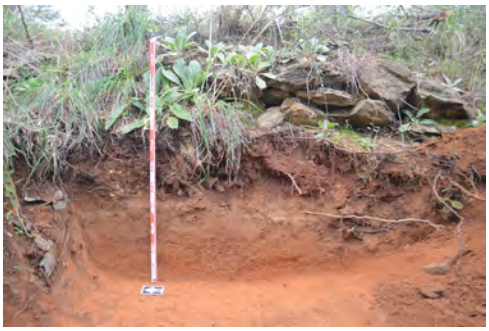
DSC_0524



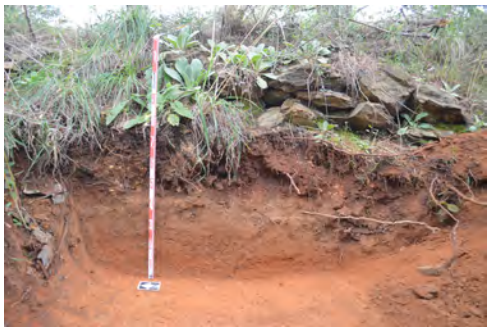
DSC_0525



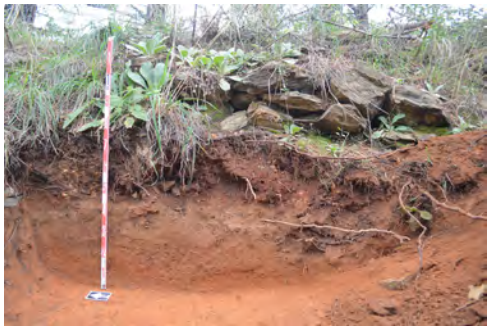
DSC_0526



DSC_0527



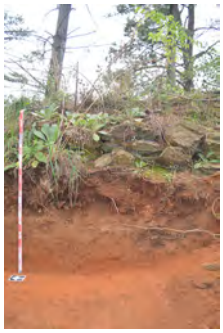
DSC_0528



DSC_0529



DSC_0530



DSC_0531


DSC_0553


DSC_0554


DSC_0555


DSC_0556


DSC_0557


DSC_0558


DSC_0559


DSC_0560


DSC_0561


DSC_0562


DSC_0563


DSC_0564


DSC_0565


DSC_0566

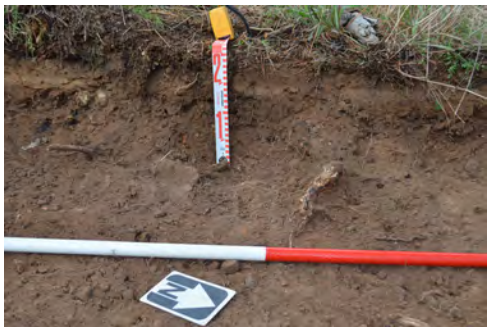

DSC_0567



DSC_0568



DSC_0569



DSC_0570


DSC_0571

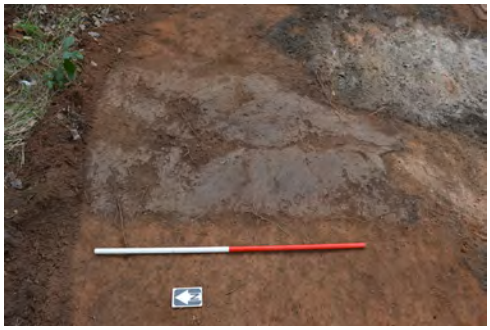

DSC_0572


DSC_0573

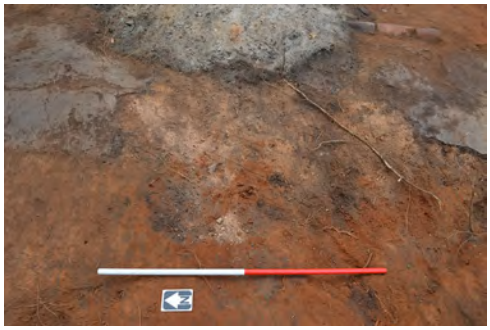

DSC_0574


DSC_0575


DSC_0576


DSC_0577


DSC_0578


DSC_0579


DSC_0580

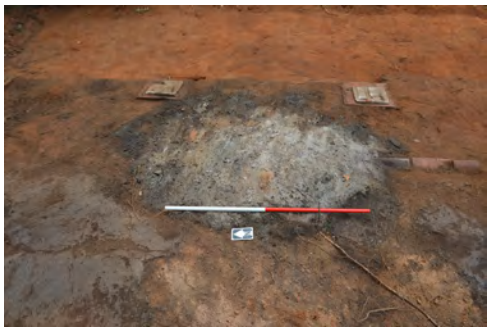

DSC_0581


DSC_0582


DSC_0583


DSC_0584


DSC_0585



DSC_0586



DSC_0587



DSC_0588



DSC_0589



DSC_0590



DSC_0591



DSC_0592



DSC_0593



DSC_0594



DSC_0595



DSC_0596



DSC_0597



DSC_0598



DSC_0599



DSC_0600



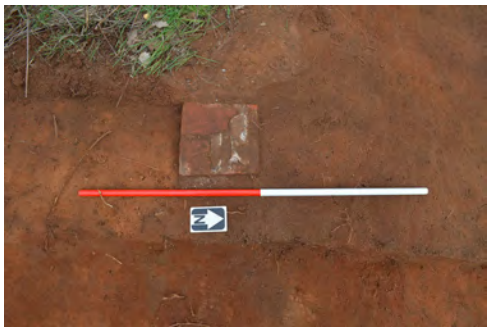
DSC_0601



DSC_0602



DSC_0603



DSC_0604



DSC_0605



DSC_0606



DSC_0607



DSC_0608



DSC_0657



DSC_0658



DSC_0659



DSC_0660



DSC_0661



DSC_0662



DSC_0663



DSC_0664



DSC_0665



DSC_0666



DSC_0667



DSC_0668



DSC_0669



DSC_0670



DSC_0671



DSC_0649



DSC_0650



DSC_0651



DSC_0652



DSC_0653



DSC_0654



DSC_0655



DSC_0656



DSC_0645



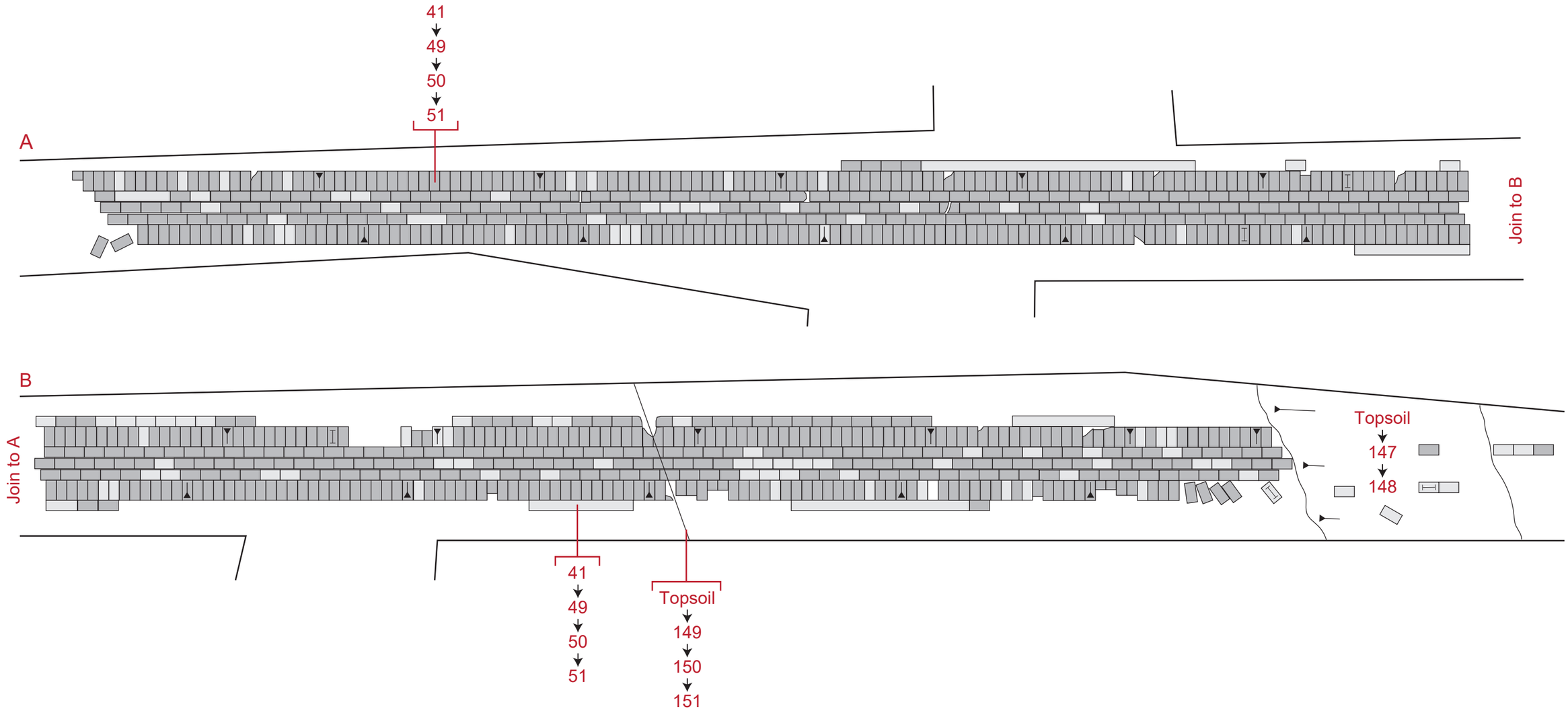
DSC_0646



DSC_0647



DSC_0648

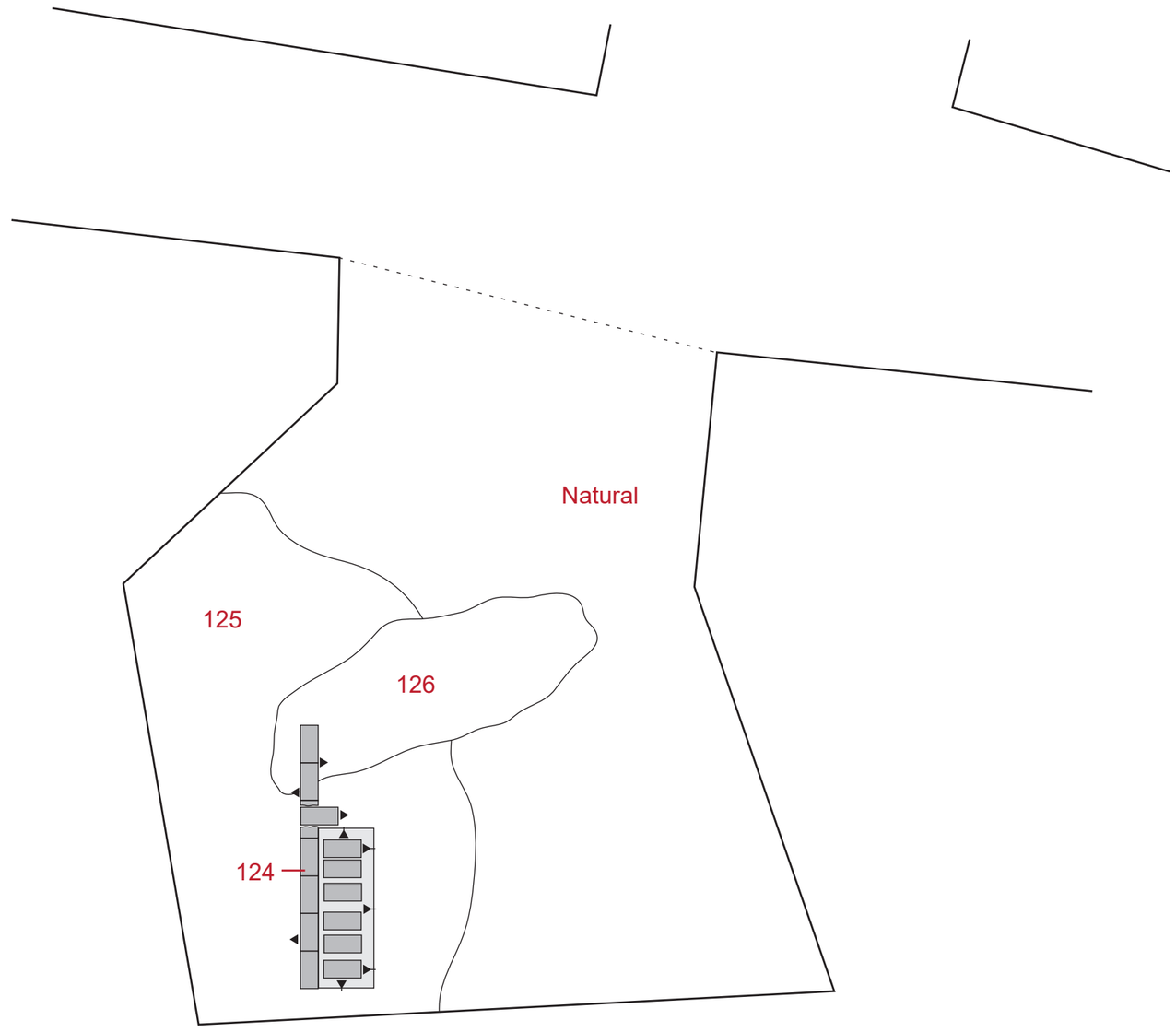


BRW8—Open Area 1, Context 50

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Brick
- Decomposed brick
- Visible frog (‘simple’)

0 0.5 1 m

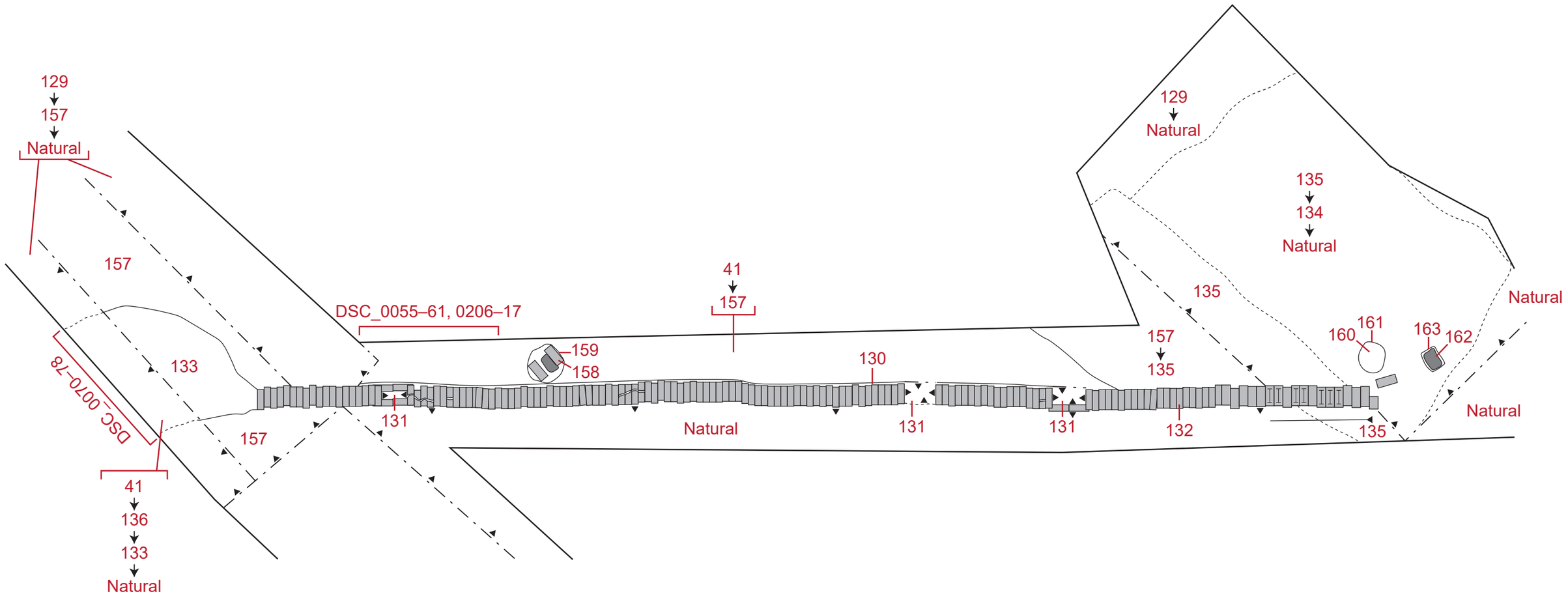


BRW8—Open Area 1, Context 124

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Edge of context (presumed)
- Slope
- Brick
- Concrete

0 0.5 1 m

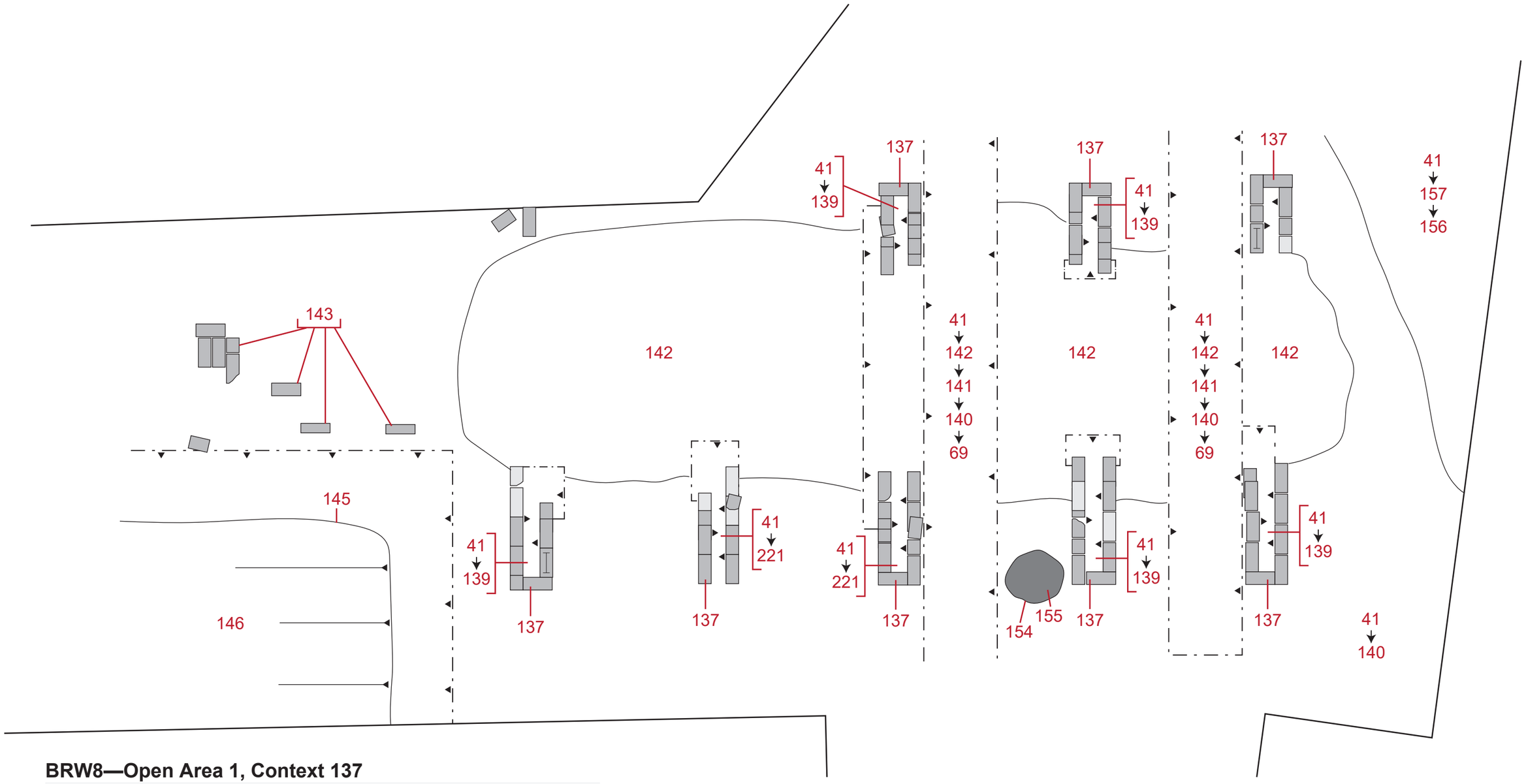


BRW8—Open Area 1, Context 132

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Brick
- Decomposed organics
- Visible frog (‘basic’)

0 0.5 1 m

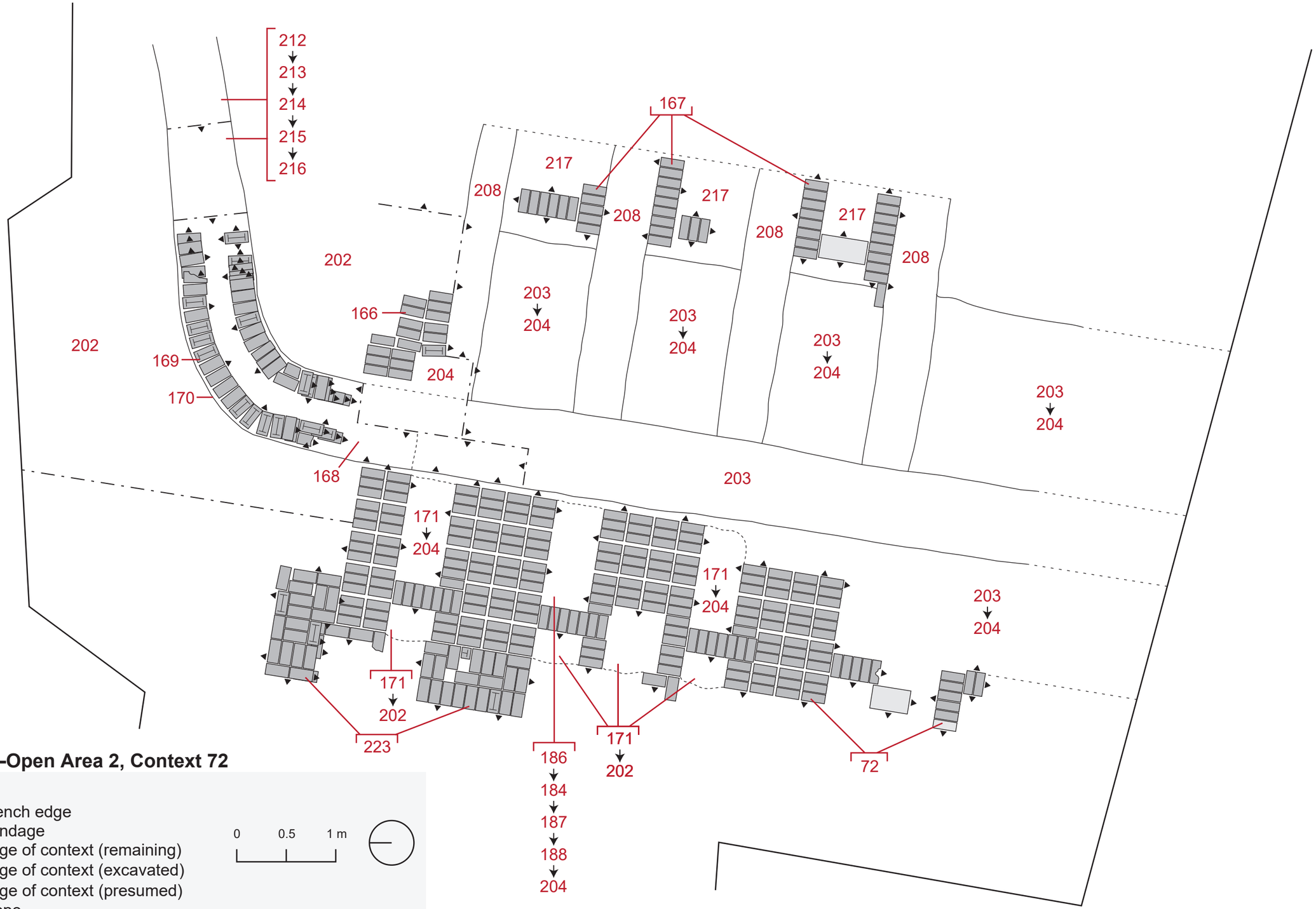


BRW8—Open Area 1, Context 137

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Brick
- Decomposed organics
- Visible frog (‘simple’)

0 0.5 1 m

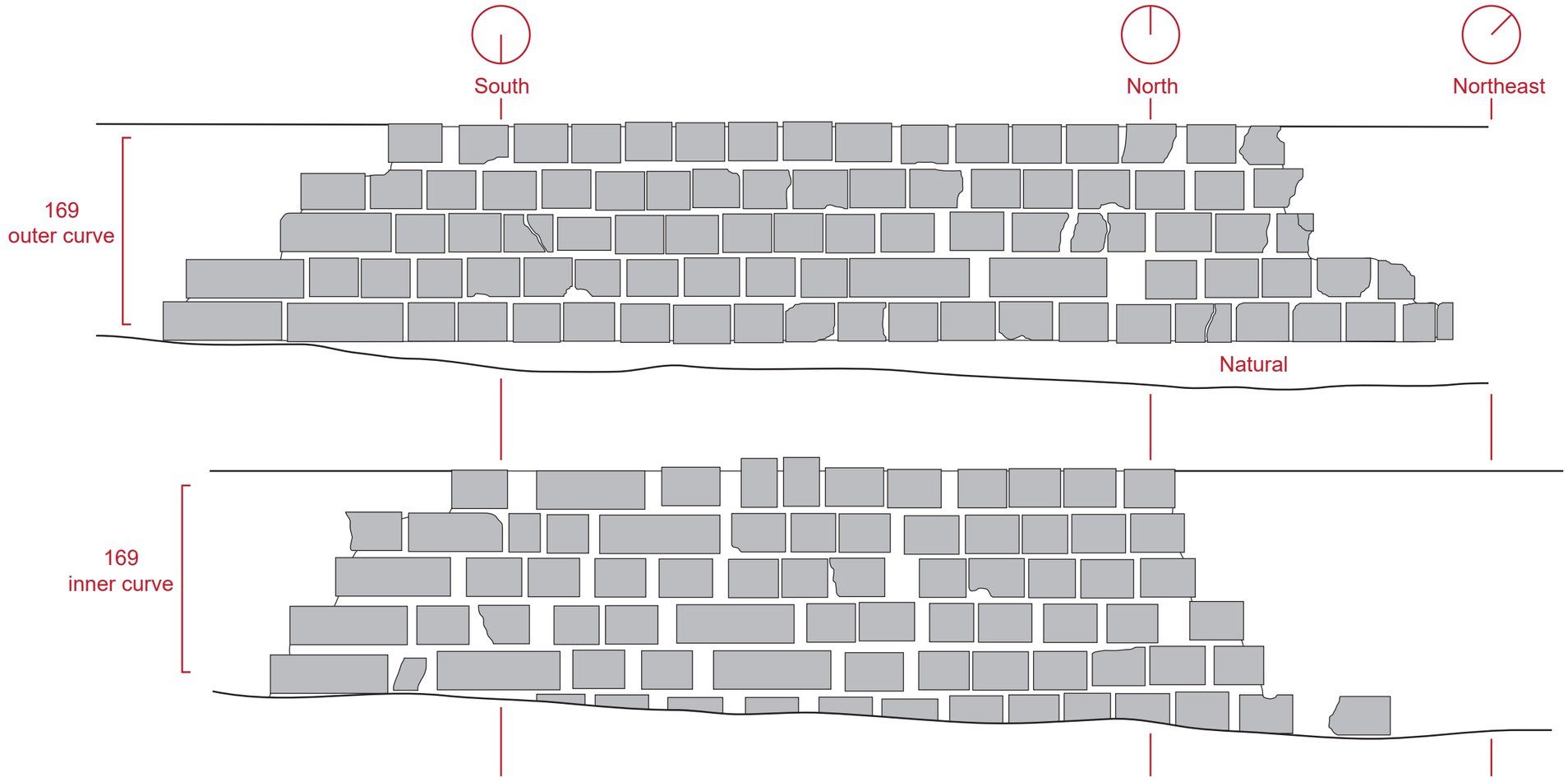


BRW8—Open Area 2, Context 72

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Edge of context (presumed)
- Slope
- Brick
- Decomposed brick
- Visible frog (‘simple’)

0 0.5 1 m

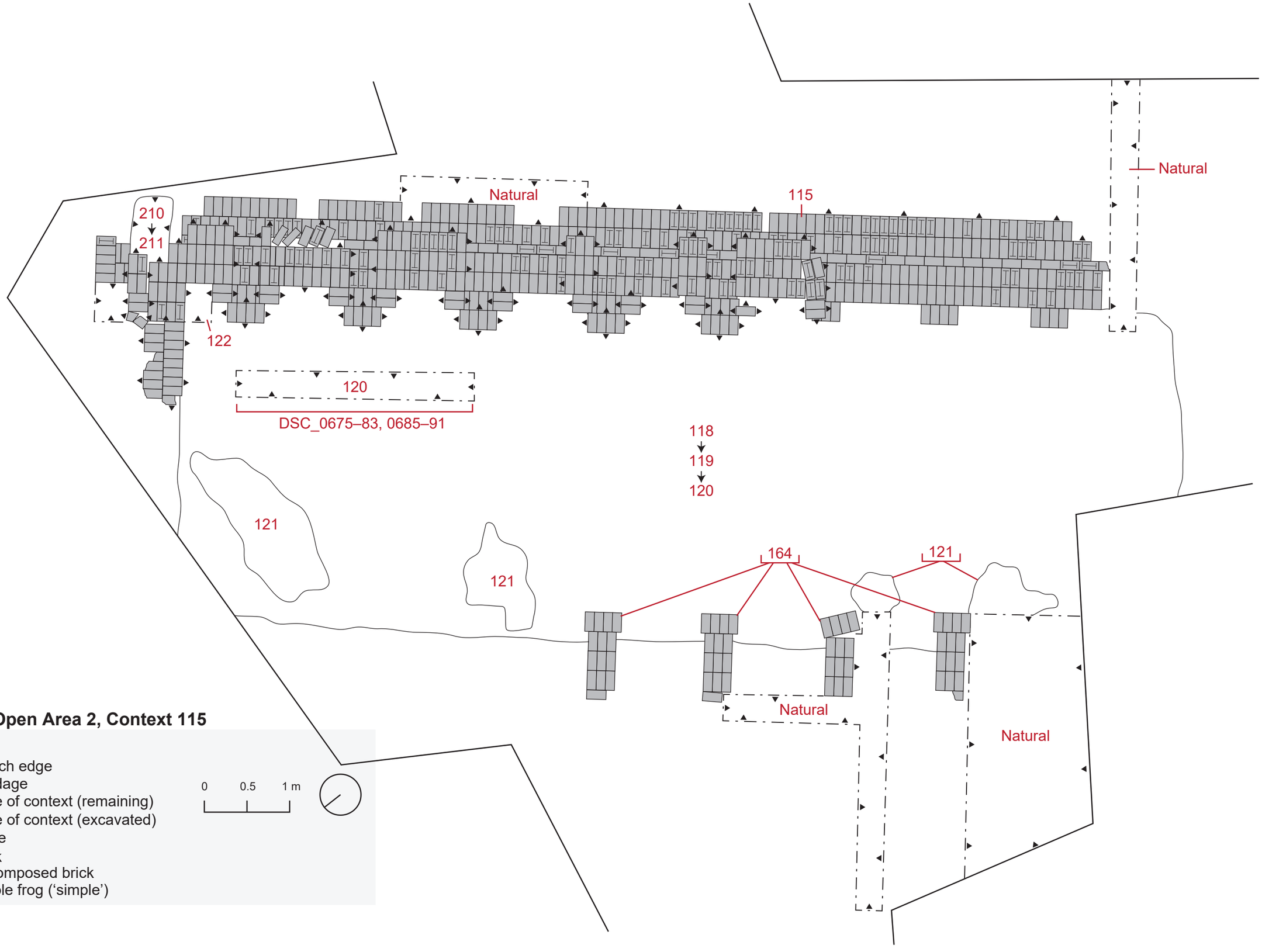


BRW8—Open Area 2, Context 169

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Brick

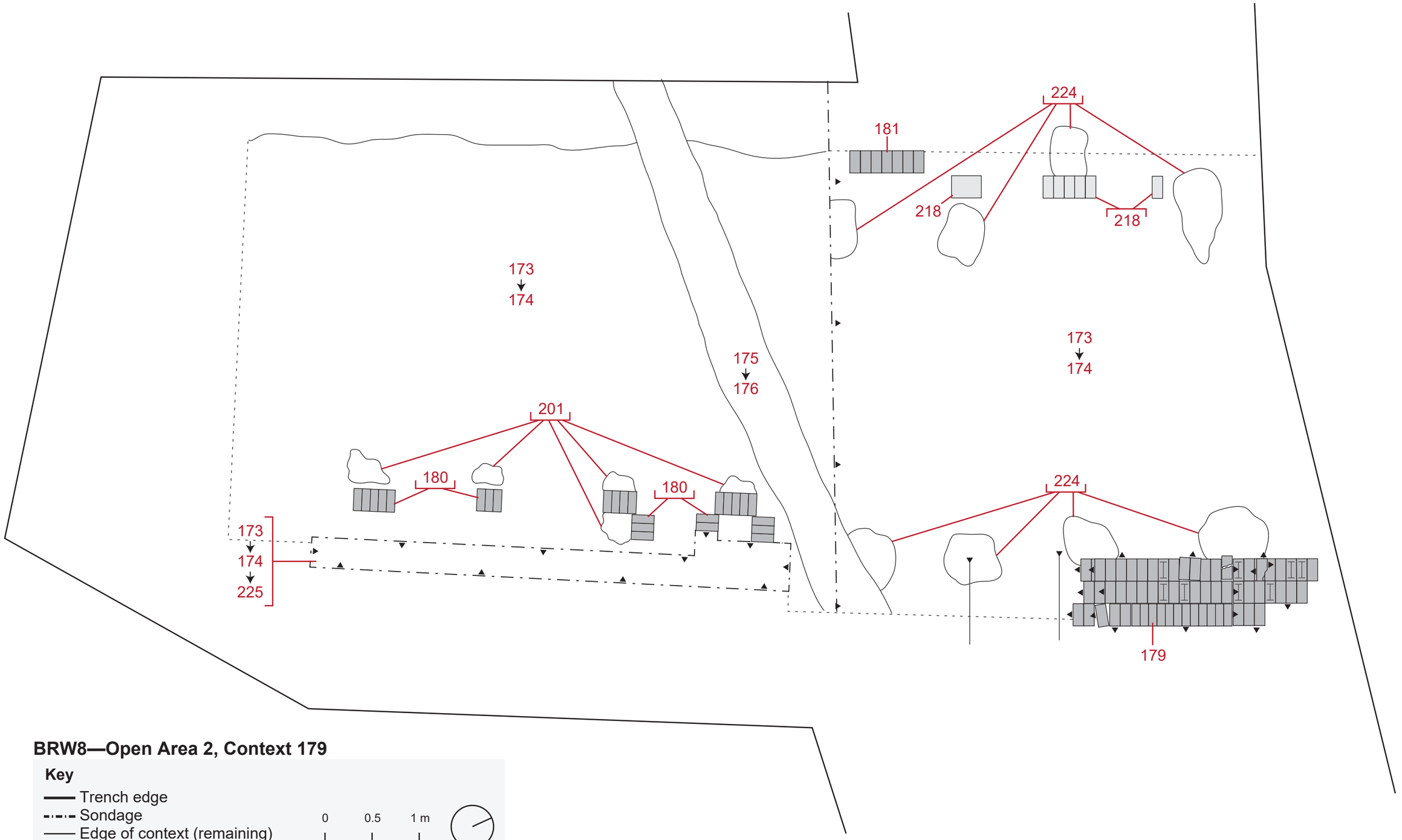
0 0.5 1 m



BRW8—Open Area 2, Context 115

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Brick
- Decomposed brick
- Visible frog (‘simple’)

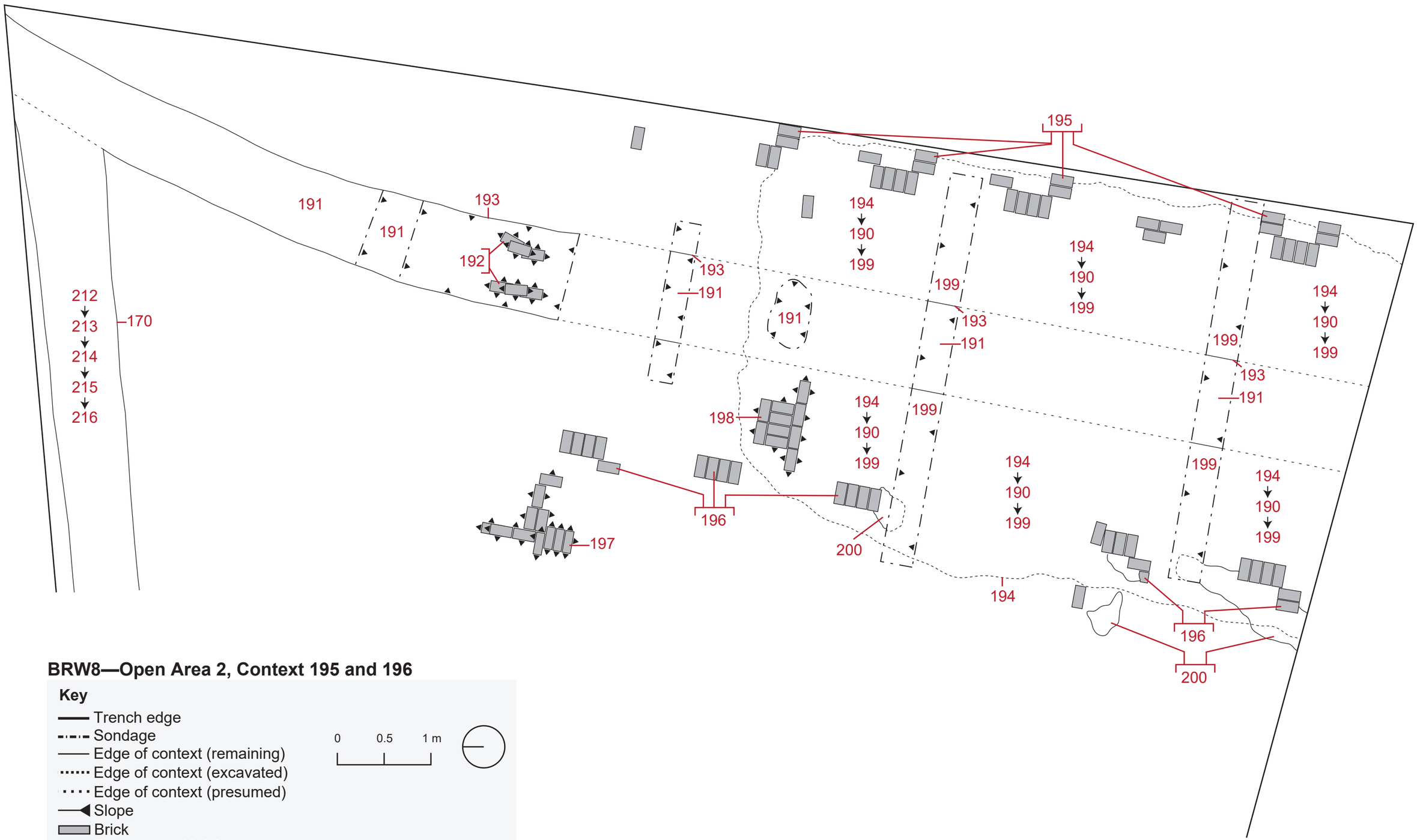


BRW8—Open Area 2, Context 179

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Edge of context (presumed)
- Slope
- Brick
- Decomposed brick
- Visible frog (‘simple’)

0 0.5 1 m

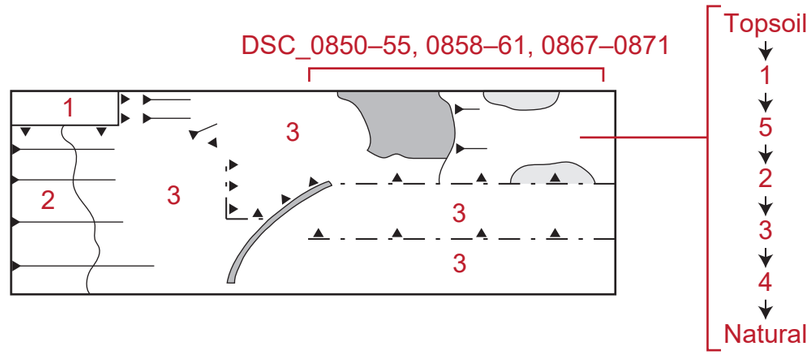


BRW8—Open Area 2, Context 195 and 196

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Edge of context (presumed)
- Slope
- Brick
- Decomposed brick
- Visible frog (‘simple’)

0 0.5 1 m

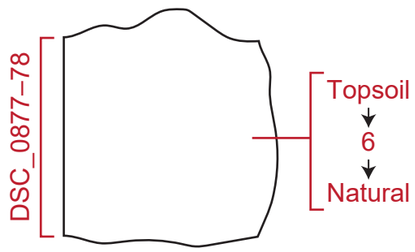


BRW7—Test Trench 1

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Ferrous metal artefact
- Shale boulder

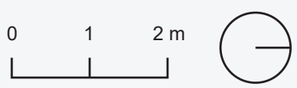
0 1 2 m

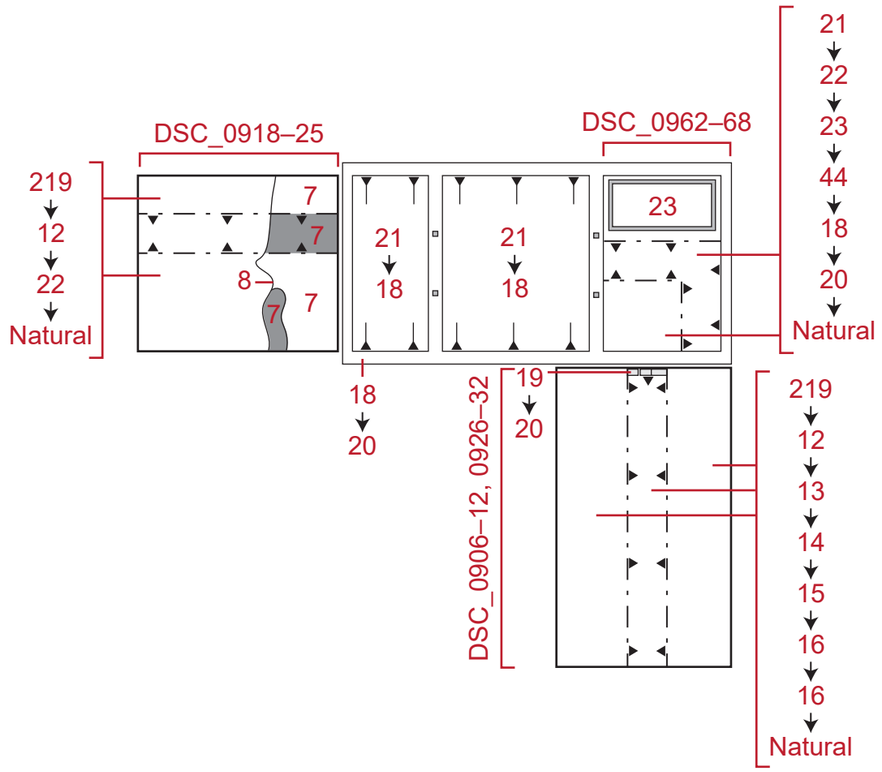


BRW7—Test Trench 2

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope



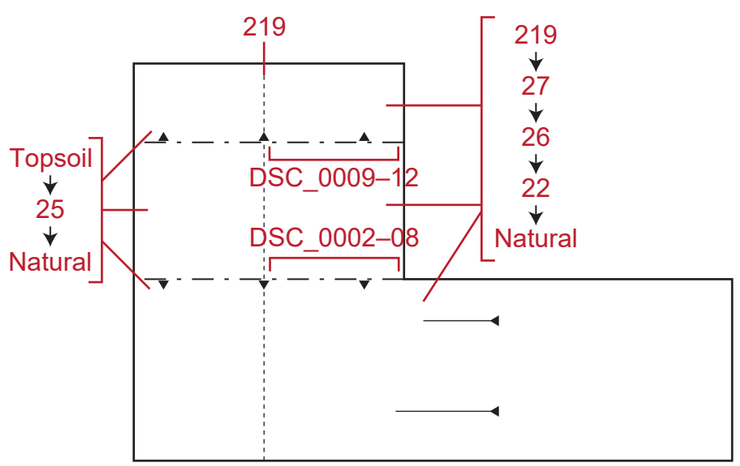


BRW11—Test Trench 3

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Ferrous metal
- Brick
- Concrete

0 1 2 m

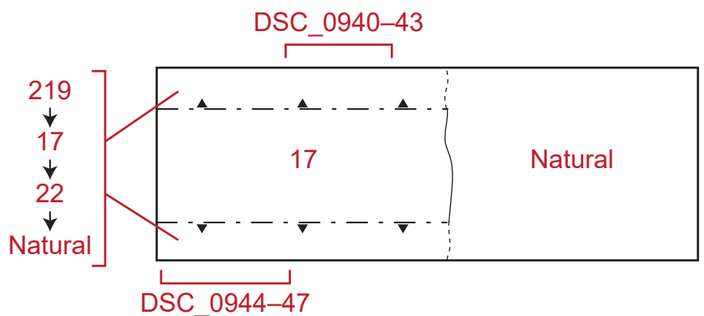


BRW11—Test Trench 4

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope

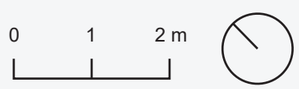
0 1 2 m

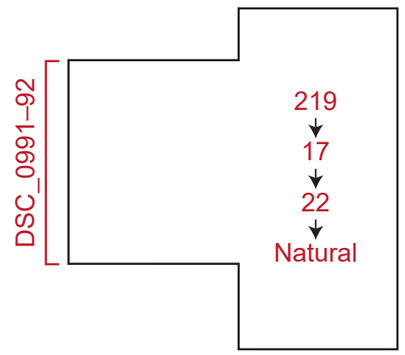


BRW11—Test Trench 5

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope

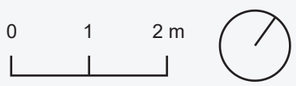


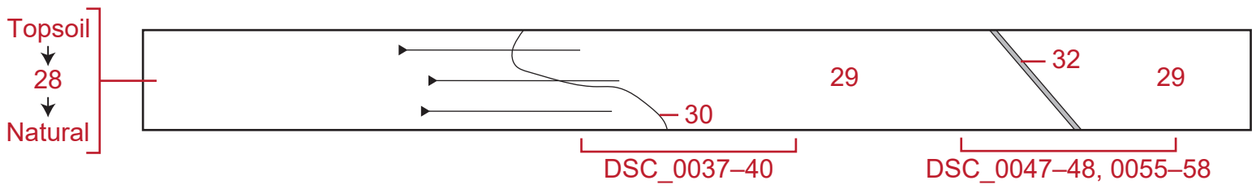


BRW11—Test Trench 6

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope

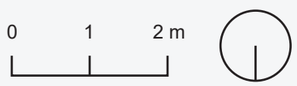


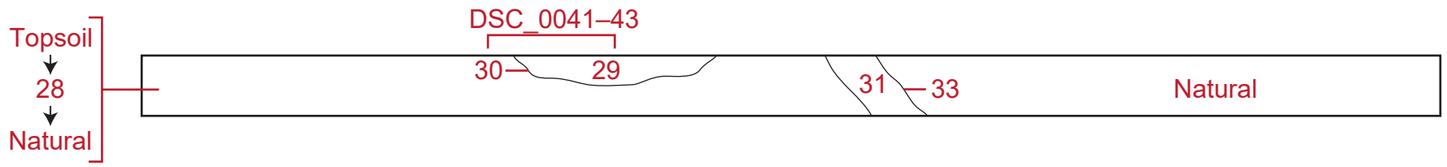


BRW8—Test Trench 7

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Water pipe



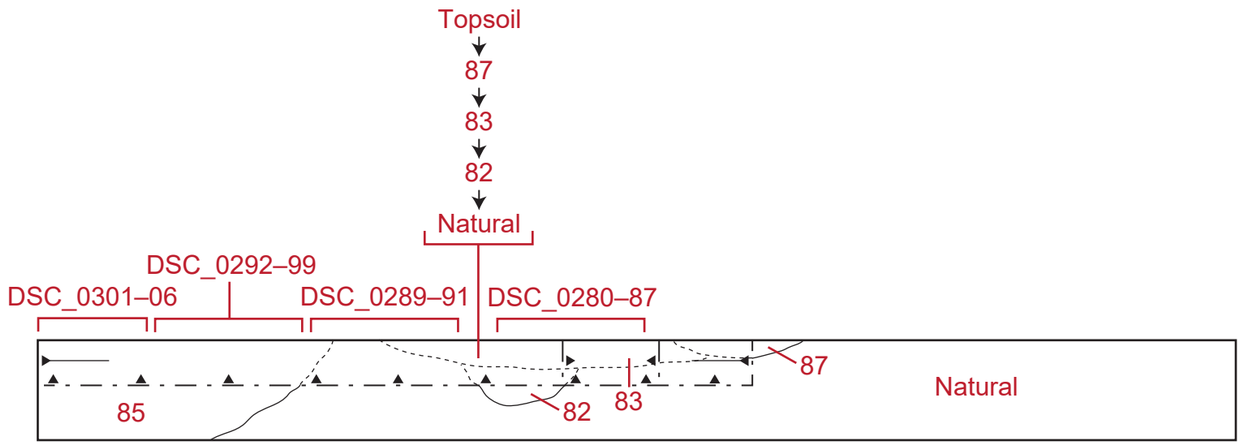


BRW8—Test Trench 8

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Water pipe

0 1.5 3 m

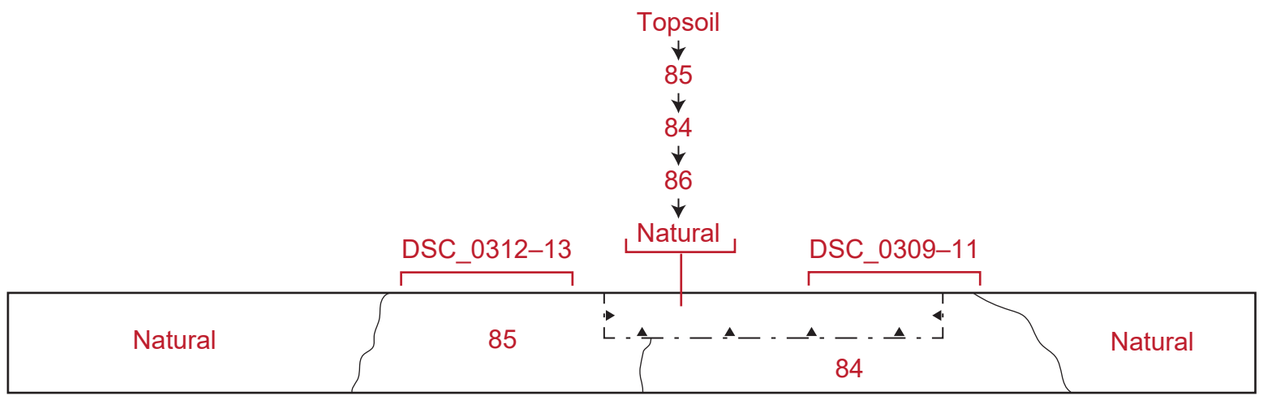


BRW1—Test Trench 12

Key

Trench edge
Sondage
Edge of context (remaining)
Edge of context (excavated)
Slope

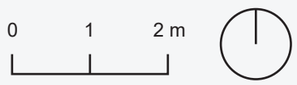
0 1 2 m

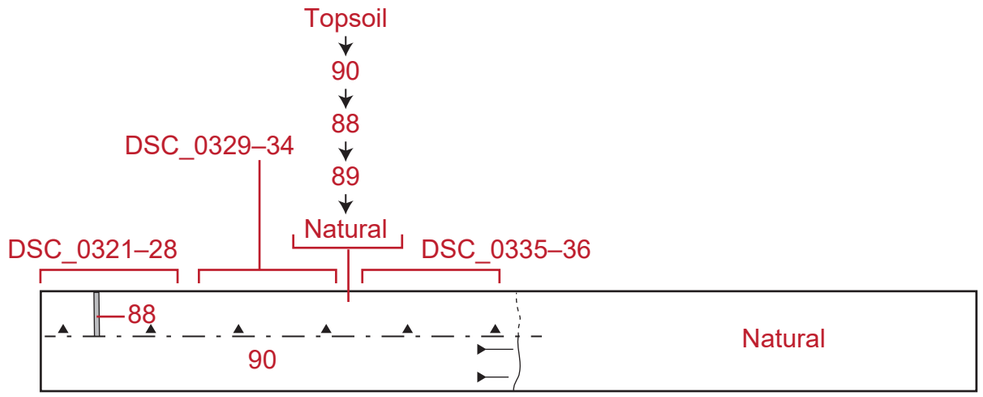


BRW1—Test Trench 13

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope



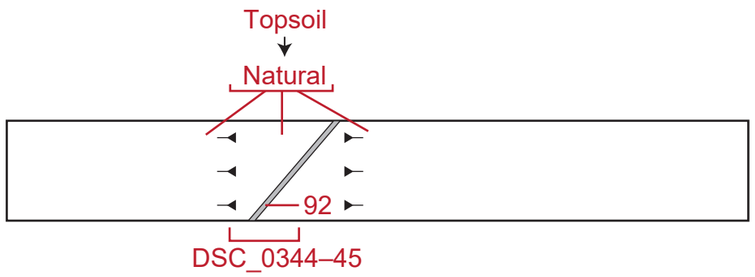


BRW2—Test Trench 14

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Water pipe

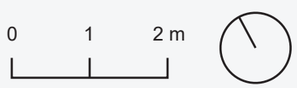
0 1 2 m

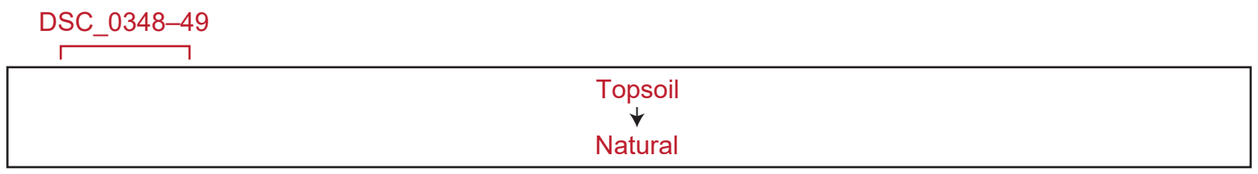


BRW2—Test Trench 15

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Water pipe

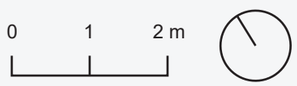


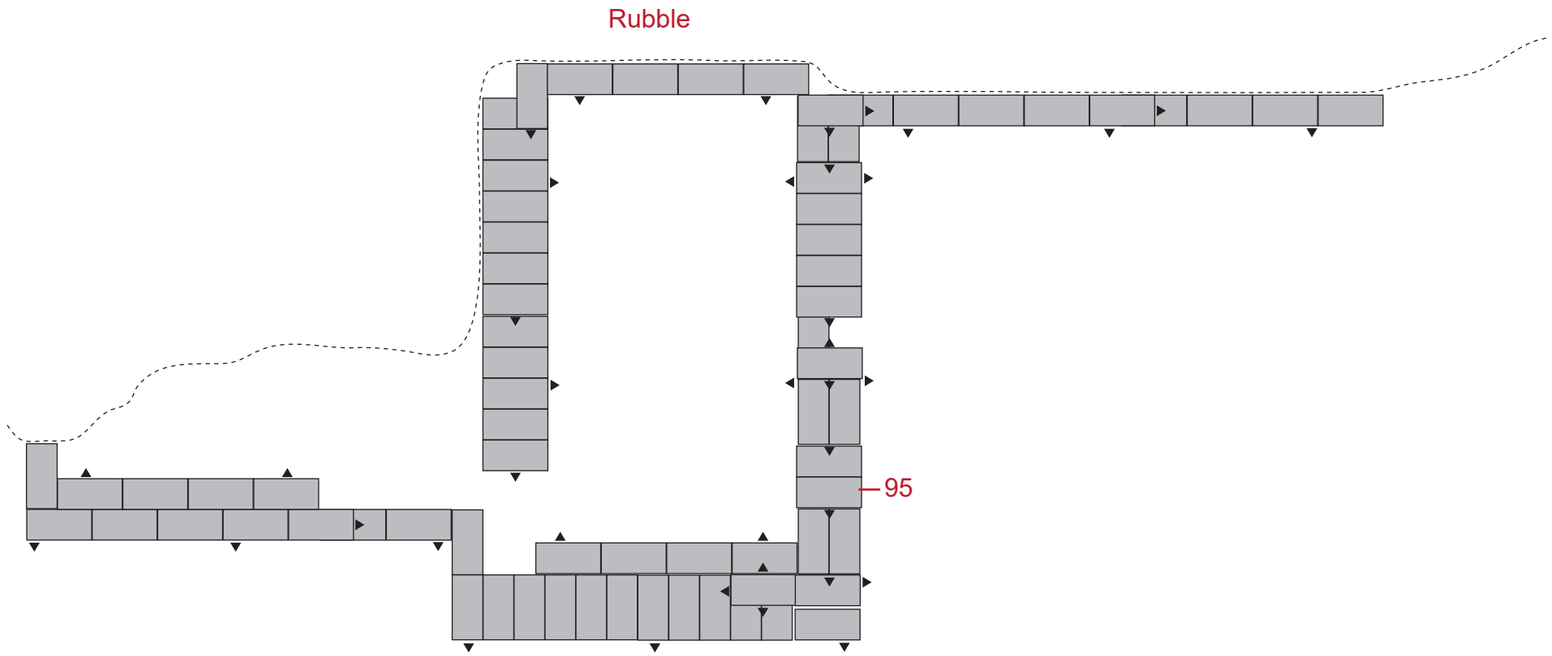


BRW2—Test Trench 16

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope



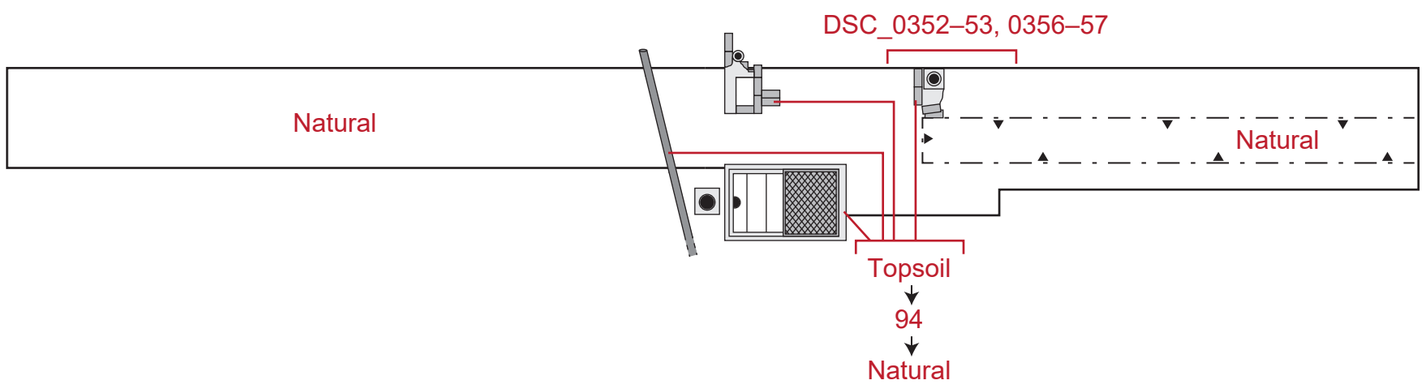


BRW2—Context 95

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Brick
- Concrete

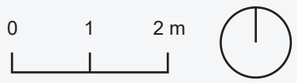
0 0.25 0.5 m

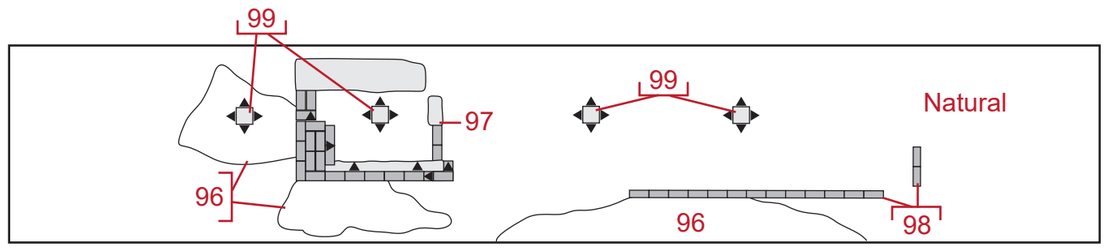


BRW2—Test Trench 17

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Water pipe / ferrous metal
- Brick
- Concrete



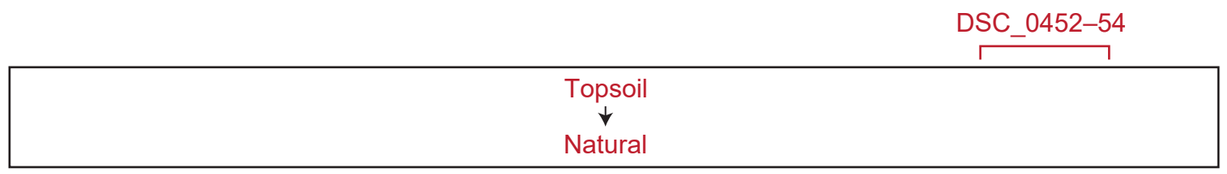


BRW2—Test Trench 18

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Brick
- Concrete

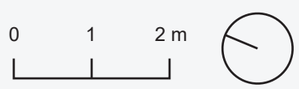
0 1 2 m

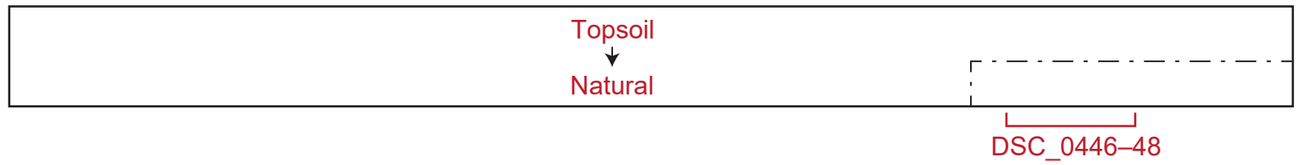


BRW3—Test Trench 19

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope

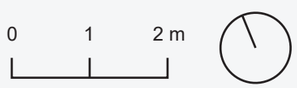


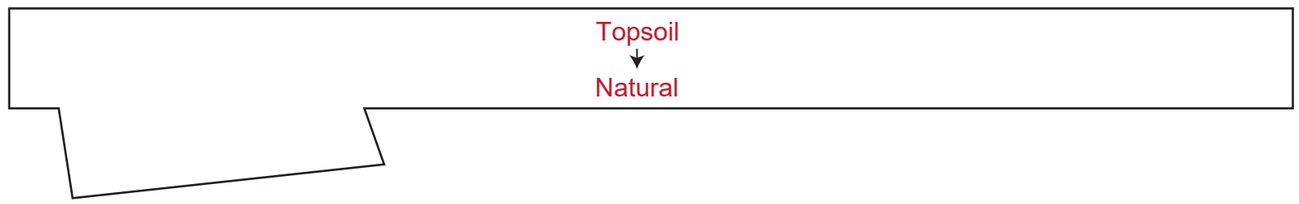


BRW3—Test Trench 20

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope

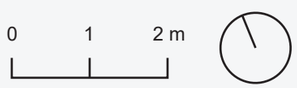


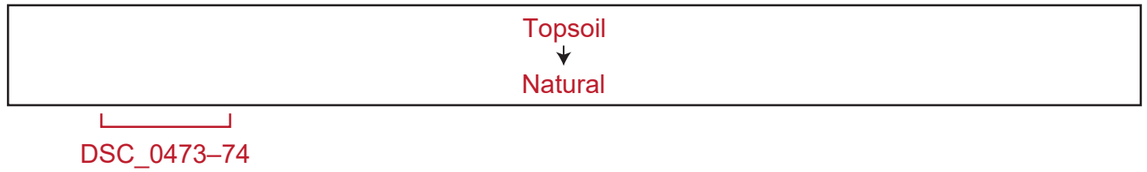


BRW10—Test Trench 21

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope

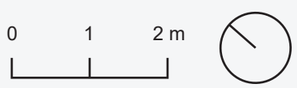


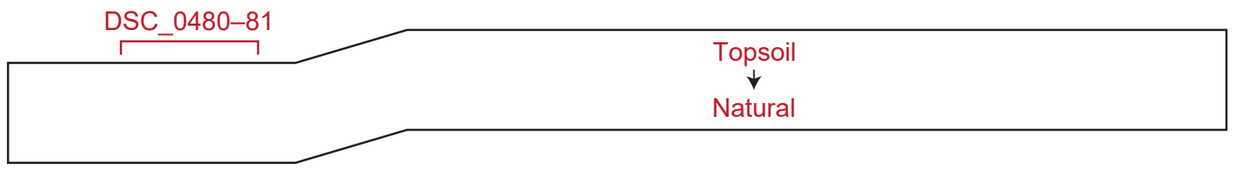


BRW3—Test Trench 22

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope

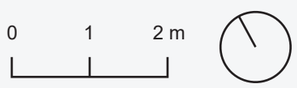


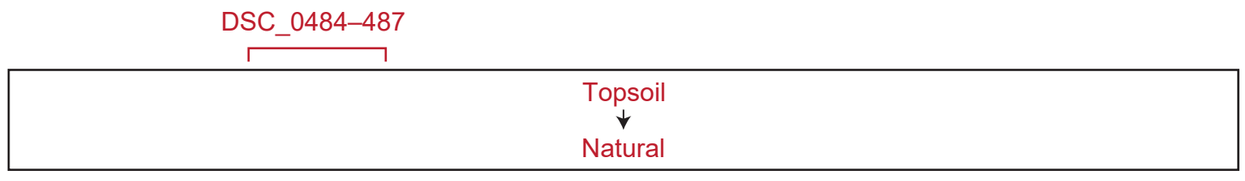


BRW3—Test Trench 23

Key

Trench edge
Sondage
Edge of context (remaining)
Edge of context (excavated)
Slope

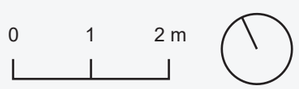


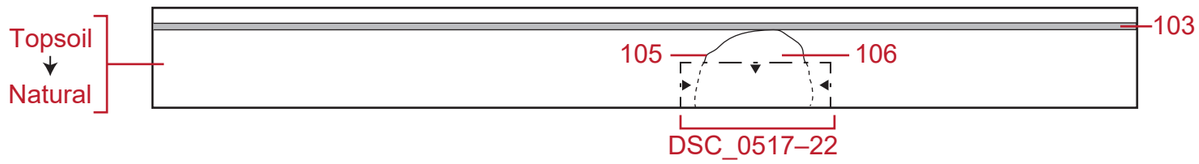


BRW3—Test Trench 24

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope



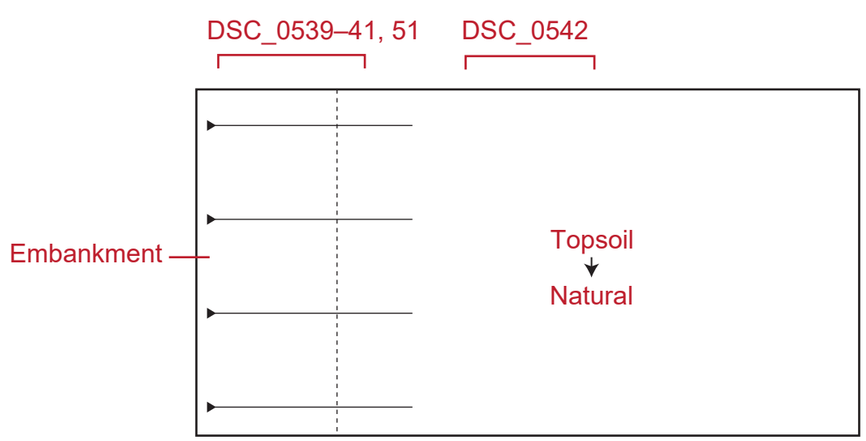


BRW10—Test Trench 25

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Water pipe

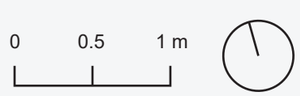
0 1 2 m

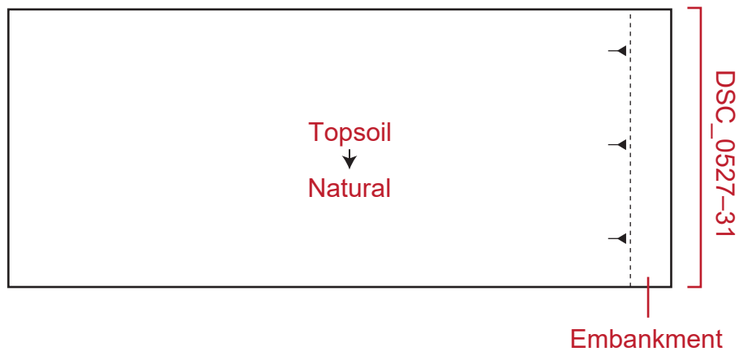


BRW10—Test Trench 26

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope



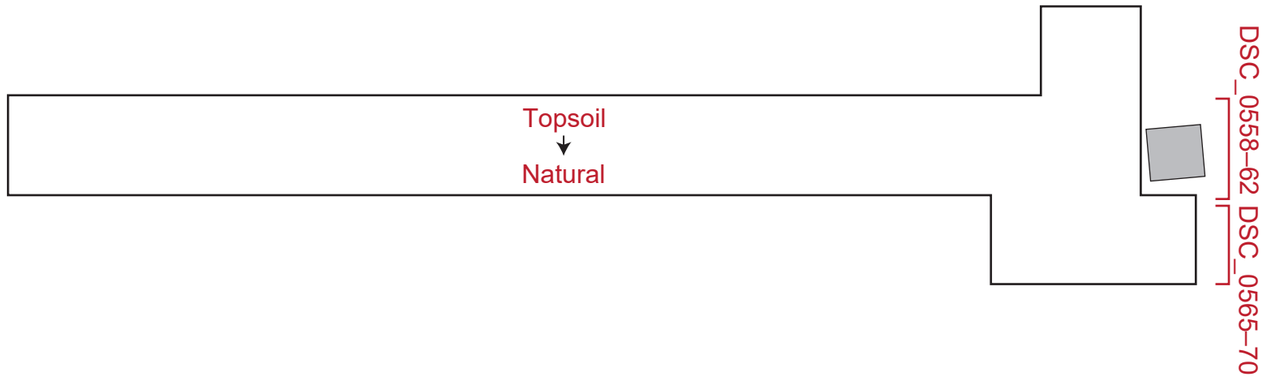


BRW10—Test Trench 27

Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope

0 0.5 1 m



BRW3—Test Trench 28

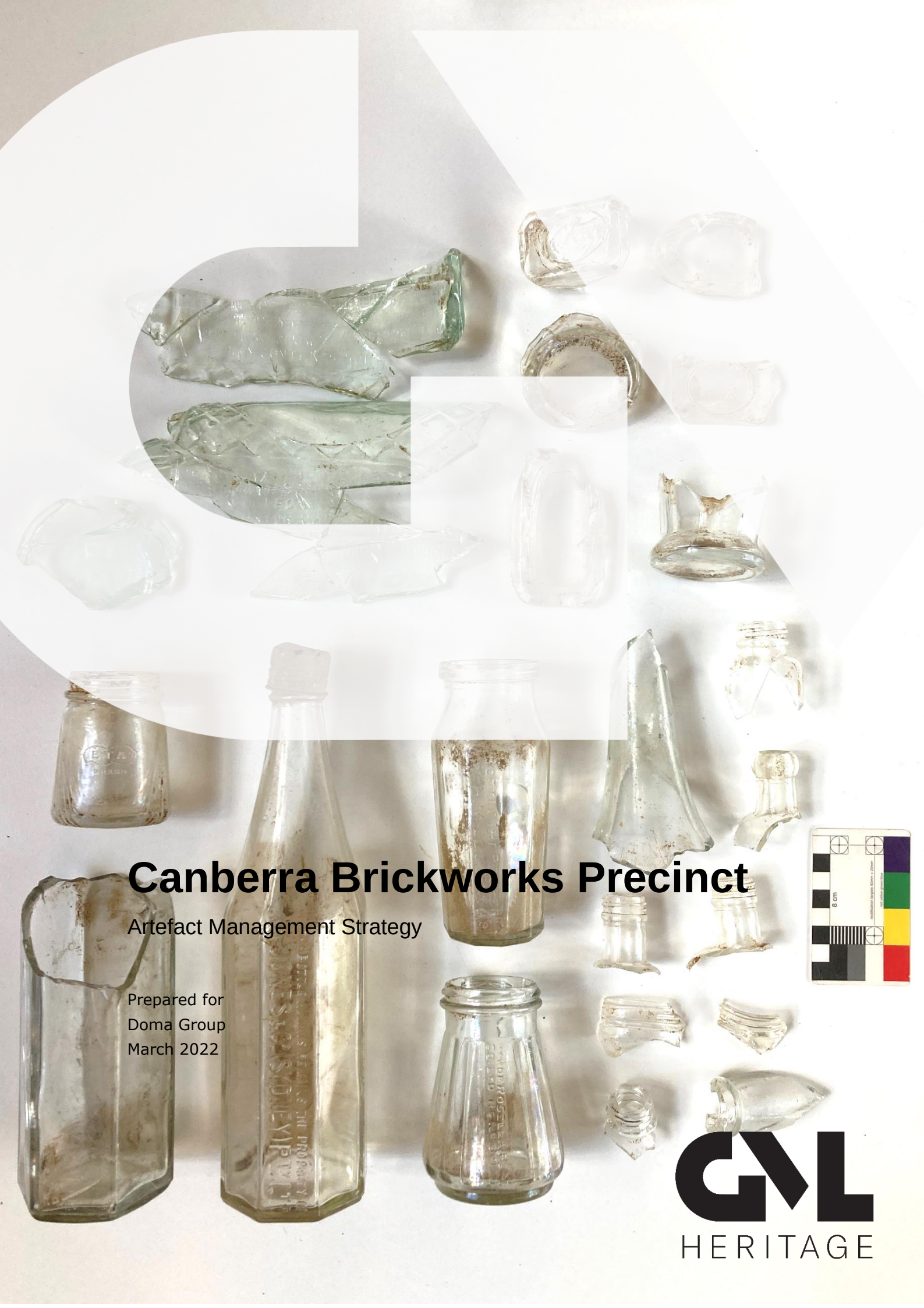
Key

- Trench edge
- Sondage
- Edge of context (remaining)
- Edge of context (excavated)
- Slope
- Ex situ footings

0 0.5 1 m

Appendix G

GML Heritage, Canberra Brickworks Precinct—Archaeological Investigations Artefact Management Strategy, prepared for Doma Group, March 2022



Canberra Brickworks Precinct

Artefact Management Strategy

Prepared for
Doma Group
March 2022

HERITAGE

Acknowledgement of Country

We respect and acknowledge the Ngunawal and Ngambri people of the lands and waterways on which we live and work, their rich cultural heritage and their deep connection to Country, and we acknowledge their Elders past and present. We are committed to truth-telling and to engaging with Ngunawal and Ngambri people to support the protection of their culture and heritage. We strongly advocate social, cultural and political justice and support the Uluru Statement from the Heart.

GML HERITAGE

Report register

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Artefacts in catalogue entry CBW_222, excavated from context *222*, Open Area 1, BRW 8. (Source: © GML Heritage 2021)

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1 Introduction

The Canberra Brickworks Precinct (the Precinct or the Brickworks) is a significant historic site with a distinctive industrial character. It has recognised heritage significance through its listing on the ACT Heritage Register as the 'Yarralumla Brickworks' and the associated 'Yarralumla Brickworks Railway Remnants'.

Doma Group (Doma) engaged GML Heritage Pty Ltd (GML) to undertake historical archaeological test excavations at the Precinct across a number of identified areas of archaeological potential. The results of this investigation are detailed in the Archaeological Excavation Report and Statement of Heritage Effects (March 2022, draft).

The following report provides a long term management strategy for the artefacts recovered as part of the archaeological investigations.



Figure 1.1 Location of the Canberra Brickworks Precinct (inclusive of the 'Yarralumla Brickworks' and 'Yarralumla Brickworks Railway Remnants'), in the broader context of Canberra. (Source: Google Earth with GML overlay, 2017)

1.1 Heritage management context

The *Heritage Act 2004* (ACT) (the Heritage Act) aims to represent and protect the rich natural and cultural heritage of the ACT. The legislation establishes a system for the recognition, registration and conservation of natural and cultural heritage places and objects, including Aboriginal places and objects.

As described previously, the 'Yarralumla Brickworks' and the 'Yarralumla Brickworks Railway Remnants' are included on the ACT Heritage Register. The Precinct is also recognised on the non-statutory Australian Institute of Architects (AIA) ACT Chapter Register of Significant Twentieth Century Architecture (RSTCA) (Item No R063) and National Trust of Australia heritage lists.

An Archaeological Research Design (ARD) and Excavation Permit application was submitted to the ACT Heritage Council under Section 61E of the Heritage Act in May 2020. Following amendments made in September 2020, this was approved under Section 61F of the Heritage Act and an Archaeological Excavation Permit (Yarralumla-S102-B1) was granted on 20 October 2020 with the following conditions:

- all excavation and related activities are to be undertaken in accordance with the September 2020 ARD;
- a long term artefact management strategy is to be submitted to the ACT Heritage Council.

1.2 Objectives

The purpose of this management strategy is to:

- identify what types of artefacts and other archaeological material comprise the recovered assemblage;
- identify which artefacts are not significant or are redundant to the research value of the assemblage and can be discarded;
- identify which artefacts are to be retained and provide recommendations for display and interpretation opportunities in accordance with the Conservation Management Plan (CMP) (September 2021) and Interpretation Strategy (December 2020, draft); and
- provide conservation recommendations including those regarding environmental conditions, storage and display, and object handling.

1.3 Authorship

This report has been prepared by Elise Jakeman (GML Consultant and Archaeologist) with input and review by Martin Rowney (GML Principal and Archaeologist).

2 Documentation of the assemblage

This section reviews the compositional nature of the artefactual assemblage, its contribution to the archaeological investigations, and how it has been processed and assessed.

2.1 Recovery and processing

During the archaeological investigations, artefacts were collected according to their context. This included contexts exposed in plan, sondages, and selected surface areas. Artefacts were placed in appropriately labelled bags or buckets and transported off site for temporary storage prior to processing.

The general procedure undertaken for the processing and cataloguing of artefacts was as follows:

- Artefacts recovered from each context were examined and separated according to fabric. They were then systematically catalogued using a Microsoft Excel-based database. This database recorded the following information:
  - the area of archaeological sensitivity, excavation unit, context, and date of excavation of the artefact;
  - the database identification number, and material and object type;
  - the weight, number of individual specimens (NISP), and minimum number of individuals (MNI) where applicable;
  - the description of the artefact, date of manufacture; and
  - interpretation and significance of the artefact or group of artefacts in relation to the archaeological context.
- Once catalogued, artefacts were separated into diagnostic and non-diagnostic items. Diagnostic items were preferentially cleaned over non-diagnostic items.
- Artefacts were then re-bagged with artefact cards identifying the area of archaeological potential, context, and database identification number.

The final artefact assemblage recovered during the archaeological investigations comprised 231 catalogue entries, which included both individual artefacts and typological groups recovered from the same archaeological context. The artefact inventory is provided as part of Appendix H to the archaeological investigation report.[1]

2.2 Archaeological investigation results

The post-excavation assessment of the assemblage determined that the majority of the artefacts had been recovered from demolition or general rubbish deposits, characteristic of the widespread movement of debris around the site.

The catalogue entries were dominated by metal artefacts (29.9 per cent) and building materials (29.4 per cent), followed by glass (17.7 per cent). Smaller numbers of ceramic (7.4 per cent), plastic items (5.2 per cent), and faunal remains (5.2 per cent) and other organic materials (4.8 per cent) were also recorded. When assessed for their function, the catalogue entries predominantly related to subsistence (22.1 per cent) (eg beverage bottles and butchered faunal remains), industrial purposes (13 per cent) and building materials (11.7 per cent) (eg machinery parts, timber pieces, and nails). Few entries were associated with personal items (4.3 per cent).[2]

2.3 Review of significance

The assessment of significance for historical archaeological artefacts is undertaken within a specialised framework that considered their research potential, rarity or representativeness, aesthetic or technical characteristics, and historical association. Consideration must also be given to the significance of the archaeological context from which they originate. Generally, artefacts that contribute to archaeological research and interpretation will be of heritage significance.

The following table outlines the framework that was used to assess the significance of the assemblage.

Table 2.1 Framework for assessing artefact significance.

Significance	Rationale	Example artefact
High	The artefact: • contributes directly to the understanding of the Brickworks and the people who worked and lived at the site; • is rare, either within the context of the Brickworks or the wider Canberra historical landscape; and/or • can be attributed to a clearly identifiable event or theme.	CBW_51
Moderate	The artefact: • contributes some information to the understanding of the Brickworks and the people who worked and lived at the site;	CBW_95

Significance	Rationale	Example artefact
	• is uncommon within the context of the Brickworks; and/or • can be attributed to a clearly identifiable event or theme.	
Low	The artefact: • contributes little information to the understanding of the Brickworks or the people who worked and lived at the site; • is common within the context of the Brickworks; and/or • can be attributed to a clearly identifiable event or theme.	CBW_71
Nil	The artefact: • contributes no information, either due to lack of diagnostic traits or recovery from an insecure context; • is common within the context of the Brickworks; and/or • cannot be attributed to a clearly identifiable event or theme.	CBW_76

2.4 Endnotes

[1] GML Heritage Pty Ltd, Canberra Brickworks Precinct—Archaeological Excavation Report and Statement of Heritage Effects, prepared for Doma Group, March 2022, Appendix H.
[2] GML Heritage Pty Ltd, Canberra Brickworks Precinct—Archaeological Excavation Report and Statement of Heritage Effects, prepared for Doma Group, March 2022, p 166.

3 Artefact management

The following section outlines strategies for the long-term management of the archaeological assemblage. These strategies have been developed with regard to the recommendations outlined in Section 8 of the archaeological investigation report, and the assessed significance and research potential of the assemblage.

3.1 Retention

The following artefacts have been identified as suitable for retention (Table 3.1, photographs of the artefacts are included in Appendix 1). This has been determined based on their rarity, representativeness of the events or themes of the Brickworks, and/or potential to contribute to further research. A total of 59 artefacts out of the full assemblage of 231 catalogue entries are recommended for retention. These artefacts predominantly comprise items of high and moderate significance, however, where appropriate some low significance items have also been included.

Table 3.1 Artefacts identified for retention.

ID	Context	Material	Type	ID	Context	Material	Type
CBW_23	34	Brick	Type artefact for common 'CB' frogged brick	CBW_133	6	Brick	Type artefact for 'air' brick
CBW_25	76	Glass	Type artefacts for 1920s bottles	CBW_137	17	Brick	'W' firebrick used in construction of a kiln
CBW_29	76	Brick	'CANBERRA C'WEALTH' frogged squint brick	CBW_143	Topsoil	Glass	Type artefacts for 1960s bottles
CBW_30	76	Brick	'Simple' frogged single bullnose brick	CBW_144	28	Glass	Type artefacts for 1960s bottles
CBW_31	Topsoil	Brick	Type artefact for common 'CANBERRA' frogged brick	CBW_148	3	Metal	Railway track portion

ID	Context	Material	Type	ID	Context	Material	Type
CBW_34	29	Paver	Type artefact for paver	CBW_155	Topsoil	Metal	Addressograph plate
CBW_37	29	Glass	Type artefacts for 1930s bottles	CBW_156	106	Brick	Types artefacts for 'AUSTRALIA' and 'C'WEALTH' roof tiles
CBW_49	95	Glass	Type artefacts for 1960s bottles	CBW_157	106	Brick	Type artefact for common 'CANBERRA C'WEALTH' frogged brick
CBW_50	95	Ceramic	Teacup fragments	CBW_172	Topsoil	Metal	Railway joints from 1920s railway track
CBW_51	95	Metal	Addressograph plate	CBW_175	129	Glass	Type artefacts for 1960s bottles
CBW_52	95	Metal	Addressograph plate	CBW_185	212	Leather	Shoe fragments
CBW_54	95	Brick	Type artefact for 'simple' frogged brick	CBW_186	212	Glass	Type artefacts for 1920s bottles
CBW_56	Topsoil	Glass	Type artefacts for 1960s bottles	CBW_192	106	Brick	'CANBERRA C'WEALTH' frogged single bullnose brick
CBW_60	Topsoil	Leather	Shoe fragments	CBW_196	117	Glass	Type artefacts for 1920s bottles
CBW_61	Topsoil	Plastic	Personal décor from Brickworks Hostel	CBW_201	49	Ceramic	Teacup fragments
CBW_63	Topsoil	Brick	Type artefact for common Type 1 'blank' frogged brick	CBW_202	49	Shell	290g of *Saccostrea glomerata* (Sydney Rock Oyster) shell

ID	Context	Material	Type	ID	Context	Material	Type
CBW_71	26	Metal	Shovel	CBW_203	49	Faunal remains	Butchered faunal remains
CBW_75	25	Brick	Type artefact for ribbed face block	CBW_209	76	Brick	Type artefact for possible Canberra cream brick
CBW_82	7	Brick	Type artefact for common 'C'WEALTH CANBERRA' frogged brick	CBW_210	76	Brick	Type artefact for common Type 2 'blank' frogged brick
CBW_86	117	Glass	Type artefacts for 1920s bottles	CBW_213	222	Metal	Door lock from 1920s married quarters
CBW_95	49	Marble	Personal object of one of the early workers	CBW_216	129	Glass	Type artefacts for 1960s bottles
CBW_96	80	Ceramic	Type artefacts for 1920s ceramics	CBW_221	222	Glass	Type artefacts for 1930s bottles
CBW_97	80	Glass	Type artefacts for 1920s bottles	CBW_224	222	Metal	Fittings from 1920s married quarters
CBW_98	80	Shell	Shell button	CBW_227	222	Ceramic	Fittings from 1920s married quarters
CBW_99	80	Faunal remains	Sample of faunal remains	CBW_230	222	Glass	Type artefacts for 1930s bottles
CBW_100	80	Metal	Bed knob from 1920s married quarters	CBW_231	222	Ceramic	Teacup fragments
CBW_101	80	Metal	Lid for a tobacco or matchstick box	CBW_233	172	Glass	Type artefacts for 1930s bottles
CBW_123	29	Leather	Shoe fragments	CBW_236	172	Ceramic	Teacup fragments

ID	Context	Material	Type	ID	Context	Material	Type
CBW_131	28	Brick	Type artefact for concrete tile	CBW_240	172	Metal	Fittings and personal objects from 1920s married quarters
CBW_132	6	Brick	Type artefact for common unfrogged frogged brick				

3.1.1 Storage conditions

Artefacts selected for retention should be stored appropriately according to material type. A list of general approaches to storage—along with specific requirements for specific materials—is provided below (table). This information is based on the *reCollections—Caring for Collections Across Australia* (1998) series developed for the Heritage Collections Council. If required, a professional conservator should be consulted for detailed advice.

Table 3.2 Guidelines for the storage and display of artefacts. (After *reCollections*, 1998)

Category	Guidelines
General	
Storage	Items should not be stored in basements, sheds, or directly on the floor. The storage area should not contain any water, drain, or steam pipes, particularly at ceiling level. There should be reasonable ventilation. Transfer all retained artefacts into archive quality boxes which are properly labelled with: • site name; • area/s of archaeological potential and excavation unit/s; • date; and • context and catalogue numbers. Periodically check all boxes, bags, and labels for degradation. Where there is evidence for degradation, replace the affected item transferring all information across to the replacement to ensure that no information is lost. Maintain accession and location registers. Store the archive logically and keep materials together.
Condition	Periodically check all artefacts in storage for signs of degradation. This may include corrosion, mould, and insect infestations. If an affected item is identified, it (and any accompanying items within the same storage box) should be removed and a professional conservator consulted for advice.

Category	Guidelines
Display	Display areas should be in a central area of a building, where they are buffered from the extremes of climatic fluctuations. The areas should not contain any water, drain, or steam pipes, particularly at ceiling level. There should be reasonable ventilation. Storage cupboards and furniture should be made of painted metal, as these provide a stable and neutral storage environment. If wooden storage or display furniture is used, these should be sealed and lined with impermeable coatings to reduce the risk of reactive chemicals from the wood affecting the enclosed artefacts. Clean and inspect display areas regularly to prevent deterioration caused by dust, mould, or insect activity.
Inorganics—Glass, ceramic, brick	
Storage	Pack in standard zip-lock bags and place in archive quality boxes. Spread the objects evenly in the box to distribute weight, keeping particularly fragile items at the top of the box. Do not over- or under-pack the boxes, add packing materials to fill out a box if necessary. When a large number of fragments are bagged together, a greater amount of damage such as breakage or abrasion is likely. To reduce such damage, consider refining the sorting process to smaller units of fragments.
Display	Artefacts should be displayed in a space that is maintained at a reasonably constant relative humidity of approximately 45 to 55 per cent and temperature of 18 to 22 degrees Celsius. These objects are not overly sensitive to light conditions, however, should not be unnecessarily high lighting.
Organics—Shell, bone, leather, wood	
Storage	Pack in standard zip-lock bags that have been perforated. Ensure the perforations are smaller than the stored object so that the object cannot fall through the holes. Place in archive quality boxes. Spread the objects evenly in the box to distribute weight, keeping particularly fragile items at the top of the box. Do not over- or under-pack the boxes, add packing materials to fill out a box if necessary. When a large number of fragments are bagged together, a greater amount of damage such as breakage or abrasion is likely. To reduce such damage, consider refining the sorting process to smaller units of fragments.
Display	Artefacts should be displayed in a space that is maintained at a reasonably constant relative humidity of approximately 45 to 55 per cent and temperature of 18 to 22 degrees Celsius. Accompanying museum lighting should be no brighter than 150 lux. Leather objects on display should be fully supported in their desired shape, to prevent warping or hardening in an undesirable position. Other delicate items should be fully supported to prevent cracking.
Metals	

Category	Guidelines
Environmental conditions	High relative humidity conditions can contribute to the degradation of metal objects. Such conditions can be counteracted by protecting metals by coating them with water repellents such as CRC, WD-40, or waxes. A conservator should be consulted to determine the suitability of the artefact and the appropriate coating material. If metal objects have been sorted in a temperate environment for a considerable period of time and demonstrate stability, the environment should not be altered to meet the recommended ideal conditions.
Storage	Interactions between different metal alloys can cause degradation and require different types of maintenance, so should be separated. Separate objects into the following three categories: • iron alloys; • copper alloys; and • other metals. Pack in standard zip-lock bags that have been perforated. Ensure the perforations are smaller than the stored object so that the object cannot fall through the holes. Pack small and large items, and composite objects in separate boxes. Spread the objects evenly in the box to distribute weight, keeping particularly fragile items at the top of the box. Do not over- or under-pack the boxes, add packing materials to fill out a box if necessary.
Display	Artefacts should be displayed in a space that is maintained at a reasonably constant relative humidity of approximately 45 to 55 per cent and temperature of 18 to 22 degrees Celsius. Accompanying museum lighting should be no brighter than 300 lux. Artefacts on display should be fully supported, with particular care provided for hinged objects to ensure that the hinge is not carrying the weight of the object.

3.1.2 Conservation

The artefacts identified for retention are presently in stable condition and do not require immediate conservation intervention. Ongoing condition review in accordance with Table 3.2 will be sufficient for these artefacts.

A professional conservator should be consulted for detailed advice.

3.1.3 Interpretation and research opportunities

The artefacts identified for retention include objects that are representative of the events and activities that occurred at the Precinct over its operation. As such, a majority of these artefacts have significance as display items that can assist in the heritage interpretation of

the site and its role in the development of Canberra. Example opportunities have been identified in Table 3.3.

Table 3.3 Display opportunities.

Opportunity	Description	Example artefacts
Timeline of production—Bricks	A number of the different brick types and changes in brick-frog style for different bricks produced at the Brickworks between 1913–1976 were demonstrated through the range of bricks recovered. These could be used to develop an informative display about the different brick frog designs and when they were in circulation. This display could be supplemented with further examples of different brick types sourced from elsewhere.	CBW_23, 28, 29, 30, 31, 34, 54, 82, 133, 157, 192, 209, and 210
Administrative	A number of addressograph plates were recovered (discussed in Section 4.2.3 of the archaeological investigation report). These plates display the names, addresses, and other personal details of a number of individuals. Further research is required to determine how these plates relate to the Precinct (ie whether these individuals were employees or other contractors). If they are determined to be directly related to the Brickworks, they may be used to develop a display documenting the workers of the facility. This display could be supplemented with historical photographs of the workers and personal accounts collected through community consultation.	CBW_51, 52, and 155
Subsistence	The workers and inhabitants of the Brickworks consumed a wide variety of products. Many of the bottles and jars that these products were packaged in were recovered during the excavation. These include drinks (eg beer, gin, cordial, and soft drink), preserves (eg jams, pasta sauces, and condiments), and oils. In addition to the manufactured goods, the remains of butchered meat cuts and oyster shells were also recovered.	CBW_25, 49, 97, 99, 143, 144, 202, 203, 216, 221, and 233

Opportunity	Description	Example artefacts
	These items could be displayed to show the different products that were consumed by the workers over the operation of the Brickworks. This display would have additional value in providing insight into early twentieth century life in Canberra.	
Personal artefacts	In addition to the food products consumed, the workers and inhabitants of the Brickworks also left a number of personal objects. Such personal objects not only include possessions (eg shoes, buttons, and a marble), but also personal toiletries and grooming products (eg bottles for shaving cream, dietary supplements, and medicinal goods). These items could be used to supplement a display about the workers and inhabitants of the Brickworks.	CBW_95, 98, 185, 221, 230, and 233

Detailed interpretation opportunities should be incorporated into the Interpretation Strategy prepared for the site.

Given the insight the assemblage provides into a key location in the historical landscape of Canberra, the retained assemblage should be made available for researchers in the future. This research may include typological analysis of early- and mid-twentieth century material culture, comparison to assemblages obtained from other archaeological sites in Canberra and the surrounding region, or other topics of interest.

3.2 Discard

The following artefacts have been identified as suitable for discard (Table 3.4). This has been determined based on their commonness, non-diagnostic or fragmentary nature, unsecure archaeological association, or lack of potential to contribute to further research. These artefacts predominantly comprise items of low and nil significance.

Table 3.4 Artefacts identified for discard.

ID	Context	Material	ID	Context	Material
CBW_2	Topsoil	Brick	CBW_122	29	Metal
CBW_3	Topsoil	Other	CBW_123	29	Organic
CBW_4	Topsoil	Bone	CBW_124	29	Brick

ID	Context	Material	ID	Context	Material
CBW_5	Topsoil	Brick	CBW_125	29	Brick
CBW_7	Topsoil	Other	CBW_126	99	Metal
CBW_8	Topsoil	Metal	CBW_127	6	Brick
CBW_9	Topsoil	Other	CBW_128	6	Other
CBW_10	Topsoil	Glass	CBW_129	6	Ceramic
CBW_11	Topsoil	Metal	CBW_130	6	Metal
CBW_12	Topsoil	Metal	CBW_132	6	Brick
CBW_13	Topsoil	Ceramic	CBW_134	6	Brick
CBW_15	Topsoil	Glass	CBW_135	17	Brick
CBW_16	Topsoil	Metal	CBW_136	17	Metal
CBW_17	34	Metal	CBW_138	17	Brick
CBW_18	34	Glass	CBW_139	29	Brick
CBW_19	34	Metal	CBW_140	17	Brick
CBW_20	34	Ceramic	CBW_141	63	Metal
CBW_21	34	Brick	CBW_142	28	Metal
CBW_22	34	Brick	CBW_145	21	Metal
CBW_24	12	Organic	CBW_146	28	Metal
CBW_26	76	Metal	CBW_147	29	Metal
CBW_27	76	Metal	CBW_150	Topsoil	Metal
CBW_32	76	Bone	CBW_151	Topsoil	Brick
CBW_33	50	Brick	CBW_152	Topsoil	Brick
CBW_35	29	Brick	CBW_153	29	Brick
CBW_36	29	Brick	CBW_154	28	Brick
CBW_38	Topsoil	Brick	CBW_156	106	Brick
CBW_39	Topsoil	Brick	CBW_158	106	Brick
CBW_40	Topsoil	Glass	CBW_159	106	Brick
CBW_41	90	Glass	CBW_160	123	Metal
CBW_43	90	Metal	CBW_162	109	Metal

ID	Context	Material	ID	Context	Material
CBW_44	90	Other	CBW_163	Topsoil	Metal
CBW_45	90	Organic	CBW_164	Topsoil	Brick
CBW_46	25	Organic	CBW_165	90	Metal
CBW_47	95	Metal	CBW_166	90	Ceramic
CBW_48	95	Glass	CBW_168	90	Glass
CBW_50	95	Ceramic	CBW_169	90	Glass
CBW_53	95	Brick	CBW_170	90	Brick
CBW_55	95	Brick	CBW_171	91	Glass
CBW_58	Topsoil	Glass	CBW_173	Topsoil	Metal
CBW_59	Topsoil	Metal	CBW_174	129	Brick
CBW_60	Topsoil	Organic	CBW_176	129	Metal
CBW_62	Topsoil	Metal	CBW_177	129	Glass
CBW_64	29	Brick	CBW_179	41	Glass
CBW_65	12	Brick	CBW_180	41	Metal
CBW_66	29	Brick	CBW_181	41	Ceramic
CBW_67	17	Brick	CBW_182	41	Ceramic
CBW_68	87	Brick	CBW_183	41	Bone
CBW_69	84	Brick	CBW_184	41	Metal
CBW_70	29	Brick	CBW_190	214	Metal
CBW_72	25	Other	CBW_191	212	Bone
CBW_73	25	Glass	CBW_193	220	Glass
CBW_74	25	Glass	CBW_194	220	Ceramic
CBW_76	25	Metal	CBW_195	220	Metal
CBW_77	34	Brick	CBW_196	117	Glass
CBW_78	34	Brick	CBW_197	117	Glass
CBW_79	34	Brick	CBW_198	149	Ceramic
CBW_80	34	Metal	CBW_199	149	Metal
CBW_81	34	Metal	CBW_205	49	Glass

ID	Context	Material	ID	Context	Material
CBW_83	21	Brick	CBW_206	49	Organic
CBW_84	13	Brick	CBW_207	49	Metal
CBW_85	7	Metal	CBW_208	49	Metal
CBW_87	117	Metal	CBW_212	76	Metal
CBW_88	Topsoil	Other	CBW_214	Topsoil	Metal
CBW_89	Topsoil	Glass	CBW_215	129	Glass
CBW_90	49	Bone	CBW_217	129	Other
CBW_91	49	Metal	CBW_218	129	Metal
CBW_92	49	Metal	CBW_219	129	Organic
CBW_94	49	Glass	CBW_220	129	Metal
CBW_100	80	Metal	CBW_223	222	Glass
CBW_102	80	Metal	CBW_225	222	Bone
CBW_103	80	Metal	CBW_226	222	Other
CBW_104	3	Brick	CBW_228	222	Ceramic
CBW_105	3	Brick	CBW_229	222	Ceramic
CBW_106	3	Organic	CBW_232	222	Metal
CBW_107	1	Brick	CBW_236	172	Ceramic
CBW_110	Topsoil	Brick	CBW_237	172	Bone
CBW_111	Topsoil	Glass	CBW_239	172	Metal
CBW_112	Topsoil	Metal	CBW_241	Topsoil	Glass
CBW_113	Topsoil	Ceramic	CBW_242	Topsoil	Metal
CBW_114	Topsoil	Metal	CBW_243	Topsoil	Brick
CBW_115	Topsoil	Metal	CBW_244	6	Brick
CBW_116	Topsoil	Other	CBW_245	Topsoil	Brick
CBW_117	Topsoil	Metal	CBW_246	Topsoil	Brick
CBW_118	Topsoil	Metal	CBW_247	3	Metal
CBW_119	Topsoil	Bone	CBW_248	3	Bone
CBW_120	90	Metal	CBW_249	3	Ceramic

ID	Context	Material	ID	Context	Material
CBW_121	17	Brick			

4 Recommendations

The majority of artefacts were identified as being unsuitable for retention, due to their commonness, non-diagnostic or fragmentary nature, unsecure archaeological association, or lack of potential to contribute to further research. A small subsection of artefacts have been recommended for retention. These artefacts provide insight into the manufacture of bricks and lives of the workers who occupied a key location in the historical landscape of Canberra.

In light of this, the following recommendations are made:

- **Interpretation Strategy**—The artefactual assemblage should be incorporated into the Interpretation Strategy for the Precinct, allowing for the communication of the results of the archaeological investigations to the current residents of Yarralumla and the future residents of the Brickworks development. The Interpretation Strategy should identify opportunities for the public display of select artefacts.
- **Artefact retention**—The artefacts identified as suitable for retention should be accessioned into the Brickworks moveable heritage collection, which has previously been documented in Appendix H of the 2021 CMP. This collection should be managed in accordance with this strategy. This collection should also be made available to researchers.
- **Artefact discard**—The artefacts identified as having no research potential and low interpretative value can be discarded appropriately.

Appendix 1

Photographs of artefacts identified for retention.

Catalogue number	Photographs
CBW_23	
CBW_25	
CBW_29	

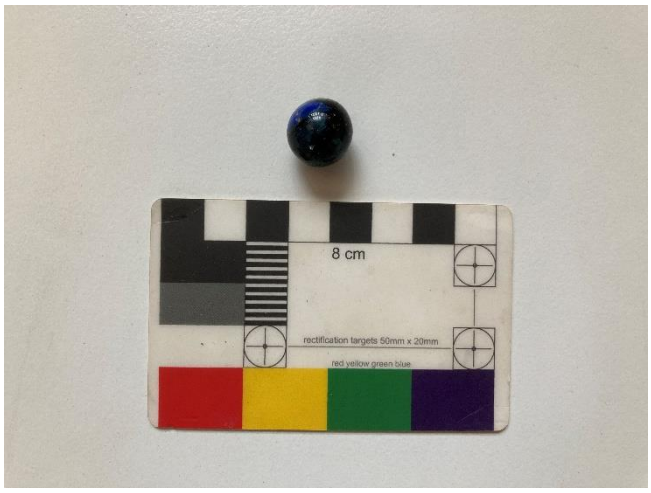
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CBW_51	
CBW_52	
CBW_54	

Catalogue number	Photographs
CBW_56	
CBW_60	
CBW_61	

Catalogue number	Photographs
CBW_63	
CBW_71	
CBW_75	

Catalogue number	Photographs
CBW_82	
CBW_86	
CBW_95	

Catalogue number	Photographs
CBW_96	
CBW_97	
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Catalogue number	Photographs
	
CBW_99	
CBW_100	

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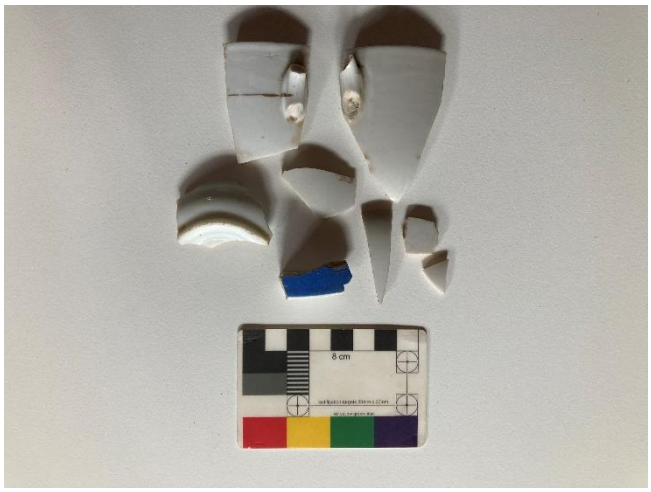
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Catalogue number	Photographs
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CBW_157	

Catalogue number	Photographs
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CBW_185	

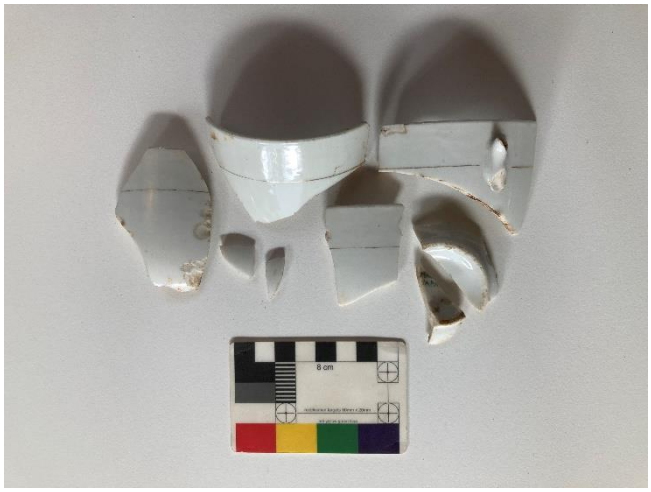
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CBW_209	
CBW_210	
CBW_213	

Catalogue number	Photographs
CBW_216	
CBW_221	 

Catalogue number	Photographs
CBW_224	
CBW_230	 

Catalogue number	Photographs
	
CBW_231	
CBW_233	

Catalogue number	Photographs
CBW_236	

Appendix H

Catalogue of artefacts recovered during March and July–August 2021 archaeological test excavations

Origin				Identification						Analysis				Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW3	TT22	Topsoil	17/03/2021	CBW_1		-	-	-	-	Void	-	-	-	-	-
BRW3	TT22	Topsoil	17/03/2021	CBW_2	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No
BRW8	TT31	Topsoil	18/03/2021	CBW_3	Other	Resin?	-	1	1	Broken resin? Stick. Looks like it could be from a piece of cutlery or a tool	-	Nil	Domestic	-	No
BRW8	TT31	Topsoil	18/03/2021	CBW_4	Bone	Faunal	6g	1	1	Misc shaft fragment	-	Nil	Subsistence	Too fragmentary to determine dominant species or subsistence strategy	No
BRW3	TT29	Topsoil	18/03/2021	CBW_5	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No
BRW3	TT29	Topsoil	18/03/2021	CBW_6		-	-	-	-	Void	-	-	-	-	-
BRW3	TT29	Topsoil	18/03/2021	CBW_7	Other	Plastic	-	1	1	Broken blue plastic straw	-	Nil	Subsistence	-	No
BRW3	TT29	Topsoil	18/03/2021	CBW_8	Metal	Miscellaneous	-	-	-	Curved metal rims? Attached to pieces of clay flooring	-	Nil	Unknown	-	No
BRW3	TT29	Topsoil	18/03/2021	CBW_9	Other	Plastic	-	1	1	Snakes Alive packet - use by March 02?	c2000	Nil	Subsistence	-	No
BRW3	TT29	Topsoil	18/03/2021	CBW_10	Glass	Bottle	53g	2	-	1 brown body shard '… BOTTLE …'	-	Nil	Subsistence	-	No
BRW3	TT29	Topsoil	18/03/2021	CBW_11	Metal	Nail	3g	1	1	-	-	Nil	Building	-	No
BRW3	TT29	Topsoil	18/03/2021	CBW_12	Metal	Bolt	4g	1	1	-	-	Nil	Building	-	No
BRW3	TT29	Topsoil	18/03/2021	CBW_13	Ceramic	Vessel	5g	1	1	Cream body sherd with outcurving lip	-	Nil	Domestic	-	No
BRW3	TT29	Topsoil	18/03/2021	CBW_14		-	-	-	-	Void	-	-	-	-	-
BRW3	TT29	Topsoil	18/03/2021	CBW_15	Glass	Window	3g	1	-	Colourless textured (dimpled) window glass shard	-	Low	Building	Likely debris resulting from demolition of Brickworks Hostel buildings	No
BRW3	TT29	Topsoil	18/03/2021	CBW_16	Metal	Sheet	85g	1	1	Fe sheeting	-	Nil	Industrial	-	No
BRW8	TT8	34	4/03/2021	CBW_17	Metal	Sheet	73g	1	1	Fe sheeting	-	Nil	Industrial	-	No
BRW8	TT8	34	4/03/2021	CBW_18	Glass	Bottle	610g brown glass, 60g colourless glass	8	5	2 brown crown finish flared lip tapered neck sloped down shoulder ; colourless circular base abrupt? heel '… 6 [triangle?]' flat base stippled resting point shallow concave push up ; brown abrupt heel '…TH … LTD' circular flat base shallow concave push up 'AGM [stacked] 1955 IS.89L' ; brown abrupt heel '... TLE ... PTY. LT' circular flat base shallow concave push up 'AGM [stacked] 1952 IS.89 2X' ; cylindrical abrupt heel 'THE N ... BOTTLE ... PTY. LTD' circular flat base shallow concave push up 'AGM [stacked] 1956 IS.89 S47?'	c mid 1950s	Low	Subsistence	Beer bottle and condiment jar fragments, likely imported rubbish from elsewhere on site	No

Origin				Identification			Analysis						Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	TT8	34	4/03/2021	CBW_19	Metal	Can	48g	2	2	White body, blue and red collar at shoulder, blue and white wave swirl decal on body at heel, 'WOOLWORTHS SPARKLING LEMONADE 370ml' ; incomplete rim	-	Nil	Subsistence	Soft drink can and fragments, likely imported rubbish from elsewhere on site	No
BRW8	TT8	34	4/03/2021	CBW_20	Ceramic	Tile	36g	2	2	2 patterned tile sherds, white base tan decoration	-	Nil	Building	Probably bathroom tile fragments, likely imported rubbish from elsewhere on site	No
BRW8	TT8	34	4/03/2021	CBW_21	Brick	Simple	-	-	-	-	1910s	-	Product	-	No
BRW8	TT8	34	4/03/2021	CBW_22	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No
BRW8	TT8	34	4/03/2021	CBW_23	Brick	CB	-	-	-	Type artefact for common 'CB' frogged brick. Red (2.5YR 4/6) brick with a total size of 227 mm long x 105 mm wide x 75 mm high. The frog presents as a rectangle set in the approximate centre of the brick. It measures 150 mm long x 53 mm wide x 10 mm deep. The centre of the frog has been imprinted with 'CB', which is flanked by two clamp imprints. The clamp imprints are present 35 mm inwards from the outer edges of the frog.	Post-war	Moderate	Product	Produced at the Brickworks following the reopening of the facility in 1944 through to its closure in 1976	Yes
BRW11	TT3 South	12	3/03/2021	CBW_24	Organic	Timber	224g	4	1	Composite timber sheet constructed from 4 individual layers. Each layer cut on an alternate grain. Semi-rounded ferrous knob 17mm long x 20mm wide x 19mm thick embedded on one side	-	Nil	Unknown	Unknown purpose	No
BRW8	TT11	76	12/03/2021	CBW_25	Glass	Bottle	1007g brown glass	5	3	Brown bulged? neck rounded shoulder 'THIS BOTTLE IS THE PROPERTY OF' straight body abrupt heel 'THE NSW BOTTLE COMPANY LTD' flat resting point flat indenatation 'AGM 1926 …' ; brown abrupt heel 'THE NSW BOTTLE … LTD' flat resting point flat indentation 'AGM 1925 S.981' ; brown abrupt heel flat indentation [no base markings]	c mid 1920s	Moderate	Subsistence	Beer bottle fragments, likely discarded in close proximity to the early kiln complex prior to demolition. Indicative of date of demolition of kiln complex	Yes
BRW8	TT11	76	12/03/2021	CBW_26	Metal	Horse shoe	-	1	1	-	-	Low	Industrial	-	No
BRW8	TT11	76	12/03/2021	CBW_27	Metal	Nondiagnostic	34g	1	1	Nondiagnostic Fe piece	-	Nil	Industrial	-	No

Origin				Identification						Analysis				Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	TT11	76	12/03/2021	CBW_28	Brick	AUSTRALIA roof tile	-	-	-	Type artefact for 'AUSTRALIA' roof tile. Red (2.5YR 5/6) low profile interlocking ceramic roof tile, likely of 'Marseilles' design. Incomplete, full dimensions unknown. Visible incomplete 'AUSTRALIA' stamp on right corner of tile. Remaining lettering unknown.	-	Moderate	Product	Produced at the Brickworks. Several design differences compared to 'C'WEALTH' roof tiles, suggesting two different phases of tile manufacture. Date of manufacture unknown	Yes
BRW8	TT11	76	12/03/2021	CBW_29	Brick	CANBERRA C'WEALTH	-	-	-	Squint brick variation of the commons 'CANBERRA C'WEALTH' frogged brick. Reddish brown (2.5YR 5/4) brick with a total size of 220 mm long x 105 mm wide x 73 mm deep. The left side of the brick has been tapered to form an off-centred point. The frog shape has been adjusted accordingly	1920s	Moderate	Product	Produced at the Brickworks during the 1920s	Yes
BRW8	TT11	76	12/03/2021	CBW_30	Brick	Simple	-	-	-	Single bullnose variation of the commons 'simple' frogged brick. Reddish brown (2.5YR 5/3) brick with a total size of 230 mm long x 110 mm wide x 7.5 mm high. The left side of the brick has been curved to form a rounded arc. The frog shape has been shrunk, but retains rectangular form. It measures 123 mm long x 56 mm wide x 10 mm deep.	1910s	High	Product	Produced at the 1913-1916 experimental kiln at the Brickworks. Likely during a trial to determine the types of brick shapes that could be produced	Yes
BRW8	TT11	Topsoil	12/03/2021	CBW_31	Brick	CANBERRA	-	-	-	Type artefact for common 'CANBERRA' frogged brick. Red (2.5YR 5/6) brick with a total size of 225 mm long x 105 mm wide x 80 mm high. The frog presents as a rectangle set in the approximate centre of the brick. It measures 170 mm long x 60 mm wide x 10 mm deep. The upper half of the frog has been imprinted with 'CANBERRA' spaced 20 mm inwards from the outer edges of the frog. Two clamp imprints are present 50 mm inwards from the outer edges of the frog.	1930s	Moderate	Product	Produced at the Brickworks during the 1930s	Yes
BRW8	TT11	76	12/03/2021	CBW_32	Bone	Faunal	-	1	1	Distal fragment, probably bird	-	Nil	Subsistence	-	No
BRW8	TT10 North	50	12/03/2021	CBW_33	Brick	Simple	-	-	-	-	1910s	-	Product	-	No
BRW8	TT8	29	4/03/2021	CBW_34	Brick	Paving	-	-	-	Type artefact for paver. Reddish brown (2.5YR 5/4) paver with a total size of 225 mm long x 105 mm wide x 50 mm high.	-	Moderate	Product	Produced at the Brickworks. Date of manufacture unknown	Yes
BRW8	TT8	29	4/03/2021	CBW_35	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No

Origin				Identification			Analysis						Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	TT8	29	4/03/2021	CBW_36	Brick	Blank frog	-	-	-	-	-	-	Product	-	No
BRW8	TT8	29	4/03/2021	CBW_37	Glass	Bottle	16g colourless glass	1	1	Colourless square with rounded corners abrupt heel '… IS I? … UNITED' flat base shallow concave push up (= United Glass Bottle Manufacturers?]	c1930s	Low	Subsistence	Likely condiment bottle, likely imported rubbish from elsewhere on site	Yes
BRW8	TT7	Topsoil	5/03/2021	CBW_38	Brick	Unknown	-	-	-	-	-	-	Product	-	No
BRW8	TT7	Topsoil	5/03/2021	CBW_39	Brick	Paving	-	-	-	-	-	-	Product	-	No
BRW8	TT7	Topsoil	5/03/2021	CBW_40	Glass	Bottle	54g	4 brown glass, 4 colourless glass	8	4 brown glass bottle shards, 4 colourless glass bottle shards	-	Nil	Subsistence	-	No
BRW2	TT14	90	15/03/2021	CBW_41	Glass	Window	46g	2	-	Colourless glass window shards	-	Low	Building	Likely debris resulting from demolition of Brickworks Hostel buildings	No
-	-	-	15/03/2021	CBW_42		-	-	-	-	Void	-	-	-	-	-
BRW2	TT14	90	15/03/2021	CBW_43	Metal	Fittings and spike	753g	5	5	-	-	Nil	Industrial	-	No
BRW2	TT14	90	15/03/2021	CBW_44	Other	Bakelite	-	-	-	Bakelite sheet	-	Nil	Domestic	-	No
BRW2	TT14	90	15/03/2021	CBW_45	Organic	Leather				Cowling? Fitting for pipe to connect to filter bag?			Industrial	-	No
BRW11	TT4	25	3/03/2021	CBW_46	Organic	Timber	4.02kg	12	12	Various pieces of shaped timber, some with nails	-	Nil	Industrial	-	No
BRW2	-	95	16/03/2021	CBW_47	Metal	Can	385g	6	6	White body, 'FANTA' diagonal across body, remaining details illegible ; blue body, white collar at shoulder and heel, 'F' in centre of gold oval, 'FOSTERS LAGER' ; 1 food? Tin ; 1 misc ; 2 bottle tops	-	Low	Subsistence	Soft drink and beer can and food container fragments, likely were contained within or discarded in close proximity to 95 prior to demolition	No
BRW2	-	95	16/03/2021	CBW_48	Glass	Window	48g	2	-	Colourless glass window shards	-	Low	Building	Likely debris resulting from the demolition of 95	No

Origin				Identification			Analysis							Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW2	-	95	16/03/2021	CBW_49	Glass	Bottle	663g colourless glass, 246g brown glass	8	8	Colourless crown finish tapered neck straight body applied colour label (ACL) on body '[fountain motif in triangle border] SCHWEPPES [printed over series of circles] THIS BOTTLE ALWAYS REMAINS THE PROPERTY OF SCHWEPPES (AUSTRALIA) LIMITED' abrupt heel 'SCHWEPPES SCHWEPPES' flat resting point shallow concave push up 'AGM [stacked] IS.552 I' (= 1960s?) ; Colourless (light aqua tinge) cylindrical abrupt heel decorated with single thread '7' circular base flat resting point 'AGM [stacked] V 715' ; brown abrupt heel '… TY. LTD AGM [stacked]' circular base stippled resting point ; brown abrupt heel 'T … PTY. ... 7I? circular base stippled resting point [no base marks] ; brown abrupt heel '... LTD' circular base stippled resting point [no base marks] ; brown abrupt heel '... COMPAN ...' circular base stippled resting point 'AGM [stacked] 1969 IS.89L 41' ; colourless abrupt heel with 7 rows fine dots as band circular base stippled resting point indented base ; colourless circular base '18'	c late 1960s/early 1970s	Moderate	Subsistence	Soft drink and beer bottle fragments, likely were contained within or discarded in close proximity to 95 prior to demolition. Indicative of date of demolition of 95	Yes
BRW2	-	95	16/03/2021	CBW_50	Ceramic	Teacup	137g	2	2	Saucer white base, pink decoration white silhouette flowers, gold rim, basemark 'FINE CHINA MADE IN JAPAN' above two branches below crown gold (= Narumi Seito So?) (made in = after 1915, Japan = after 1921, made in occupied Japan = 1947-1952, dropped after this)	c1960s?	Low	Domestic	Tea set fragments, likely were contained within or discarded in close proximity to 95 prior to demolition	No
BRW2	-	95	16/03/2021	CBW_51	Metal	Personnel addressograph plates	-	21	21	[see 'CBW_51, 52, 155 Add' sheet]	1970	High	Administrative	A collection of addressograph plates for a number of individuals. It is unknown whether these individuals were employed at the Brickworks, or why the plates were being stored in the mess hall rather than the administration block	Yes

Origin				Identification						Analysis				Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW2	-	95	16/03/2021	CBW_52	Metal	Car addressograph plates	-	13	13	[see 'CBW_51, 52, 155 Tags' sheet]	1960s	High	Administrative	A collection of addressograph plates for a number of vehicles. It is unknown whether these vehicles were owned by the Brickworks, or why the plates were being stored in the mess hall rather than the administration block	Yes
BRW2	-	95	16/03/2021	CBW_53	Brick	CANBERRA C'WEALTH	-	-	-	-	1920s	-	Product	-	No
BRW2	-	95	16/03/2021	CBW_54	Brick	Simple	-	-	-	Type artefact for 'simple' frog. Red (2.5YR 4/6) brick with a total size of 240mm long x 110mm wide x 82mm high. The frog presents as an inverted triangular prism set in the approximate centre of the brick. It measures 163mm long x 57mm wide x 13mm deep. Two clamp imprints are present between the outer edges of the frog and the edges of the brick	1910s	High	Product	Produced at the Brickworks during the operation of the experimental kiln	Yes
BRW2	-	95	16/03/2021	CBW_55	Brick	CANBERRA C'WEALTH	-	-	-	-	1920s	-	Product	-	No
BRW8	TT30	Topsoil	18/03/2021	CBW_56	Glass	Bottle	669g brown glass	2	2	Brown crown finish tapered neck sloped down shoulders 'THIS BOTTLE IS THE PROPTERY OF' straight body abrupt heel 'THE NSW BOTTLE COMPANY PTY. LTD' flat resting point shallow concave push up 'AGM [stacked] 1967 IS.89L 38' ; brown abrupt heel 'THE PROPERTY OF ... BRAN' flat resting point flat indentation 'AGM [stacked] IS.1873 6'	c late 1960s	Low	Subsistence	Beer bottle fragments, found in topsoil above 41. Probably indicative of closure of 41, although closure could have comprised fill using of nearby materials, resulting in artefacts contemporaneous with deposition of 41 becoming stratigraphically later	Yes
BRW3	TT23	Topsoil	17/03/2021	CBW_57	Glass	Bottle	227g brown glass, 62g colourless glass	4	3	Brown abrupt heel 'M THIS BOTTLE ALWA … THE MANUFACTURERS BOTT … CO OF VICTORIA PTY LTD' (= Manufacturers Bottle Co-Operative of Victoria, M = manufactured in Melbourne) circular base stippled resting point shallow concave push up '1 [or I?] 45 [in circle]' ; brown circular base flat resting point 'AGM [stacked] 1958 S.89 835?' ; colourless abrupt heel '... LED RE ...' circular base stippled resting point (shallow half moons) shallow concave push up ; brown crown finish flared lip tapered neck	c late 1950s	Low	Subsistence	Beer bottle and condiment jar fragments, found in topsoil not associated with any archaeological features. May be associated with the fringe camp or Brickworks Hostel	Yes
BRW3	TT23	Topsoil	17/03/2021	CBW_58	Glass	Window	52g	2	-	Colourless textured (moulded bubbles) window glass shard	-	Low	Building	Likely debris resulting from demolition of Brickworks Hostel buildings	No

Origin				Identification			Analysis						Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW3	TT23	Topsoil	17/03/2021	CBW_59	Metal	Miscellaneous	3.48kg	3	3	Stove top filament ; Fe metal sheet ; twisty fence post	-	Nil	Domestic	Stove top filament and fence post likely originate from occupation of Brickworks Hostel	No
BRW3	TT23	Topsoil	17/03/2021	CBW_60	Organic	Leather	112g	1	1	Tongue, vamp, and footbed, slip-on ankle boot	-	Nil	Personal	-	No
BRW3	TT23	Topsoil	17/03/2021	CBW_61	Other	Plastic	-	1	1	Plastic white doily	c1950s	Low	Domestic	Décor from Brickworks Hostel	Yes
BRW3	TT23	Topsoil	17/03/2021	CBW_62	Metal	Can	79g	1	1	No diagnostic labelling present	-	Nil	Subsistence	-	No
BRW3	TT23	Topsoil	17/03/2021	CBW_63	Brick	Blank frog	-	-	-	Type artefact for common Type 1 'blank' frog. Red (2.5YR 4/6) brick with a total size of 230 mm long x 110 mm wide x 80 mm high. The frog presents as a blank rectangle set in the approximate centre of the brick. It measures 175 mm long x 57 mm wide x 10 mm deep. Two clamp imprints are present 55 mm inwards from the outer edges of the frog.	-	Moderate	Product	Type artefact	Yes
BRW8	TT7	29	5/03/2021	CBW_64	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No
BRW11	TT3	12	3/03/2021	CBW_65	Brick	CB	-	-	-	-	Post-war	-	Product	-	No
BRW8	TT7	29	5/03/2021	CBW_66	Brick	Paving	-	-	-	-	-	-	Product	-	No
BRW11	TT5	17	4/03/2021	CBW_67	Brick	Simple	-	-	-	-	1910s	-	Product	-	No
BRW1	TT12	87	15/03/2021	CBW_68	Brick	CANBERRA C'WEALTH	-	-	-	-	1920s	-	Product	-	No
BRW1	TT13	84	15/03/2021	CBW_69	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No
BRW8	TT7	29	5/03/2021	CBW_70	Brick	Misfired	-	-	-	-		-	Product	-	No
BRW11	TT4	26	4/03/2021	CBW_71	Metal	Shovel	-	1	1	Large shovel	Pre-1970s	Low	Industrial	Broken shovel deposited beneath the concrete slab of the extrusion plant. Would have been used to shovel a wide variety of materials before it broke and was discarded.	Yes
BRW11	TT4	25	4/03/2021	CBW_72	Other	Plastic	-	1	1	Service pipe cap	-	Nil	Domestic	-	No
BRW11	TT4	25	4/03/2021	CBW_73	Glass	Bottle	-	2	2	1 brown glass bottle base shard, 1 colourless glass bottle base shard	-	-	Subsistence	-	No
BRW11	TT4	25	4/03/2021	CBW_74	Glass	Window	53g	3	-	Colourless textured (dappled) window glass with wire support	-	Low	Building	Window glass, possibly from the extrusion plant building or another building demolished on site	No

Origin				Identification			Analysis							Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW11	TT4	25	4/03/2021	CBW_75	Brick	Ribbed face block	-	-	-	Type artefact for ribbed face block. Dark reddish brown (5YR 2.5/2) brick with a total size of 218mm long x 145mm wide x 55mm high. Three half cylindrical depressions are present on one broad side of the brick. Each depression is 35mm wide x 20mm deep. The outer depressions are spaced 35mm inwards from the edge of the brick. Each rib formed between the depressions is 22mm wide	-	Low	Product	The different colouration of the clay matrix suggests it was likely not produced at the Brickworks, however, this cannot be confirmed. It may have been made from a different mixture of clay to support the different brick form, resulting in the darker colouration	Yes
BRW11	TT4	25	4/03/2021	CBW_76	Metal	Nail	895g	35	35	Approx 30 cut nails ; 1 long round head spike ; 1 long hexagonal head spike ; 1 short hexagonal spike ; 1 short round head screw ; 1 broken long spike	-	Nil	Building	-	No
BRW8	TT9	34	9/03/2021	CBW_77	Brick	C'WEALTH CANBERRA	-	-	-	-	1920s	-	Product	-	No
BRW8	TT9	34	9/03/2021	CBW_78	Brick	Simple	-	-	-	-	1910s	-	Product	-	No
BRW8	TT9	34	9/03/2021	CBW_79	Brick	Blank frog	-	-	-	-	-	-	Product	-	No
BRW8	TT9	34	9/03/2021	CBW_80	Metal	Sheet	79g	1	1	Fe sheeting	-	Nil	Industrial	-	No
BRW8	TT9	34	9/03/2021	CBW_81	Metal	Can				Drinking can			Subsistence	-	No
BRW11	TT3 West	7	3/03/2021	CBW_82	Brick	C'WEALTH CANBERRA	-	-	-	Type artefact for common 'C'WEALTH CANBERRA' frogged brick. Red (2.5YR 4/6) brick with a total size of 225 mm long x 110 mm wide x 73 mm high. The frog presents as a rectangle set in the approximate centre of the brick. It measures 185 mm long x 65 mm wide x 10 mm deep. The frog has been imprinted with 'C'WEALTH CANBERRA' spaced over two lines.	1920s	Moderate	Product	Produced at the Brickworks in the 1920s, apparently concurrently with 'CANBERRA C'WEALTH' frogged bricks. It is unknown why two variations of this frog were produced at the same time, one possibility is that the frogs denoted different buyers markets (eg government/public vs private dwellings/other buildings)	Yes
BRW11	TT3 Centre	21	4/03/2021	CBW_83	Brick	Air	-	-	-	-	Post-war	-	Product	-	No
BRW11	TT3 South	13	3/03/2021	CBW_84	Brick	Blank frog	-	-	-	-	-	-	Product	-	No
BRW11	TT3 West	7	3/03/2021	CBW_85	Metal	Rod	1.05kg	1	1	Fe rod	-	Nil	Building	May have been support for structure (thicker than rebar, but similar look)	No

Origin				Identification			Analysis						Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	TT10 South	117	10/03/2021	CBW_86	Glass	Bottle	286g brown glass, 17g colourless glass, 1g milk glass	27	3	Brown circular flat base shallow concave push up '… W LTD' (Zetland Glass Bottle Works Ltd = Z G B W Ltd base mark = not manufactured after amalgamation in 1922) ; brown circular flat base shallow concave push up '… Z G? ...' (Zetland Glass Bottle Works Ltd = Z G B W Ltd base mark = not manufactured after amalgamation in 1922/5) ; brown circular abrupt heel '… A' flat base shallow concave push up no marks ; brown circular body '…TED … 21 … AUSTRALI ...' ; brown body '... ADE ...'	c 1920, no later than 1922	Low	Subsistence	Beer and soft drink bottle fragments, likely imported rubbish from elsewhere on site during demolition of early kiln complex. May be indicative of date of demolition of early kiln complex	Yes
BRW8	TT10 South	117	10/03/2021	CBW_87	Metal	Nail	3g	1	1	-	-	Nil	Building	-	No
BRW8	TT8	Topsoil	4/03/2021	CBW_88	Other	Plastic				Sprinkler head, 'Hardie Pope'	-	Nil	Domestic	-	No
BRW8	TT8	Topsoil	4/03/2021	CBW_89	Glass	Bottle	29g green glass	1	1	Light green circular base shallow concave push up 'AGM [stacked] IS.1864' (IS. = c1941-c1968)	c1941-c1968	Nil	Subsistence	Likely beer bottle fragment, found in topsoil not associated with any archaeological features	No
BRW8	TT10 North	49	9/03/2021	CBW_90	Bone	Faunal	-	11	-	1 complete long bone, 1 distal epiphysis, 5 long bone shaft fragments, 1 scapula fragment, 3 unknown fragments	-	Nil	Subsistence	-	No
BRW8	TT10 North	49	9/03/2021	CBW_91	Metal	Nondiagnostic	58g	8	8	Miscellaneous nondiagnostic Fe fragments	-	Nil	Industrial	-	No
BRW8	TT10 North	49	9/03/2021	CBW_92	Metal	Nail	2g	1	1	-	-	Nil	Building	-	No
BRW8	TT10 North	49	9/03/2021	CBW_93		-	-	-	-	Void	-	-	-	-	-
BRW8	TT10 North	49	9/03/2021	CBW_94	Glass	Bottle	-	1	1	-	-	Nil	Subsistence	-	No
BRW8	TT10 North	49	9/03/2021	CBW_95	Glass	Marble	-	1	1	Common glass marble (= 15mm diameter), machine? made, black base with loose dark 3 seafoam green and 1 light blue swirl, some pitting on surface	-	Moderate	Personal	A personal posession of one of the workers, likely during the operation of the experimental plant. Was probably accidentally dropped and lost when 50 was infilled	Yes
BRW8	TT11	80	12/03/2021	CBW_96	Ceramic	Teacup	173g	11	3	Cream, gold line around lip/handle/body, worn off on lip by right-handed drinker (thin body = ?tea) ; cream, handle attachment (thin body = ?tea) ; cream body (thick body = ?coffee)	-	Moderate	Domestic	2 tea cups and 1 coffee mug fragments, probably associated with 222 artefacts. May have been discarded in close proximity to the early kiln complex following demolition of the dormitories, or may have been discarded previously due to breaking during use and imported into demolition rubble	Yes

Origin				Identification			Analysis							Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	TT11	80	12/03/2021	CBW_97	Glass	Bottle	657g brown glass, 249g green glass, 279g colourless glass	50	15	Light green cylindrical body 'NSW BOTTLE … LIMIT … 191 …' beer ; mid green rectangular chamfered heel '… LFE'S … D[?]AM' completely flat no push up base '… M' (AGM = 1923-1930) = UDOLPHO WOLFE'S SCHIEDAM AROMATIC SCHNAPPS (1859-1941) ; colourless cylindrical body 'AU … ARY'S ... TOMATO CATSUP' colourless abrupt heel '... BOTTLE IS ... TILLOCK & CO ... SYDNEY AUSTRALIA' (catsup = 1920s, by 1930s = ketchup) flat base shallow concave push up 'AGM 2 W M 647' (= 1923-1930) ; brown cylindrical heel '... TTLE COMPA' ; brown body 'NSW' ; brown circular abrupt heel '... TED ... 1921 ... ADE IN AUSTRALIA' flat base shallow concave push up ; brown body '... TED ... 921 ... AUSTRA ...' ; brown abrupt heel 'L?SC? ... AUSTRA' ; mid green tapered neck (=?wine bottle) with seam ; colourless cap seat finish ?flat octagonal body abrupt heel flat indentation base 'Z? G B .. 8?' (Zetland Glass Bottle Works Ltd = Z G B W Ltd base mark = not manufactured after amalgamation in 1922/5)	c early 1920s	Moderate	Subsistence	Beer bottle, condiment jar and bottle, and window glass fragments, likely discarded in close proximity to the early kiln complex prior to demolition. Indicative of date of demolition of kiln complex	Yes
BRW8	TT11	80	12/03/2021	CBW_98	Organic	Button				White ?shell button			Personal		Yes
BRW8	TT11	80	12/03/2021	CBW_99	Bone	Faunal	266g	31	2 sheep	left mandible, sheep ; mandible, sheep, butchery along inferior border ; distal right humerus, ?sheep, possible butchery on shaft ; distal left tibia, sheep, butchery on shaft ; distal right tibia, sheep, butchery on shaft (smaller than left tibia) ; 3 misc shaft, 1 burnt ; 3 misc flat ; 8 misc teeth ; 12 misc fragments	-	Low	Subsistence	Dominant species sheep, evidence of butchery. Lack of representation of full skeletal assemblage indicative of select meat cuts being sourced off site and brought back for consumption	Yes
BRW8	TT11	80	12/03/2021	CBW_100	Metal	Bed knob	-	1	1	Cu, spherical with flattened top, broken base, 50mm log x 50mm diameter at widest point, 13 concentric rings	-	Low	Domestic	Bed knob, likely originating from 1920s married quarters dormitories area, probably associated with 222 artefacts	No

Origin				Identification			Analysis						Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	TT11	80	12/03/2021	CBW_101	Metal	Tin box lid	-	1	1	Fe, rectangular, 83mm long x 60mm wide x approx 10mm deep (highly fragmented), interference fit no clear hinge, embossed circle 40mm diameter in centre of lid	-	Low	Personal	Lid for a possible tobacco or matchstick box, likely discarded in close proximity to the early kiln complex prior or during demolition	Yes
BRW8	TT11	80	12/03/2021	CBW_102	Metal	Nail	64g	23	23	-	-	Nil	Industrial	-	No
BRW8	TT11	80	12/03/2021	CBW_103	Metal	Miscellaneous	213g	7	7	Nondiagnostic Fe strips and pieces, Cu wire, bottle cap	-	Nil	Industrial	-	No
BRW7	TT1	3	2/03/2021	CBW_104	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No
BRW7	TT1	3	2/03/2021	CBW_105	Brick	CB	-	-	-	-	Post-war	-	Product	-	No
BRW7	TT1	3	2/03/2021	CBW_106	Organic	Timber	632g	1	1	Timber post, square	-	Nil	Building	-	No
BRW7	TT1	1	2/03/2021	CBW_107	Brick	CB	-	-	-	-	Post-war	-	Product	-	No
BRW2	TT18	Topsoil	16/03/2021	CBW_108	Glass	Miscellaneous	665g brown glass, 203g colourless glass, 78g green glass	13	9	Colourless tumbler tapered body abrupt heel flat resting point flat indentation '7' ; colourless screw top finish no neck [jar collar] ; brown crown finish metal cap attached ; colourless threaded screw finish roughly cylindrical neck white metal? screw cap attached (softdrink) ; brown abrupt heel '… SW … PTY' circular base flat resting point shallow concave push up 'AGM [stacked] 1967 R.11?' ; brown abrupt heel '... S P ...' circular base flat resting point flat indentation 'AGM [stacked] N IS 618 3' ; brown abrupt heel '... E ... 9 A?' circular base stippled resting point shallow concave push up [no base marks] ; mid green abrupt heel circular base stippled resting point flat indentation [no base marks] ; colourless straight body abrupt heel decorations (two stacked lines of rectangular boxes flat resting point flat indentation 'PECKS R?D ... 73 20' (= PECKS RD NO 30273 = 1960s?) ; brown body 'THIS BOTT ...'	c late 1960s	Low	Subsistence	Soft drink and beer bottle, drinking glass, and condiment jar fragments, likely discarded in close proximity to 96, 97, 98, 99 prior to demolition. Indicative of date of demolition of 96, 97, 98, 99	Yes
BRW2	TT18	Topsoil	16/03/2021	CBW_109	Glass	Bottle	-			Same as CBW_108	-	-	-	-	-
BRW2	TT18	Topsoil	16/03/2021	CBW_110	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No
BRW2	TT18	Topsoil	16/03/2021	CBW_111	Glass	Window	97g	4	-	4 window glass shards	-	Low	Building	Likely debris resulting from demolition of	No

Origin				Identification						Analysis				Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
														Brickworks Hostel buildings	
BRW2	TT18	Topsoil	16/03/2021	CBW_112	Metal	Can	32g	3	2	White body, red collar at shoulder and heel, 'TOOHEYS DRAUGHT', beer stein imagery on body ; 2 pull tabs	-	Nil	Subsistence	-	No
BRW2	TT18	Topsoil	16/03/2021	CBW_113	Ceramic	Teacup	45g	4	2 tea cups, 2 mugs	White body slightly flared lip, green and faded blue 'bluebell sprig' motif (thin body = ?tea); cream handle, shallow curve (thick body = ?coffee) ; white external body, blue internal body (thick body = ?coffee) ; white body, brown '?oak leaf' motif (thin body = ?tea)	-	Nil	Domestic	2 tea cups and 2 coffee mug fragments, found in topsoil not associated with any archaeological features. May be associated with the Brickworks Hostel	No
BRW2	TT18	Topsoil	16/03/2021	CBW_114	Metal	Sticky tape dispenser	-	1	1	Sticky tape dispenser	-	Nil	Administrative	-	No
BRW2	TT18	Topsoil	16/03/2021	CBW_115	Metal	Garden	673g	2	2	Fe fine tooth rake ; shed-style door hinge	-	Nil	Domestic	-	No
BRW2	TT18	Topsoil	16/03/2021	CBW_116	Other	Plastic	-	3	3	Swimming goggles, grommet, button	c1970s	Low	Personal	-	No
BRW2	TT18	Topsoil	16/03/2021	CBW_117	Metal	Nail	15g	5	5	-	-	Nil	Building	-	No
BRW2	TT18	Topsoil	16/03/2021	CBW_118	Metal	Mechanical toy	-	1	1	MEHANOTEHNIKA RSO ATEST Z-75199' = Grand Prix Table Top Pinball (Mehanotehnika 1952, changed to Mehano 1990)	c1980s?	Nil	Domestic	More likely to be associated with the post-closure use of the Brickworks, rather than the occupation of the Brickworks Hostel	No
BRW2	TT18	Topsoil	16/03/2021	CBW_119	Bone	Faunal	12g	5	-	2 misc shaft fragments, butchery removed proximal and distal epiphyses ; 3 misc flat bones	-	Nil	Subsistence	Too fragmentary to determine dominant species or subsistence strategy	No
BRW2	TT14	90	15/03/2021	CBW_120	Metal	Rod	5.76kg	120	120	Approximately 120 metal rods. Each rod measures 355mm long x 5mm diameter	-	Nil	Industrial	Located within dump of waste materials. Likely leftover materials from the construction of something in the Precinct, but purpose unknown	No
BRW11	TT5	17	4/03/2021	CBW_121	Brick	C'WEALTH CANBERRA	-	-	-	-	1920s	-	Product	-	No
BRW8	TT7	29	5/03/2021	CBW_122	Metal	Sheet	92g	1	1	Fe sheeting	-	Nil	Industrial	-	No
BRW8	TT7	29	5/03/2021	CBW_123	Organic	Leather	15g	1	1	Shoe throat and quarter, 5 laces eyelets, dress shoe ?men's	-	Moderate	Personal	Likely imported rubbish from elsewhere on site	No
BRW8	TT7	29	5/03/2021	CBW_124	Brick	Roof tile?	-	-	-	Curved body with flat base, frag, could also be gutter piece?	-	Low	Product	-	No
BRW8	TT7	29	5/03/2021	CBW_125	Brick	Fire brick	-	-	-	Highly fragmentary, no frog present	-	Moderate	Building	-	No
BRW2	TT18	99	16/03/2021	CBW_126	Metal	Ant cap	-	-	-	Fe ant capping for 99	-	Low	Building	Ant capping for concrete upright supports for	No

Origin				Identification						Analysis				Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
														Brickworks Hostel meat safe	
BRW7	TT2	6	2/03/2021	CBW_127	Brick	Misfired	-	-	-	-	-	-	Product	-	No
BRW7	TT2	6	2/03/2021	CBW_128	Other	Plastic	-	1	1	Food packet bag (eg biscuit box insert)	-	Nil	Subsistence	-	No
BRW7	TT2	6	2/03/2021	CBW_129	Ceramic	Tile		3	2	2 white ?bathroom tiles, 1 grey tile, no pattern	-	Nil	Building	Probably bathroom tile fragments, likely imported rubbish from elsewhere on site	No
BRW7	TT2	6	2/03/2021	CBW_130	Metal	Can	73g	2	2	Black body with diagnonal silver-red-silver stripe decal, 'TARAX BLACK LABEL LEMONADE 370ml' 'PREMIUM QUALITY BLACK LABEL LEMONADE 370ml' ; blue body, [label indiscernible]	c 1970s	Nil	Subsistence	Soft drink cans, likely imported rubbish from elsewhere on site or deposited during backfilling of eastern edge of quarry	No
BRW8	TT7	28	5/03/2021	CBW_131	Brick	Concrete tile				Green painted concrete tile	-	Moderate	Building	Unlikely to have been produced at the Brickworks, but this cannot be confirmed	Yes
BRW7	TT2	6	2/03/2021	CBW_132	Brick	No frog	-	-	-	Type artefact for common unfrogged brick. Red (2.5YR 4/6) brick with a total size of 225mm long x 110mm wide x 75mm high. No frog or other mark is present on the brick	-	-	Product	-	Yes
BRW7	TT2	6	2/03/2021	CBW_133	Brick	Air	-	-	-	Type artefact for common air brick. Red (2.5YR 4/8) brick with a total size of 225mm long x 110mm wide x 76mm high. Three cylindrical holes ('air' holes) are present through the broad surface of the brick. Each hole has a diameter of 35mm. The outer holes are spaced 35mm inwards from the edge of the brick. There is 20mm between each hole	c late 1960s - early 1970s	Moderate	Product	Produced at the Brickworks in its final phase of production, c late 1960s-early 1970s	Yes
BRW7	TT2	6	2/03/2021	CBW_134	Brick	CB	-	-	-	-	Post-war	-	Product	-	No
BRW11	TT5	17	4/03/2021	CBW_135	Brick	AUSTRALIA roof tile	-	-	-	-	-	-	Product	-	No
BRW11	TT5	17	4/03/2021	CBW_136	Metal	Fitting	479g	1	1	Fe anchor point	-	Nil	Industrial	-	No

Origin				Identification			Analysis						Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW11	TT5	17	4/03/2021	CBW_137	Brick	W firebrick	-	-	-	White (2.5YR 8/1) firebrick with a total size of 220 mm long x 110 mm wide x 75 mm high. The frog presents as a single 'W' imprinted in the approximate centre of the brick. It is oriented vertically and measures 45 mm long	-	Moderate	Building	Firebrick used in the construction of the kilns at the Brickworks, likely one belonging to the later operational phases. Firebricks were not produced on site. This brick would have been imported specifically for the construction or alteration of a kiln structure. The 'W' may denote 'Wunderlich', a large scale producer of building materials during the 19th and 20th C	Yes
BRW11	TT5	17	4/03/2021	CBW_138	Brick	Blank frog	-	-	-	-	-	-	Product	-	No
BRW8	TT7	29	5/03/2021	CBW_139	Brick	Blank frog	-	-	-	-	-	-	Product	-	No
BRW11	TT5	17	4/03/2021	CBW_140	Brick	CB	-	-	-	-	Post-war	-	Product	-	No
BRW8	TT10 North	63	10/03/2021	CBW_141	Metal	Miscellaneous	1.24kg	3	3	Fe bar ; ?rail spike ; nail	-	Nil	Industrial	-	No
BRW8	TT7	28	5/03/2021	CBW_142	Metal	Pipe	708g	1	1	Fe water pipe segment	-	Nil	Industrial	-	No
BRW2	TT17	Topsoil	16/03/2021	CBW_143	Glass	Bottle	400g colourless glass	1	1	Colourless crown finish tapered neck champagne shoulders applied colour label (ACL) on shoulders '6 3/4 FL.OZ. PEPSI COLA TRADEMARK REG'D' '6 3/4 FL.OZ. PEPSI 177' white background with red Pepsi/Pepsi Cola Trademark Reg'd straight body with raised twisted smooth ridges abrupt heel ACL 'ANOTHER QUALITY PRODUCT OF PEPSICO. INC. N.Y.' embossed 'IS.1464 AGM [stacked] B 67 0' flat resting point flat indentation no base marks	c early 1960s	Low	Subsistence	Soft drink bottle, likely discarded during occupation of BRW2	Yes

Origin				Identification						Analysis				Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	TT7	28	5/03/2021	CBW_144	Glass	Bottle	1903g brown glass, 256g colourless glass	8	5	Colourless straight body with raised twisted smooth ridges bulged heel flat resting point flat indentation '14-A-59 AGM [stacked] IS.1464.18' ; colourless body raised twisted smooth ridges ; colourless body applied colour label (ACL) white circle white border red letter fragment ; brown abrupt heel '... E ALWA ... ' circular base flat resting point flat indentation 'AGM [stacked] A IS.11 2' (A = Adelaide) ; brown crown finish tapered neck sloped down shoulders 'THIS BOTTLE IS THE PROPTERY OF' straight body abrupt heel 'THE NSW BOTTLE COMPANY PTY. LTD' flat resting point shallow concave push up 'AGM [stacked] 1958 IS.89 818' ; brown crown finish tapered neck sloped down shoulders 'THIS BOTTLE IS THE PROPTERY OF' straight body abrupt heel 'THE NSW BOTTLE COMPANY PTY. LTD' flat resting point shallow concave push up 'AGM [stacked] 1959 IS.89 863' ; brown crown finish tapered neck sloped down shoulders 'THIS BOTTLE IS THE PROPTERY OF' straight body abrupt heel 'THE NSW BOTTLE COMPANY PTY. LTD' flat resting point shallow concave push up 'AGM [stacked] 1963 B IS.89 45'	c early 1960s	Low	Subsistence	Soft drink and beer bottle fragments, likely imported rubbish from elsewhere on site during deposition of 28	Yes
BRW11	TT3 Centre	21	4/03/2021	CBW_145	Metal	Machine	674g	1	1	Machine foot	-	Nil	Industrial	Would have secured machine to bolts present in 18 in extrusion pad	No
BRW8	TT7	28	5/03/2021	CBW_146	Metal	Fitting	286g	1	1	Fe anchor point	-	Nil	Industrial	-	No
BRW8	TT7	29	5/03/2021	CBW_147	Metal	Rod	340g	1	1	Fe bar	-	Nil	Industrial	-	No
BRW7	TT1	3	2/03/2021	CBW_148	Metal	Rail	10.2kg	1	1	Rail track, bent	-	Moderate	Industrial	A portion of rail track. Located within a dump of waste materials. Likely from the operation of railway carts within the quarry to assist with the transport of materials from the quarry face to the processing facilities	Yes
BRW2	-	95	16/03/2021	CBW_149	Glass	Bottle	-	-	-	Same as CBW_49	-	-	-	-	-
BRW2	TT18	Topsoil	16/03/2021	CBW_150	Metal	Spike	5.62kg	1	1	Fe spike	-	Nil	Industrial	-	No

Origin				Identification			Analysis						Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW2	TT18	Topsoil	16/03/2021	CBW_151	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No
BRW2	TT18	Topsoil	16/03/2021	CBW_152	Brick	Concrete	-	-	-	Concrete with large conglomerates	-	Nil	Building	-	No
BRW8	TT7	29	5/03/2021	CBW_153	Brick	Misfired	-	-	-	-	-	-	Product	-	No
BRW8	TT7	28	5/03/2021	CBW_154	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No
BRW2	TT17	Topsoil	16/03/2021	CBW_155	Metal	Personnel addressograph plates		1	1	[see 'CBW_51, 52, 155 Tags' sheet]	1963	High	Administrative	One addressograph plate for an individual. It is unknown whether this individual was employed at the Brickworks, or why the plate was being stored in the mess hall rather than the administration block	Yes
BRW10	TT25	106	17/03/2021	CBW_156	Brick	AUSTRALIA roof tile	-	-	-	-	-	-	Product	-	No
BRW10	TT25	106	17/03/2021	CBW_157	Brick	CANBERRA C'WEALTH	-	-	-	Type artefact for common 'CANBERRA C'WEALTH' frogged brick. Reddish brown (2.5YR 4/4) brick with a total size of 230 mm long x 110 mm wide x 73 mm high. The frog presents as a rectangle set in the approximate centre of the brick. It measures 180 mm long x 63 mm wide x 10 mm deep. The frog has been imprinted with 'CANBERRA C'WEALTH' spaced over two lines.	1920s	-	Product	Produced at the Brickworks in the 1920s, apparently concurrently with 'C'WEALTH CANBERRA' frogged bricks. It is unknown why two variations of this frog were produced at the same time, one possibility is that the frogs denoted different buyers markets (eg government/public vs private dwellings/other buildings)	Yes
BRW10	TT25	106	17/03/2021	CBW_158	Brick	Blank frog	-	-	-	-	-	-	Product	-	No
BRW10	TT25	106	17/03/2021	CBW_159	Brick	Misfired	-	-	-	-	-	-	Product	-	No
BRW8	TT10 South	123	19/03/2021	CBW_160	Metal	Fitting	284g	1	1	Fe tie down spike	-	Nil	Industrial	-	No
BRW8	TT10 South	123	19/03/2021	CBW_161		-	-	-	-	Void	-	-	-	-	-
BRW3	TT29	109	18/03/2021	CBW_162	Metal	Miscellaneous	162g	4	4	?latch or strap tension piece ; 3 nails	-	Nil	Building	-	No
BRW3	TT21	Topsoil	16/03/2021	CBW_163	Metal	Miscellaneous	-	3	3	Piece of curly fence post ; broken/twisted metal pipe ; horse shoe	-	Nil	Industrial	-	No
BRW3	TT21	Topsoil	16/03/2021	CBW_164	Brick	Blank frog	-	-	-	-	-	-	Product	-	No
BRW2	TT14	90	15/03/2021	CBW_165	Metal	Miscellaneous		-	-	4 Fe sheets ; Fe piece ; Fe pipe ; pipe bag connector (similar to other?) ; Cu pipe piece ; Fe bracket ; Fe pipe piece	-	Nil	Industrial	-	No

Origin				Identification			Analysis						Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW2	TT14	90	15/03/2021	CBW_166	Ceramic	Telegraph insulator	26g	1	1	White ceramic stay/guy insulator, 52mm long x 25mm wide x 10mm high, two pairs of tongues and grooves, single central threading cavity	-	Nil	Technological	-	No
BRW2	TT14	90	15/03/2021	CBW_167		-	-	-	-	Void	-	-	-	-	-
BRW2	TT14	90	15/03/2021	CBW_168	Glass	Window	12g	1	-	1 piece window glass	-	Low	Building	Likely debris resulting from demolition of Brickworks Hostel buildings	No
BRW2	TT14	90	15/03/2021	CBW_169	Glass	Water glass	169g colourless glass	1	1	Colourless tumbler tapered abrupt heel flat resting point flat indentation '3'	-	Nil	Subsistence	Water glass fragment, likely imported rubbish from elsewhere on site. Location within BRW2 would suggest domestic origin	No
BRW2	TT14	90	15/03/2021	CBW_170	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No
BRW2	TT15	91	15/03/2021	CBW_171	Glass	Nondiagnostic	5g	2	-	2 fragments milk glass	-	Nil	Unknown	-	No
BRW10	TT26	Topsoil	17/03/2021	CBW_172	Metal	Rail	-	22	22	22 Fe rail joints. Each joint measures 460mm long x 50mm wide x 15mm high. Four bolt holes are distributed along the length of each joint. The outer two holes are spaced 50mm from the edges of the joint, 85mm from the next holes, and 95mm between the two centre holes	1920s	High	Industrial	Rail joints remaining following the dismantling of the railway line. Unknown why the joints were left whilst the other railway material (tracks, sleepers, ballast, etc) were removed	Yes
BRW3	TT23	Topsoil	17/03/2021	CBW_173	Metal	Fence	-	1	1	Twisty fence post	-	Nil	Building	-	No
BRW8	OA1	129	-	CBW_174	Brick	Simple, CB, Air	-	-	-	Some CB / air bricks still bonded with mortar in English bond courses	Post-war	-	Product	-	No
BRW8	OA1	129	22/07/2021	CBW_175	Glass	Bottle		1	1	Whole bottle with disintegrating plastic cap. Funnel shaped with ribbed neck. Text around base says 'This bottle always remains the property of Big Sister Foods Ltd'. Text on base says IS 1384 2. Has GM logo on base.	1957-c1970	Low	Subsistence	-	Yes
BRW8	OA1	129	22/07/2021	CBW_176	Metal	Miscellaneous	-	1	1	Metal wire. Could have been part of a fence.	-	Nil	Building	-	No
BRW8	OA1	129	22/07/2021	CBW_177	Glass	Bottle	7g	1	1	Brown glass fragment	-	Nil	Subsistence	-	No
BRW8	OA1	129	22/07/2021	CBW_178		-	-	-	-	Void	-	-	-	-	-
BRW8	OA1	41	22/07/2021	CBW_179	Glass	Bottle	-	-	3	The necks of the bottles are narrow and wide. They could have been malformed by heat or pressure	-	Nil	Subsistence	-	No

Origin				Identification			Analysis							Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	OA1	41	22/07/2021	CBW_180	Metal	Nail	7g	1	1	Fe nail, 7.5cm in length.	-	Nil	Building	-	No
BRW8	OA1	41	22/07/2021	CBW_181	Ceramic	Telegraph insulator	46g	1	1	White ceramic stay/guy insulator, incomplete x 29mm wide x 15mm high, crosshatched texture on one surface, two threading cavities	-	Nil	Technological	-	No
BRW8	OA1	41	22/07/2021	CBW_182	Ceramic	Telegraph insulator	59g	1	1	White ceramic rim and shoulder fragment, 80mm high, internal fold at shoulder, likely telegraph insulator Thick white ceramic rim fragment. Has fold/double layer	-	Nil	Technological	-	No
BRW8	OA1	41	22/07/2021	CBW_183	Bone	Faunal	15g	2	1 sheep	left distal tibia, sheep ; 1 misc fragment	-	Low	Subsistence	Too fragmentary to determine dominant species or subsistence strategy	No
BRW8	OA1	41	22/07/2021	CBW_184	Metal	Unknown	3.7kg	1	1	Large steel piece of metal with screws in the bottom. Piece of metal is over 30cm in length and 10cm in height. It is curved on top and appears to have been connected to a piece of machinery or a vehicle	-	Nil	Industrial	-	No
BRW8	OA2	212	3/08/2021	CBW_185	Organic	Leather	249g	29	5	Toe with sole, pieces nailed together, ?women's ; 2 quarters, laces eyelets ; heel, constructed from min 6 stacked pieces nailed together ; 1 set laces eyelets ; 2 ?vamps, 1 with heel fragment attached, pull on ankle boot ; 22 nondiagnostic pieces	-	Moderate	Personal	Collection of shoe pieces in fill of 170, deposited during conversion of Kiln D from downdraught kiln to Scotch kiln. May include fragment of women's shoe. Fragments likely collected from nearby accommodation (eg dormitories)	Yes
BRW8	OA2	212	3/08/2021	CBW_186	Glass	Bottle	-	-	-	Clear bottle glass fragments. Rectangular base, text at base says 'This bottle always remains the property of John Dewar and Sons Ltd'. 6 oz bottle ; Brown bottle glass fragments. Looks to be a beer bottle from NSW Bottle Company 1925 ; Green glass bottle fragments. Resch's beer bottle. Produced in Sydney. Includes horse/lion crest ; Other glass bottle fragments. One base fragment blue tinged. One clear glass fragment which could be a bottle stopper.	1920s	High	Subsistence	Dumped in the fill of 170, deposited during conversion of Kiln D from downdraught kiln to scotch kiln. Fragments likely collected from nearby accommodation (eg dormitories)	Yes
BRW8	OA2	212	3/08/2021	CBW_187	Glass	Bottle	-	-	-	Same as CBW_186	-	-	-	-	-
BRW8	OA2	212	3/08/2021	CBW_188	Glass	Bottle	-	-	-	Same as CBW_186	-	-	-	-	-

Origin				Identification			Analysis							Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	OA2	212	3/08/2021	CBW_189	Glass	Bottle	-	-	-	Same as CBW_186	-	-	-	-	-
BRW8	OA2	214	3/08/2021	CBW_190	Metal	Miscellaneous	-	-	-	Highly rusted metal fragments. Three flat fragments. Two cylinder fragments, one with a perforation - could be piping. One Fe nail with bent head. One thick, bent wire about 12cm long. One thin wire, could have been part of a fence.	-	Nil	Building	-	No
BRW8	OA2	212	3/08/2021	CBW_191	Bone	Faunal	88g	9	1 sheep, 1 ?cow	acetabulum, sheep ; left metatarsal, sheep ; rib, ?cow ; ?proximal ulna ; proximal radius, sheep, possible butchery on epiphysis ; 2 misc odd bone ; 2 misc shaft	-	Low	Subsistence	Too fragmentary to determine dominant species or subsistence strategy	No
BRW8	OA2	191	3/08/2021	CBW_192	Brick	CANBERRA C'WEALTH	-	-	-	Single bullnose variation of the commons 'CANBERRA C'WEALTH' frogged brick. Reddish brown (2.5YR 5/4) brick with a total size of 225 mm long x 150 mm wide x 73 mm high. The bottom left corner of the brick has been curved to form a rounded arc. The frog shape has been adjusted accordingly	1920s	High	Product	Produced at the Brickworks during the 1920s	Yes
BRW8	OA2	220	3/08/2021	CBW_193	Glass	Bottle	57g	11	-	11 shards of brown bottle glass	-	Nil	Subsistence	-	No
BRW8	OA2	220	3/08/2021	CBW_194	Ceramic	Teacup	19g	1	1	White, gold rim (thin body = ?tea)	-	Nil	Domestic	Tea cup fragments, likely imported rubbish from elsewhere on site during demolition of early kiln complex	No
BRW8	OA2	220	3/08/2021	CBW_195	Metal	Miscellaneous	-	1	1	Copper u-shaped wire	-	Nil	Building	-	No
BRW8	OA2	117	3/08/2021	CBW_196	Glass	Bottle	-	9	1	9 shards of brown bottle glass including complete base	-	Moderate	Subsistence	Deposited during closure of Kiln B	Yes
BRW8	OA2	117	3/08/2021	CBW_197	Glass	Bottle	-	6	1	6 shards of bright green bottle glass including most of the base	-	Moderate	Subsistence	Deposited during closure of Kiln B	Yes
BRW8	OA1	149	20/07/2021	CBW_198	Ceramic	Telegraph insulator	169g	3	3	2 white ceramic stay/guy insulator, 77mm long x 30mm wide x 15 mm high, three grooves two tongues, two threading cavities ; white ceramic stay/guy insulator, incomplete x 29mm wide x 15mm high, crosshatched texture on one surface, two threading cavities	-	Nil	Technological	-	No
BRW8	OA1	149	20/07/2021	CBW_199	Metal	Nail	5g	1	1	Fe nail	-	Nil	Building	-	No
BRW8	OA1	49	3/08/2021	CBW_200		-	-	-	-	Void	-	-	-	-	-

Origin				Identification			Analysis						Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	OA1	49	3/08/2021	CBW_201	Ceramic	Teacup, telegraph insulator	61g vessel ceramic, 2 partial insulator brackets	10	5	White rim and handle shoulder (thin body = ?tea) ; white rim and handle shoulder, gold line around body across handle (thin body = ?tea) ; white inswept heel flat resting point shallow concave push up ; blue external body, white internal body abrupt heel flat resting point flat indentation (= bowl) ; white ceramic stay/guy insulator, incomplete x 27mm wide x 15mm high, crosshatched texture on one surface, one threading cavity ; white ceramic stay/guy insulator, incomplete, smooth surface	-	Low	Domestic / technological	3 tea cups, 1 bowl, and 2 stay/guy insulator fragments in 49, fill for 50. Likely originated from nearby c1916 dormitories either during use of following demolition, deposited prior to or during closure of 50, not indicative of date of closure	Yes
BRW8	OA1	49	3/08/2021	CBW_202	Organic	Shell	290g oyster shell	-	-	Saccostrea glomerata (Sydney Rock Oyster)	-	Moderate	Subsistence	Quantity of oyster shell in 49, fill for 50. Likely deposited immediately following consumption and allowed to remain until remaining 49 deposited at close of 50. Not only demonstrates importation of food into Canberra from Sydney, but also the targeted importation of particular delicacies (despite oysters generally still being part of the lower socioeconomic subsistence)	Yes
BRW8	OA1	49	26/07/2021	CBW_203	Bone	Faunal	742g	107	2 sheep, 1 ?bird (?chicken)	distal metacarp/tarsal, sheep ; proximal radius epiphysis, unfused, sheep ; distal right radius, sheep ; distal right tibia, sheep, butchery on shaft ; glenoid fossa, sheep ; 2 distal left humerous, sheep, possible butchery on 1 shaft ; distal right humerous, sheep ; distal right tibia, sheep, butchery on shaft ; distal left radius, sheep ; proximal right radius, sheep ; right mandible, sheep ; left mandible, ?sheep ; distal ?ulna ; 4 distal long bone fragments ; ?tarsal ?bird ; 4 vertebral body fragments ; 4 misc teeth, ?sheep ; 23 misc shaft fragments ; 10 misc odd bones ; 48 misc fragments	-	Low	Subsistence	Dominant species sheep, evidence of butchery. Lack of representation of full skeletal assemblage indicative of select meat cuts being sourced off site and brought back for consumption	Yes
BRW8	OA1	49	26/07/2021	CBW_204		-	-	-	-	Same as CBW_203	-	-	-	-	-
BRW8	OA1	49	26/07/2021	CBW_205	Glass	Nondiagnostic	13g	5	-	4 colourless shards ; 1 vitrified strand	-	Nil	Unknown	-	No

Origin				Identification			Analysis							Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	OA1	49	26/07/2021	CBW_206	Organic	Leather	18g	5	-	Nondiagnostic leather fragments	-	Nil	Unknown	Deposited in 49 likely during operation of 50. May be fragments of leather shoe or machinery component	No
BRW8	OA1	49	26/07/2021	CBW_207	Metal	Miscellaneous	420g	32	32	1 copper wire ; 1 screw ; 30 nails	-	Nil	Building	-	No
BRW8	OA1	49	26/07/2021	CBW_208	Metal	Miscellaneous	-	-	-	Two parts of a metal base. One hollow metal tube with hook on the end. Metal base looks like something would have slid into it-has tracks. Space for two nails in the base. One partially defined indentation at opposite end to the screw holes	-	Low	Industrial	-	No
BRW8	OA2	76	3/08/2011	CBW_209	Brick	?cream	-	-	-	White (10YR 8/1) brick with a total size of 230mm long x 115mm wide x 75mm high. The frog is partially obscured by mortar. It presents as a rectangle set in the approximate centre of the brick. It measures a minimum o f105mm long x 40mm wide x 13mm deep. The centre of the frog has been imprinted with a stylised 'E' or '3'	-	Moderate	Building	Possible Canberra cream brick. Production from c1930s to c1966	Yes
BRW8	OA2	76	3/08/2011	CBW_210	Brick	Blank frog	-	-	-	Type artefact for common Type 2 'blank' frog. Reddish brown (2.5YR 5/4) brick with a total size of 235 mm long x 110 mm wide x 72 mm high. The frog presents as a blank rectangle set in the approximate centre of the brick. It measures 190 mm long x 67 mm wide x 7 mm deep. Two clamp imprints are present 60 millimetres inwards from the outer edges of the frog.	-	Moderate	Product	Type artefact	Yes
BRW8	OA2	76	3/08/2011	CBW_211	Bone	Faunal	88g	4	1 sheep	right distal radius, sheep ; left radius, sheep ; right distal metatarsal, sheep ; misc shaft	-	Low	Subsistence	Dominant species sheep. Lack of representation of full skeletal assemblage indicative of select meat cuts being sourced off site and brought back for consumption	Yes
BRW8	OA2	76	3/08/2011	CBW_212	Metal	Miscellaneous	-	-	-	Oval shaped metal plate, rectangular metal bar with hooked ends, metal fragment, small metal oval-shaped ring, motor which could be associated with lawnmower/whippersnipper, and horseshoe	-	Low	Unknown	-	No
BRW8	OA2	222	3/08/2011	CBW_213	Metal	Door lock	-	1	1	Iron door lock. F Lasseter and Co		Moderate	Domestic		Yes

Origin				Identification						Analysis				Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	OA1	Topsoil	19/07/2021	CBW_214	Metal	Miscellaneous	-	-	-	Bent metal cap, potentially stainless steel. Rusted metal rectangle - 16cm x 3cm with a hole at the top	-	Nil	Unknown	-	No
BRW8	OA1	129	21/07/2021	CBW_215	Glass	Bottle	1.87kg	5	4	Brown crown finish tapered neck sloped down shoulders 'THIS BOTTLE IS THE PROPTERY OF' straight body abrupt heel 'THE NSW BOTTLE COMPANY PTY. LTD' flat resting point shallow concave push up 'AGM [stacked] 1966 R.I 3X ; brown crown finish tapered neck sloped down shoulders 'THIS BOTTLE IS THE PROPTERY OF' straight body abrupt heel 'THE NSW BOTTLE COMPANY PTY. LTD' flat resting point shallow concave push up 'AGM [stacked] 1964 R.I I' ; brown crown finish tapered neck sloped down shoulders 'THIS BOTTLE IS THE PROPTERY OF' straight body abrupt heel 'THE NSW BOTTLE COMPANY PTY. LTD' flat resting point shallow concave push up 'AGM [stacked] 1966 R.I 4A' ; brown crown finish tapered neck sloped down shoulders ; straight body abrupt heel 'TH ... ANY PTY LTD' flat resting point shallow concave push up 'AGM [stacked] ... 65 ' ;	mid 1960s	Low	Subsistence	Soft drink and beer bottle fragments, likely imported rubbish from elsewhere on site during deposition of 129. Given the domestic nature of the artefacts, they probably originated from the demolition of the Brickworks Hostel	No

Origin				Identification						Analysis				Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	OA1	129	21/07/2021	CBW_216	Glass	Bottle and jar	1.05kg	11	5	Brown lips concealed by in situ plastic cap straight neck sloped down shoulders straight body abrupt heel oval flat base 'IS 1376 8 AGM [stacked]' ; colourless lips concealed by in situ metal cap 'DAFFODIL' nonexistant neck sloped down shoulders slightly tapered body '1 CUP 3/4 1/2 1/4' '1 CUP 2/3 1/3' [measurements] inswept heel circular flat base 'THE PROPERTY OF VEGETABLE OILS PTY LTD ALL STATES' ; colourless crown finish tapered neck 'DIXI COLA' [within ACL white ovals] stepped shoulders straight body 'DIXI COLA [ACL white ovals] S-O-O REFRESHING BOTTLED UNDER AUTHORITY OF THE DIXI-COLA COMPANY BALTIMORE, MARYAND, USA' abrupt heel circular flat base '6 61' ; colourless continuous threaded lugnon-existent neck horizontal shoulders rounded body decorated with 8 flutes [cut crystal look] footed base abrupt heel flat base (= salt/pepper shaker) ; colourless continuous threaded lug sloped shoulders raised "stitching" pattern straight body inswept heel 'THIS JAR ALWAYS REMAINS THE PROPERTY OF COTTEES LIMITED'	c1960s	Low	Subsistence	Soft drink and beer bottle fragments, likely imported rubbish from elsewhere on site during deposition of 129. Given the domestic nature of the artefacts, they probably originated from the demolition of the Brickworks Hostel	Yes
BRW8	OA1	129	21/07/2021	CBW_217	Other	Plastic	-	1	1	FIVE STAR' tobacco vacuum sealed packet 'READY RUBBED CIGARETTE TOBACCO'	1960-1970s	Low	Personal	-	No
BRW8	OA1	129	21/07/2021	CBW_218	Metal	Miscellaneous	-	-	-	Metal fitting with slots for another piece to fit into (number on metal fitting is 80208). Metal pole approx 30cm long, with rectangular metal plate attached 13cmx10cm	-	Nil	Industrial	-	No
BRW8	OA1	129	21/07/2021	CBW_219	Organic	Shell	16g	1	1	1 half of a Katelysia sp. Shell	-	Nil	Subsistence / personal	-	No
BRW8	OA1	129	21/07/2021	CBW_220	Metal	Can	71g	1	1	Red body 'COCA COLA', white collar at shoulder 'IT'S THE REAL THING', vertical white wave decal (= 1970s)	c1970s	Low	Subsistence	Soft drink can, deposited as rubbish during closure of Brickworks	No

Origin				Identification						Analysis				Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	OA2	222	3/08/2021	CBW_221	Glass	Bottle	3537g colourless glass	139	53	Colourless abrupt heel completely level resting point '… D' ; colourless ?octagonal body 'BRYLC … REC?P …' (= ?Brylcreem) ; colourless body recessed panel 'O …' ; colourless cap seat bore tapered neck sloped down shoulders tapered decahedron body 'BOTTLE THE PROPERTY OF H.M. LEGGO & CO' down one panel opposite raised oval label space rounded heel flat resting point concave base ' L5 , 3 AGM [stacked]' (Leggo & Co = 1918>) ; colourless lug threaded lips bead string rim tapered neck sloped shoulder conical body 17 flutes 'PTY OF ROSELLA P & M CO LTD RC NO 3910' down one panel opposite raised oval label space with stipple at base inswept heel flat resting point flat base 'J198 ... ?S ... ?M' ; colourless continuous threased lip bead string rim no neck ovoid body striation decoration on short sides of ovoid 'ETA [in peanut] BRAND' rounded heel flat resting point flat base ' THIS JAR ALWAYS REMAINS THE PROPERTY OF NUT FOODS LTD ?AGM [stacked]' (= peanut butter, jar design appeared from c1935) ; cap in situ colourless tapered neck sloped shoulders octagonal body 'THIS BOTTLE ALWAYS REMAINS THE PROPERTY OF H JONES & CO (SYDNEY) PTY LTD' down one flute abrupt heel flat resting point flat base 'AGM [stacked] S 391' (H Jones = IXL brand) ; colourless sexagonal body abrupt base flat resting point flat base 'AGM S 2 30' ; colourless circular abrupt heel flat resting point flat base '... HE ... ?EM WORKS 79' ; colourless flat resting point flat base '... TARIUM HEALTH FOOD CO ...' (= Sanitarium Health Food) ; colourless fluted body abrupt heel flat resting point flat base 'PROPERT ... SANI ...' (= ?Sanitarium Health Food) ; colourless ovoid body abrupt heel flat resting point flat body 'O ...' ; colourless ovoid body abrupt heel flat resting point flat base ; colourless abrupt heel 'ROSELLA PR ...' flat resting point flat base ;	1930s	Moderate	Subsistence / personal	Part of concentrated dump of domestic artefacts within rubble from demolition of experimental kiln complex. May indicate gradual demolition of the complex, with additional demolition activities undertaken in the 1930s. If so, domestic artefacts likely originate from married quarters	Yes

Origin				Identification						Analysis			Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
										colourless round with 5 flutes on one half '... MAINS ... Y OF ... SONS CO LTD ... ASTLE' tapered to bulged heel flat resting point flat base 'AGM S 437' ; colourless rectangular with rounded corners abrupt heel completely flat resting point 'J 29 R X 2' superimposed off-centre and irregular oval etching ; colourless ovoid ?flutes '... LA ... IO' tapered to bulged heel flat resting point flat base ; colourless rectanguar with flat chamfered body recessed panel on one side abrupt heel flat resting point flat base 'I X ?8 ... 57?2' superimposed off-centre and irregular oval etching ; colourless rectangular with rounded corners abrupt heel flat resting point flat base ; colourless ovoid abrupt heel flat resting point flat base 'AGM ?S 66 S' ; colourless recessed panel 'WORLD FAMED' vertical line decoration 'BLOOD MIXTURE' (= Clarke's World Famed Blood Mixture, c late 1920s/early 1930s) ; aquamarine raised smooth ridge shoulders cylindrical body raised oval label space surrounded by crosshatched diamonds on one side panels on other sides 'THIS BOTTLE IS THE PROPERTY OF BRO?OKE'S LEMOS L?ON ... OT BE LEGALLY ?US ... ?ERS FOR ANY PURPOSE ... MOS LIMITED ... FACTURERS OF ... LEMOS ... STERE?D ... RADE MARK ...NO 072 AUSTRALIA, NO 8449 INDIA, NO 5898 GREAT BRITAIN, NO/1926 UNION OF SOUTH AFRICA, NO 6778 US AMERICA, NO 1921 NEW ZEALAND, ?REG O 1925 ?CANA ONLY CONTENTS SOLD' abrupt heel with figure decoration? flat resting point flat base 'AGM [stacked] ... 07' (= Brooke's Lemos Cordial, no information available) ; colourless chamfered ' "O ...N C ... ?E S" ' ; colourless chamfered recessed panel ' ... ?E N" ' ; colourless chamfered ' ... BRAND ' ; colourless sloped shoulder ' THIS JAR A ... THE ... MATT?H ... ' ; colourless rounded lip cylindrical neck rounded shoulder ; colourless continuous					

Origin				Identification						Analysis			Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
										thread bead string rim ; colourless continuous thread bead string rim cylindrical neck horizontal shoulder ; colourless continuous thread bead string rim cylindrical neck ?horizontal shoulder ; colourless ? thread bead string rim cylindrical neck ; colourless continuous thread bead string rim no neck horizontal shoulder ; colourless tapered neck sloped shoulder ;					
BRW8	OA2	222	3/08/2021	CBW_222	Glass	Bottle	-	-	-	Same as CBW_221	-	-	-	-	-
BRW8	OA2	222	3/08/2021	CBW_223	Glass	Bottle	59g	11	3	1 small whole bottle with metal lid. 1 small neck and rim, 1.8cm in diameter. 1 1954 base. 1 ridged fragment. 2 shards with 'company' written on them. 5 indistinguishable shards	mid 1950s	Nil	Subsistence	-	No

Origin				Identification						Analysis				Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	OA2	222	3/08/2021	CBW_224	Metal	Miscellaneous	-	-	-	Brown bakelite light switch? ' "RING-GRIP" PATS PENDG MADE IN AUSTRALIA' on back ; chrome? cap with two circular perforation on one side and threading at base 'TRADE [symbol of a diamond with letter M and arrow in centre] MARK NATIONAL NATIONAL …ECTRIC WORKS MADE IN JAPAN [National was an electrical appliance company] ; small chrome? pipe with two perforations opposite each other at one end, possibly associated? with chrome cap	c1930s	Moderate	Building	Likely debris from demolition of 1920s married quarters	Yes
BRW8	OA2	222	3/08/2021	CBW_225	Bone	Faunal	35.4g	3	2 individuals, species unknown	vertebral body fragment ; ?femur shaft fragment ; right rib fragment	-	Low	Subsistence	Too fragmentary to determine dominant species or subsistence strategy	No
BRW8	OA2	222	3/08/2021	CBW_226	Other	Plastic	-	3	3	Faux tortoiseshell patterned plastic bowl, plastic lid which does not fit the bowl, and half a plastic clip/clasp	-	Low	Domestic	-	No
BRW8	OA2	222	3/08/2021	CBW_227	Ceramic	Light switch				Slick ceramic light switch with copper 'dolly switch' toggle	1920s-1940s	Moderate	Domestic		Yes
BRW8	OA2	222	3/08/2021	CBW_228	Ceramic	Unknown	32g	2	1	White ceramic ?spout, curved opening white glaze dipped 45mm, remaining shaft unglazed and rough, total length 98mm	-	Nil	Technological	-	No
BRW8	OA2	222	3/08/2021	CBW_229	Ceramic	Telegraph insulator	104g	1	1	Brown ceramic spool shackle insulator, 38mm high x 45mm diameter	-	Nil	Technological	-	No
BRW8	OA2	222	3/08/2021	CBW_230	Glass	Jar	85g	1	1	Cobolt blue lips concealed by in situ metal cap ground neck horizontal shoulders straight body abrupt heel footed base circular 'double triangle' (= Vicks VapoRub)	1930s	Moderate	Personal	Part of concentrated dump of domestic artefacts within rubble from demolition of experimental kiln complex. May indicate gradual demolition of the complex, with additional demolition activities undertaken in the 1930s. If so, domestic artefacts likely originate from married quarters	Yes

Origin				Identification			Analysis							Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW8	OA2	222	3/08/2021	CBW_231	Ceramic	Teacup	113g	8	3	White body and rim, gold line around handle/body (thin body = ?tea) ; white inswept heel flat resting point shallow concave push up "MAD … JAPA …"	-	Moderate	Domestic	3 tea cups fragments, part of concentrated dump in 76 from c1916 dormitories. Density of artefacts suggests direct deposition directly from the dormitories, rather than importation in later material during demolition of the early kiln complex. Relationship between two deposits could indicate contemporaneous demolition of all structures	Yes
BRW8	OA2	222	3/08/2021	CBW_232	Metal	Miscellaneous	423g	11	11	2 bottle lids ; nail ; screw ; bolt ; misc Fe pieces ; 3 metal wires of varying thickness, one with remnants of coating	-	Nil	Building / subsistence	-	No
BRW8	OA2	172	30/07/2021	CBW_233	Glass	Bottle and jar	563g colourless glass, 179g brown glass, 67g blue glass	46	19	Colourless lug threaded lips ; colourless continuous threaded lips ; colourless continuous threaded lips nonexistant neck straight body ; colourless lug threaded lips nonexistant neck straight body ; colourless lug threaded lips ; colourless lug threaded lips nonexistant neck straight body vertical grooves on short side of oval ; colourless straight body rectangular circle impressions on short side of body abrupt heel 'REGO ...' flat base 'AGM [stacked] U628' ; colourless straight body abrupt heel flat base '... U855' ; colourless circular abrupt heel flat base '... LCOM ...' ; colourless straight body abrupt heel single thread decoration flat base circular 'AGM [stacked] S545' ; colourless straight body abrupt heel oval flat base 'PD&CO 564' ; colourless straight body vertical grooves all way round abrupt heel circular flat base '12 F138 M AGM [stacked]' ; colourless three part finish lip straight neck rounded shoulders oval ; pale aquamarine lips concealed by in situ metal cap three neck ring straight neck sloped shoulders irregular body shards 'BROOKE'S ... MANU ... ED AND ... SED' (= Brooke's lemos cordial) ; brown non-existant neck continuous threaded lips straight body abrupt heel flat base 'KRUSCHEN 8' (= Kruschen salts) ; cobolt blue non-existant neck lug threaded lips '… IN … SHAV … REAM' straight body	1930s	Moderate	Subsistence / personal	Part of concentrated dump of domestic artefacts within rubble from demolition of experimental kiln complex. May indicate gradual demolition of the complex, with additional demolition activities undertaken in the 1930s. If so, domestic artefacts likely originate from married quarters	Yes

Origin				Identification						Analysis			Interpretation		
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
										abrupt heel 'BOTTLE PATD. … NO. 481953' flat base 'BMC' (= Ingram's Shaving Cream) ; 15 nondiagnostic colourless shards					
BRW8	OA2	172	30/07/2021	CBW_234	Glass	Jar	-	-	-	Same as CBW_233	-	-	-	-	-
BRW8	OA2	172	30/07/2021	CBW_235	Glass	Jar	-	-	-	Same as CBW_233	-	-	-	-	-
BRW8	OA2	172	30/07/2021	CBW_236	Ceramic	Teacup		1	1	White base and body sherd	-	Moderate	Domestic	-	No
BRW8	OA2	172	30/07/2021	CBW_237	Bone	Faunal				Two bone fragments. One indistinguishable. One potential chicken scapula - longer fragment with joint		Low	Subsistence	-	No
BRW8	OA2	172	30/07/2021	CBW_238	Other	Plastic	-	1	1	Faux tortoiseshell clasp	-	Moderate	Personal	-	No
BRW8	OA2	172	30/07/2021	CBW_239	Metal	Miscellaneous	311g	5	-	2 bottle lids ; 1 screw lid ; fittings for pipes	-	Nil	Building / subsistence	-	No
BRW8	OA2	172	30/07/2021	CBW_240	Metal	Miscellaneous	-	-	-	1 Erebus lock (= 1915-1945), 1 cannister, 1 stamp?roller?, 1 head of pin or nail with flower pattern	1915-1945 Erebus	-	Domestic / personal	-	Yes

Origin				Identification						Analysis				Interpretation	
BRW	EU	Context	Date excavated	ID	Material	Type	Weight	NSIP	MNI	Description	Date	Sig.	Category	Interpretation	Retain
BRW3	TT22	Topsoil	17/03/2021	CBW_241	Glass	Bottle	55g	1	1	Brown abrupt heel flat base 'N'	-	Nil	Subsistence	-	No
BRW3	TT22	Topsoil	17/03/2021	CBW_242	Metal	Miscellaneous	48g	4	-	Sheet metal fragments	-	Nil	Industrial	-	No
BRW3	TT22	Topsoil	17/03/2021	CBW_243	Brick	CANBERRA	-	-	-	-	1930s	-	Product	-	No
BRW7	TT02	6	2/03/2021	CBW_244	Brick	Roof tile?	-	-	-	Roof tile fragment?			Product		No
BRW3	TT29	Topsoil	18/03/2021	CBW_245	Brick	CB	-	-	-	-	-	-	Product	-	No
BRW3	TT29	Topsoil	18/03/2021	CBW_246	Brick	Blank frog	-	-	-	-	-	-	Product	-	No
BRW3	TT29	3	18/03/2021	CBW_247	Metal	Miscellaneous	9g	2	2	1 Fe nail ; 1 Sn top of can	-	Nil	Building / subsistence	-	No
BRW3	TT29	3	18/03/2021	CBW_248	Bone	Faunal				Small piece of bone, probably sheep scapula. Relatively clean cut at base of fragment and possible butchery strike perpendicular to base			Subsistence		No
BRW3	TT29	3	18/03/2021	CBW_249	Ceramic	Vessel	-	1	1	Red clay ceramic with thick, hard mottled brown varnish. Flat lip and incurving base. Parallel incised lines on interior of vessel	-	Low	Building	Likely sewer pipe or similar	No

Appendix I

GML Heritage, Canberra Brickworks Quarry—Draft Statement of Heritage Effects, prepared for Doma Group, September 2021



Canberra Brickworks Quarry

Statement of Heritage Effects

Report prepared for Doma Group

September 2021

Acknowledgement of Country

At GML we acknowledge that we work and live on the land of the First Australians. We know that this land was never ceded, and we respect the rights and interests of Australia's first people in land, culture, and heritage. We acknowledge their Elders past and present and support the concepts of voice, treaty, and truth in the Uluru Statement from the Heart.

Report Register

The following report register documents the development and issue of the report entitled Canberra Brickworks Quarry—Statement of Heritage Effects, undertaken by GML Heritage Pty Ltd in accordance with its quality management system.

Job Number	Issue Number	Notes/Description	Issue Date
20-0421	1	Preliminary Draft Report	9 February 2021
20-0421	2	Draft Report	31 March 2021
20-0421	3	Revised Draft Report	2 September 2021

Quality Assurance

GML Heritage Pty Ltd operates under a quality management system which has been certified as complying with the Australian/New Zealand Standard for quality management systems AS/NZS ISO 9001:2016.

The report has been reviewed and approved for issue in accordance with the GML quality assurance policy and procedures.

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Executive Summary

Doma Group (Doma) engaged GML Heritage Pty Ltd (GML) to undertake a Statement of Heritage Effects (SHE) assessment for the former quarry located at the Canberra Brickworks.

The quarry is included on the ACT Heritage Register as part of the 'Yarralumla Brickworks' citation. It is valued for its significance as:

- The type locality for the geological 'Yarralumla Formation' dating from the Silurian Period 425 million years ago.
- A key aspect of the original brick making operation at the Canberra Brickworks as it existed up until c1940.
- An area of high archaeological potential that may yield further information about the history and operation of the Brickworks over time.

The proposed works comprise several landscape modification works that would infill two areas within the quarry cutting and grade an area outside of the cutting.

The landscape modification works have been proposed to meet the following objectives:

- Crime Prevention Through Environmental Design (CPTED)—By altering the geometry of the quarry, areas that are currently security and safety concerns will become active parts of the environment and community.
- Positive heritage outcomes—Proceeds from the sale of the reclaimed land would contribute to the restoration and adaptation of the core heritage buildings located within the Canberra Brickworks precinct.

Assessment of the impacts to the heritage significance of the quarry that may occur as part of the proposed works were found to be largely concerned with identified geological formation C.

There will be no impact to the overall archaeological significance of the quarry. Observations made during contamination and geotechnical investigations indicated that the quarry is characterised by consistent spread of post-war brick rubble.

There will be little impact to the overall character and aesthetic quality of the quarry.

Recommendations for the proposed works are as follows:

- Gradient of the southern infill area—The proposed infill gradient should be adjusted to be a steeper angle to maintain the distinct appearance of the cutting.
- Geological formation C—Ongoing liaison with a suitably qualified geologist and the ACT Heritage Council should be undertaken to implement harm mitigation measures during the proposed works and for ongoing management.



1 Introduction

The Canberra Brickworks Precinct is a significant historic site with a distinctive industrial character. It has recognised heritage significance through its listing on the ACT Heritage Register as the 'Yarralumla Brickworks', and the associated 'Yarralumla Brickworks Railway Remnants'.

Doma Group (Doma) engaged GML Heritage Pty Ltd (GML) to prepare a Statement of Heritage Effects (SHE) assessment for the former quarry located at the Brickworks. This SHE considers potential heritage impacts arising from proposed landscape modification works to be undertaken as part of the adaptive re-use and development of the Canberra Brickworks Precinct.

1.1 Site Identification

1.1.1 Terminology

The Canberra Brickworks Precinct is subject to two separate ACT Heritage Register listings (Section 1.1.2) and has been referred to historically by many names (eg the Old Canberra Brickworks, Yarralumla Brickworks, Westridge Brickworks, the Commonwealth Brickworks, and the Government Brickworks). For consistency, this assessment utilises the terminology outlined in the updated Conservation Management Plan (CMP) prepared by GML:

- **Canberra Brickworks Precinct**—The area comprising Blocks 1, 7, and 20, which is inclusive of the 'Yarralumla Brickworks' and 'Yarralumla Brickworks Railway Remnants' heritage citations.
- **Canberra Brickworks**—Referred to as the 'Yarralumla Brickworks' in the ACT Heritage Register citation. It has a specific legislative boundary and contains the quarry subject to this assessment.
- **Railway Remnants**—Referred to as the 'Yarralumla Brickworks Railway Remnants' in the ACT Heritage Register citation. It has a specific legislative boundary and is not subject to this assessment.

1.1.2 Location

The Canberra Brickworks Precinct is in the suburb of Yarralumla, to the west of central Canberra (Figure 1.1). It occupies Blocks 1, 7, and 20, Section 102. The site is bordered to the north and east by low density residential development, to the west by the Royal Canberra Golf Course and Westbourne Woods, and to the south by open space. It comprises the heritage listed sites and additional unlisted lands that were part of the ancillary operation of the brickworks.

The quarry is located in Block 20, Section 102, within the boundary of the Canberra Brickworks heritage citation (Figure 1.2). It contains four geological features (A–D) that demonstrate the key characteristics of the Yarralumla Formation.



Figure 1.1 Location of the Canberra Brickworks Precinct (inclusive of the 'Yarralumla Brickworks' and 'Yarralumla Brickworks Railway Remnants'), in the broader context of Canberra. (Source: Google Earth with GML overlay, 2017)



Figure 1.2 Location of the quarry (red) within the Canberra Brickworks Precinct. (Source: Google Earth with GML overlay, 2017)

1.1.3 Element Naming and Numbering

Individual elements (built and geological) located within the Canberra Brickworks Precinct have been assigned identification numbers by the ACT Heritage Register 'Yarralumla Brickworks' citation and 2010 CMP prepared by Lovell Chen (discussed further in the forthcoming CMP update). The identification numbers associated with the former quarry are detailed in Table 1.1.

The ACT Heritage Register citation also includes a grading of heritage significance. The quarry is included in Schedule 1—Elements of 'Exceptional Significance, referred to as 'core elements'.

Table 1.1 Element Names and Numbering Applicable to the Former Quarry Located at the Canberra Brickworks Precinct.

CMP Identification	ACT Heritage Register Citation Identification
01 Quarry	11 Quarry 12 Geological features A, B, C, D

1.2 Heritage Status

1.2.1 *Heritage Act 2004* (ACT) and the ACT Heritage Register

The *Heritage Act 2004* (ACT) (Heritage Act) aims to represent and protect the rich natural and cultural heritage of the ACT. The legislation establishes a system for the recognition, registration and conservation of natural and cultural heritage places and objects, including Aboriginal places and objects.

The quarry is included in the 'Yarralumla Brickworks' citation on the ACT Heritage Register. Specific requirements are outlined for the quarry and its associated geological features (Appendix A):

- The quarry landform should be retained in a manner whereby it is clearly evident to be a man made excavation, associated with the industrial use of the site. Revegetation, enhanced hard and soft landscaping, and low–medium height buildings with a high proportion of landscape open space may be permitted in the vicinity of the quarry. The shape of the quarry may be altered in a minor manner, however, access points into and out of the quarry area should utilise existing openings and gradients within the landform. The historical linkage between the quarry and kiln areas shall be expressed in any new development.
- The geological features shall be integrated within any site landscaping treatment. Disturbance of the immediate surface shall be limited to works that protect, stabilise, or enhance the interpretation of the geological values. The immediate environs of the geological features to a distance of approximately 10 metres shall be retained as landscape open space.

1.2.2 Non-Statutory Listings

The Canberra Brickworks Precinct (inclusive of the former quarry) is also subject to two non-statutory heritage listings:

- 'Yarralumla Brickworks'—The Australian Institute of Architects (AIA) ACT Chapter Register of Significant Twentieth Century Architecture (RSTCA), Item No. R063.
- 'Canberra Brickworks'—National Trust of Australia (ACT) 'Classified' place (20 July 1981).

1.3 Project Methodology

This SHE has been prepared with reference to the following resources:

- ACT Heritage Register citations for the Yarralumla Brickworks and the Railway Remnants;

- Navin Officer Heritage Consultants Pty Ltd (NOHC), Archaeological Assessment Canberra Brickworks and Environs, Draft Report, prepared for the ACT Government Land Development Agency, September 2016 (2016 archaeological assessment);
- SMEC Australia Pty Ltd, Preliminary Geotechnical Site Investigation for the Canberra Brickworks, prepared for the ACT Government Land Development Agency, November 2013; and
- GML Heritage Pty Ltd, Canberra Brickworks—Conservation Management Plan, Final Draft Report, prepared for Doma Group (Doma), January 2021 (CMP 2021).

GML reviewed the proposed landscape modifications for the quarry (Section 4.1). A pedestrian surface inspection of the quarry was undertaken on 15 December 2020 to examine site conditions and the proposed modifications.

A revised significance assessment of the quarry has been provided in the CMP 2021 to verify the identified heritage values, add detail to the ACT Heritage Register citation, and reflect the adoption of the ACT Heritage HERCON criteria.

1.3.1 The *Burra Charter* Principles

This SHE has been prepared with reference to the *Burra Charter—The Australia ICOMOS Charter for Places of Cultural Significance* (Australia ICOMOS, 2013) (the Burra Charter) and its practice notes. These set a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance, including owners, managers, and custodians. The Burra Charter provides specific guidance for physical and procedural actions that should occur in relation to significant places.

1.3.2 Limitations

This SHE did not assess the potential impacts on Aboriginal heritage values. A 2014 Aboriginal Cultural Heritage Assessment of the Canberra Brickworks Precinct (NOHC, August 2014) found that the Brickworks does not contain any known Aboriginal places or objects.[1] Overall, the site is considered to have no potential to contain Aboriginal archaeological deposits due to the disturbance caused by past land use practices.[2] Intangible heritage values were not examined during the assessment.

This SHE did not examine the quarry cutting for additional or previously unrecorded geological formations. The four areas of significant geological formations that are currently recognised within the quarry cutting (Section 3.1) have been assessed for potential impacts.

1.4 Authorship

This report has been prepared by Elise Jakeman, Heritage Consultant and Archaeologist, and Martin Rowney, Principal.

1.5 Endnotes

1 Navin Officer Heritage Consultants Pty Ltd, Canberra Brickworks, Yarralumla, ACT—Stage 1, Aboriginal Cultural Heritage Assessment, prepared for the ACT Government Land Development Agency, August 2014, p 11.

2 Navin Officer Heritage Consultants Pty Ltd, Canberra Brickworks and Environs, Denman Street, Yarralumla, South Canberra—Archaeological Assessment, prepared for the ACT Government Land Development Agency, September 2016, p 3.

2 Historical Context

This section is based on the CMP 2021, which provides a detailed historical review of the development and operation of the Canberra Brickworks Precinct, and inventory sheet for the quarry (Appendix B). No additional research has been undertaken to prepare this section.

2.1 The Development of the Brickworks

2.1.1 Establishment of the Brickworks, 1911–1930

The Brickworks was established by the Commonwealth Government in the early days of Canberra's development as the Federal Capital. Due to the costs associated with transporting bricks from outside of the Territory, it was decided that a local quarry and brickworks be established to support the construction of houses and government buildings, and the population growth in the new town.

Of the two sites investigated, 38 acres of sheep grazing land on Frederick Campbell's property 'Yarralumla Station' was selected for its potential to produce bricks of an excellent quality, equal to the best commercially produced bricks for hardness and porosity.[1]

Development of the Brickworks began in 1913 with initial infrastructure comprising a grinding pan, brick making machine and elevator, portable steam engine, and four open kilns. It was expected that much of this equipment would be temporary and that more permanent infrastructure would be established in 1914. The arrival of World War I led to a shift in government priorities and commitments and resulted in restrictions on the works program for Canberra. This shift, together with a coal strike, caused the first closure of the Canberra Brickworks in December 1916. A 1916 contour and detail survey identified early Brickworks infrastructure, including the quarry (Figure 2.1).

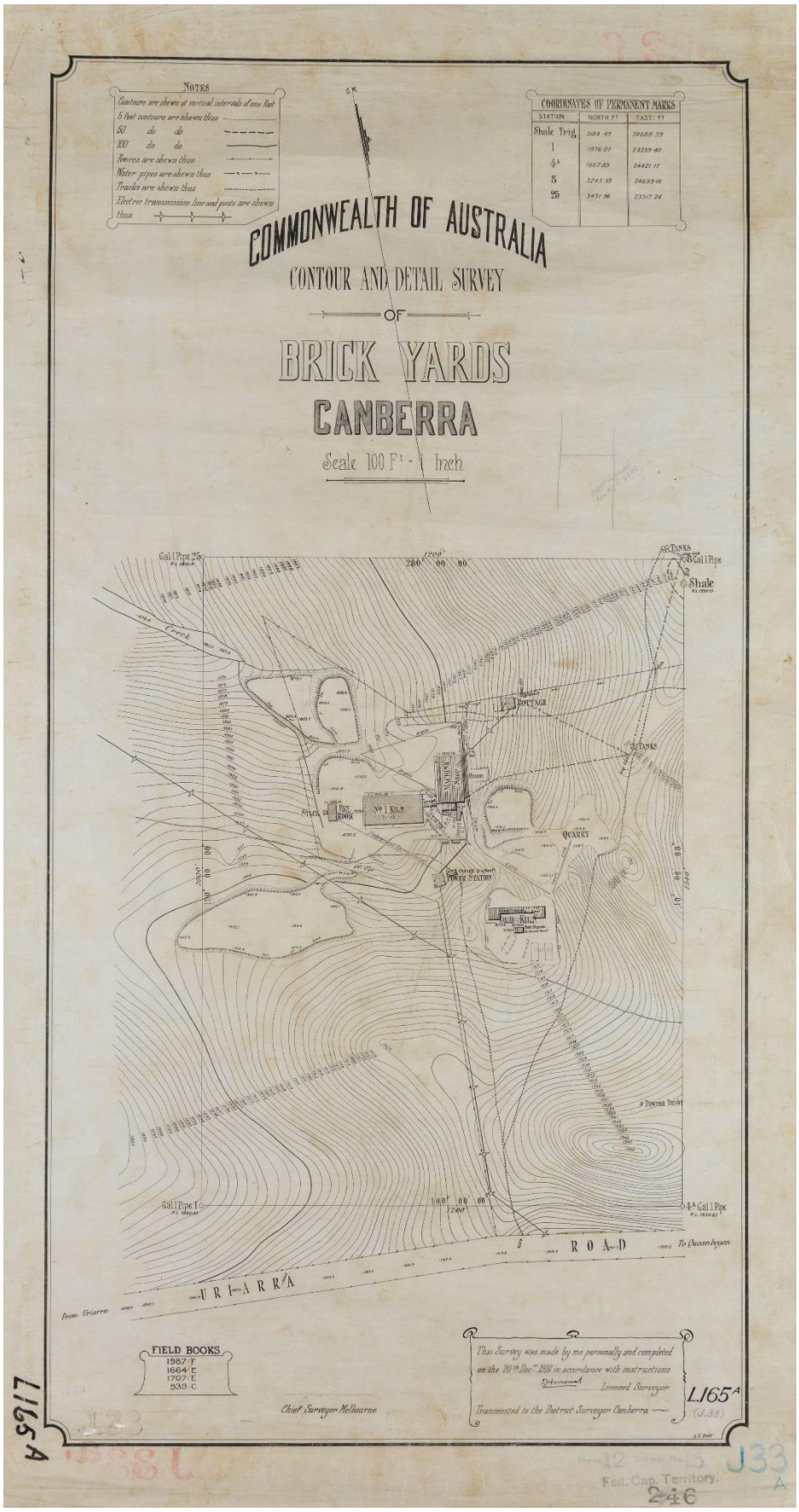


Figure 2.1 1916 contour and detail survey of the Brick Yards Canberra. (Source: NAA: A6664, L165A, 1916)

2.1.2 Expansion Phase, 1921–1942

With the end of World War I, the government proceeded with the construction of Canberra and formally reopened the Brickworks in 1921, which had undergone machinery repairs the previous year. The 1920s saw an increase in residential construction and major civic construction projects throughout Canberra, in response to government plans to move public servants from Melbourne, and the completion of the Provisional Parliament House in 1927 was a significant achievement for the fledgling capital.

The Depression curtailed production at the Brickworks and timber was used instead of the more expensive coal to operate the kilns. With significant reduction in demand, the Brickworks closed for a second time in 1931. It reopened in 1935, but this proved to be short-lived due to the arrival of World War II. The Brickworks closed for a third time in 1942 and staff were laid off with a caretaker instituted to issue bricks for essential works only.

2.1.3 Post-World War II Phase, 1944–1976

In 1944 the Brickworks reopened on a limited scale. This soon increased to respond to the post-war housing shortage, which led to major expansion and redevelopment works at the Brickworks.

The 1950s saw a change in the brick making process and a series of new crushers and hoppers was introduced, as well as an elevator and a series of conveyor belts. New brick press buildings and a workshop replaced the early machine shop adjacent the Staffordshire kiln. Despite extensive upgrades and works, a 1959 report on the operations, management, equipment, and economics of the Brickworks addressed concerns over low productivity at the site and the quality of bricks being produced.

By 1973, the Brickworks was considered in need of extensive modernisation and proposals were prepared by Commonwealth Brickworks Pty Ltd for upgrade works. These proposals were rejected by the National Capital Development Commission (NCDC) on environmental grounds and a new brickworks site was released at Mitchell in Canberra's north. The allocation of a new brickworks led to final closure of the Brickworks and the kilns were unloaded for the last time in August 1976.

2.1.4 Post-Closure Phase, 1976–2017

In 1976, local developer and businessman Alan Marr (A R Marr Pty Ltd) put forward a proposal to develop the Brickworks as an integrated tourist, recreation, and retail centre with medium density housing to the east and north of the site. Marr succeeded in having the land rezoned to accommodate his vision and carried out maintenance and reconstruction works to the kilns. Landscaping of the quarry, involving land fill and the creation of the reflection lake, proceeded in 1978. The redeveloped Brickworks was opened to the public as a tourist attraction in July 1979. However, limited income opportunities and high capital costs forced Marr's business into provisional liquidation.

The 1988 *Canberra Brickworks South Canberra Policy Plan* suggested a range of potential uses for the site such as housing, commercial accommodation, and office and retail space. The government adopted the plan, despite it being poorly received by the community. Hooker Projects submitted the preferred 'Expression Of Interest', which proposed a development that adapted the kilns and machine bays, and contained a sports precinct, museum, restaurant, hotel, and visitor attractions. A depressed economy led to Hookers being placed in provisional liquidation and by 1992 their proposal was defunct. It is around this time the Commonwealth handed the Brickworks site over to the ACT Government.

Further development proposals were investigated but none proceeded and during this phase the Brickworks continued to accommodate a range of tenants, including artists, designers, and manufacturers. In 2001 the Brickworks was included on the ACT Heritage Register as the 'Yarralumla Brickworks'. In 2013, the

remnants of the former 1920s narrow-gauge railway were individually listed as the 'Yarralumla Brickworks Railway Remnants'.

In September 2013, the ACT Government's Land Development Agency (LDA) (now the Suburban Land Agency) released the *Canberra Brickworks and Environs Planning and Development Strategy*, which sought to promote the adaptive re-use of the site and its surrounds with respect to its heritage significance. Following revision of the strategy in 2015, the LDA called for development proposals to be submitted and in 2017 it was announced that the preferred tenderer was local Canberra developer Doma with its submission for a mixed-use residential, commercial, and retail development that utilised much of the historic Brickworks infrastructure.

2.2 The Quarry

The raw material quarried for the 'temporary' Brickworks from 1913 was a hard yellow shale, obtained by levelling a knoll to the east of the site. The shale varied greatly in quality and material from the various seams had to be mixed thoroughly to secure a uniform colour in the bricks, which led to increased production costs. Raw materials were transported from the quarry to the Brickworks by a narrow gauge tramway, which was constructed so that tram trucks ran downhill and empty trucks returned to the quarry area using manpower. The tram lines could be relocated as the quarry face advanced.



Figure 2.2 The Brickworks quarry face with workers, c1920–30. (Source: NAA, A3650, 3315)



Figure 2.3 The Brickworks quarry and narrow gauge railway track, c1920–30. (Source: NAA, A3650, 3314)



Figure 2.4 View of the quarry showing the narrow-gauge tramway used to transport shale to the crusher, 1921. (Source: National Archives of Australia)

Quarrying at the site was reported to be a complex process and costlier than comparable brickworks due to seams of unusable material, such as limestone and sandstone. From the mid-1930s, raw materials were brought in from outside the Brickworks.

Levelled areas of the quarry floor were subsequently used to house Brickworks-related facilities, including an open-sided roofed enclosure for clay storage, which has since been removed. It is shown in an aerial photograph of the site taken in 1976 (Figure 2.5). Another smaller structure, located farther east, is also shown although its purpose is not known. After the closure of the Brickworks, AR Marr Pty Ltd proposed the construction of a narrow-gauge railway and a 'reflection pool' in the former quarry (Figure 2.6). A concrete dividing wall capped with stone paving is a remnant of the walkway proposed by AR Marr to cross the 'reflection pool'. However, the pool failed to retain water and was frequently dry.



Figure 2.5 Detail of a 1976 aerial photograph showing the clay storage shed and an unknown smaller structure to the right (east) (both demolished). (Source: ACT Heritage Library with Lovell Chen overlay)



Figure 2.6 Detail of site landscaping plan prepared by A R Marr Pty Ltd showing the reflection pond and the location of the model railway, c1977. (Source: ACT Heritage Library)

2.3 Endnotes

[1] National Archives of Australia, Series A110/FC 1913/1055, in Ian Carnell, 'Canberra's Cornerstone', *Canberra Historical Journal*, No. 5, March 1990, cited by Lester Firth Associates, 1986, Section 2.2.1.

3 Site Context

3.1 Geological Features

The quarry reflects an integral part of Canberra's geology, which consists of a range of sedimentary and volcanic rock types. The main rock types are:

- deep water sediments of late Ordovician and early Silurian age;
- shallow water sediments of middle to late Silurian age; and
- volcanic rocks of middle Silurian to early Devonian age.

There are also minor outcrops of recent river gravels and stream deposits. The deep-water sediments (mudstone and siltstone) of the early Silurian age (424–423 million years ago) are present as what is known as the 'Yarralumla Formation'. The Yarralumla Formation comprises a very fine-grained sedimentary rock known as shale, which is fossiliferous in places.

There are four specific locations in the quarry that demonstrate particular aspects of the site and the Yarralumla Formation (Figure 3.1):

- A and D show excellent examples of anticline in calcareous siltstone. The siltstone can be seen to grade to sandstone from the inner strata to the outer.[1]
- B shows a typical tuffaceous mudstone and siltstone of the Yarralumla Formation. The tuff is poorly cemented and consists of a fine-grained white clay matrix containing large fragments of siltstone.[2]
- C shows abundant fossils of mainly brachiopods, trilobites, coral and crinoids preserved in a bedding plane. The quarry is one of the only locations in which the fossil contents of the Yarralumla Formation can be closely observed.[3]

These geological features are included in the 'Yarralumla Brickworks' citation on the ACT Heritage Register.

An updated, detailed geological assessment of the quarry was undertaken by ACT Geotechnical Engineers Pty Ltd, February 2021. The assessment concluded that there are no additional fossils of scientific value located in the area of the proposed works.[4]

3.2 Archaeological Potential

This SHE uses the assessment of archaeological potential and significance drawn from the 2016 archaeological assessment. A total of 12 areas containing or with potential to contain archaeological deposits were identified during the assessment.[5] The quarry (BRW7) was identified as one of these areas.

A summary of the identified archaeological features within of BRW7 and level of archaeological potential is detailed in Table 3.1. Figure 3.1 depicts the approximate location of these features. The other 11 sites identified in the 2016 archaeological assessment are not discussed here.

Table 3.1 Summary of Observations of the Quarry Made During the 2016 Archaeological Assessment. *Note that no mapping of the identified archaeological features was provided in the 2016 assessment, so locations are approximate based on the description provided.* (After: NOHC 2016, p 37–40)

Recording Code	Type of Site	Identified Archaeological Features	Archaeological Potential
BRW7	Surface Feature	• A sequence of uniform depressions (approximately 1 metre in diameter) of unknown purpose.	High

Recording Code	Type of Site	Identified Archaeological Features	Archaeological Potential
	Area of Archaeological Sensitivity	• An in-ground circular, brick-lined tank (approximately 3 metres in diameter) that has been backfilled. • Brick rubble backfill located in various locations within the profile of the quarry cutting. • Two grassy mounds that may be evidence of a demolished structure. • A raised earth embankment that is the remnant of the c1977 model railway track.	

Although the area was not identified in the 2016 archaeological assessment as containing any archaeological features, two distinct 'knoll'-like landforms located southeast of the quarry cutting are characteristic of spoil dumping (Figure 3.1). This is supported by geotechnical testing conducted in 2013, in which a test pit (TP25) located between the two landforms revealed a profile of 'uncompacted brick waste and quarry cuttings'.[6] These features may contain archaeological information regarding the growth, use, and abandonment of the quarry.

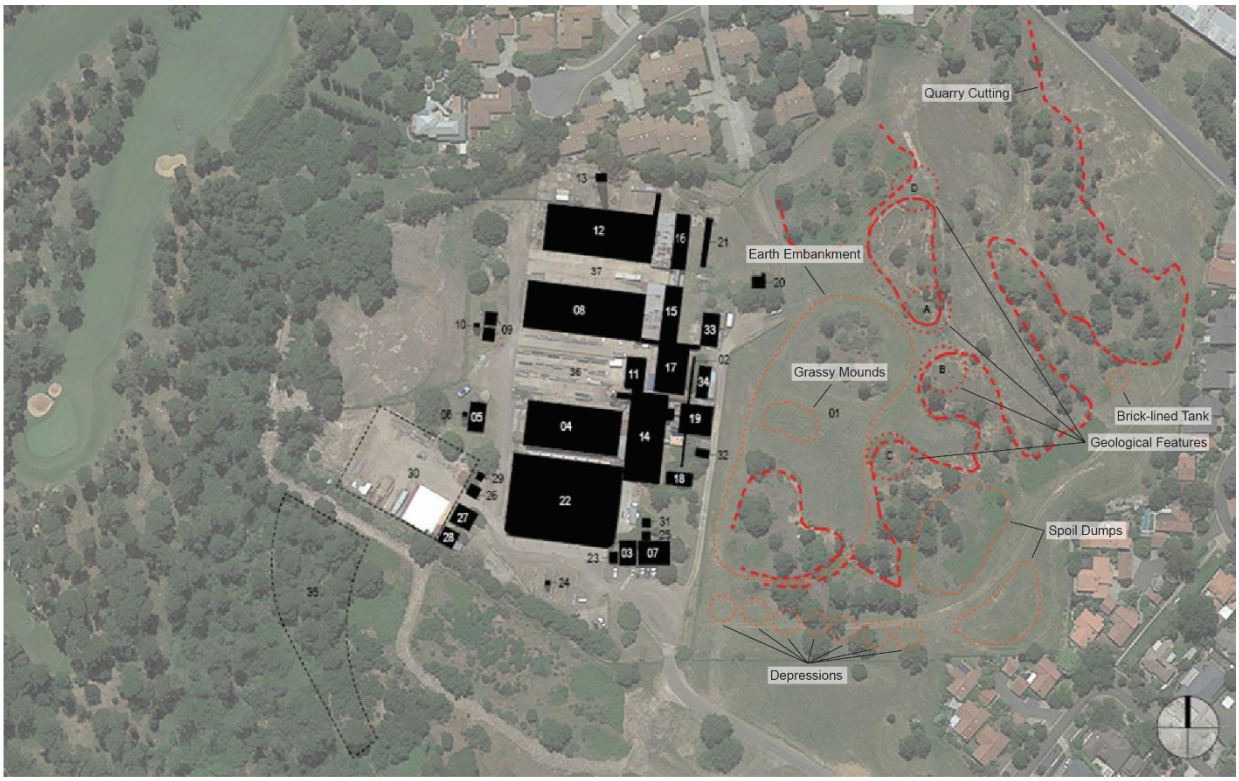


Figure 3.1 The location of the geological features A–D (red) and archaeological features (orange) within the quarry. These locations are approximate and not to scale. (Source: Google Earth with GML overlay, 2021)

Contamination and geotechnical investigations within the quarry were undertaken by AGON Environmental during 16–18 February 2021. These works were supervised by GML for impact to the identified archaeological features and the broader potential of the quarry itself.

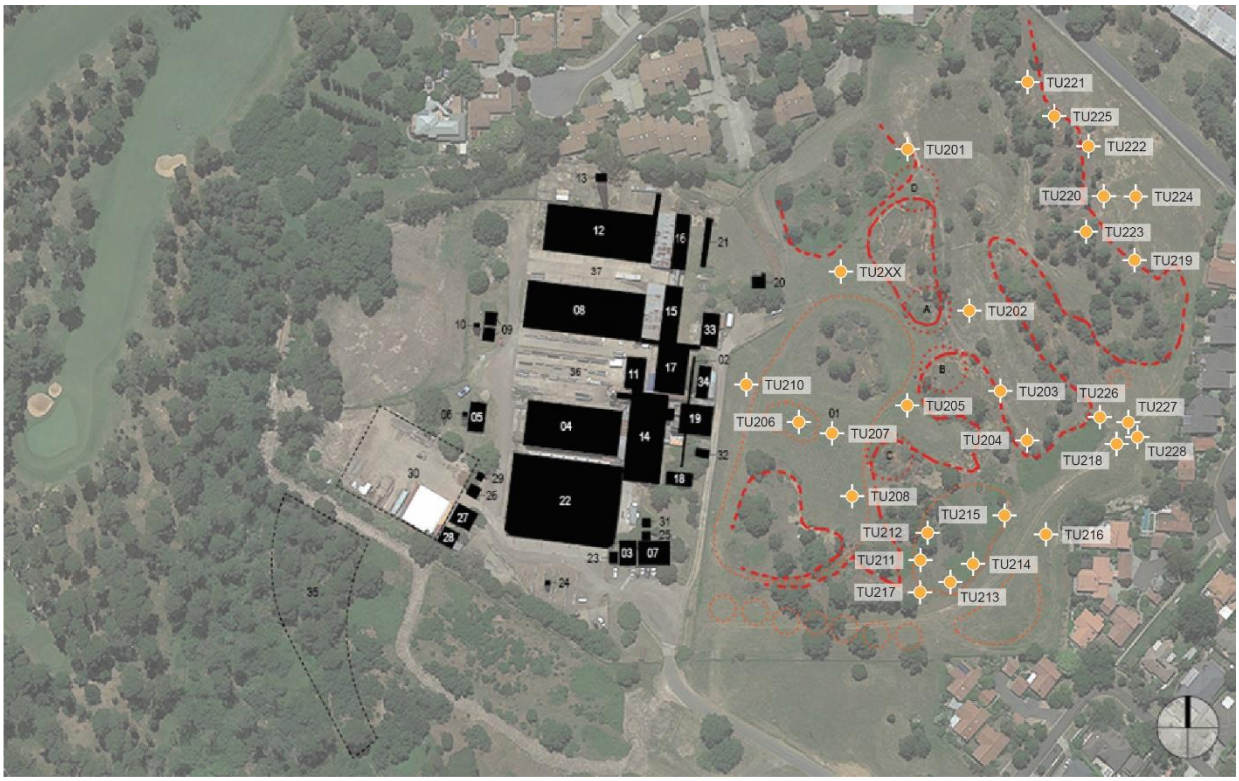


Figure 3.2 The TUs monitored during contamination and geotechnical investigations within the quarry. (Source: Google Earth with GML overlay, 2021)

Test units (TUs) within the western cutting and adjacent to the eastern border of the cutting indicated that the quarry is characterised by a consistent spread of brick rubble. The bricks were largely dominated by 'CB' frogs, followed by air bricks, with isolated examples of 'C'wealth Canberra'/'Canberra C'wealth' and 'Canberra' frogs. The rubble varied between 3 metres to 7 metres deep. Miscellaneous discarded machinery pieces and other debris was included within the rubble (Figure 3.3 and Figure 3.4).



Figure 3.3 Miscellaneous ferrous metal machinery and mining tool pieces from TU218.



Figure 3.4 Miscellaneous rubbish (c1960 'Fanta' bottle, c late 1960s/early 1970s 'Tooheys' beer can, and unknown date 'Bega Yogurt' lid) from TU209.

The results from the TUs excavated at the locations of the following identified archaeological features are summarised below (Table 3.3):

- the earth embankment adjacent to geological feature C;
- the grassy mounds in the western extent of the quarry; and

- the spoil dumps to the southeast of the quarry cutting.

Table 3.2 Summary of Archaeological Observations Made during Contamination and Geotechnical Investigations, February 2021.

Identified Archaeological Feature	TU	Results	Photographs
Earth Embankment	205	Archaeological deposits— 1) Loose fill, <15% brick rubble ('CB' frog), immediately below ground surface, approximately 300mm deep 2) Yellow clayey deposit, approximately 310mm below ground surface, approximately 50mm deep 3) Crushed granite deposit, approximately 360mm below ground surface, approximately 20–50mm deep 4) Slag/ash deposit, approximately 410mm below ground surface, approximately 20–200mm deep 5) Loose fill, <10% brick rubble ('CB' frog), approximately 610mm below ground surface, approximately 3.5m deep Artefacts—Miscellaneous ferrous metal sheet (may be associated with welded sheet and railway track found in TU212) Interpretation—No evidence of c1978 model railway track or earthen embankment constructed to support a track. Although the 'CB' frogged bricks indicate that the deposits are post-war, they are characteristic of a waste dump. This is particularly supported by the presence of slag and ash, loose fill, and mixed clay deposits Date—Post-war	 **Figure 3.5** TU205 at completion of excavation, facing northeast. The eastern profile has collapsed, obscuring deposit e), however, deposits a)—d) are visible in the profile.  **Figure 3.6** Miscellaneous ferrous metal sheet.
Grassy Mounds	206	Archaeological deposits— 1) Loose fill, <5% brick rubble ('CB' frog), immediately below ground surface, approximately 700mm deep 2) Some lenses of clayey material within fill, no clear stratification Artefacts—Miscellaneous ferrous metal sheet (may be associated with welded sheet and railway track found in TU212) and industrial spring Interpretation—No evidence of a demolished structure (ie sections of intact bonded bricks, pieces or deposits of mortar, other building materials). Although the 'CB' frogged bricks indicates that the deposits are post-war (consistent with the photographic evidence for structures	 **Figure 3.7** TU206 at completion of excavation, facing north.

Identified Archaeological Feature	TU	Results	Photographs
		within the quarry), they are characteristic of a waste dump Date—Post-1972	 **Figure 3.8** Miscellaneous ferrous metal sheet.  **Figure 3.9** Industrial spring.
	207	Archaeological deposits— 1) Loose fill, <10% brick rubble ('CB' frog), immediately below ground surface, approximately 500mm deep 2) Slag/ash deposit, approximately 500mm below ground surface, approximately 50–200mm deep 3) Yellow clayey deposit, approximately 520mm below ground surface, approximately 50–200mm deep 4) Loose fill, <5% brick rubble ('CB' frog), approximately 720mm below ground surface, approximately 150mm deep 5) Crushed granite deposit, approximately 870mm below ground surface, approximately 300mm deep Artefacts—Miscellaneous ferrous metal and barrel collar Interpretation—No evidence of a demolished structure (ie sections of intact bonded bricks, pieces or deposits of mortar, other building materials). Although the 'CB' frogged bricks indicates that the deposits are post-war (consistent with the photographic evidence for structures within the quarry), they are characteristic of a waste dump	 **Figure 3.10** TU207 at completion of excavation, facing northwest.  **Figure 3.11** Miscellaneous ferrous metal and barrel collar.

Identified Archaeological Feature	TU	Results	Photographs
		Date—Post-1972	
Spoil Dumps	211	Archaeological deposits— 1) Loose fill, immediately below ground surface approximately 600m deep 2) Crushed granite deposit, approximately 600mm below ground surface, approximately 200mm deep 3) Yellow clayey deposit, approximately 800mm below ground surface, approximately 50mm deep 4) Slag/ash deposit, 40% brick rubble ('CB' frog) approximately 850mm below ground surface, approximately 800mm deep Artefacts—Nil Interpretation—A deposit of misfired bricks and waste material that was removed from the kilns and deposited to the east of the quarry Date—Post-war	 **Figure 3.12** TU211 at completion of excavation, facing southwest.
	212	Archaeological deposits— 1) Loose fill, <10% brick rubble ('CB' frog), immediately below ground surface, approximately 4m deep Artefacts—Railway track with attachment plate (similar to plates in TU205 and 206) and miscellaneous ferrous pipe Interpretation—Deposit of waste or excess bricks and industrial debris Date—Post-war	 **Figure 3.13** TU212 at completion of excavation, facing west.  **Figure 3.14** Railway track with attachment plate. The plate has several holes where it would have been fixed to the ground surface. This indicates that it was a moveable feature, which could be repositioned throughout the quarry based on the active mining front.

Identified Archaeological Feature	TU	Results	Photographs
			 **Figure 3.15** Railway track.  **Figure 3.16** Miscellaneous ferrous pipe.
	213	Archaeological deposits— 1) Loose fill, <5% brick rubble ('CB' frog), immediately below ground surface, approximately 5m deep Artefacts—Nil Interpretation—Deposit of waste or excess bricks Date—Post-war	 **Figure 3.17** TU213 at completion of excavation, facing northeast.

Identified Archaeological Feature	TU	Results	Photographs
	214	Archaeological deposits— 1) Loose fill, <5% brick rubble ('CB' frog), immediately below ground surface, approximately 3m deep 2) Crushed granite deposit, approximately 3m below ground surface, approximately 300mm deep 3) Loose fill, 10% brick rubble ('CB' frog), approximately 3.3m below ground surface, approximately 1m deep 4) Crushed granite deposit, approximately 4.3m below ground surface, approximately 300mm deep 5) Loose fill, 25% brick rubble ('CB' frog, one 'Canberra C'wealth' frog), approximately 4.6m below ground surface, depth unknown due to excavator machine exceeding reach Artefacts— Mortared 'CB' frogged bricks, English bond, 8 courses, identified at approximately 6.5m deep Interpretation—Largely a deposit of waste or excess bricks. A small number of bricks (<1%) had evidence of mortar, indicating that they once belonged to a structure. Currently there is no evidence that buildings existed along the eastern border of the quarry cutting, so the bonded bricks may originate from a structure elsewhere at the Brickworks Date—Post-war	 **Figure 3.18** TU214 at completion of excavation, facing west.  **Figure 3.19** Bonded 'CB' frogged bricks.
	217	Archaeological deposits— 1) Loose fill, 50% brick rubble ('CB' frog), immediately below ground surface, approximately 5m deep Artefacts—c1934–1948 'Hellier's Cordial' bottle, miscellaneous ferrous metal sheets, 'CB' frogged brick with fused slag attachment, miscellaneous ferrous metal collar Interpretation— Deposit of waste or excess bricks Date—Post-war	 **Figure 3.20** TU217 at completion of excavation, facing northeast.

Identified Archaeological Feature	TU	Results	Photographs
			 **Figure 3.21** c1934–1948 'Hellier's Cordial' bottle, manufactured in Queanbeyan.  **Figure 3.22** Miscellaneous ferrous metal sheets, 'CB' frogged brick with fused slag attachment.  **Figure 3.23** Miscellaneous ferrous metal collar.

3.3 Significance Assessment

The following statement of significance is provided in the CMP 2021:

> *The quarry dates from the establishment of the Brickworks and demonstrates a key aspect of the original brick making operation and as it existed up until c1940.*
>
> *The quarry is also considered to be of scientific significance as the type locality for the geological Yarralumla Formation, a major sedimentary sequence dating from the Silurian Period, 424–423 million years ago. The rock units at the site provide the reference section for comparison with other outcrops within the Yarralumla Formation and, in this context, are of both research and educational value.*
>
> *The quarry was assessed as having high archaeological potential*[7] *based on its ability to yield further information about the history and operation of the Brickworks over time.*

The following statement of significance regarding the geological features of the quarry is provided in the 'Yarralumla Brickworks' citation on the ACT Heritage Register (Appendix A):

> *[The quarry is] of considerable geological value as the type locality for the 'Yarralumla Formation', dating from the Silurian Period 425 million years ago. The scheduled stratigraphic rock units constitute the reference section against which all other outcrops within the Formation are compared. It is the only fossil marine unit within the extensive volcanic marker horizons of South Canberra.*

3.4 Endnotes

1 SMEC Australia Pty Ltd, Preliminary Geotechnical Site Investigation for the Canberra Brickworks, prepared for the ACT Government Land Development Agency, November 2013, p 15.
2 SMEC Australia Pty Ltd, Preliminary Geotechnical Site Investigation for the Canberra Brickworks, prepared for the ACT Government Land Development Agency, November 2013, p 17.
3 SMEC Australia Pty Ltd, Preliminary Geotechnical Site Investigation for the Canberra Brickworks, prepared for the ACT Government Land Development Agency, November 2013, p 16.
4 ACT Geotechnical Engineers Pty Ltd, Canberra Brickworks Development—Blocks 1, 7, and 20, Section 102, Yarralumla Backfilling of Old Quarry Area—Geotechnical Fossil Study, prepared for Doma Group, March 2021, p 6.
5 Navin Officer Heritage Consultants Pty Ltd, Canberra Brickworks and Environs, Denman Street, Yarralumla, South Canberra—Archaeological Assessment, prepared for the ACT Government Land Development Agency, September 2016, p 25.
6 SMEC Australia Pty Ltd, Preliminary Geotechnical Site Investigation for the Canberra Brickworks, prepared for the ACT Government Land Development Agency, November 2013, p 12, 23.
7 Navin Officer Heritage Consultants, Archaeological Assessment Canberra Brickworks and Environs, report prepared for the Land Development Agency, September 2016.

4 Assessment of the Proposal

The landscape modification works have been proposed to meet two objectives:

- **Crime Prevention Through Environmental Design (CPTED)**—The existing cutting of the quarry has resulted in inaccessible areas with safety concerns and lacking in natural surveillance. The proposed landscape modification works will meet the following principles of CPTED:
    - Natural surveillance—By designing spaces and buildings that foster human activity and interaction and overlook the environment, the opportunity for crime is reduced.
    - Natural access—By 'channelling' the movement of people through the environment, either into spaces to increase activity and natural surveillance or away from areas that are generally inappropriate for pedestrian movement.
    - Territorial reinforcement—By establishing a sense of place, amenity, and pride of ownership, there is a great propensity to take care of the environment and community.
    - Target hardening—By making it as difficult as practicable to steal or vandalise property or buildings, a property owner or occupier seeks to deter criminal activity.
- **Positive heritage outcomes for the wider Canberra Brickworks precinct**—The proceeds from the sale of the reclaimed land would contribute to the restoration and adaptation of the core heritage buildings located within the Canberra Brickworks precinct.

4.1 Description of the Proposal

A concept plan for the proposed landscape modification works has been developed by Sellick Consultants for Doma (Figure 4.1). The proposed landscape modification works include:

- **Infill**—Two areas of the existing quarry cutting will be infilled.
    - The northern area will be infilled to provide level surfaces for the construction of dwellings and to remove access to a portion of the quarry considered to be unsafe. The gradient of the infill where it faces inwards to the quarry cutting will match the extant gradient.
    - The southern area will be infilled to create park landscaping. The gradient of the infill where it faces inwards to the quarry cutting will slope gradually towards the quarry floor.
- **Grading**—One area outside of the existing quarry cutting will be graded to provide a level surface for the construction of dwellings. The spoil created through the works will be used for the southern area of infill.



Figure 4.1 Proposed areas of infill and grading in the Canberra Brickworks quarry. (Source: Sellick Consultants 2019)



Figure 4.2 Detail of the proposed development Masterplan for the Canberra Brickworks Precinct in the quarry area. (Source: Doma Group)

4.2 Alternative Approaches to the Activity

Several alternative approaches have been considered in place of the proposed landscape modification works.

Closed-circuit Television (CCTV) monitoring and a physical security presence (eg security personnel) have been proposed to combat the security and safety issues associated with the space, particularly the northern infill area. However, these have been deemed to be unfeasible due to:

- ongoing expenses and requirement for personnel;
- impracticalities of being located in a park setting; and
- not being part of a passive design solution.

By infilling the area and creating a useable space, concerns regarding security and safety can be combated with the additional bonus of providing a positive town planning outcome.

5 Statement of Heritage Effects

This SHE assesses the potential heritage impacts from the proposed landscape modifications to the quarry in relation to its identified geological and archaeological values, and the specific requirements outlined in the 'Yarralumla Brickworks' citation on the ACT Heritage Register.

5.1 Assessment of Impacts

The quarry is significant for its key role in the brick making operation, geological characteristics, and its overall form and aesthetic qualities. It has also been identified as having high potential for archaeological features.

Table 5.1 Assessment of the Impacts of the Proposed Landscape Modification Works to Identified Geological and Archaeological Features of the Quarry.

Impact to Geological Feature/s	Impact to Archaeological Feature/s
Northern Infill Area	
There will be no impact to identified geological features.	There will be no impact to identified archaeological features. The 2016 archaeological assessment identified an in-ground circular, brick-lined tank that has been backfilled. Survey of this area and results obtained during the contamination and geotechnical investigations indicate that this feature is more likely to be representative of the general spread of brick rubble across the quarry. This was supported by excavation of the feature during archaeological test excavations in March 2021, which identified the feature as being an accumulation of rubble, not a structural feature. Limited additional archaeological information can be determined from further examination of the brick rubble.
Southern Infill Area	
This work has the potential to impact identified geological features. Geological feature C is located immediately adjacent to the proposed infill area and may be impacted by the works. Impact to the feature may result in significant harm to its condition, relationship with the other geological features of the quarry, and type example of an element of the Yarralumla Formation. Impacts may include: • accidental damage to the face of the feature by heavy machinery; • disturbance of the ground surface above the feature resulting in structural damage; or • concealment of the feature by the deposition of infill material.	There will be no impact to identified archaeological features. The 2016 archaeological assessment identified two archaeological features: • Two grassy mounds present in the southwestern area of the quarry floor and abutting the northern extent of the proposed infill distribution. • A sequence of uniform depressions abutting the southern extent of the proposed infill distribution. Results obtained during the contamination and geotechnical investigations indicated that the grassy mounds are not the remnants of a c1960s structure. The archaeological deposits identified are consistent with the general spread of brick rubble across the quarry. Limited additional archaeological information can be determined from further examination of the brick rubble.The uniform depressions are considered to have nil archaeological potential.
Grading Area	
There will be no impact to identified geological features.	There will be no impact to identified archaeological features. Two spoil dumps were identified southeast of the quarry cutting. Results obtained during the contamination and

Impact to Geological Feature/s	Impact to Archaeological Feature/s
	geotechnical investigations indicated these features comprise of approximately 2–7 metres of brick fill. The predominant frog was 'CB' indicating that the deposits accumulated post-war, possibly during the closure of the Brickworks in 1976. Limited additional archaeological information can be determined from further examination of the brick rubble.

An assessment of the impacts of the proposed landscape modification works in accordance with the 'Yarralumla Brickworks' specific requirements (Appendix A) is discussed in Table 5.2.

Table 5.2 Assessment of the Impacts of the Proposed Landscape Modification Works in Accordance with the 'Yarralumla Brickworks' Specific Requirements, as Detailed in the ACT Heritage Register Citation.

'Yarralumla Brickworks' Specific Requirements	Impact Assessment
a) The quarry landform should be retained in a manner whereby it is clearly evident to be a man made excavation, associated with the industrial use of the site. Revegetation, enhanced hard and soft landscaping, and low–medium height buildings with a high proportion of landscape open space may be permitted in the vicinity of the quarry. The shape of the quarry may be altered in a minor manner, however, access points into and out of the quarry area should utilise existing openings and gradients within the landform. The historical linkage between the quarry and kiln areas shall be expressed in any new development.	**Northern Infill Area** The proposed gradient of the infill where it faces inwards to the quarry cutting will match the extant gradient (Figure 5.1). This will maintain the character and aesthetic quality of the quarry as a man made excavation. Details regarding the revegetation and building plans have not been provided or assessed as part of this SHE. The infill will not alter the access points into and out of the quarry. The infill will not affect the legibility of the historical linkage between the quarry and the kiln area. Details regarding the expression of the link between the quarry and kiln areas, through the new development work, have not been provided or assessed as part of this SHE. **Southern Infill Area** The proposed gradient of the infill where it faces inwards to the quarry cutting will be gradual. This does not reflect the current nature of the cutting (Figure 5.2). Details regarding the revegetation and building plans have not been provided or assessed as part of this SHE. The infill will not alter the access points into and out of the quarry. The infill will not affect the legibility of the historical linkage between the quarry and the kiln area. Details regarding the expression of the link between the quarry and kiln areas, through the new development work, have not been provided or assessed as part of this SHE. **Grading Area** The proposed grading will remove spoil dumps associated with the dumping of brick waste, which are part of the character of the quarry as a man made excavation. However, they do not have a direct role in the aesthetic quality of the quarry. Details regarding the revegetation and building plans have not been provided or assessed as part of this SHE. The grading will not alter the access points into and out of the quarry.

'Yarralumla Brickworks' Specific Requirements	Impact Assessment
	The grading will not affect the legibility of the historical linkage between the quarry and the kiln area. Details regarding the expression of the link between the quarry and kiln areas, through the new development work, have not been provided or assessed as part of this SHE.
b) The geological features shall be integrated within any site landscaping treatment. Disturbance of the immediate surface shall be limited to works that protect, stabilise, or enhance the interpretation of the geological values. The immediate environs of the geological features to a distance of approximately 10 metres shall be retained as landscape open space.	**Northern Infill Area** No geological features of scientific value have been identified in the proposed infill area.[1] **Southern Infill Area** Geological feature C is located immediately adjacent to the proposed infill area and may be impacted by the works. Impact to the feature may result in harm to its condition, relationship with the other geological features of the quarry, and type example of an element of the Yarralumla Formation. **Grading Area** The proposed grading is situated outside of the quarry cutting. No geological features of scientific value have been identified in the proposed infill area.[2]



Figure 5.1 The location of the proposed northern infill area. (Source: GML 2020)



Figure 5.2 The location of the proposed southern infill area (right). Geological feature C (left) is immediately adjacent to the proposed area. (Source: GML 2020)



Figure 5.3 The location of the proposed grading outside of the quarry cutting. The 'knoll'-like landforms are characteristic of spoil dumping and comprise of a large quantity of brick rubble. *Note the photograph does not depict the eastern-most landform.* (Source: GML 2020)

5.2 Conclusion

Impacts to the heritage significance of the quarry are largely concerned with identified geological and archaeological features. The proposed landscape modification works have the potential to impact geological formation C.

There will be little impact to the overall character and aesthetic quality of the quarry.

Recommendations to reduce or mitigate these potential impacts are outlined in Section 6.

5.3 Endnotes

1 ACT Geotechnical Engineers Pty Ltd, Canberra Brickworks Development—Blocks 1, 7, and 20, Section 102, Yarralumla Backfilling of Old Quarry Area—Geotechnical Fossil Study, prepared for Doma Group, March 2021, p 6.

2 ACT Geotechnical Engineers Pty Ltd, Canberra Brickworks Development—Blocks 1, 7, and 20, Section 102, Yarralumla Backfilling of Old Quarry Area—Geotechnical Fossil Study, prepared for Doma Group, March 2021, p 6.

6 Recommendations

The proposed works will largely have little impact to the overall character and aesthetic quality of the quarry. The proposed gradient of the northern infill area where it faces inwards to the quarry cutting will match the extant gradient and therefore will maintain the appearance of an artificial cutting. The current proposed gradient of the southern infill area where it faces inwards to the quarry cutting will be gradual. This does not reflect the current nature of the cutting. The following recommendation is made regarding this:

- **Gradient of the southern infill area**—The proposed infill gradient should be adjusted to be a steeper angle. This would maintain the distinct appearance of the cutting and keep with the character and aesthetic quality of the quarry as a man made excavation.

The proposed works have the potential to impact identified geological features within and in proximity to the quarry. These should be proactively managed in accordance with the following recommendations:

- **Geological formation C**—Impact to the feature may result in significant harm to its condition and relationship with the other geological features of the quarry. Ongoing liaison with a suitably qualified geologist and the ACT Heritage Council should be undertaken to implement harm mitigation and ongoing management. During the undertaking of the works, ACT Geotechnical Engineers have recommended the area be fenced off and an exclusion zone established a minimum of 5 metres around the perimeter of geological formation C. The 'Yarralumla Brickworks' specific requirements (Appendix A) states that 'immediate environs of the geological features to a distance of approximately 10 metres shall be retained as landscape open space'. This will need to be accommodated in future management of the quarry.

It is considered that there will be no impact to the identified archaeological significance of the quarry. Results from the contamination and geotechnical investigations indicate that there is a consistent spread of brick rubble within the western quarry cutting and adjacent to the eastern border of the cutting (Section 3.2). This is dominated by 'CB' frogged bricks, which demonstrates that the deposit accumulated post-war and is likely associated with the closure of the Brickworks in 1976. Limited additional archaeological information can be determined from further examination of the brick rubble.

6.1 General Mitigation Measures

If archaeological material—including structural remains and artefact deposits—is identified during the works and has not already been assessed as part of the monitoring undertaken during the contamination and geotechnical assessment, the Unanticipated Finds Protocol (UFP) should be implemented (Appendix D).

Under the UFP, works should stop to allow for the inspection and recording of the finds by a suitably qualified archaeologist. If isolated objects not in situ are found, then these items should be collected. If structural features and/or in situ deposits are found, then the landscape modification works should be suspended in that location until further assessment is undertaken and appropriate permissions are sought from the ACT Heritage Council.

Appendices

Appendix J

Unanticipated Finds Protocol

Unanticipated Finds Protocol

Protocol to be followed in the event that previously unrecorded or unanticipated archaeological material (objects, artefacts, deposits or relics) are encountered.

1 All ground surface disturbance in the area of the finds should cease immediately when unanticipated archaeological material is uncovered. The discoverer of the find(s) will notify machinery operators in the immediate vicinity of the find(s) so that work can be halted.

2 All work in the vicinity of the discovery will cease.

3 Contact the project archaeologist to assess the nature of the finds.

4 The project archaeologist will record the finds. This will include a significance assessment and the lodgement of site information for all new recordings with ACT Heritage.

5 If the finds are historical artefacts not in-situ, the finds will be recorded and collected and stored with the project proponent or project archaeologist and incorporated into the assemblage of other historical artefactual material at the conclusion of subsequent archaeological investigation phases.

6 If the finds are in-situ structural features or in-situ archaeological deposits of assessed significance a determination will be made between the project archaeologist and the onsite operators regarding the following:

    a. If sufficient information has been gained by the test location, then the sampling process will not re-commence and the find will be reburied using the excavated soil;

    b. If the test location can be moved to a location not directly impacting surface features, then the sampling process will re-commence at that new location and the finds will be reburied using the excavated soil;

    c. If there are no suitable location alternatives and further sampling is required, the following will be undertaken:

        i. All work in the location will remain on hold as the following steps are completed:

        ii. ACT Heritage will be informed of the findings and a further course of action will be discussed.

iii. Based on discussions with ACT Heritage further assessment processes and formal permission under the ACT Heritage ACT may be required to facilitate the removal of the features.

iv. At the completion of the additional assessment phases the agreed mitigation measures will be carried out prior to the removal of the features based on the conditions of approval.

7 If the finds are Aboriginal artefacts, the project archaeologist will contact ACT Heritage and the four ACT Representative Aboriginal Organisations (RAOs) to discuss ongoing management measures.

8 Work will not commence at the find location until ACT Heritage, the RAOs and the Project archaeologist have agreed an approach to managing the artefacts, and the finds location.

Protocol to be followed in the event that suspected human remains are encountered.

1 All ground surface disturbance in the area of the finds, should cease immediately the finds are uncovered.

a. The discoverer of the find(s) will notify machinery operators in the immediate vicinity of the find(s) so that work can be temporarily halted; and

b. The site supervisor and the development proponent will be informed of the find(s). If there is substantial doubt regarding a human origin for the remains, then consider if it is possible to gain a qualified opinion within a short period of time. If feasible, gain a qualified opinion (this can circumvent proceeding further along the protocol for remains which turn out to be non-human). If conducted, this opinion must be gained without further disturbance to any remaining skeletal material and its context as possible (Be aware that the site may be considered a crime scene containing forensic). If a quick opinion cannot be gained, or the identification is positive, then proceed to the next step.

2 Immediately notify the following people of the discovery:

a. The local Police (this is required by law);

b. ACT Heritage;

c. Representatives from the RAOs (where appropriate); and

d. The project archaeologist (if not already present).

3 Facilitate the evaluation of the find(s) by the statutory authorities and comply with any stated requirements. Depending on the evaluation of the find(s), the management of the find(s) and their location may become a matter for the Police and/or Coroner.

4 Construction related works in the area of the find(s) may not resume until the development proponent receives written approval from the relevant statutory authority: from the Police or Coroner in the event of an investigation; and from the ACT Heritage Council in the case of human remains outside of the jurisdiction of the Police or Coroner.

5 In the event that the proponent continues an active role in the evaluation and/or management of the find(s), via a direction or advice from the Police, Coroner and/or Heritage Council, then all or some of the following steps may be conducted:

6 Facilitate, in co-operation with the appropriate authorities, the definitive identification of the skeletal material by a specialist (if not already completed). This must be done with as little further disturbance to any remaining skeletal material and its context as possible.

7 If the specialist identifies the bone as non-human then, where appropriate, the protocol for the discovery of historical or Aboriginal artefacts (above) should be followed.

8 If the specialist determines that the bone material is human, then the proceeding course of action may be of three types:

a. The bone(s) are of an Aboriginal and non-Aboriginal person who died less than 100 years ago and where traumatic death is suspected. Such remains come under the jurisdiction of the ACT Coroner's Act 1997. All further decisions and responsibilities regarding the remains and find location rest with the ACT Police, and/or the ACT Coroner.

b. The bone(s) are of a non-Aboriginal person who died more than 100 years ago. In this case, and where the Police have indicated that they have no interest in the find(s), the following steps may be followed:

    i. Ascertain the requirements of the ACT Heritage Council, the development proponent, the project archaeologist, and the views of any relevant community stakeholders;

    ii. Based on the above, determine and conduct an appropriate course of action. Possible strategies could include one or more of the following:

1. Avoiding further disturbance to the find and conserving the remains in situ (this option may require relocating the development and this may not be possible in some contexts);
2. Conducting (or continuing) archaeological salvage of the finds following receipt of any required statutory approvals;
3. Scientific description (including excavation where necessary), and possibly also analysis of the remains prior to reburial;
4. Recovering samples for dating and other analyses; and/or
5. Subsequent reburial at another place and in an appropriate manner determined by the Heritage Council and in consultation with other relevant stakeholders.

c. The bone(s) are of an Aboriginal person who died more than 100 years ago. In this case the following steps may be followed:
    i. Ascertain the requirements of the local RAOs, the ACT Heritage Council, the development proponent, and the project archaeologist;
    ii. Based on the above, determine and conduct an appropriate course of action. Possible strategies could include one or more of the following:
        1. Avoiding further disturbance to the find and conserving the remains in situ, (this option may require relocating the development and this may not be possible in some contexts);
        2. Conducting (or continuing) archaeological salvage of the finds following receipt of any required statutory approvals;
        3. Scientific description (including excavation where necessary), and possibly also analysis of the remains prior to reburial;
        4. Recovering samples for dating and other analyses; and/or
        5. Subsequent reburial at another place and in an appropriate manner determined by the RAOs and the Heritage Council.

Inspired People.
Dedicated Team.
Quality Outcomes.

Briefing Note

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Date: 28 September 2021

Subject: **Canberra Brickworks – Environmental Offsets Supplementary Report**

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This briefing note and any attachments are confidential and are intended to provide information for use in discussions between Umwelt and the named recipient(s) only.

1.0 Introduction

The following briefing note provides a summary of the environmental offsetting process undertaken for the Canberra Brickworks Precinct Project, including key decision points and rationale. This document has been prepared to provide additional information for the updated bilateral Environmental Impact Statement (EIS) being prepared under the ACT's *Planning and Development Act 2007* (PD Act) and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), specifically addressing clarifications requested by entities during the consultation period on the Draft EIS.

Umwelt were engaged in 2018 to commence preparing the EIS for the development of the Canberra Brickworks Precinct. A preliminary phase of that scope of works was ecological survey to confirm the extent of golden sun moth (*Synemon plana*) habitat within the Proposal Area, and the provision of environmental offsetting advice.

2.0 Impact to Golden Sun Moth

The development of the Canberra Brickworks Precinct will directly impact on 1.58 hectares of golden sun moth habitat, within areas of exotic grassland dominated by Chilean needlegrass (*Nassella neesiana*).

As described in the EIS, this habitat is considered marginal habitat, being located in exotic grassland, within a timbered area, and with low connectivity with surrounding habitat. It is also at the extent of the larger area of habitat surrounding Dudley Street and Cotter Road, and its removal would not result in any fragmentation of remaining habitat.

The low quality of habitat, the small size of the patch, the dominance of a weed of national significance (and declared Class 3 pest plant in the ACT), and the fact that there has not been evidence of breeding occurring within this habitat (i.e. only males identified during surveys) the patch was considered to be of low priority for protection within the Proposal Area.

As such, the project requires an offset for the entire area of habitat.

3.0 Background and Offset Strategy Rationale

In 2018, when commencing work on this EIS, Umwelt were concurrently preparing the ecological offsets strategy for the adjacent Canberra Brickworks Access Road, on behalf of the ACT Government. This project required substantial offsets for the removal of golden sun moth habitat and natural temperate grassland of the south eastern highlands endangered ecological community.

Preliminary discussions were held with the Department of Agriculture Water and the Environment (DAWE) (then DoEE) (21/2/2018) regarding the potential to offset both projects within the one offset area, being the North Mitchell Grasslands. The rationale for this investigation was the following:

- Impacts were located at the same area, for closely related projects
- The proposed offset area had adequate habitat to offset both projects
- There were no other offsets for golden sun moth made available by the Offsets Team at the time.

However, due to the fact that one offset would be funded by the ACT Government, and one by a private developer, DAWE were not satisfied the offset could meet the following Offset Policy principal:

> 'Transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.'

i.e. The ability to transparently measure and attribute conservation outcomes to two separate projects (with two proponents) within the one offset site had too many uncertainties and was not supported in principal.

In 2018, the process for obtaining an Offset was to first discuss project requirements with the ACT Environmental Offset Team. These discussions confirmed that there were no other available offsets for golden sun moth in the quantum required for this project, as a large number of potential offsets were tied up within the Eastern Broadacre Strategic Assessment Area, and the other potential sites identified in an Analysis of Potential Offset Sites Across the ACT (Umwelt 2017) (prepared for EPSDD) had complexities associated with site custodianship (e.g. NCA land) or site usage (e.g. urban open space) that made them unsuitable as an offset for this project.

Umwelt identified the potential for seeking an offset within NSW as an alternative. This approach was supported by DAWE, due to the BioBanking scheme (at the time) being an accredited process under the EPBC Act. Umwelt received in principle support to determine offset requirements by using the EPBC Offset Calculator to determine hectares of habitat required, then translate these into BioBanking credits through a credit/hectare conversion. Preliminary comments on our methodology were received.

Due to this approach not having been taken for an ACT project previously, Umwelt sought advice and concurrence from the Impact Assessment Team (14/3/2018). The Impact Assessment Team confirmed that:

> 'The ACT Environmental Offsets Policy allows for offsets across the border (within the bio-region), so this option could be considered. Obviously, the management structures around using a site in NSW would need to be carefully considered and long term protection of the site demonstrated.' [1]

Umwelt were asked to provide information to be presented at the following ACT Government Environmental Offsets Working Group. This information was circulated to the Working Group, and presented on 10/4/2018. Follow up clarifications were provided to the Impact Assessment Team and the Environmental Offsets Team on 11/4/2018.

Following this consultation process, pursuing BioBanking credits for the project was confirmed as the approach in the Application for Scoping Document under the PD Act, which was circulated for entity comments.

4.0 Proposed Offset

The proposed offset, the 'Panorama BioBank Site' is approximately 92.8 hectares in size and is located on Old Cooma Road in Googong, NSW, approximately 4.5 km from the ACT border at Hume. It occurs in the Murrumbidgee Catchment Management Area (CMA) and in the South Eastern Highlands Bioregion and Monaro subregion.

[1] Personal communication: Tegan Liston, Acting Senior Manager - Impact Assessment and Business Improvement, Environment, Planning and Sustainable Development Directorate (email, 14/3/2018)

It was subject to a Biodiversity Assessment Report (BAR) prepared by Umwelt in December 2017[2]. This BAR included extensive literature review, identification of landscape features, detailed biometric field surveys, and the calculation of ecosystem and species credits in accordance with BioBanking Assessment Methodology (BBAM) (OEH 2014).

Specifically, to golden sun moth, habitat surveys were undertaken on 16th November 2017. The following survey effort was employed:

• Six point-intersect transects (50 metre) to systematically assess suitable ground vegetation cover to determine the cover of wallaby grasses (*Rytidosperma* spp.) and Chilean needlegrass (*Nassella neesiana*) for golden sun moth

• Random meanders covering as much area as possible recording any incidental observations of flying golden sun moth

Suitable grass species cover was also reviewed from the floristic plots completed across all other areas of the site. The location of point-intersect transects are shown in **Figure 1** below.



Figure 1 Targeted Golden Sun Moth Survey at Offset Site (Umwelt, 2017)

The targeted habitat surveys found *Rytidosperma* species throughout the site including ringed wallaby grass (*Rytidosperma caespitosum*), short wallaby grass (*Rytidosperma carphoides*) and silvertop wallaby grass (*Rytidosperma pallidum*). These species occur in a patchy but widespread distribution across the Panorama BioBank Site, most prominently in the grassland habitats of the site.

[2] Umwelt (2017) *Panorama BioBank Site, Biodiversity Assessment Report, Final Following OEH Review*, prepared for Robin Pty Ltd (December 2017)

Based on the review of the data from previous floristic surveys, point-intersect transects and opportunistic meanders across the site, the species polygon for golden sun moth includes the grassland components of vegetation communities MR648 and MR669 – as shown in **Figure 3** below.



Figure 2 Golden Sun Moth habitat at the Panorama BioBank Site (Umwelt, 2017)



Figure 3 Golden Sun Moth Habitat Mapped at the Panorama BioBank Site (Umwelt, 2017)

Based on the assessment undertaken in Umwelt (2017), the proposed offset site contains 34.8 hectares of golden sun moth habitat, which equated to 247 species credits.

4.1 Offset Site Management Requirements

Based on the BAR, the site would be subject to ongoing management requirements to ensure the protection and improvement of ecological values.

The assumptions related to quality, threat and ongoing management of the offset site in **Section 5** are based on these management actions, which are summarised below:

- management of grazing for conservation
- weed management
- management of fire for conservation
- management of human disturbance
- retention of regrowth and remnant native vegetation
- replanting or supplementary planting where natural regeneration will not be sufficient
- retention of dead timber
- erosion control
- retention of rocks.

Specifically for areas of golden sun moth habitat, are the following additional management requirements:

- no supplementary planting for the overstorey and midstorey
- weed invasion is controlled
- natural regeneration to be monitored for density and slashed where deemed appropriate.

4.2 Offset Governance

The BioBanking Agreement Application for the Panorama BioBanking Site was submitted 12/04/2017.

The BioBanking Scheme was replaced by the Biodiversity Offsets Scheme (BOS) under the *Biodiversity Conservation Act 2016* (BC Act) which commenced in August 2017.

Existing BioBanking agreements remain in place and are managed under the BC Act as Biodiversity Stewardship Agreements. The Biodiversity Conservation Trust (BCT) has taken on the ongoing management of BioBanking agreements, including administration of annual reports, application for variations and annual payments.

4.3 Appropriateness of Site for use as an ACT Offset

The key considerations when determining whether this site was appropriate for use as an offset for the Canberra Brickworks project were 1) whether the offset was located in the same region as the impact, 2)

whether the long term management of the site could be assured, 3) whether the offset habitat was 'like-for-like' with the impacted habitat.

The offset identified is as close to the ACT as possible, within 5 kilometres of the border. It is considered appropriate to utilise a cross border offset when the benefits to the biodiversity of the ACT Region are tangible, as with this example.

The long-term management of the site is certain, through the established (and EPBC accredited) NSW BioBanking scheme, including the oversight, compliance monitoring, and funding of the offset through the BCT.

The offset area provides a better quality example of golden sun moth habitat than the impact area. It does not represent habitat comprising Chilean needlegrass, as the impact area does, and has much higher long-term viability and resilience due to its larger patch size and quality.

5.0 Determination of Habitat Quality

To determine offset requirements using the EPBC Offset Calculator, a consistent approach for determining quality of impacted habitat, and offset habitat must be used, to ensure offsets are appropriate and proportionate to the proposed loss.

Umwelt have developed a range of metrics, specific to golden sun moth to allow this assessment of quality, in line with the EPBC Act Offset Guide (**Figure 3**).

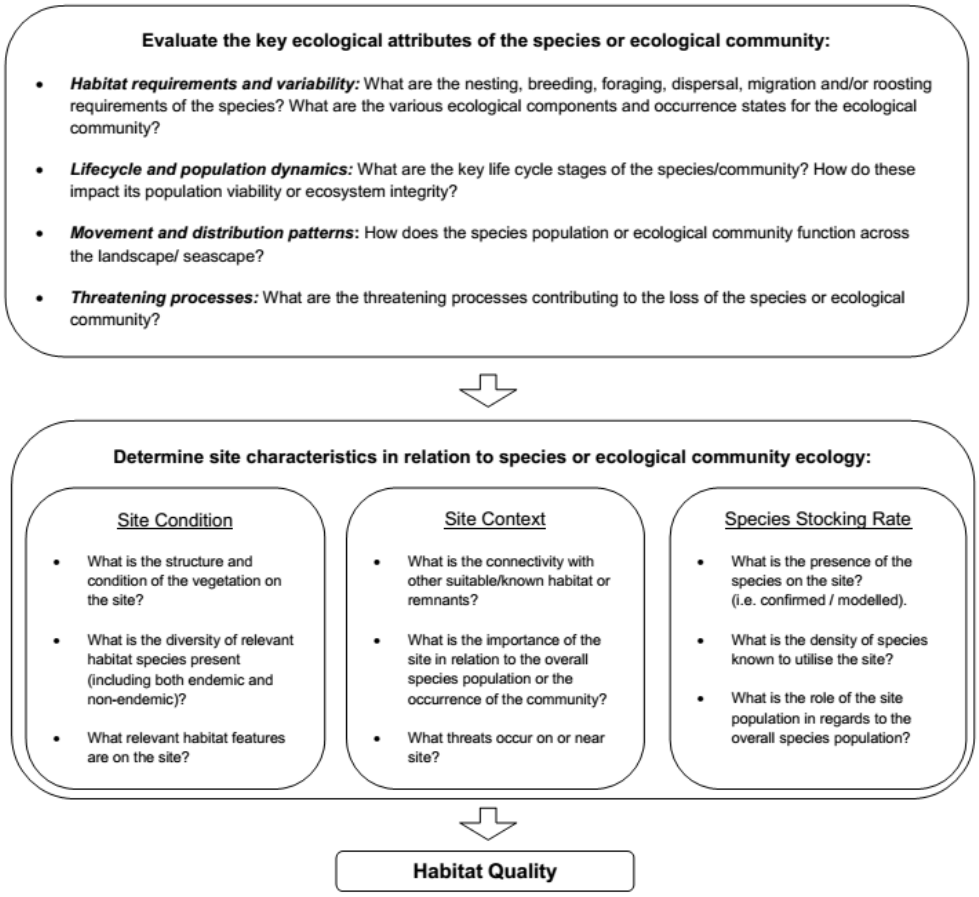


Figure 4 Determining Habitat Quality for an Offset (SEWPaC, 2012)

5.1 Site Condition

Site condition scores for golden sun moth are based on listing criteria for the species, and represent a combination of:

- structure and condition of vegetation on site (native grassland or pasture)
- presence of forage species
- presence and cover of weeds.

The following site condition criteria have been developed specifically for golden sun moth.

Vegetation Structure

Vegetation structure is a reflection of the habitat type (i.e. grassland or open woodland) and the amount of inter-tussock space available (i.e. rank or open grassland). Golden sun moth typically occupies grassland; therefore, grassland structures score higher than woodland.

The species also requires inter-tussock space in which the females bask to attract males during breeding (i.e. flying) season, therefore, open grassland scores higher than rank grassland (DEWHA, 2009a)[3]. The range of vegetation structure scores is shown in **Table 1**. Any vegetation type that does not fit into one of these categories is not considered to be golden sun moth habitat from a structural perspective and is highly unlikely to support the species.

Table 1 Vegetation Structure Sub-Scores for Golden Sun Moth

Score	Rationale
1	Grassy open woodland or shrubland. It is the least suitable of habitats that are occupied by golden sun moth.
2	Rank (i.e. overgrown) grassland.
3	Open grassland. Provides optimal habitat structure.

Vegetation Condition

The vegetation condition sub-score considers the proportion of exotic to native species and the availability of golden sun moth forage species at the site. Scores are determined based on dominance to give an overall impression of the types of grass species that occur. Exotic species dominance is ranked lowest as it is considered to be a sign of poor ecosystem health and a detriment to biodiversity as a whole.

Sites with mixed dominance, or dominance of native non-forage species (e.g. kangaroo grass) are given an equal score. This is considered appropriate as it is believed that the presence (not dominance) of forage species is enough to provide habitat for golden sun moth in some circumstances. Despite this, sites with a dominance of forage species are ranked the highest as they provide the most habitat resources for golden sun moth and are considered to be of a higher quality. The range of habitat vegetation scores that may be assigned is shown in **Table 2**.

[3] Department of Environment, Water, Heritage and the Arts (2009a) *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana),* Nationally Threatened Species and Ecological Communities EPBC Act Policy Statement 3.12, Department of Environment, Water, Heritage and the Arts, Canberra.

Table 2 Vegetation Condition Sub-Scores for Golden Sun Moth

Score	Rationale
1	Dominated by exotic species.
2	Mixed exotic and native forage species dominance.
3	Dominated by native forage species (e.g. short wallaby grass and spear grasses).

Forage Species Diversity

The forage species diversity sub-score demonstrates the species richness (i.e. the number of species present at a site) and the evenness of the percentage cover for each species. It is important to note the difference between species richness (total number of species present) and species diversity (a function of species richness and abundance). The range of scores presented here is outlined in **Table 3**.

Table 3 Forage Species Diversity Sub-Scores for Golden Sun Moth

Score	Rationale
1	Low species diversity.
2	Medium species diversity.
3	High species diversity.

5.2 Site Context

Site context includes consideration of:

- patch size
- patch shape
- isolation and/or connectivity
- threats.

Specifically for golden sun moth, the following site context values have been developed.

Patch size is based on the Significant Impact Guidelines for the species:

- Patch is less than 1 hectare. There is not considered to be a minimum patch size for golden sun moth habitat, however areas less than 1 hectare are considered very small, and at high risk from external influences and catastrophic events.
- Patch is between 1 and 10 hectares. The Significant Impact Guidelines refer to small or fragmented habitat area as <10 hectares.
- Patch is greater than 10 hectares. The Significant Impact Guidelines refer large or contiguous habitat as >10 hectares.

The approach for connectivity has been developed on the understanding of golden sun moth's limited ability to disperse. Females are not able to traverse over any non-habitat substrate due to their poor flying

ability (ACT Government 2005)[4], and as such any break in habitat connectivity is considered an absolute barrier that females cannot cross. The distance that males will traverse depends upon the substrate they are travelling over. A substrate that consists of non-habitat grassland will be permeable for male golden sun moths up to a distance of 200 metres (ACT Government 2005); whilst a substrate of concrete, water, bare ground or the like is taken on the basis of observation to be permeable up to a distance of 15 metres. Beyond this distance they are considered absolute barriers and male moths will not cross. In addition, features such as trees, shrubs, or buildings are an absolute barrier for male golden sun moth (DEWHA 2009b)[5].

Based on this, any separation in habitat greater than 200 metres is considered likely to represent separate populations. The matrix surrounding each patch has also been considered, with native pasture or grassland matrix being considered of higher value than exotic grassland or development.

- 20 metres or less separation would indicate a high level of connectivity between patches
- Less than 200 metres but more than 20 metres between patches would indicate some potential for movement between habitat
- More than 200 metres to the closest patch of habitat. This distance is considered a barrier to movement.

Consideration of threats has been based on the presence and intensity of key threats, as identified in Significant Impact Guidelines for golden sun moth and the species' Conservation Advice. The extensive list of threats provided by the guidance material covers a wide range of land use activities and processes that are the consequence of four main categories of threat as follows:

- Land use and management change:
    - Grazing, pasture improvement, cropping, ploughing
    - Overstocking
    - Urban development and infrastructure
- Conflicting management practices:
    - Fire regimes
- Degrading processes:
    - Exotic species (including pasture species)
    - Loss of inter-tussock spaces
    - Soil compaction

[4] ACT Government (2005) Action Plan No. 28 A Vision Splendid of the Grassy Plains Extended, ACT Lowland Grassland Conservation Strategy, Environment ACT, Canberra

[5] Department of Environment, Water, Heritage and the Arts (2009b) *Background Paper to EPBC Act Policy Statement 3.12 – Nationally Threatened Species and Ecological Communities Significant Impact Guidelines for the Critically Endangered golden Sun Moth (Synemon plana),* Department of the Environment, Water, Heritage and the Arts, Canberra.

- Drought and climate change.

Table 4 Site Context Scores for Golden Sun Moth

Score	Rationale
Patch Size	
1	Patch is less than 1 ha
2	Patch is less than 10 ha
3	Patch is greater than 10 ha
Patch Shape	
1	Highly irregular shape
2	A moderately irregular shape
3	A simple shape approaching a square or circle in configuration
Isolation / Connectivity	
1	More than 200 m to the nearest golden sun moth population would indicate the population is isolated and has no capacity for natural recolonisation. It should be noted however that given females are very poor fliers, recolonisation even between very closely associated sites is potentially unlikely. Regardless, this factor is considered important as the ability for males to move between occupied patches is an indication of connectivity and the potential for genetic interchange.
2	Less than 200 m but more than 20 m between patches would indicate some potential for movement between sites however this may also be limited by other factors that golden sun moth find insurmountable.
3	20 m or less separation across suitable ground would indicate ready potential for movement of males between patches.
Surrounding Threats	
0	Threat absent
1	Low intensity threat (2 or less threats)
2	High intensity threat (3 or more threats)

5.3 Species Stocking Rate

Stocking rates are based on observations of flying moths during targeted surveys. Although there is presently insufficient information to fully explain the relationship between flying moth numbers and population size, it is considered the most appropriate method for representing stocking rates.

When targeted surveys have not recently been completed during the appropriate flying season at the site, conservative assumptions based on historical results have been made.

Table 5 Species Stocking Rates for Golden Sun Moth

Quality	Rationale
0	No records in potential habitat
1	Very low numbers of golden sun moth observed during surveys (1 or less per minute)
2	Low number of moths observed (5 or less per minute)
3	Low to Moderate number of moths observed (5 - 10 per minute)
4	Moderate to high number of moths observed (10 - 20 per minute)

Quality	Rationale
5	High numbers of moths observed (20 or more per minute)

5.4 Gaps and Assumptions

As the ecological surveys completed for the impact site, and the offset site differ in methodology, based on their respective survey guidelines (i.e. EPBC Act Survey Guidelines for the impact site, and the BBAM for the offset site), there are some metrics where data is not available for the offset site.

In this case, we are able to set the lowest available score for the offset site, to result in a conservative outcome, and ensure the offset site is not overvalued. These 'assumed' scores are highlighted in the following sections.

5.5 Offset Calculator Inputs

The following table uses the above metrics to demonstrate the performance of the proposed golden sun moth offset against the Commonwealth's offset calculator. Cells highlighted in orange indicate where data assumptions have been made for the offset site.

Table 5.6 Performance of the Proposed Golden Sun Moth Offset

Variable	Value	Rationale							
Summary of Quality									
Impact Area	1.58 ha	Direct impact to 1.58 hectares of golden sun moth habitat.							
		ID	**Area (ha)**	**Site Condition**	**Site Context**				**Stocking Rate**
					Isolation	**Shape**	**Threats**	**Size**	
		Canberra Brickworks	1.58	3/5 Open grassland, exotic dominated, low diversity.	2/3 Within 200 m of other patches, not well connected.	1/3 Very irregular.	2/2 High threats.	2/3 <10 hectares.	2/5 Low.
Quality of Impact Area	5	A weighted quality score of 5 has been determined by considering the site condition, context, and stocking rates of the impact area, weighted by the size of the patch. This data has been transparently shown in the above section.							
Available Offset	34.8 ha	Offset contains 34.8 hectares of golden sun moth habitat. This has been allocated 247 species credits. i.e. the site has generated 7.1 credits per hectare of golden sun moth habitat.							
Offset Area	TBD	Proposed direct offset at Panorama BioBanking Site in Googong, NSW. Contains up to 34.8 hectares of golden sun moth habitat.							
		ID	**Total Area (ha)**	**Site Condition**	**Site Context**				**Stocking Rate**
					Isolation	**Shape**	**Threats**	**Size**	
		Panorama BioBanking Site	34.8	4/5 Open grassland, mixed native and exotic species, moderate diversity.	1/3 Well connected within site, but limited understanding of regional context.	1/3 Very irregular.	1/2 Low intensity threats.	3/3 >10 hectares.	1/5 Very low. Conservative as recurring golden sun moth counts have not

<table>
<tr><th>Variable</th><th>Value</th><th>Rationale</th></tr>
<tr><td></td><td></td><td>been conducted.</td></tr>
<tr><td>Quality of Offset Area</td><td>5</td><td>A weighted quality score of 5 has also been determined for the offset area by considering the site condition, context, and stocking rates of the overall offset area, weighted by the size of the habitat.
A conservative species stocking rate of ‘low’ has been applied as no ongoing annual counts of golden sun moth have been undertaken, following confirmation of species presence (the requirement under the BBAM).
A conservative site context score for isolation has also been applied, as we do not have detailed wider habitat mapping although there are numerous species records within a 5 kilometre radius, including in Jerrabomberra and Hume/Environa.</td></tr>
<tr><td colspan="3">
<table>
<tr><th></th><th colspan="2">Raw
(weighted scores by area)</th></tr>
<tr><th></th><th>Impact</th><th>Offset</th></tr>
<tr><td>Site Condition</td><td>3</td><td>4</td></tr>
<tr><td>Stocking Rate</td><td>2</td><td>1</td></tr>
<tr><td>Site Context (totals)</td><td>6</td><td>7</td></tr>
<tr><td>Isolation</td><td>2</td><td>1</td></tr>
<tr><td>Shape</td><td>1</td><td>1</td></tr>
<tr><td>Threats</td><td>2</td><td>1</td></tr>
<tr><td>Size</td><td>2</td><td>3</td></tr>
</table>
<table>
<tr><th></th><th colspan="2">Transformed
(scores out of 10)</th></tr>
<tr><th></th><th>Impact</th><th>Offset</th></tr>
<tr><td>Site Condition</td><td>6</td><td>8</td></tr>
<tr><td>Stocking Rate</td><td>4</td><td>2</td></tr>
<tr><td>Site Context</td><td>5</td><td>6</td></tr>
<tr><td>Quality</td><td>5</td><td>5</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Offset Calculator</td><td></td></tr>
<tr><td>Time over which loss is averted</td><td>20</td><td>This is the maximum time period over which the guide is designed to function, it is appropriate for permanent impacts.</td></tr>
<tr><td>Risk of loss without offset</td><td>5%</td><td>There are a number of factors that could influence the risk of loss of a site, including:
• presence and strength of formal protection mechanisms currently in place on the proposed site (e.g. zoning, restrictive covenants or state vegetation clearing laws)
• presence of pending development applications, mining leases or other activities on the proposed offset site that indicate development intent and likelihood
• average risk of loss for similar sites.
The risk of loss (distinct to the future quality without offset) is considered to be low for this site, as the process to protect the site as a conservation area has already been progressed, therefore risk of development is low, however it is still subject to factors that contribute to the risk of loss of the species, including weeds, grazing and pasture improvement etc.</td></tr>
<tr><td>Risk of loss with offset</td><td>1%</td><td>Management actions implemented as a result of the purchase of BioBanking credits would include a management framework designed to strategically address golden sun moth. Only unforeseeable factors would result in the loss from the habitat offset site.</td></tr>
</table>

Variable	Value	Rationale
Time until ecological benefit	5	This assessment is considerate of the time that it would take to see a measurable improvement in quality of the existing golden sun moth habitat patches with active management, required under the BioBanking agreement (refer **Section 6**).
Future quality without offset	4	*Future quality without offset* is the estimate of the habitat quality based on a business as usual scenario – that is, considering current management practices, use of the site and historic trends for the quality of golden sun moth habitat in the region. The drop in quality from 5 to 4 is conservative, and based on other sites of known golden sun moth habitat in the ACT Region and reflects the following assumptions: • Increase in exotic species, decrease in diversity, and decrease in quality of grassland structure • Increase in threats.
Future quality with offset	6	A very conservative estimate of the future quality of the BioBanking site has been assumed. This is because under the scheme, the Proponent cannot influence future habitat quality improvement. The Proponent has no ongoing input into the management of the land or monitoring/reporting under the scheme. Rather, that is a requirement of the property owner/site steward, who must then manage the site under a Biodiversity Stewardship Agreement, which places a covenant over the land. The increase in quality from 5 to 6 is conservative, and reflects the following assumptions based on the management measures specified in the BAR: • Increase in native species diversity, and maintenance of open grassland structure • Improvement in shape complexity through offset site management requirements (Section 4.1) • Decrease in threats, primarily weeds, grazing, and regeneration. This score makes no assumptions on the increase of habitat area, or increased species stocking rates.

Quality increase
Quality decrease

	Raw (weighted scores by area)	
	Offset (without)	Offset (with)
Site Condition	3	5
Stocking Rate	1	1
Site Context (totals)	*6*	*9*
Isolation	1	1
Shape	1	1
Threats	2	0
Size	3	3

	Transformed (scores out of 10)	
	Offset (without)	Offset (with)
Site Condition	6	8
Stocking Rate	2	2
Site Context	5	9
Quality	**4**	**6**

Variable	Value	Rationale
Confidence in result	60 - 75%	Confidence in the low risk of loss is high (75%) due to the proven effectiveness, compliance and reporting requirements under the BioBanking agreement. Confidence in the quality predictions is moderate (60%) as the Proponent cannot influence future habitat quality improvement. To mitigate this uncertainty, very conservative estimates have been used.
Overall Performance	104.47%	This offset provides 100% of the direct offset required for the project.
Area of Offset Required	9.5 ha	This amount of offset habitat, with the criteria assessed within provides 100% of the offset required.
Credits Required	68 credits	-

6.0 Assessment Against Offset Policy

An environmental offset proposed for a project being assessed under the ACT / Commonwealth Bilateral process must demonstrate compliance with the relevant offset policies.

The offset principles for the EPBC Act and ACT Offset Policies are consistent. Compliance of this proposed offset against each of these principles is provided below.

Table 7 Assessment Against Offset Principles

Offset Principles	Response
Suitable offsets must:	
Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action	The proposed offset delivers an overall conservation outcome by ensuring the long term protection of 9.5 hectares of golden sun moth habitat within an area being managed for conservation, to compensate for the loss of 1.58 hectares of habitat within exotic grassland in an urban setting, with low long term viability.
Be built around direct offsets but may include other compensatory measures	This offset comprises 100% direct offsets. No other compensatory measures are proposed.
Be in proportion to the level of statutory protection that applies to the protected matter	The performance of the offset has been considered against the Offset Assessment Guide (the Offset Calculator), which determines the appropriateness of an offset or avoidance action against the species' annual probability of extinction (based on IUCN category definitions). Golden sun moth was assessed using a 6.8% annual probability of extinction. Use of the guide confirms that the offset measures proposed are proportionate to the level of statutory protection that applies to the species.
Be of a size and scale proportionate to the residual impacts on the protected matter	The performance of the proposed offset has been considered against the Offsets Assessment Guide which determines the appropriateness of an offset against an impacted MNES. The proposed offset provides 104.5% direct offset which is considered to be of a size and scale proportionate to the impacts to golden sun moth.
Effectively account for and manage the risks of the offset not succeeding	The proposed offset involves the purchase of credits generated under the BioBanking scheme, which are now managed under a Biodiversity Stewardship Agreement (refer Section 4.2). Annual reporting and compliance are the responsibility of the site steward, and are overseen by the BCT, a statutory body, to ensure the ongoing success of the offset. The Offsets Assessment Guide takes into consideration the risk of the offset not succeeding through the 'confidence in result' metrics. As the Proponent has no ability to influence the long term management of the offset following the purchase of credits, a moderate confidence level has been applied, however it is important to note that the BioBanking scheme and its successor, the BOS, have both been accredited as offset methodologies by the Commonwealth, and as such their governance, auditing and compliance processes are considered adequate to effectively account for and manage the risks of the offset not succeeding.

Offset Principles	Response
Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs	The proposed offset is considered to be additional to what is required by the statutory duty of care of the Proponent, which would be a 100% direct offset, or a 90% direct offset and other compensatory measures.
Be efficient, effective, timely, transparent, scientifically robust and reasonable	The proposed offset would be delivered in a timely manner. In the interests of demonstrating a commitment to this offset, the Proponent has already secured 35 credits, with an option agreement for an additional 65 credits in place. This will ensure that all required credits will be purchased prior to any impact occurring. The BioBanking scheme was accredited under the EPBC Act, providing assurance that it is a robust and transparent process. The calculation of offset requirements is transparently presented in this document, highlighting where assumptions have been made where information gaps or differences in methodologies occur. In each of these instances, a conservative assumption has been made to ensure that the offset is not overvalued, and is scientifically robust.
Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	As above, and in Section 4.2, the BioBanking scheme and its successor, the BOS, have both been accredited as offset methodologies by the Commonwealth, and as such their governance are considered transparent and readily measured, monitored, audited and enforced. This monitoring, auditing and enforcement will occur between the BioBanking Site's owner, and the BCT. The Proponent will have no ongoing management responsibilities over this offset following the purchase of credits.

Based on this assessment, the proposed offset is consistent with the EPBC Act and ACT Offset Policies.

Supplementary Environmental Site Assessment

Canberra Brickworks

Yarralumla ACT



Prepared for:	DOMA Group
Date:	3 July 2021
Reference No:	JC0546
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AGON DOCUMENT CONTROL

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Written			**Approved**	
			David Probert Principal Environmental Scientist	
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01	DRAFT	08/07/2021	J.O and H.T	DP

Rev No	Copies	Recipient
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1.0 INTRODUCTION

1.1 Preamble

DOMA Group (DOMA) engaged Agon Environmental Pty Ltd (Agon) to conduct a Supplementary Environmental Site Assessment (SESA) at the Canberra Brickworks defined as Block 764 Canberra Central and Block 7 Section 102 Yarralumla (the site, see Figure 1). It is understood that DOMA intend to the redevelop the site as a mixed-use development inclusive of residential, commercial and public space areas. Specific development Precincts are presented in **Section 2.1**.

A number of environmental investigations have been undertaken at the site; however, data gaps were identified in Arcadis (2017) *Data Review and Data Gap Analysis and Sampling, Analysis and Quality Plan, V03 dated 26 June 2017* (the SAQP). Accordingly, this SESA has been prepared to address the data gaps identified in the SAQP and is subject to review by the ACT EPA approved Contaminated Land Site Auditor Dr Lange Jorstad of Geosyntec Consultants in preparation of a Site Audit Statement (SAS) of the site.

In additional, this SESA presents all the contemporary and historical site assessment data with respect to the proposed development Precincts. The intent is to determine which Precincts are suitable, from a contamination perspective, for the proposed redevelopment and if any management and/ or remediation strategies are required to render any Precinct suitable for their intended uses.

For ease of review figures have been included in report with tabulated soil and groundwater analysis results provided in **Appendix A**.

1.2 Objectives

The primary objectives of the SESA are as follows:

- Identify and characterise the nature and extent of potential site contamination targeting the Areas of Environmental Concern (AECs) identified in the Arcadis (2017) SAQP.
- Determine if a potential risk exists to the identified receptors from any site contamination in context of the Development precincts.
- If required, the development of strategies to remediate and/ or manage any identified contamination and render any Precincts site suitable for the proposed redevelopment.

1.3 Scope of Work

The scope of work for this assessment comprised:

- Review of available site history data and previous findings.
- Drilling of 15 boreholes (BH01-BH15) to a maximum depth of 17 metres below ground level (mbgl). Conversion of boreholes BH101, BH103, BH104, BH105 and BH106 to groundwater monitoring wells (MW100-MW104 respectively).
- Excavation of 59 test pit locations (TP201-TP259) to a maximum depth of 5.0 mbgl.
- Completion of a groundwater monitoring event of all newly installed groundwater wells and existing groundwater wells at the site.
- Collection and laboratory analysis of soil and groundwater samples by commercial analytical laboratories for identified contaminants of concern using NATA registered methods.
- Comparison of analytical results with applicable guidelines, to provide a preliminary indication of risks to human health and/ or the environment.
- Revision of the Conceptual Site Model (CSM) presented in the Arcadis (2017) SAQP.
- Compilation of this information in this report and provision of a conclusion as to the suitability of each development Precinct for the proposed redevelopment

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1.4 Supporting Documents

Agon has reviewed the following supporting documentation in preparation of this SESA:

- Robson (2015) Stage 1 Environmental Site Assessment. Canberra Brickworks Remediation Project, Block 1 Section 102 Yarralumla, Canberra Central ACT. February 2015 (revised March 2015). Ref 9623_EAR_Stage 1 ESA Report_20150312.
- SMEC (2014) Preliminary (Environmental) Site Investigation, Canberra Brickworks. 18 February 2014. Ref 3002369.
- SMEC (2016a) Canberra Brickworks: Detailed Environmental and Geotechnical Site Investigation. Canberra Brickwork Precinct, Yarralumla, ACT. 31 October 2016. Ref 3002523.
- SMEC (2016b) Canberra Brickworks: Groundwater Investigation-Addendum Report. Canberra Brickwork Precinct, Yarralumla, ACT. Ref 3002523.
- Arcadis (2017) Data Review and Data Gap Analysis and Sampling, Analysis and Quality Plan, V03.

1.5 Legislative Framework

The DSI has been prepared in general accordance with the guidelines endorsed by the ACT EPA (2017) Contaminated Sites Environment Protection Policy (CSEPP).

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2.0 SITE DETAILS

2.1 Site Identification

Formal identification of the site is summarised below in Table 1.

Table 1: Site Identification

Site Address	End of Denman Street, Yarralumla, ACT
Allotment Description	Block 7 Section 102, Yarralumla Block 764, Canberra Central and Block 1 Section 102 Yarralumla Blocks 11 & 12 Section 38, Fyshwick, Canberra ACT
Land Zoning	CZ6: Leisure and Accommodation RZ1: Suburban PRZ2: Restricted Access Recreation Zone
Current Land Use	Vacant
Proposed Land Use	Mixed use including residential, commercial and public space. Development Precincts are defined as follows: • Heritage Core – Commercial Land use. • Road and Open Space Network • Precincts 1, 2, 3, 4, 5, 6, 7, 8, 9 – Medium Density Residential. • Precinct 10 & 11 – Low Density Residential. The development Precincts are shown in Figure 1.
Total Area	16 Hectares or thereabouts

2.2 Physical Setting and Current Land Use

The site is situated in the division of Yarralumla within the Canberra Central district and is bound by the Royal Canberra Golf Course (west and north), Bentham Street (north) and low density residential (south). Access to the site is made via Denman Street (south). The site itself is the former Canberra Brickworks and comprises:

- Former Brickworks (western portion of the site), several remnant buildings including 6 kilns, 4 stack houses, office building and amenities, 3 machinery sheds, workshops, boiler house, a substation, a powerhouse, storage sheds and other minor buildings. This portion of the site was previously occupied by Thor's Hammer, a wood recycling business.
- The quarry (eastern portion of the site) includes a large grassed area with several exposed natural siltstone bedrock features which has been levelled with an unknown amount of fill and bricks which have also been formed into mounds.
- The demolished and overgrown workers accommodation area (south).
- Vacant areas (south).

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Figure 1: Site Location and Precinct Plan
Source: ACTmapi (2021)

2.4 Surrounding Land Uses

Surrounding areas comprise the suburb of Yarralumla. These suburbs include commercial, residential, community and open urban land uses as permitted under the Territory Plan Zoning. The immediate surrounding land uses to the site are summarised below in Table 2.

Table 2: Surrounding Land Use

Direction	Land Use
North	Lane Poole Place and Bentham Street, residential properties surrounding the roads and beyond
East	Schomburgk Street, Woollis Street and Bentham Street with associated residential properties
South	Denman Street leads to and bisects the northern and southern portions of the Site, beyond which is Block 7 Section 102 comprising numerous trees and open spaces. Cotter Road lies beyond the trees.
West	Treed area, beyond which lies the Royal Canberra Golf Course

2.5 Site Geology, Hydrology and Hydrogeology

The environmental setting of the site is summarised from SMEC (2016) and Arcadis (2017) as follows:

- The Geology of Canberra 1:100, 000 Sheet 8287 (1992) shows that the Canberra brickworks is underlain by calcareous and tuffaceous mudstone and siltstone of the Late Silurian Yarralumla Formation. The formation outcrops within multiple areas within the site.
- Review of the 1:100,000 Hydrology of the Australian Capital Territory and Environs (1984) indicated that the groundwater beneath the Site is generally present in fractured rock. The quality tends to be variable and was described as 500 – 1,000 mg/ L TDS. The yield was described as approximately 1.0 L/ s.
- The topography of the Site is variable due to historical brick material extraction works. The site generally slopes to the west north-west. SMEC (2016) identified a total of five catchments in the site.
- The southern areas of the site gradually slope to the southwest, south, and southeast. The topography of this area has been modified to include the Cotter Road and Yarra Glen/ Adelaide Avenue. Surface water flow has been mapped to generally flow south towards Yarralumla Creek which discharges into the Molonglo River.

3.0 HISTORICAL INFORMATION

3.1 General History

The Canberra Brickworks was operated between 1913 and 1976. Since its closure, it has remained largely vacant with the exception of a commercial wood working/ recycling business known as Thor's Hammer. The brickworks itself contains a range of structures/ areas associated with the brick production process; for the purpose of this SESA, these historical areas at the site have been extracted from the SMEC (2014) PSI and shown in Figure 2.

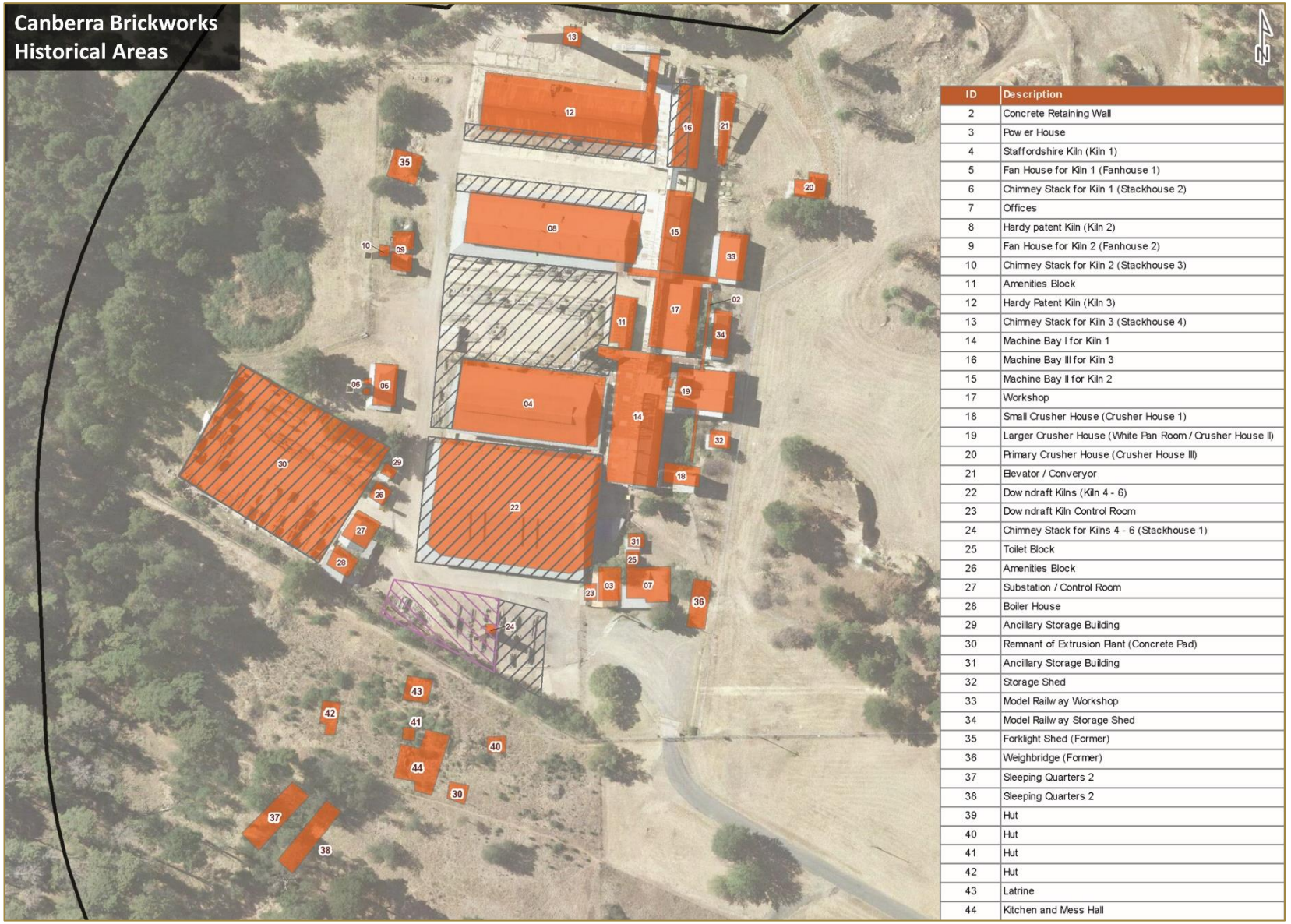
3.2 Previous Environmental Investigations

A detailed account of the site history is provided in Arcadis 2017 (SAQP); in summary:

- Contaminants of Potential Concern (CoPC) were generally below adopted criteria. Exceedances of Lead and Zinc were reported in isolated areas. Bonded asbestos was also identified in an area known as the Asbestos Dump and surficially around the brickworks.
- Potential risk to ecological receptors and human health associated with the brickworks, quarry, and former worker's accommodation was considered low-moderate.
- The southern areas of the site typically comprised natural soil grading to weathered rock. As analytical results were below the adopted site criteria, SMEC (2016) considered the potential for contamination to be present as low.
- Based on the results of the surface water and groundwater assessment SMEC (2016) recommended additional surface and groundwater monitoring to further investigate the presence of benzene in water.

3.3 Areas of Environmental Concern

The Arcadis (2017) SAQP identified the following AECs which warranted further assessments. See Table 3 below.



ID	Description
2	Concrete Retaining Wall
3	Pow er House
4	Staffordshire Kiln (Kiln 1)
5	Fan House for Kiln 1 (Fanhouse 1)
6	Chimney Stack for Kiln 1 (Stackhouse 2)
7	Offices
8	Hardy patent Kiln (Kiln 2)
9	Fan House for Kiln 2 (Fanhouse 2)
10	Chimney Stack for Kiln 2 (Stackhouse 3)
11	Amenities Block
12	Hardy Patent Kiln (Kiln 3)
13	Chimney Stack for Kiln 3 (Stackhouse 4)
14	Machine Bay I for Kiln 1
16	Machine Bay III for Kiln 3
15	Machine Bay II for Kiln 2
17	Workshop
18	Small Crusher House (Crusher House 1)
19	Larger Crusher House (White Pan Room / Crusher House II)
20	Primary Crusher House (Crusher House III)
21	Elevator / Converyor
22	Dow ndraft Kilns (Kiln 4 - 6)
23	Dow ndraft Kiln Control Room
24	Chimney Stack for Kilns 4 - 6 (Stackhouse 1)
25	Toilet Block
26	Amenities Block
27	Substation / Control Room
28	Boiler House
29	Ancillary Storage Building
30	Remnant of Extrusion Plant (Concrete Pad)
31	Ancillary Storage Building
32	Storage Shed
33	Model Railw ay Workshop
34	Model Railw ay Storage Shed
35	Forklight Shed (Former)
36	Weighbridge (Former)
37	Sleeping Quarters 2
38	Sleeping Quarters 2
39	Hut
40	Hut
41	Hut
42	Hut
43	Latrine
44	Kitchen and Mess Hall

Figure 2: Historical Areas
Source: SMEC (2014)

Table 3: Areas of Environmental Concern

AEC	CoPCs	Description
AEC#01 Kilns	Metals BTEX PAHs Dioxins TRH	Sands, dust, surface areas located within the Kilns. This media reported elevated concentrations of Lead and Zinc in excess of the adopted ASC (2013 NEPM HIL D criteria).
AEC#02 Surface Soils Kiln 1 Fan House	Metals	Surface soils west of the fan house for Kiln 1 reported elevated concentrations of Zinc and Lead.
AEC#03 Quarry Fill	Metals OCP/ OPP TRH PCBs BTEX Asbestos. PAHs	Soil sampling within the infilled quarry has not identified the presence of any gross chemical contamination. However, there is uncertainty in the exact nature, extent and composition of filling activities. Further assessment was recommended to reduce this uncertainty.
AEC#04 Groundwater Quarry Area	Metals PAHs TRH PCBs BTEX	Defined as the groundwater directly below the former Quarry which has been extensively infilled. Insufficient historical assessment has been performed at this AEC.
AEC#05 Brickworks Soils	Metals PAHs TRH PCBs BTEX	Defined as general soils around and below the brickworks (i.e., the Heritage Core area). Insufficient historical assessment has been performed at this AEC.
AEC#06 Groundwater Brickworks Area	Metals PAHs TRH PCBs BTEX	Defined as the groundwater directly below the brickworks (i.e., the Heritage Core area). Insufficient historical assessment has been performed at this AEC.
AEC#07 UST	Metals BTEX TRH PAHs	A former UST was identified by SMEC (2016). Insufficient historical assessment has been performed at this AEC.
AEC#08 Asbestos Dump	Metals OCP/ OPP TRH PCBs BTEX Asbestos. PAHs	A mound of soil, anecdotally identified as containing asbestos building material debris, is present in the northern portion of Precinct 1 and was subject to remedial works by Robson (2015) which removed majority of the asbestos materials. Further assessment of the mound and any residual asbestos impacts is required.
AEC#09 Fill Whole Site	Metals OCP/ OPP TRH PCBs BTEX Asbestos. PAHs	Extensive fill material has been identified across the site. There is uncertainty in the exact nature, extent and composition of filling activities. Further assessment was recommended to reduce this uncertainty.
AEC#10 Residential Precincts	Metals OCP/ OPP TRH PCBs BTEX Asbestos. PAHs	The location of the development areas was not known at the time of SMEC (2016). Accordingly additional targeted locations were proposed.
AEC#11 Benzene in Groundwater	BTEX	SMEC (2016) detected benzene (albeit at low concentrations) in groundwater at monitoring wells M2 and M7. Temporal and spatial variation of benzene concentrations within groundwater at the site have not been fully assessed.

4.0 ASSESSMENT CRITERIA

The Arcadis (2017) SAQP presents rational for the appropriate groundwater and soil assessment criteria for assessing the site, these have been reviewed by Agon and refined as follows:

Soil

- ASC (2013) NEPM Ecological Investigation Levels (EILs):
  - Urban residential and public open space – Values adopted from Arcadis (2017) SAQP.
  - Commercial/ Industrial – Generated from data sourced from Robson (2015).
- ASC (2013) NEPM Ecological Screening Levels (ESLs):
  - Urban residential and public open space (fine soil texture).
  - Commercial/ industrial (fine soil texture).
- ASC (2013) NEPM Human Health Investigation Levels (HILs):
  - HIL A – Low Density Residential (soil access).
  - HIL B – Medium Density Residential (limited soil access).
  - HIL C – Recreational Land Use.
  - HIL D – Commercial/ Industrial Land Use.
- ASC (2013) NEPM Human Health Screening Levels (HSLs) with a Clay geology:
  - HSL A – Low Density Residential (soil access).
  - HSL B – Medium Density Residential (limited soil access).
  - HSL C – Recreational Land Use.
  - HSL D – Commercial/ Industrial Land Use.

Groundwater

- ASC (2013) NEPM: Groundwater Investigation Levels (EILs):
  - Groundwater Investigation Levels (EILs) - Freshwater.
  - HSLs (Clay) for petroleum hydrocarbon vapour intrusion depth to water >8mbgl.
- ACT EPA (2017) 'Environmental Guidelines for service station sites and hydrocarbon storage'. These provide assessment criteria for TPH, BTEX and lead.

The applicability of the assessment criteria to each development Precinct is shown below in Table 4.

Table 4: Adopted Assessment Criteria

Precinct	Description	Criteria
Heritage Core	Comprised of the brickwork's kilns, workshops and general areas. Area to be used for mixed commercial.	EIL (Commercial/ Industrial) ESL (Commercial/ Industrial) HIL D HSL D (Clay)
Open Space and Road Network	Proposed open public spaces (Quarry Park, the Remnants) and road network.	EIL (Urban Residential) ESL (Urban Residential & Open Space) HIL C HSL C (Recreational, Clay, 0-1m)
Precincts 1-9	Predominately comprised of medium density residential land uses with underground carparking. As the area will comprise underground carparking EILs/ ESLs have not been considered.	HIL B HSL B (Clay, 0-1m)
Precincts 10-11	Proposed low density residential allotments.	HIL A HSL A (Clay, 0-1m) EIL Urban Residential

5.0 FIELD PROGRAM

The sections that follow provide a summary of the assessment completed as part of the SESA.

5.1 Sampling Plan and Rationale

The sampling plan is detailed below in Table 5 with the SESA sample locations depicted in Figure 3. Previous investigation sample locations are also provided as Figures 4, 5 and 6.

Table 5: Sampling and Analysis Plan

Sample Location	Target Area	Rationale
AEC#01 – Kilns (Surface Soils)		
KS1-KS6 CB1-CB11	Surface sands and clay base of the Kilns (Heritage Core)	Both kiln dust samples and the clay base beneath the kilns were sampled to provide further insight into concentrations of CoPCs.
AEC#02 – Kiln 1 Fan House (Surface Soils)		
TP257	Kiln 1 Fan House	Test pit 257 was advanced adjacent to the Kiln 1 fan house which reported elevated concentrations of Zinc and Lead.
AEC#03 – Quarry Fill		
TP201-TP208	Quarry Fill	Sample locations were distributed across the quarry area to provide site wide coverage and intercept any potential soil contamination arising from uncontrolled fill across the site.
AEC#04 – Groundwater (Quarry Area)		
M4, M5 M6	Groundwater (Quarry)	All monitoring wells within the quarry were sampled as part of this SESA. M1 was observed to be dry.
AEC#05 - Brickworks Soils		
BH101, BH102 BH104-BH109	Brickworks (Heritage Core)	Boreholes were advanced across the brickworks area.
AEC#06 - Groundwater (Brickworks Area)		
MW100-MW104	Brickworks (Heritage Core)	Five wells were installed within the historical brickworks area. These wells (sampled in conjunction with existing groundwater wells) were considered sufficient to assess the nature and extent of CoPCs in groundwater beneath the site.
AEC#07 - UST		
BH103	UST	BH103 was advanced in the area to assess for any hydrocarbon impacts to soil as a result of the underground storage of fuels.
AEC#08 - Asbestos Dump		
TP246-TP252	Asbestos Dump (Precinct 1)	Test pits advanced within the area identified as the ‘asbestos dump’ to determine quality of soils and degree of asbestos impacts.
AEC#09 – Fill (Whole Site)		
TP200-TP259 BH100-BH115	General site area	Fill material was sampled where encountered in all sample locations.
AEC#10 – Residential Precincts		
TP211-TP225 TP231-TP245	General site area	Further test pitting was conducting in footprints of the precincts to provide insight into the suitability of site soils for the proposed land uses.
AEC#11 -Benzene in Groundwater		
M2, M3 MW100-MW104	Groundwater (Brickworks)	Groundwater wells were assessed for benzene to determine the nature and extent of these impacts to groundwater (if any).

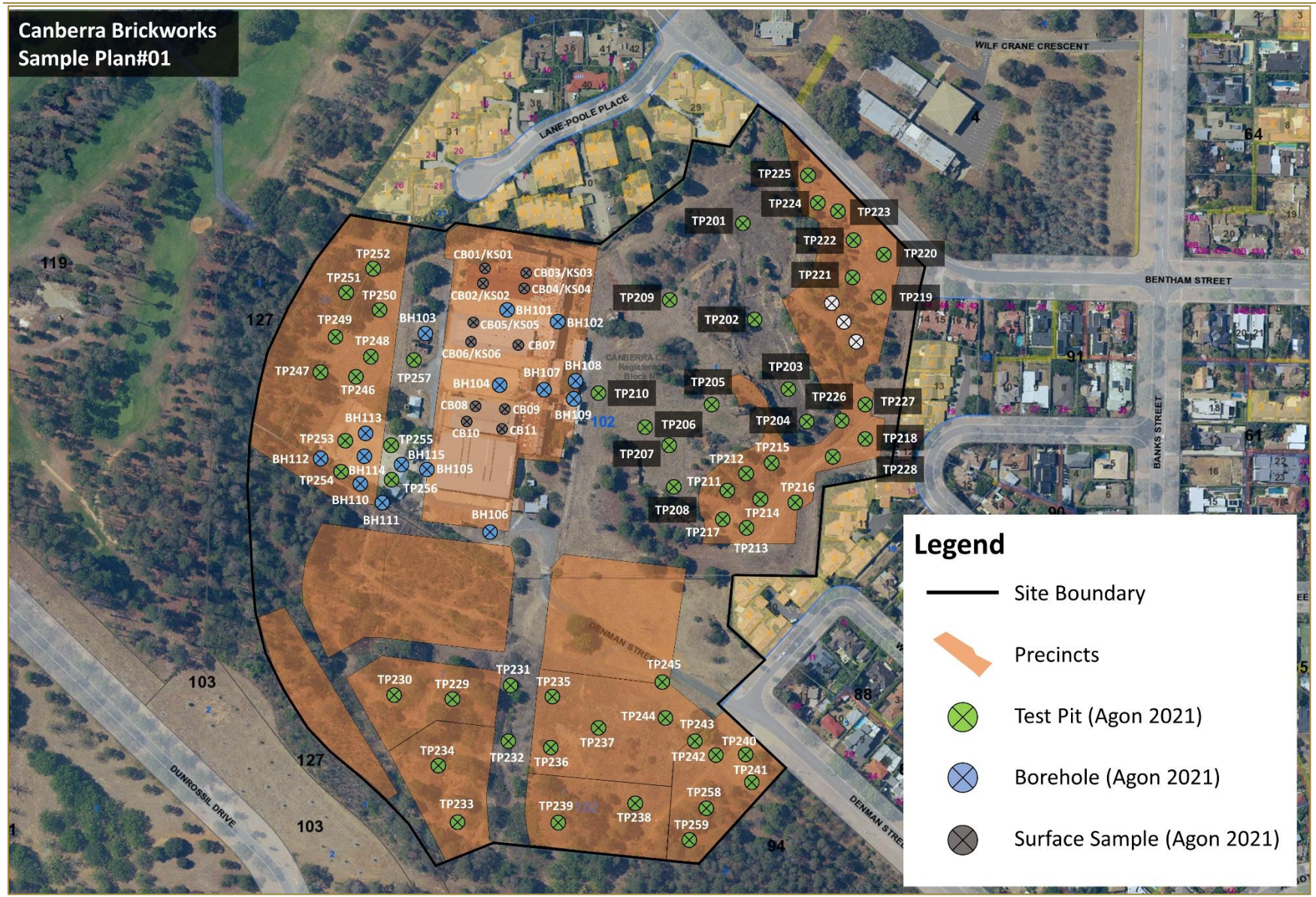


Figure 3: Agon (2021) SESA Sample Locations

Source: ACTmapi (2021)

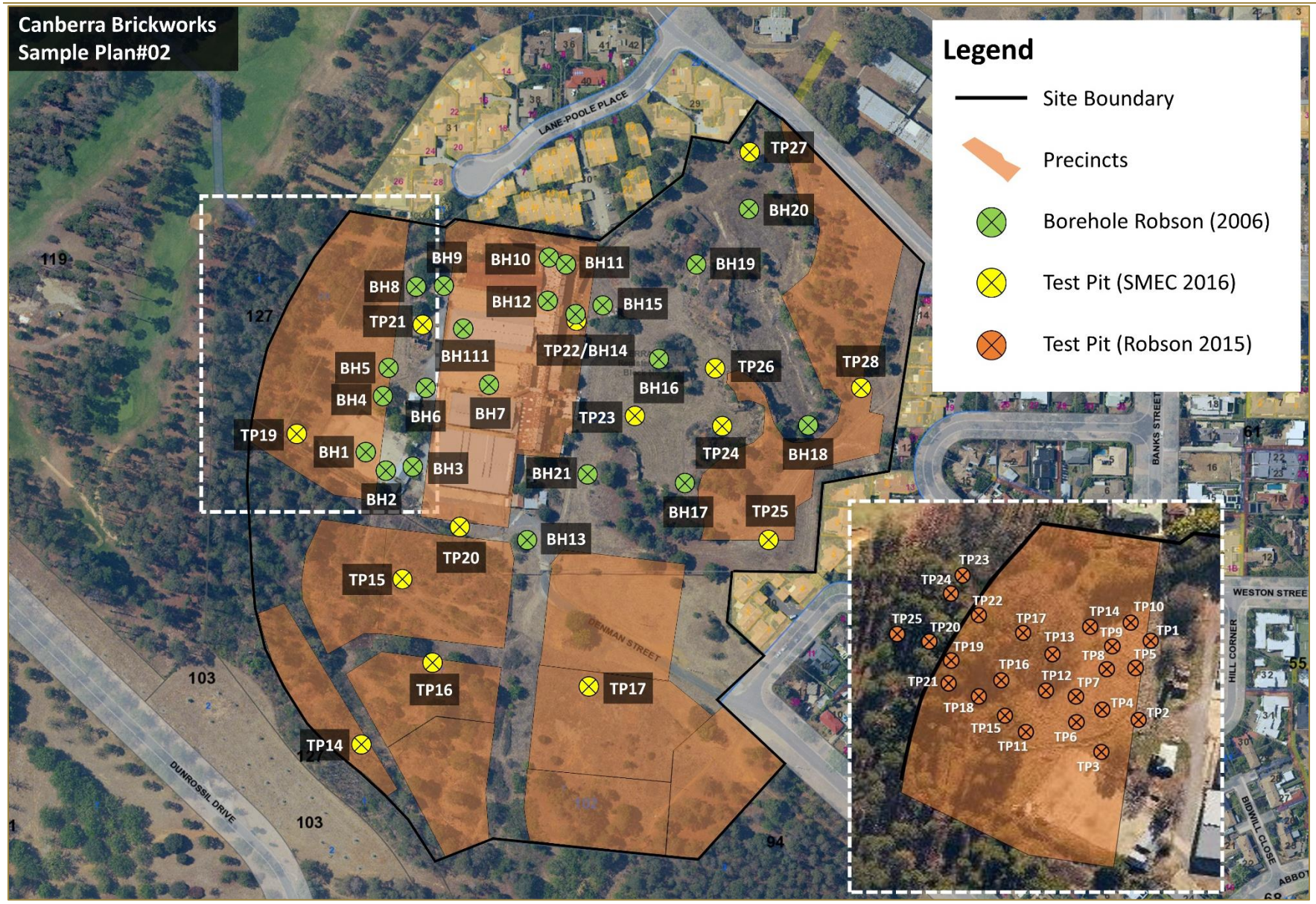


Figure 4: **SMEC (2013) and Robson (2006 and 2015) Sample Locations**
Source: ACTmapi (2021)

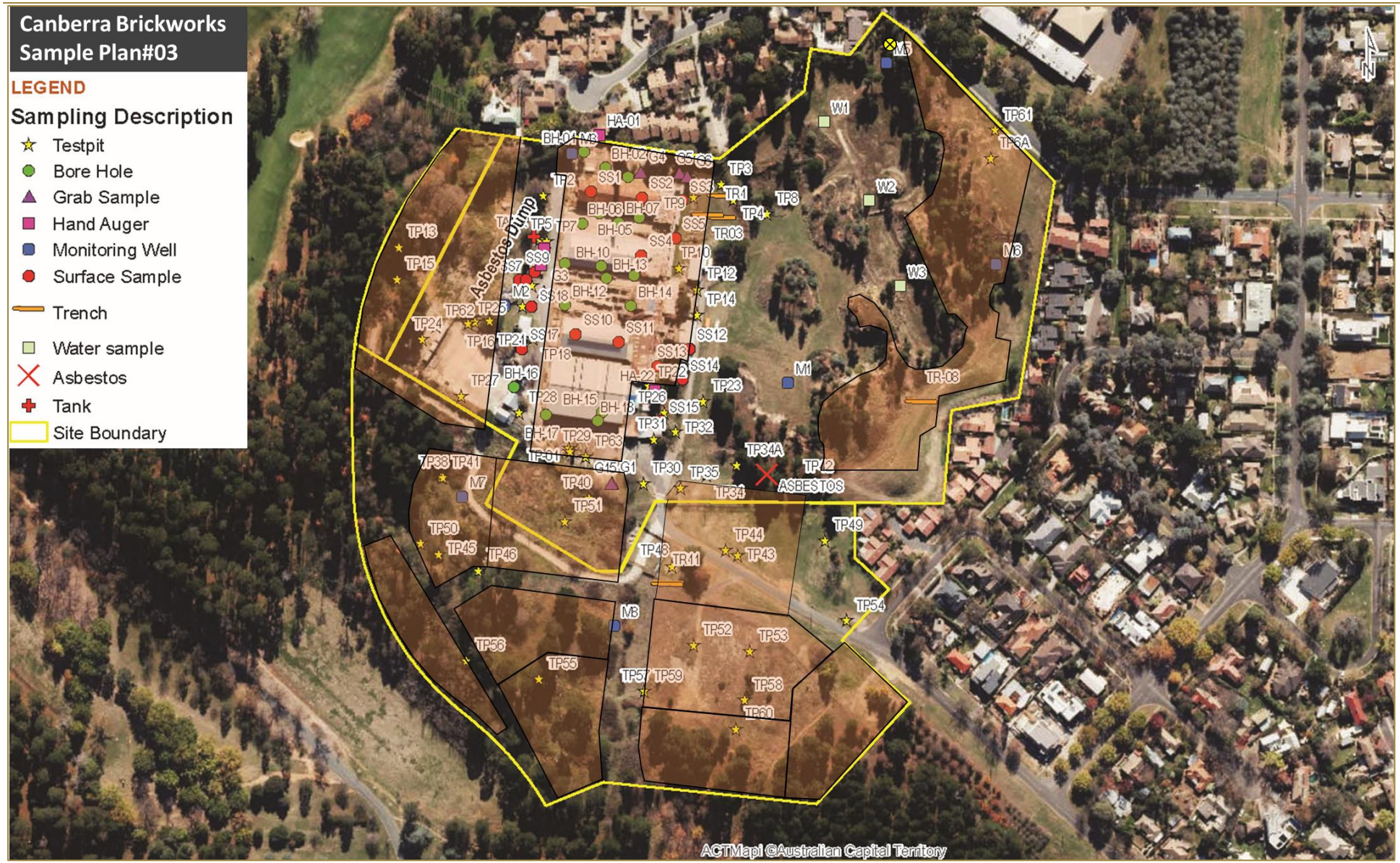


Figure 5: **SMEC (2016) Sample Locations**
Source: ACTmapi (2021)



Figure 6: Groundwater Well Locations
Source: ACTmapi (2021)

5.2 Field Methodologies

The soil and groundwater investigation were undertaken between March 2021 and May 2021. Field methodologies employed are described below in Table 6.

Table 6: Soil Investigation Methodology

Task	Description
Service Location	Prior to the commencement of soil investigations, the site was cleared for underground utilities by licensed underground service locators. Copies of Dial Before You Dig plans were obtained and reviewed onsite during underground service locating.
Test Pits	Test pits were excavated by contractor D-Group using a 7 and 30 tonne excavator. Surface samples were collected by hand using nitrile gloves, while deeper samples were collected from fresh soil material from the excavator bucket, ensuring samples were collected from fresh soil that had not contacted the bucket surface. Upon completion, test pits were backfilled with the excavated soil and compacted (tyre rolled). Photographs showing site conditions are provided in **Appendix B**.
Boreholes **Groundwater Wells**	Boreholes were drilled by Numac using a track mounted Geoprobe utilising solid stem augers and air hammer drilling methodologies. Samples were collected by Agon from the drilling cuttings. Selected boreholes were converted to groundwater monitoring wells (MW100-MW104), these wells were constructed from Class 18 uPVC 50 mm outside diameter machine threaded casing and screen (0.5 mm slots). Graded filter sand was added to approximately 0.5 m above the top of the screened interval. A minimum 0.5 m hydrated bentonite seal was added above the filter sand. Soil cores were logged in general accordance with the Australian Standard AS1726-1993 and the Unified Soil Classification System (USCS). Samples were screened in field for the presence of volatile contaminants using a calibrated PID. Borehole logs and groundwater well construction details are included in **Appendix C**.
Soil Sample Collection	Samples were typically collected from the boreholes and test pits at 0.5m, 1.0m and every 0.5-1.0m thereafter targeting changes in lithology and/ or at the presence of visual or olfactory indicators contamination. Samples were collected using disposable nitrile gloves and placed in clean laboratory provided jars. Samples were immediately placed on ice in a cooler prior to transport to the laboratory. Duplicate samples were forwarded by Eurofins to the secondary laboratory (ALS Environmental).
Groundwater Development	Development of the monitoring wells used surge methodology (bailer) to remove accumulated installation debris and improve water flow into the screened interval. Each well was purged 3 well volumes.
Groundwater Gauging	Onsite monitoring well caps were opened, the Standing Water Level (SWL) and Total Depth (TD) and presence of LNAPL (Light Non Aqueous Phase Liquids) were measured using an electronic oil separator interface probe (IP). The SWL and TD measurements were taken from each well prior to purging.
Groundwater Purging	Wells were purged using Micropurge low flow sample kits. During purging a calibrated Water Quality Meter (WQM) was used to measure water parameters, including temperature, electrical conductivity, redox, dissolved oxygen and pH. Wells which yielded sufficient groundwater were purged until the water parameters had stabilised to within 10% and at least one well volume purged. Once stabilised, purged water was considered representative of the groundwater at the Site.
Groundwater Sampling	Groundwater samples were collected directly from the tubing connected to the Micro purge pump into laboratory prepared sample bottles and kept chilled. Samples collected for metals analysis were field filtered (0.45 micron filter), prior to filling acid preserved laboratory provided sample bottles. Groundwater wells M4, M5 and M6 all had less than a metre of water present so were sampled using a Hyrdasleeve. no-purge grab sampler. The Hydrasleeve was lowered into the monitoring well at a sufficiently slow speed (<0.3m/ s, in accordance with manufacturer's specifications) to minimise disturbance before being left to stabilise for a minimum of 5 minutes. After stabilising (approximately 5 minutes), the Hydrasleeve was removed at a minimum speed of 0.3m/ s to allow the check valve to open. Samples were transferred from Hydrasleeves into the sample containers using a discharge tube.
QA/ AC	An evaluation of QA/ QC is presented in **Appendix D**.
Laboratory Method	All primary and QA/ QC samples were submitted to Eurofins Laboratories (NATA accreditation No. 1261). Inter-laboratory duplicates were submitted to ALS Laboratories (NATA accreditation no. 2562). Laboratory analysis was conducted in accordance with the requirements of the ASC NEPM (2013) and are referenced to USEPA and APHA methods.

5.3 Variations to SAQP

Overall Agon consider that the field investigation was undertaken in compliance with the Arcadis (2017) SAQP. The following additional sample locations were advanced:

- Shallow hydrocarbon odours and stained soils were observed to be present directly below the concrete slab located in the southern portion of Precinct 1. Sample locations TP253-TP27 and BH110-BH115 were advanced to determine the nature and extent of these impacts.
- BH108 and BH109 were advanced at the location of the former oil store.

6.0 RESULTS

6.1 Soil Conditions

Soil observations have been separated into the following sub areas and are supported by photographs provided in **Appendix B**:

Quarry Area

- Fill was predominantly found in the central and south-east portion of the Quarry Area.
- No fill was observed in the north-east portion (TP219-TP225) of the Quarry Area.
- Fill material typically comprised of clayey sands and gravelly sandy clays with gravels and cobbles of siltstone. The most widespread anthropological inclusions were brick materials, and these were encountered in almost all sample locations. Less frequently observed anthropogenic inclusions comprised ash, bitumen, metal waste and machinery pieces.

Brickworks (Heritage Core)

- Fill was observed in the majority of sampling points within the heritage core area and was recorded to a maximum depth of 1.5 mbgl in BH101. Fill was predominantly comprised of reworked natural clays with no anthropogenic inclusions. No evidence of anthropogenic inclusions were encountered in any sample locations.
- BH102 intercepted black stained sands directly below the surface concrete slab. The staining appeared to have an oily texture possibly related to the use of machinery lubricants associated with brick production.
- BH108 and BH109 intercepted black stained fill overlying weathered siltstone at depths between 0.5 and 1.0 m. This location was adjacent to a former above ground oil storage area, Agon noted remnant pipework originating from this area suggesting lubrication oils were plumbed from this area and distributed to machinery associated with brick production.
- Two underground fuel supply lines were found to run between the former boiler house and Kilns 4-6. These fuel lines were exposed with viscous black hydrocarbons observed around the lines suggestive of a heating oil type hydrocarbon, the fuel lines were found to terminate at the boiler house. The fuel lines are associated with the transition from coal fired kilns to hydrocarbon fuel fired kilns.

Asbestos Dump (Precinct 1)

The area known as the asbestos dump comprises a large mound of soil which was subject to remedial works in 2015. Robson (2015) detailed the removal of 323.6 tonnes of asbestos impacted soil from the surficial layer of the mound. Robson (2015) undertook further test pitting at the mound and determined the mound to contain bonded asbestos impacted soil comingled with other wastes (metal, glass, plastic, brick, tile, slag, ash and wood fragments). The asbestos impacted materials were observed to be present in a shallow (1 m) layer as well as being present in deeper pockets.

Observations made by Agon during this SESA are as follows:

- The southern portion of mound predominately comprised layers of fill free of anthropogenic inclusions.
- More frequent pockets of anthropogenic inclusions were noted in the central and northern portions of the mound. Fragments of potential bonded asbestos were observed at:
    - TP248 -2.0: A single fragment (22 g / 70 x 35 x 5 mm) of cement sheeting.
    - TP250-3.0: A single fragment (104 g / 110 x 50 x 7 mm) of cement sheeting.
- The fill mound was variable in soil types and density of anthropogenic inclusions. No other indicators of contamination (i.e., staining or odours) were observed.

Southern Portion of Precinct 1

- Hydrocarbon odours and stained soils were observed to be present directly below the former extrusion plant slab, notably in sample locations TP254, TP255, TP256 and BH111. The impacts appeared to be confined to shallow subgrade gravels directly below the concrete slab and are confined by the underlying stiff clays.
- Sample locations TP253-TP27 and BH110-BH115 were advanced to determine the nature and extent of these impacts.
- The area is east of the former boiler house (known as the extrusion plant) where two underground fuel supply lines which extend to Kilns 4-6. No evidence of a UST could be identified in the area via exploratory test pits and GPR survey. It is possible heating oil was stored in ASTs at the former extrusion plant with leaks/ spills contributing to the shallow hydrocarbon impacts encountered below the extrusion plant east of the boiler bouse.
- Agon note the exploratory test pits exposed a layer of surficial bonded asbestos (depths between 0-100mm) at a number of locations depicted in the Clearance Certificate provided in **Appendix G**. Jesco Asbestos Removalists were engaged to undertake an emu pick to remove any residual bonded asbestos on the site surface. At the completion of these works the areas were inspected by Class A Licensed Asbestos Assessor Peter Hengst (License No. AA00010) which confirmed there to be no visible surface asbestos fragments.

Southern Areas (Precincts 2-11)

- Soils encountered in the southern areas of the site consisted primarily of natural materials consisting of silts, clays and bedrock (both weathered and fresh siltstone). Clays were more prevalent in the southern areas than other sections of the site and were red-brown, pale-brown and graded to olive-brown with depth. In some locations black mottling was observed within the clay and were attributed to weathered iron specs. Bedrock consisted of siltstone that varied from grey to yellow-brown.
- Fill was observed in two distinct areas consisting of Precinct 2 and 7.
    - A shallow (200 mm) shallow mixed waste deposit was uncovered underneath a worn bituminous surface at sample location TP243 in Precinct 2. The waste deposit was observed to include a range of anthropogenic inclusions including bitumen, metals pieces, brick and a potential fragment of bonded asbestos material.
    - The western portion of Precinct 7 (TP235-TP237) had a historical bitumen hardstand which was in a very poor state of repair.

6.2 Soil Analysis Results (All Data)

All historical and contemporary (collected as part of this SESA) data has been compiled for each of the development Precincts and compared to the adopted assessment criteria identified in **Section 5**. All exceedances of the adopted criteria are detailed in Table 77.

6.2.1 Precinct 1

Tabulated soil analysis results are included in Table 1, **Attachment A** with copies of the laboratory certificates included in **Appendix E**. In summary, a total of 99 samples have been analysed from this area of the site. All soil analysis results were less than the adopted assessment criteria with the exception of concentrations of Lead and Benzo(a)pyrene (BaP) in two samples (see Table 77).

Bonded asbestos fragments were identified at the following sample locations:

- TP248 -2.0: A single fragment (22g / 70 x 35 x 5mm) of cement sheeting was confirmed to contain chrysotile, amosite and crocidolite asbestos.

- TP250-2.0: Chrysotile, amosite and crocidolite asbestos detected in weathered fibre cement fragments. Total estimated asbestos concentration in FA = 0.000071% w/ w*
- TP250-3.0: A single fragment (104g / 110 x 50 x 7mm) of cement sheeting was confirmed to contain chrysotile, amosite and crocidolite asbestos.
- TP03 (0.0-0.1): Fragments (20 x 10 x 3mm) of cement sheeting was confirmed to contain chrysotile asbestos.
- TP09 (0.0-0.1): Fragments (100 x 60 x 5mm) of cement sheeting was confirmed to contain chrysotile, amosite and crocidolite asbestos.
- Robson (2015) presumed cement sheeting to contain asbestos at sample locations TP5 (1.9-2.0), TP6 (0.9-1.0), TP13 (0.0-0.1), TP13 (0.4-0.5), TP13 (1.9-2.0) and TP13 (2.9-3.0).

Fibrous Asbestos (FA) and Asbestos Fibre (AF) (<2 mm) was also detected in one location as follows:

- TP 13: FA and AF were detected at 0.0-0.1m (0.37 % w/ w) and 1.9-2.0m (0.053 % w/ w).

The extent of remediation works undertaken by Robson in 2014 is unknown. It is probable that some of the asbestos impacts reported in Robson (2015) summarised above have been remediated and removed from site.

6.2.2 Precincts 2-9

Tabulated soil analysis results are included in Table 2, **Attachment A** with copies of the laboratory certificates included in **Appendix E**. In summary, a total of 45 samples have been analysed from these areas of the site.

All soil analysis results were below adopted assessment criteria with the exception of BaP in a sample collected at 0.2 m depth in TP 243 (see Table 77). TP243 was the location of a thin (200mm) shallow mixed waste deposit (refer **Section 6.1**) uncovered underneath a worn bituminous surface. It is probable the elevated B(a)P concentrations were a result of bitumen fragments being incorporated into the sample.

A single fragment (256g / 160 x 110 x 4mm) of cement sheeting was also detected at sample location TP243. This fragment was confirmed to contain chrysotile and amosite asbestos.

6.2.3 Precincts 10-11

Tabulated soil analysis results are included in Table 3, **Attachment A** with copies of the laboratory certificates included in **Appendix E**. In summary, a total of 46 samples have been analysed from this area of the site.

All soil analysis results were below adopted assessment criteria with the exception of a single sample for lead in TP 223 at 1 m depth (see Table 77). This sample was retrieved from 1 mbgl in a test pit that was advanced directly into natural soils. No indicators of contamination (i.e. staining, odour, anthropogenic inclusions) were observed. On this basis Agon are of the opinion the result to be anomalous and not representative of in-situ conditions in this area of the site. Further assessment is recommended to support this opinion.

6.2.4 Heritage Core

Tabulated soil analysis results are included in Table 4, **Attachment A** with copies of the laboratory certificates included in **Appendix E**. In summary, a total of 79 samples have been analysed from this area of the site. All soil analysis results were below adopted assessment criteria with the exception of those summarised in Table 77.

6.2.5 Road and Open Space Network

Tabulated soil analysis results are included in Table 5, **Attachment A** with copies of the laboratory certificates included in **Appendix E**. In summary, a total of 101 samples have been analysed from this area of the site. All

soil analysis results were below adopted assessment criteria with the exception of those summarised in Table 77.

Table 77: Soil Analysis – Exceedances of Adopted Criteria

Sample Location	Depth (m)	Contaminant	Concentration (mg/kg)	Criterion Exceeded	
				Criterion	Concentration (mg/kg)
PRECINCT 1					
BH110	1	Lead	2,600	**HIL B** **EIL Urban Residential**	1,100
TP13	0.0-0.1	BaP	9.5	**HIL B**	4
PRECINCT 2-9					
TP243	0.2	BaP	16	**HIL B**	4
PRECINCTS 10-11					
TP223	1	Lead	3,400	**HIL B** **EIL Urban Residential**	1,100
HERITAGE CORE					
SS4	Surface	Zinc	2,100	**EIL Urban Residential**	650
SS5	Surface		1,000		
BH18	0.2-0.3		660		
BH108	0.5	TRH C10-C16	1,600	**ESL** **Urban Residential and Open Space**	170
ROAD AND OPEN SPACE NETWORK					
SS6	Surface	Lead	4,300	**HILD** **EIL Urban Residential**	600 1,100
SS7	Surface		1,500		
SS6	Surface	Zinc	5,400	**EIL Urban Residential**	430
SS7	Surface		1,800		
HA7	0.2-0.3		460		
HA8	0.1-0.2		640		
TP34A	0.5		830		
BH111	0.5	TRH C10-C16	670	**ESL** **Urban Residential and Open Space**	120
	1		420		
TP210	0.1		260		
TP256	0.2		200		
TP210	0.1	TRH C16-C34	1,500		1300
TP255	0.3		3,200		
TP256	0.1		3,100		

TP256	0.2		4,400		

6.3 Groundwater Results

6.3.1 Groundwater Conditions

The Standing Water Levels (SWL), Total Depth (TD) and observations recorded during the GME undertaken as part of this DSI are summarised below in Table 88.

Table 88: Groundwater Conditions

Well ID	Date	SWL (m TOC)	TD (m TOC)	Observations
M1	5/ 3/ 21	-	8.5	Dry
M2	5/ 3/ 21	7.91	19.252	Clear, no odour/ sheen
M3	4/ 3/ 21	4.156	4.812	Turbid brown, no odour/ sheen
M4	4/ 3/ 21	2.813	3.56	Clear, no odour/ sheen
M5	4/ 3/ 21	4.65	4.8	Clear, no odour/ sheen
M6	4/ 3/ 21	14.12	14.46	Turbid brown, no odour/ sheen
MW100	4/ 3/ 21	2.905	5	Slightly turbid, brown, no odour/ sheen
MW101	4/ 3/ 21	5.234	6.9	Slightly turbid, brown, no odour/ sheen
MW103	4/ 3/ 21	9.755	12	Slightly turbid, brown, no odour/ sheen
MW104	4/ 3/ 21	13.612	17	Slightly turbid, brown, no odour/ sheen

Notes:
SWL: Standing Water Level; TD: Total Depth; TOC: Top of Casing

6.3.2 Groundwater Parameters

Groundwater parameters were measured during the first GME and is summarised in Table 99.

Table 99: Groundwater Parameters

Well ID	Dissolved Oxygen (ppm)	Electrical Conductivity (µS/ cm)	pH	Redox (mV)	Temperature (°C)
M1	Well Dry				
M2	2.44	0.422	6.38	103.1	21.9
M3	4.31	0.58	6.03	151.1	20.1
M4	Poor recharge, grab sample collected				
M5	Poor recharge, grab sample collected				
M6	Poor recharge, grab sample collected				
MW100	11.06	0.454	6.62	170	21.9
MW101	10.3	1.01	7.15	59.9	16.8
MW102	Poor recharge, grab sample collected				
MW103	5.46	0.59	7.46	140.1	19.2

MW104	7.11	0.55	7.61	72.9	22.15

Notes:
Redox = Reduction / Oxidisation Potential

6.3.3 Groundwater Analytical Results

A tabulated summary of groundwater analytical results is presented in Table 6 **Appendix A**. Laboratory report and chain of custody documentation are included in **Appendix D**. In summary, groundwater analysis results were less than the adopted groundwater assessment criteria with the exception of:

- **Cadmium**: Dissolved cadmium concentrations at sample location M2 were reported to be 0.004 mg/L exceeding the adopted GIL criterion of 0.0002 mg/L.
- **Copper**: Dissolved copper concentrations at sample locations M3, MW101 and MW102 were reported between 0.003 and 0.012 mg/L exceeding the adopted GIL criterion of 0.0014 mg/L.
- **Lead**: Dissolved lead concentrations at sample locations M3 and MW102 were reported between 0.041 and 0.004 mg/L exceeding the adopted GIL and ACT EPA (2017) criterion of 0.0034 mg/L.
- **Zinc**: Dissolved zinc concentrations at sample locations M2, M3, M6, MW101 and MW102 were reported between 0.014 mg/L and 0.2 mg/L exceeding the adopted GIL criterion of 0.008 mg/L.

In summary, only dissolved metals were detected in groundwater at the site at variable concentrations. SMEC (2016b) concluded that '*the presence of heavy metals may be a reflection of the underlying geology or may also include an anthropogenic component*'.

6.4 QA/ QC Assessment

The QA/ QC program implemented for the Investigation was generated as the outcome of the seven-step Data Quality Objective (DQO) process, as described in Arcadis (2017) SAQP. The achievement of the project DQOs was demonstrated by reference to the Data Quality Indicators (DQIs) which include precision, accuracy, representativeness, completeness and comparability.

The data evaluation procedure employed in the assessment of the field and laboratory QA/ QC data (refer **Appendix D**) indicated that the reported analytical results are representative of soil conditions at the sample locations and that the overall quality of the analytical data produced is acceptably reliable for the purpose of this investigation.

7.0 REVISED CONCEPTUAL SITE MODEL

7.1 Revised CSM

The initial Conceptual Site Model (CSM) presented in the Arcadis (2017) SAQP has been revised based on quantitative (and additional qualitative) data presented in this SESA. The revised CSM provides a description of potential pathways by which actual or potential site contamination sources may reach and impact on receptors. Where incomplete contaminated source-pathway-receptor linkages exist, the exposure to (or migration of) the chemical substance via that pathway cannot occur.

Table 1010: Revised Conceptual Site Model

AEC	Source	Receptors	Pathway Discussion
AEC#01 - Kilns (Surface Soils)	Kiln Sands	Workers Occupants	**No longer considered an AEC** The sands and clay base of the kilns were assessed and did not report elevated concentrations of CoPC.
AEC#02 – Kiln 1 Fan House (Surface Soils)	Surface Soils	Workers Occupants	Test pit TP257 was advanced in proximity to surface samples SS6 and SS7 which reported elevated Lead and Zinc. The elevated Lead and Zinc could not be replicated at a vertical depth of 0.5m in TP257. Agon note the ground surface in many areas of the brickworks contain surficial waste materials including deteriorated metals. It is possible the surface samples inadvertently incorporated deteriorated metallic particulates. The exceedance reported at SS6 and SS7 is not considered to pose a significant contamination risk noting the area falls within an area proposed for a roadway. Pathways are discussed as following: • Migration pathway incomplete – No evidence of gross contamination that would migrate to deeper soils and/ or groundwater. • Exposure pathway potentially complete – Risk of worker contact with soils containing deteriorated metals during construction and maintenance.
AEC#03 – Quarry Fill	Quarry Fill	Workers Occupants Visitors	**The Quarry Fill remains an AEC** Isolated exceedances of the EIL/ ESL reported in the quarry fill. Pathways are discussed as following: • Migration pathway incomplete – No evidence of gross contamination that would migrate to deeper soils and/ or groundwater. • Human exposure pathway incomplete – No exceedances of the adopted human health criteria under an open public space land use setting. • Ecological exposure pathway incomplete – Areas of isolated EIL/ ESL exceedances are unlikely to present overall risk to the proposed use of the area as parklands (i.e., Quarry Parkland). Whilst no complete exposure pathways have been identified under the proposed development of the Quarry. There remains a significant volume of unassessed fill that will require management for unexpected finds of contamination during intrusive excavation works.
AEC#04 – Groundwater (Quarry Area)	Quarry Fill	Groundwater Ecology	**No longer considered an AEC** No detections of CoPC present in groundwater below the quarry. Elevated concentrations of metals exceeding the adopted GIL criteria were reported but given the depth of groundwater and absence of current (or planned) local groundwater extraction there are no conceivable exposure pathways to receptors at the site.
AEC#05 - Brickworks Soils	Brickworks Soil	Workers Occupants	**The Brickworks remains an AEC** Isolated exceedances of the EIL/ ESL reported in soils at the brickworks. The exceedances are unlikely to present overall risk to the proposed use of the area for commercial purposes.
AEC#06 - Groundwater (Brickworks Area)	Brickworks Soil	Groundwater Ecology	**No longer considered an AEC** No detections of CoPC present in groundwater below the quarry. Elevated concentrations of metals exceeding the adopted GIL criteria were reported but given the depth of groundwater and absence of current (or planned) local groundwater extraction there are no conceivable exposure pathways to receptors at the site.
AEC#07 - UST	Storage of Fuels	Workers Soil Ecology Groundwater Ecology	**The UST remains an AEC until removed and validated** No gross impacts of hydrocarbons as a result of the underground storage of fuels identified in soils or groundwater in proximity to the AEC. However, the UST will continue to be a potential source of contamination until it is removed, there is also uncertainty as to the exact location of the UST. It is recommended the UST be located by mechanical means, excavated and validated.
AEC#08 - Asbestos Dump	Asbestos impacted soils	Workers Occupants	**The Asbestos Dump remains an AEC** The 'Asbestos Dump' contains pockets of anthropogenic inclusions which may contain fragments of bonded asbestos, these asbestos impacts and/ or other unexpected finds will require management and/ or remediation during construction works.
AEC#09 – Fill (Whole Site)	Uncontrolled fill	Workers Occupants Visitors	**Fill at the site remains an AEC** There remains a significant volume of unassessed fill that will require management for unexpected finds of contamination during intrusive excavation works.
AEC#10 – Residential Precincts	Soils	Occupants	**No longer considered an AEC** With the exception of the isolated areas identified in **Section 6.2**.
AEC#11 -Benzene in Groundwater	Unknown	Groundwater Ecology Occupants Workers	**No longer considered an AEC** SMEC (2016) reported detections of benzene in M2 and M7. This result could not be replicated during the GME undertaken as part of this SESA which included additional groundwater wells MW100, MW101, MW102, MW103 and MW104. In the absence of other indicators of hydrocarbon based contamination (i.e., sheen, odours, other detections in TRH fractions) Agon are of the opinion the detection of low levels of Benzene were result a result of either sample or laboratory error. No potential migration/ exposure/ migration pathway exists.

7.4 Revised CSM Summary and Uncertainties

Overall, the revised CSM has not identified any complete contaminant-source-pathway-receptor linkages associated with the AECs with exception of the following discrete areas present in the following development Precincts:

- **Precinct 1 (Medium Density Residential)**
    - Asbestos Dump (AEC#08) – The fill mound identified as the Asbestos Dump contains pockets of anthropogenic inclusions which may contain fragments of bonded asbestos. The fill mound is located in Precinct 1 which is proposed to be bulk excavated for the construction of basement carparking. It is recommended a trial be undertaken to determine if mechanical screening be undertaken to determine if asbestos impacts (and other anthropogenic inclusions) can be removed to enable the offsite reuse of the soils contained in the mound. Screened soil would be subject to further assessment in accordance with ACT EPA (2020) *Information Sheet 4 Requirements for the reuse and disposal of contaminated soils in the ACT*.
    - BH110-1.0 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria. The source of this impact is unclear and could be anomalous, further assessment is recommended.
- **Precinct 2 (Medium Density Residential)**
    - TP243 – Contains bonded asbestos impacts and concentrations of B(a)P greater than 2.5x the adopted human health assessment criteria. Accordingly, this sample location is considered to be a hotspot that warrants further assessment, remediation and validation.
- **Precinct 11 (Low Density Residential)**
    - TP223 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria. The source of this impact is unclear and could be anomalous, further assessment is recommended.
- **Road and Open Space Network**
    - SS6 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria. Accordingly, this sample location (which should be extended to include SS7) is considered to be a hotspot that warrants remediation and validation.
    - UST (AEC#07) – The UST remains a potential source of hydrocarbon impacts to soil and groundwater. The UST must be decommissioned, removed and validation in accordance with ACT EPA (2016) *Information Sheet 1 Decommissioning, assessment and Audit of Sites Containing Above Ground or Underground Fuel Storage Tanks.*

The Heritage Core and Road and Open Space Network contain discrete areas of metals or hydrocarbon impacts exceeding the adopted ecological screening criteria. These impacts are not considered to pose a significant contamination risk for redevelopment to include commercial, road and open public space land uses. Management of these impacts during redevelopment is recommended to ensure these soils are not inadvertently moved to more sensitive areas of the site.

The site contains a significant volume of uncontrolled fill predominately located in Precinct 1, the brickworks area and the former Quarry. In addition, surficial bonded asbestos fragments were observed in the southern portion of Precinct 1 (refer Clearance Certificate **Appendix G**). There remains a risk from further surficial bonded asbestos impacts and/ or other unexpected finds of contamination to be encountered during intrusive excavation works.

It is recommended a Development Site Management Plan (DSMP) be prepared to manage the known impacts and unexpected finds that may be encountered during development works.

8.0 CONCLUSIONS AND RECOMMENDATIONS

This SESA has assessed the Areas of Environmental Concern (AECs) identified in the Arcadis (2017) SAQP.

in summary, the findings of this SESA indicate that the AECs do not pose a contamination risk that would preclude the suitability of the site for the proposed development Precincts, with the exception of discrete areas which warrant further assessment and/ or remediation.

To address the impacts within these discrete areas and provide an overall framework for the management of known and potential unexpected finds of contamination during development works, Agon recommend the preparation of the following documents:

- **Remediation Works Plan (RWP)**

  The RWP is to be prepared to provide a methodology to guide the further assessment and/ or remediation of the areas identified and discussed in **Section 7.4**.

- **Development Site Management Plan Construction (DSMP)**

  The DSMP is to be prepared to provide guidance regarding the management of potentially contaminated soils that may be encountered, reworked and moved at the site during development works. Areas of known/ suspected contamination are to be identified in the plan based on the findings of this SESA (refer **Section 7.4**). It is also recommended that an Unexpected Finds Protocol (UFP) be included to aid in the identification of contamination types or areas that were not explicitly anticipated based on this SESA.

On this basis Agon provide the following conclusions with regard to each of the development Precincts:

- **Precinct 1**: Could be made suitable for the proposed medium density residential development subject to implementation of the RWP and DSMP.
- **Precinct 2**: Could be made suitable for the proposed medium density residential development subject to implementation of the RWP and DSMP.
- **Precincts 3 to 9**: Are suitable for the proposed medium density residential development subject to implementation of the DSMP.
- **Precinct 10**: Is suitable for the proposed low density residential development subject to implementation of the DSMP.
- **Precinct 11**: Could be made suitable for the proposed low density residential development subject to implementation of the RWP and DSMP.
- **Heritage Core**: Is suitable for the proposed commercial development subject to implementation of the DSMP.
- **Road and Open Space Network**: Is suitable for the proposed development of roadways and public open spaces subject to implementation of the RWP and DSMP.

9.0 LIMITATIONS OF THIS REPORT

This report has been prepared in accordance with industry recognised standards and procedures current at the time of the work. The report presents the results of the assessment based on the quoted scope of works (unless otherwise agreed in writing) for the specific purposes of the engagement by the Client. No warranties expressed or implied are offered to any third parties and no liability will be accepted for use of this report by third parties.

The assessment of environmental and human health risk included in this report relate to the whole site as described in the report. If the site is subject to demolition works or redevelopment, the risk profile of the site will change and the conclusions of this report will no longer be valid. If the site is subject to subdivision different to the proposed development at time of writing, the risk profile of each division of the site will change and the conclusion of this report will no longer be valid.

Consideration of the aesthetic and geotechnical suitability of site soils has been excluded from this report. Aesthetic and geotechnical suitability may need to be addressed in subsequent assessments.

All information provided by third parties has been assumed to be correct and complete. Agon does not assume any liability for misrepresentation of information by third parties or for matters not visible, accessible or present on the subject site.

Opinions and judgements expressed herein are based on Agon's understanding of current regulatory standards and should not be construed as legal opinions.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties other than those listed above.

This report should be read in full.

10.0 REFERENCES

ACT Department of Environment and Sustainable Development Information Sheet 7 – Guidance for undertaking preliminary contamination investigations for development/ lease variation purposes. Australian Capital Territory.

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SMEC (2016b) *Canberra Brickworks: Groundwater Investigation – Addendum Report*. Canberra Brickwork Precinct, Yarralumla, ACT. Ref 3002523

APPENDIX A: TABULATED ANALYTICAL RESULTS

APPENDIX B: LOGS

APPENDIX C: SITE PHOTOGRAPHS

APPENDIX D: QUALITY ASSURANCE AND QUALITY CONTROL

APPENDIX E: LABORATORY CERTIFICATES

APPENDIX F: SUPPORTING INFORMATION

Remediation Works Plan
Canberra Brickworks
Yarralumla ACT



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AGON ENVIRONMENTAL
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AGON DOCUMENT CONTROL

Report Title:	Project Reference
Remediation Works Plan Canberra Brickworks	JC0546_RWP.01
Written	**Approved**

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Rev No	Copies	Recipient
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1.0 INTRODUCTION

1.1 Preamble

DOMA Group (DOMA) engaged Agon Environmental Pty Ltd (Agon) to prepare this Remediation Works Plan (RWP) to outline the further assessment and/or remediation of a number of Areas of Environmental Concern (AEC) and discrete areas (defined as 'Hotspots') with complete contaminant-source-pathway-receptor linkages. These complete linkages were identified in the revised Conceptual Site Model (CSM) presented in the report titled Agon (2021) Supplementary Environmental Site Assessment (SESA) prepared for the Canberra Brickworks (the site).

The AECs and hotspots are summarised as follows from the Agon (2021) SESA with reference to the relevant development Precincts in which they occur:

- **Precinct 1 (Medium Density Residential)**
    - Asbestos Dump (AEC#08) – The fill mound identified as the Asbestos Dump contains pockets of anthropogenic inclusions which may contain fragments of bonded asbestos.
    - BH110-1.0 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria.
- **Precinct 2 (Medium Density Residential)**
    - TP243 – Contains bonded asbestos impacts and concentrations of B(a)P greater than 2.5x the adopted human health assessment criteria.
- **Individual Housing Block Precinct (Low Density Residential)**
    - TP223 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria.
- **Road and Open Space Network**
    - SS6 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria.
    - UST (AEC#07) – The UST remains a potential source of hydrocarbon impacts to soil and groundwater.

Further assessment and/or remediation of these AECs and Hotspots is required to enable land suitability statements to be made in support of the proposed redevelopment of the Canberra Brickworks.

1.2 Objectives

The objectives of this RWP will be specific to each AEC and Hotspot identified, however the overall objective is to outline:

- An assessment plan to provide a greater understanding of the nature and extent of contamination at the identified areas to verify the actual presence of contaminant-source-pathway-receptor linkages
- A targeted remediation strategy that if implemented (and demonstrated to be successful) would eliminate any complete contaminant-source-pathway-receptor linkages

The Data Quality Objectives (DQOs) developed for this RWP are presented in **Appendix A**.

1.3 Supporting Documents

Agon has reviewed the following supporting documentation in preparation of this SESA:

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- Robson (2015) Stage 1 Environmental Site Assessment. Canberra Brickworks Remediation Project, Block 1 Section 102 Yarralumla, Canberra Central ACT. February 2015 (revised March 2015). Ref 9623_EAR_Stage 1 ESA Report_20150312.
- SMEC (2014) Preliminary (Environmental) Site Investigation, Canberra Brickworks. 18 February 2014. Ref 3002369.
- SMEC (2016a) Canberra Brickworks: Detailed Environmental and Geotechnical Site Investigation. Canberra Brickwork Precinct, Yarralumla, ACT. 31 October 2016. Ref 3002523.
- SMEC (2016b) Canberra Brickworks: Groundwater Investigation-Addendum Report. Canberra Brickwork Precinct, Yarralumla, ACT. Ref 3002523.
- Arcadis (2017) Data Review and Data Gap Analysis and Sampling, Analysis and Quality Plan, V03.
- Agon (2021) Supplementary Environmental Site Assessment (SESA).

1.4 Legislative Framework

The RWP has been prepared in general accordance with the guidelines endorsed by the ACT EPA (2017) Contaminated Sites Environment Protection Policy (CSEPP).

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2.0 SITE DETAILS

2.1 Site Identification

Formal identification of the site is summarised below in Table 1.

Table 1: Site Identification

Site Address	End of Denman Street, Yarralumla, ACT
Allotment Description	Block 7 Section 102, Yarralumla Block 764, Canberra Central and Block 1 Section 102 Yarralumla Blocks 11 & 12 Section 38, Fyshwick, Canberra ACT
Land Zoning	CZ6: Leisure and Accommodation RZ1: Suburban PRZ2: Restricted Access Recreation Zone
Current Land Use	Vacant
Proposed Land Use	Mixed use including residential, commercial and public space. Development Precincts are defined as follows: • Heritage Core – Commercial Land use. • Road and Open Space Network • Precincts 1, 2, 3, 4, 5, 6, 7, 8, 9 – Medium Density Residential. • Individual Housing Block Precinct – Low Density Residential. The development Precincts are shown in **Figure 1**.
Total Area	16 Hectares or thereabouts

2.2 Physical Setting and Current Land Use

The site is situated in the division of Yarralumla within the Canberra Central district and is bound by the Royal Canberra Golf Course (west and north), Bentham Street (north) and low density residential (south). Access to the site is made via Denman Street (south). The site itself is the former Canberra Brickworks and comprises:

- Former Brickworks (western portion of the site), several remnant buildings including 6 kilns, 4 stack houses, office building and amenities, 3 machinery sheds, workshops, boiler house, a substation, a powerhouse, storage sheds and other minor buildings. This portion of the site was previously occupied by Thor's Hammer, a wood recycling business.
- The quarry (eastern portion of the site) includes a large grassed area with several exposed natural siltstone bedrock features which has been levelled with an unknown amount of fill and bricks which have also been formed into mounds.
- The demolished and overgrown workers accommodation area (south).
- Vacant areas (south).

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Figure 1: Site Location and Precinct Plan
Source: ACTmapi (2021)

2.4 Surrounding Land Uses

Surrounding areas comprise the suburb of Yarralumla. These suburbs include commercial, residential, community and open urban land uses as permitted under the Territory Plan Zoning. The immediate surrounding land uses to the site are summarised below in Table 2.

Table 2: Surrounding Land Use

Direction	Land Use
North	Lane Poole Place and Bentham Street, residential properties surrounding the roads and beyond
East	Schomburgk Street, Woollis Street and Bentham Street with associated residential properties
South	Denman Street leads to and bisects the northern and southern portions of the Site, beyond which is Block 7 Section 102 comprising numerous trees and open spaces. Cotter Road lies beyond the trees.
West	Treed area, beyond which lies the Royal Canberra Golf Course

2.5 Site Geology, Hydrology and Hydrogeology

The environmental setting of the site is summarised as follows:

- The Geology of Canberra 1:100, 000 Sheet 8287 (1992) shows that the Canberra brickworks is underlain by calcareous and tuffaceous mudstone and siltstone of the Late Silurian Yarralumla Formation. The formation outcrops within multiple areas within the site.
- Review of the 1:100,000 Hydrology of the Australian Capital Territory and Environs (1984) indicated that the groundwater beneath the Site is generally present in fractured rock. The quality tends to be variable and was described as 500 – 1,000 mg/ L TDS. The yield was described as approximately 1.0 L/ s.
- The topography of the Site is variable due to historical brick material extraction works. The site generally slopes to the west north-west. SMEC (2016) identified a total of five catchments in the site.
- The southern areas of the site gradually slope to the southwest, south, and southeast. The topography of this area has been modified to include the Cotter Road and Yarra Glen/ Adelaide Avenue. Surface water flow has been mapped to generally flow south towards Yarralumla Creek which discharges into the Molonglo River.

3.0 HISTORICAL INFORMATION

3.1 General History

The Canberra Brickworks was operated between 1913 and 1976. Since its closure, it has remained largely vacant with the exception of a commercial wood working/ recycling business known as Thor's Hammer. The brickworks itself contains a range of structures/ areas associated with the brick production process. A detailed account of the site history is provided in the previous reports reference in Section 1.3.

3.2 Current Status of Environmental Assessments

A number of environmental investigations have been undertaken at the site; the Agon (2021) SESA compiled and presented all the contemporary and historical environmental assessment data with respect to the proposed development Precincts. The intent of the Agon (2021) SESA was to determine which Precincts are suitable, from a contamination perspective, for the proposed redevelopment and if any management and/or remediation strategies are required to render any Precinct suitable for their intended uses.

A total of 11 AECs were identified as being present at the site, these are summarised below in Table 3.

Table 3: Areas of Environmental Concern

AEC	CoCs		Description
AEC#01 Kilns	Metals PAHs TRH	BTEX Dioxins	Sands, dust, surface areas located within the Kilns. This media reported elevated concentrations of Lead and Zinc in excess of the adopted ASC (2013 NEPM HIL D criteria).
AEC#02 Surface Soils Kiln 1 Fan House	Metals		Surface soils west of the fan house for Kiln 1 reported elevated concentrations of Zinc and Lead.
AEC#03 Quarry Fill	Metals TRH BTEX PAHs	OCP/ OPP PCBs Asbestos.	Soil sampling within the infilled quarry has not identified the presence of any gross chemical contamination. However, there is uncertainty in the exact nature, extent and composition of filling activities. Further assessment was recommended to reduce this uncertainty.
AEC#04 Groundwater Quarry Area	Metals TRH BTEX	PAHs PCBs	Defined as the groundwater directly below the former Quarry which has been extensively infilled. Insufficient historical assessment has been performed at this AEC.
AEC#05 Brickworks Soils	Metals TRH BTEX	PAHs PCBs	Defined as general soils around and below the brickworks (i.e., the Heritage Core area). Insufficient historical assessment has been performed at this AEC.
AEC#06 Groundwater Brickworks Area	Metals TRH BTEX	PAHs PCBs	Defined as the groundwater directly below the brickworks (i.e., the Heritage Core area). Insufficient historical assessment has been performed at this AEC.
AEC#07 UST	Metals TRH	BTEX PAHs	A former UST was identified by SMEC (2016). Insufficient historical assessment has been performed at this AEC.
AEC#08 Asbestos Dump	Metals TRH BTEX PAHs	OCP/ OPP PCBs Asbestos.	A mound of soil, anecdotally identified as containing asbestos building material debris, is present in the northern portion of Precinct 1 and was subject to remedial works by Robson (2015) which removed majority of the asbestos materials. Further assessment of the mound and any residual asbestos impacts is required.
AEC#09 Fill Whole Site	Metals TRH BTEX PAHs	OCP/ OPP PCBs Asbestos.	Extensive fill material has been identified across the site. There is uncertainty in the exact nature, extent and composition of filling activities. Further assessment was recommended to reduce this uncertainty.

AEC#10 Residential Precincts	Metals OCP/ OPP TRH PCBs BTEX Asbestos. PAHs	The location of the development areas was not known at the time of SMEC (2016). Accordingly additional targeted locations were proposed.
AEC#11 Benzene in Groundwater	BTEX	SMEC (2016) detected benzene (albeit at low concentrations) in groundwater at monitoring wells M2 and M7. Temporal and spatial variation of benzene concentrations within groundwater at the site have not been fully assessed.

3.3 Revised Conceptual Site Model

Overall, the revised CSM presented in the Agon (2021) SESA did not identify any complete contaminant-source-pathway-receptor linkages associated with the AECs with exception of the following discrete areas present in the following development Precincts:

- **Precinct 1 (Medium Density Residential)**
    - Asbestos Dump (AEC#08) – The fill mound identified as the Asbestos Dump contains pockets of anthropogenic inclusions which may contain fragments of bonded asbestos. The fill mound is located in Precinct 1 which is proposed to be bulk excavated for the construction of basement carparking. It is recommended a trial be undertaken to determine if mechanical screening be undertaken to determine if asbestos impacts (and other anthropogenic inclusions) can be removed to enable the offsite reuse of the soils contained in the mound. Screened soil would be subject to further assessment in accordance with ACT EPA (2020) *Information Sheet 4 Requirements for the reuse and disposal of contaminated soils in the ACT*.
    - BH110-1.0 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria. The source of this impact is unclear and could be anomalous, further assessment is recommended.
- **Precinct 2 (Medium Density Residential)**
    - TP243 – Contains bonded asbestos impacts and concentrations of B(a)P greater than 2.5x the adopted human health assessment criteria. Accordingly, this sample location is considered to be a hotspot that warrants further assessment, remediation and validation.
- **Individual Housing Block Precinct (Low Density Residential)**
    - TP223 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria. The source of this impact is unclear and could be anomalous, further assessment is recommended.
- **Road and Open Space Network**
    - SS6 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria. Accordingly, this sample location is considered to be a hotspot that warrants remediation and validation.
    - UST (AEC#07) – The UST remains a potential source of hydrocarbon impacts to soil and groundwater. The UST must be decommissioned, removed and validation in accordance with ACT EPA (2016) *Information Sheet 1 Decommissioning, assessment and Audit of Sites Containing Above Ground or Underground Fuel Storage Tanks.*

4.0 ASSESSMENT AND/OR REMEDIATION PLAN

4.1 General

The sampling and analytical plan has been developed based on the objectives of this RWP with respect to the revised CSM presented in the Agon (2021) SESA with consideration of:

- Standards Australia 2005, AS4482.1 – 2005 Guide to the investigation and sampling of sites with potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds (Standards Australia AS4482.1-2005).
- ASC NEPM (1999, amended 2013) - Schedule B (2): Site Characterisation.
- NSW Environment Protection Authority (1995) Sampling Design Guidelines.
- Site accessibility constraints.
- The location of underground and overhead services.

The sampling plan is detailed below in Table 4 with the nominal sampling locations are depicted in Figure 3. Field and laboratory methods are provided in **Appendix B**.

4.2 Assessment and/or Remediation Plan

Table 4 identifies the AECs and Hotspots targeted by this RWP; it also includes the following details:

- The proposed objective of the works with regard to the specific AEC or Hotspot, be it further assessment or remediation.
- The adopted assessment or validation criteria on the basis of the proposed development Precinct in which the AEC or Hotspot occurs.
- The extent of further assessment or remediation, including an evaluation of feasibility.
- The scope of work associated with each AEC and Hotspot targeted by this RWP.

Table 4: Assessment and/or Remediation Plan

Target	Description	CoC	Adopted Criteria	Extent	Options Assessment	Scope of Work
AEC#08 **Asbestos Dump**	The fill mound identified as the Asbestos Dump contains pockets of anthropogenic inclusions which may contain fragments of bonded asbestos. The fill mound is located in Precinct 1 which is proposed to be bulk excavated for the construction of basement carparking	Asbestos	**Precinct 1** HIL B HSL B (Clay, 0-1m)	**Area** – 2,700m^3 **Depth** – Est. 2mbgl	**1. Do Nothing** Not feasible, fill mound is surplus. **2. Offsite Disposal** Not feasible and cost prohibitive, the fill mound contains anthropogenic wastes and bonded asbestos. **3. Trial Screening and Separation** **Feasible**, the mound is predominantly comprised of fill soil with pockets of anthropogenic inclusions which may contain occasional fragments of bonded asbestos. The trial, if successful, would allow waste materials (including bonded asbestos) to be separated from otherwise uncontaminated soils allowing greater onsite/offsite reuse of soils demonstrated to be free of contamination.	The proposed trial will include the following scope of work: • Selection of smaller sub area of the fill mound, approximate dimensions are 10m10mx2m with an approximate 200 m^3 volume of fill to be mechanically screened through a 100mm excavator bucket. The screened material will be sorted into the following stockpiles: ○ Stockpiled anthropogenic inclusions expected to include steel, bricks, concrete, timber, fragment of bonded asbestos (>100mm). ○ Stockpile screened fill expected to be predominately comprised of reworked soils with minor traces of brick fragments and other solid inert wastes. • To manage the risk of disturbing bonded fragments, the screening works are to comply with the Asbestos Handling Specification (Table 5). • Following screening works the stockpiles of anthropogenic inclusions and fill soils will be assessed in accordance with ACT EPA (2019) *Information Sheet 4 Requirements for the reuse and disposal of contaminated soils in the ACT* to determine offsite reuse and/or disposal options. No soil is to be removed from site until approved by the ACT EPA. The results of the trial will be documented to determine the effectiveness of the methodology to adequately remove/remediate the potential presence of bonded asbestos impacts to the soils present in the fill mound. If successful, the methodology will be proposed for the remainder of the soil present in the fill mound known as the 'Asbestos Dump'.
BH110-1.0	Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria. The source of this impact is unclear and could be anomalous, further assessment is recommended.	Metals	**Precinct 1** HIL B HSL B (Clay, 0-1m)	Nature and extent unknown, further assessment recommended	**1. Do Nothing** Not feasible, impacts may pose a human health risk. **2. Offsite Disposal** Not feasible, insufficient information is available to evaluate extent and volume of soil for offsite disposal. **3. Further Assessment** **Feasible**, further assessment may be used to determine extent and volume of impacts.	The sample location will be further assessed by the following scope of work: • Advancement of 4 sample locations (either test pits or boreholes) boreholes on a 2-3m grid around BH110 to an investigation depth of 2 mbgl which is considered to be the depth by which soils could potentially be disturbed during redevelopment. • Soil samples will be collected at 0.5 m, 1.0 m and at 1 m intervals thereafter up 2.0 m into underlying natural soils. Additional samples will be collected in should evidence of contaminated soils (i.e., stained or odorous) or changes in lithology be observed. • Approximately 16 primary samples will be generated by the field program. These samples will be analysed at the following rates to verify the nature of Lead impacts: ○ Metals including Lead – 100% analysis rate. The additional assessment data will be used to better understand the nature and extent of Lead impacts detected at sample location BH110. If the further assessment confirms the presence of contamination the Remediation and Validation Specification (Section 4.3) is to be followed.
TP243	Contains bonded asbestos impacts and concentrations of B(a)P greater than 2.5x the adopted human health assessment criteria. Accordingly, this sample location is considered to be a hotspot that warrants further assessment, remediation and validation	PAHs Asbestos	**Precinct 2** HIL B HSL B (Clay, 0-1m)	**Area** – 20m^3 **Depth** – Est. 0.2mbgl		TP243 was the location of a thin (200mm) shallow mixed waste deposit uncovered underneath a worn bituminous surface. This location will be further assessed by the following scope of work: • Advancement of 4 -6 sample locations (either test pits or boreholes) boreholes on a 2-3m grid around TP243 to a depth of 1mbgl determine the extent of the shallow mixed waste materials. The grid will be extended in the field until no evidence of shallow mixed waste are encountered. • Soil samples will be collected at 0.2 m, 0.5 m and at 1 m intervals thereafter up 1.0 m into underlying natural soils. Additional samples will be collected in should evidence of contaminated soils (i.e., stained or odorous) or changes in lithology be observed. • Approximately 12 primary samples will be generated by the field program. These samples will be assessed in accordance with the requirements of ACT EPA (2019) *Information Sheet 4 Requirements for the reuse and disposal of contaminated soils in the ACT*. The additional assessment will allow the determination of the nature and extent of the shallow waste deposit identified at sample location TP243 for the purpose of remediation (i.e. offsite disposal) in accordance with the Remediation and Validation Specification (Section 4.6).
TP223	Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria. The source of this impact is unclear and could be anomalous, further assessment is recommended.	Metals	**Individual Housing Block Precinct** HIL A HSL A (Clay, 0-1m)	Nature and extent unknown, further assessment recommended		The sample location will be further assessed by the following scope of work: • Advancement of 4 sample locations (either test pits or boreholes) boreholes on a 2-3m grid around TP233 to an investigation depth of 2 mbgl which is considered to be the depth by which soils could potentially be disturbed during redevelopment. • Soil samples will be collected at 0.5 m, 1.0 m and at 1 m intervals thereafter up 2.0 m into underlying natural soils. Additional samples will be collected in should evidence of contaminated soils (i.e., stained or odorous) or changes in lithology be observed. • Approximately 16 primary samples will be generated by the field program. These samples will be analysed at the following rates to verify the nature of Lead impacts: ○ Metals including Lead – 100% analysis rate. The additional assessment data will be used to better understand the nature and extent of Lead impacts detected at sample location TP223 which is in natural soils. It's possible the initial result was anomalous;

Target	Description	CoC	Adopted Criteria	Extent	Options Assessment	Scope of Work
						accordingly the further assessment is required to verify the presence, nature and extent of elevated Lead in natural soils at this location.
SS6	Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria.	Metals	**Road/Open Space Network** EIL (Urban Residential) ESL (Urban Residential & Open Space) HIL C HSL C (Recreational, Clay, 0-1m)	Surface soils, extent unknown, further assessment recommended		The sample location will be further assessed by the following scope of work: • Advancement of 4 sample locations (either test pits or boreholes) boreholes on a 2-3m grid around SS6 to an investigation depth of 1.0 mbgl. • Soil samples will be collected at 0.1, 0.5 m and 1.0 m. Additional samples will be collected in should evidence of contaminated soils (i.e., stained or odorous) or changes in lithology be observed. • Approximately 16 primary samples will be generated by the field program. These samples will be analysed at the following rates to verify the nature of Lead impacts: o Metals including Lead – 100% analysis rate. The additional assessment will allow the determination of the nature and extent of the shallow soil contamination identified at sample location SS6 for the purpose of remediation (i.e. offsite disposal) in accordance with the Remediation and Validation Specification (Section 4.6).
AEC#07 **UST**	The UST remains a potential source of hydrocarbon impacts to soil and groundwater. The UST must be decommissioned, removed and validation in accordance with ACT EPA (2016) *Information Sheet 1 Decommissioning, assessment and Audit of Sites Containing Above Ground or Underground Fuel Storage Tanks.*	TRH BTEX Metals		**Area** – 20m^3 **Depth** – Est. 0.2mbgl	1. **Do Nothing** Not feasible, the UST may pose an ongoing source of hydrocarbons. 2. **Remove UST and Validate** **Feasible**, the UST is to be removed in accordance with regulatory requirements.	The exact location, size and condition of the UST is unknown. It was identified at SMEC (2016) sample location TP05. The following scope of work is proposed: • Exploratory test pits be undertaken in proximity to SMEC (2016) sample location TP05. Once the UST is identified it should be exposed to determine its size and condition. GPS coordinates are to be taken of the UST for its later removal. • Once identified, the UST must be decommissioned, removed and validation in accordance with ACT EPA (2016) *Information Sheet 1 Decommissioning, assessment and Audit of Sites Containing Above Ground or Underground Fuel Storage Tanks*. • The physical removal of the UST will require the submission of a Development Application (DA) as it is considered to fall under the category of demolition works. It is envisaged the UST removal works will be incorporated as part of the DA for redevelopment of the site. The UST removal works, when they occur, are to be supported with the following nominal validation sampling plan: o Following removal of the UST and vent lines undertake screening of the excavation using a calibrated 10.6v PID. Visually contaminated, odorous and/or soil exhibiting elevated PID readings to be excavated and stockpiled.. Once complete the excavation is to be validated by the collection of the following samples: ▪ Base – One sample per base or per 5m^2. ▪ Walls – One sample per wall or one sample per 5 linear metres. ▪ QA/QC samples to be collected in accordance with **Appendix B**.



Figure 2: **RWP Locations**
Source: ACTmapi (2021)

4.3 Remediation and Validation Specification

For the AECs and Hotspots requiring further assessment (refer Table 4), the subsequent data will be reviewed in consultation with the Site Auditor to determine if remediation of any identified contamination is required. Should it be determined that remediation is required, the following nominal remediation and validation specification will be applied:

- The nature, extent and volume of soils requiring remediation will be specified and formalised in a soil classification report prepared in accordance with:
    - ACT EPA (2019) *Information Sheet 4 Requirements for the reuse and disposal of contaminated soils in the ACT.*
    - Environmental Standards (2021) *Assessment and Classification of Liquid and Non-Liquid Wastes.*
- The soil classification report is to be submitted to the ACT EPA for review and approval as per ACT EPA (2019). No soils are to leave the site without ACT EPA approval.
- Once approved the soils may be excavated and removed from site immediately. If stockpiling of soils is unavoidable, refer stockpiling specification in Table 5.
- Following removal of soils, the following nominal validation sampling program is to be implemented in accordance with the field methodologies specified in **Appendix B**:
    - Base – One sample per base or per 5m^2.
    - Walls – One sample per wall or one sample per 5 linear metres.
    - Contaminants of concern and validation assessment criteria for each AEC/Hotspot is presented in Table 4.
- All details of the soil classification, EPA approvals, material tracking and disposal records are to be kept for inclusion in reporting (refer Section 4.6).

4.4 General RWP Specifications

The following general specifications are applicable to works undertaken as part of the RWP.

Table 5: General RWP Specifications

Item	Specification
General Health and Safety	Based on the proposed scope of intrusive excavation activities to be undertaken, the Contractor (and nominated Sub-Contractors) will prepare a job specific Safe Work Method Statement (SWMS). If known asbestos impacted soils are to be intercepted by the RWP works then measures outlined under **Asbestos Handling Specification** apply.
Soil Disposal Specification	Any surplus soil needed to be removed from the site generated as part of the RWP must be assessed in accordance with ACT EPA (2019) Information Sheet 4. No soil is to leave the site without ACT EPA approval.
Imported Soils Specification	Only Virgin Excavated Natural Material (VENM), as defined in ACT EPA (2019) Information Sheet 10, or commercially available products (subgrade, gravels, road base) are to be imported to Site for use as backfill. The imported material must be supported by the following documentation: • In the instance of VENM, a copy of the ACT EPA VENM clearance. • Receipts confirming the source, type and volume of the commercial product imported to site.
Stockpile Specification	If stockpiling of soils is unavoidable the following nominal measures must be implemented (as appropriate to the nature of the works): • Stockpiles must be placed on sealed areas or on plastic sheeting. • Stockpiles must be removed as soon as practicable. • Stockpiles must be wet-down or covered to minimise dust emissions. • Appropriate sedimentation and erosion controls must be put in place. • During excavation activities, the excavation and excavated materials are to be sprayed with water or covered to reduce dust emissions.

	At completion of the excavation works, the site surface is to be re-instated to the condition prior to excavation, i.e. sealed areas of the site must be re-sealed, etc.
Asbestos Handling Specification	In the case of soils potentially containing asbestos materials, identified, or encountered unexpectedly, a Worksafe ACT licensed Asbestos Assessor must be engaged to advise on mitigation measures during the handling and/or removal of impacted soils. In addition to the general dust generation mitigation measures the following will also apply: • Oversight of all handling and removal of asbestos impacted soils by a Worksafe ACT licensed Asbestos Removalist. • Provision of air monitoring for asbestos fibres is to be in accordance with the Work Health and Safety (How to Safely Remove Asbestos Code of Practice) Approval 2020 and Guidance Note for Membrane filter method for estimating airborne asbestos dust, 2nd Edition [NOHSC: 3003 (2005)] – the requirement, nature and extent of air monitoring to be advised by the Asbestos Assessor and will be dependent on the nature of asbestos material being handled. • Water spraying will be utilised as required to dampen dust during works in soils that may contain asbestos. The Worksafe ACT licensed Asbestos Removalist and Assessor will provide advice based on daily weather conditions for the management of dust.
Material Tracking Specification	For the purposes of the RWP recording the source location and volume of the material removed from site, the waste classification and reuse or disposal approval from EPA, and weighbridge dockets from the landfill (for material disposed at landfill) demonstrating that the amount of material received at landfill is: • Equivalent to the amount of material removed from the site. • Consistent with the amount of material approved for disposal under the EPA approval. These details are to be retained for reporting (Section 4.6).

4.5 Revision of the RWP

The RWP is to remain an iterative document, which means should a more feasible or effective option or additional data become available, the RWP may be revised to provide a more accurate characterisation of site conditions and a more effective remediation approach.

4.6 Reporting

Reporting on the AECs and Hotspots presented in this RWP may occur periodically as they are assessed and/or remediated and validated. The general report structure is summarised as follows:

- Introduction.
- Target AEC and/or Hotspot.
- Field Methodologies.
- QA/QC.
- Results.
- Comment on compliance to the RWP with regard to the proposed assessment, remediation and/or validation requirements.
- Revised Conceptual Site Model with regard to the targeted AEC and/or Hotspot.
- Conclusion as to the suitability of the AEC and/or Hotspot area following further assessment or remediation and validation works for the proposed land uses.
- Recommendations.

The report will be prepared in general accordance with the requirements of the guidelines endorsed by the ACT EPA as contained in the ACT EPA (2017) Contaminated Sites Environment Protection Policy (the CSEPP).

Development Site Management Plan (DRAFT)
Canberra Brickworks
Yarralumla ACT



Prepared for:	DOMA Group
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AGON DOCUMENT CONTROL

Report Title:	Project Reference
Development Site Management Plan Canberra Brickworks	JC0546_DSMP.01 DRAFT
Written	**Approved**

Rev No	Status	Date	Author	Reviewer
01	DRAFT	08/07/2021	J.O	

Rev No	Copies	Recipient
01	1 electronic	**Note** – This is a DRAFT document and is subject to review by the Site Auditor and the ACT Environmental Protection Authority (EPA) prior to finalisation and implementation.

1.0 INTRODUCTION

1.1 Preamble

DOMA Group (DOMA) engaged Agon Environmental Pty Ltd (Agon) to prepare this Development Site Management Plan (DSMP) for the Canberra Brickworks defined as Block 764 Canberra Central and Block 7 Section 102 Yarralumla (the site, see Figure 1). DOMA intend to the redevelop the site as a mixed-use development inclusive of residential, commercial and public space areas.

Previous environmental investigations have been undertaken at the site which have identified a number of Areas of Environmental Concern (AEC) including the presence of uncontrolled filling of various thickness across majority of the site. Accordingly, this DSMP has been prepared to provide guidance regarding the management of known (and potentially) contaminated soils that may be encountered in the uncontrolled fill at the site during intrusive excavation works.

For the purposes of this plan, "intrusive work" includes any activity that involves ground disturbance, including (but not limited to): excavation, piling, scraping, trenching, drilling, hand digging, landscaping and underground services installation and maintenance works. Areas of suspected contamination are identified in this plan, and an Unexpected Finds Protocol (UFP) is included to aid in the identification of contamination types or areas that were not explicitly anticipated in this plan based on the land use history.

For clarity, this DSMP is not a Construction Environmental Management Plan (CEMP). It is strictly focused on identification and management of potentially contaminated soils during intrusive works. However, it is expected that this DSMP will be referred to and adopted within any subsequent CEMP's prepared for redevelopment work at the site.

1.2 Objective

The objective of this DSMP is to specify a management framework for potentially contaminated fill and/or soils during any intrusive works at the Canberra Brickworks. The included UFP details a standardised process in the event that materials suspected to be contaminated are encountered during intrusive works and provides guidance to workers at the site in recognising potentially contaminated material including (but not limited to):

- Visually contaminated or odorous soil and/or groundwater.
- Asbestos containing material (ACM).
- Aesthetically unacceptable material such as ash and soils containing waste (including demolition waste).

1.3 Legislative Framework

The site is located within the ACT and is therefore subject to the statutory requirements, and any revision of the same, listed below in Table 1.

Table 1: Legislation and Guidelines

Discipline	Legislation
Environment	*Environment Protection Act (1997)* *Environment Protection Regulation (2005)* *Planning and Development Act (2007)*
Construction and Land Development	*Environment Protection Guidelines for Construction and Land Development in the ACT (2011)*

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Contaminated Land	*ACT Environment Protection Policy (2017) Contaminated Sites Environmental Protection Policy* *ACT EPA (2015) Policy on Institutional Controls and Enforcement of Site Management Plans required for Contaminated Sites* *ACT EPA (2020) Contaminated Sites Information Sheet 11 – Environment Protection Authority Report Submission Requirements* *NSW Environment Protection Authority (2020), Contaminated Land Guidelines: Consultants Reporting on Contaminated Land* *NSW Environment Protection Authority (1995), Sampling Design Guidelines* *NSW Environment Protection Authority (2017) Contaminated Land Management – Guidelines for the NSW Site Auditor Scheme (3rd Edition)* *National Environment Protection Council (NEPC), 1999. National Environment Protection (Assessment of Site Contamination) Measure (the "NEPM"), as amended in 2013 (herein referred to as the ASC NEPM 2013)*
Water	*Water Resources Act (2007)*
Waste	*Environment ACT (2000), ACT's Environmental Standards: Assessment and Classification of Liquid and Non-Liquid Wastes* *ACT EPA (2020) Contaminated Sites Information Sheet 4 – Requirements for the reuse of contaminated soil in the ACT* *ACT EPA (2020) Contaminated Sites Information Sheet 11 – Environment Protection Authority Report Submission Requirements*
Health and Safety	*Work Health and Safety Act and Regulations, 2011*

1.4 DSMP Structure

This DSMP has been structured under these section headings for ease of implementation during redevelopment works at the Site.

- **Section 2** – **Site Setting**: A brief summary of the history, previous investigation and other information related to the site.
- **Section 3** – **Roles and Responsibilities**: Outlines roles and responsibilities to be followed during any intrusive excavation works.
- **Section 4** – **Assessment of Activities**: A brief assessment of activities related to excavation works and relevant management/mitigation measures.
- **Section 5** - **Unexpected Finds Protocol**: Outlines the protocols to follow should unexpected finds be encountered during intrusive works.
- **Section 6** – **DSMP Monitoring and Review**: Procedures for the monitoring, review and updating of the DSMP should here be any significant changes to the scope of the project and/or sub-surface conditions.

1.5 Limitations

This report has been prepared in accordance with industry recognised standards and procedures considered industry standard practice at the time of the work. The aim of this DSMP is to provide DOMA with advice in relation the environmental management of soils during excavation.

The plan has been prepared on a quoted scope of for the specific purposes of the commission agreed between Agon and DOMA. This plan should be read in full and no warranties expressed or implied are offered to any third parties. No liability will be accepted for use of any part of this report in any other context or for any other purpose or by third parties.

Information provided by others has been assumed to be correct and complete. Agon Environmental assumes no liability for misrepresentation of information by others, or for matters not visible, accessible or present on the subject site during any site inspections conducted during the time of the work.

2.0 SITE SETTINGS

2.1 Site Identification

Formal identification of the site is summarised below in Table 2.

Table 2: Site Identification

Site Address	End of Denman Street, Yarralumla, ACT
Allotment Description	Block 7 Section 102, Yarralumla Block 764, Canberra Central and Block 1 Section 102 Yarralumla Blocks 11 & 12 Section 38, Fyshwick, Canberra ACT
Land Zoning	CZ6: Leisure and Accommodation RZ1: Suburban PRZ2: Restricted Access Recreation Zone
Current Land Use	Vacant
Proposed Land Use	Mixed use including residential, commercial and public space. Development Precincts are defined as follows: • Heritage Core – Commercial Land use. • Road and Open Space Network • Precincts 1, 2, 3, 4, 5, 6, 7, 8, 9 – Medium Density Residential. • Individual Housing Block Precinct – Low Density Residential. The development Precincts are shown in Figure 1.
Total Area	16 Hectares or thereabouts

2.2 Physical Setting and Current Land Use

The site is situated in the division of Yarralumla within the Canberra Central district and is bound by the Royal Canberra Golf Course (west and north), Bentham Street (north) and low density residential (south). Access to the site is made via Denman Street (south). The site itself is the former Canberra Brickworks and comprises:

- **Former Brickworks** (western portion of the site), several remnant buildings including 6 kilns, 4 stack houses, office building and amenities, 3 machinery sheds, workshops, boiler house, a substation, a powerhouse, storage sheds and other minor buildings. This portion of the site was previously occupied by Thor's Hammer, a wood recycling business.
- **The Quarry** (eastern portion of the site) includes a large grassed area with several exposed natural siltstone bedrock features which has been levelled with an unknown amount of fill and bricks which have also been formed into mounds.
- The demolished and overgrown **Workers Accommodation Area** (south).
- **Vacant areas** (south).

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Figure 1: Site Location and Precinct Plan
Source: ACTmapi (2021)

2.4 Surrounding Land Uses

Surrounding areas comprise the suburb of Yarralumla. These suburbs include commercial, residential, community and open urban land uses as permitted under the Territory Plan Zoning. The immediate surrounding land uses to the site are summarised below in Table 3.

Table 3: Surrounding Land Use

Direction	Land Use
North	Lane Poole Place and Bentham Street, residential properties surrounding the roads and beyond
East	Schomburgk Street, Woollis Street and Bentham Street with associated residential properties
South	Denman Street leads to and bisects the northern and southern portions of the Site, beyond which is Block 7 Section 102 comprising numerous trees and open spaces. Cotter Road lies beyond the trees.
West	Treed area, beyond which lies the Royal Canberra Golf Course

2.5 Site Geology, Hydrology and Hydrogeology

The environmental setting of the site is summarised as follows:

- The Geology of Canberra 1:100, 000 Sheet 8287 (1992) shows that the Canberra brickworks is underlain by calcareous and tuffaceous mudstone and siltstone of the Late Silurian Yarralumla Formation. The formation outcrops within multiple areas within the site.
- Review of the 1:100,000 Hydrology of the Australian Capital Territory and Environs (1984) indicated that the groundwater beneath the Site is generally present in fractured rock. The quality tends to be variable, with salinities between 500 – 1,000 mg/ L TDS, and yield reported at approximately 1.0 L/ s.
- The topography of the Site is variable due to historical brick material extraction works. The site generally slopes to the west north-west. SMEC (2016) identified a total of five catchments in the site.
- The southern areas of the site gradually slope to the southwest, south, and southeast. The topography of this area has been modified to include the Cotter Road and Yarra Glen/ Adelaide Avenue. Surface water flow has been mapped to generally flow south towards Yarralumla Creek which discharges into the Molonglo River.

2.6 General Site History

The Canberra Brickworks was operated between 1913 and 1976. Since its closure, it has remained largely vacant with the exception of a commercial wood working/ recycling business known as Thor's Hammer. The brickworks itself contains a range of structures/ areas associated with the brick production process. A detailed account of the site history is provided in the previous reports.

2.7 Historical Environmental Assessments

A number of environmental investigations have been undertaken at the site; the Agon (2021) SESA compiled and presented all the contemporary and historical environmental assessment data with respect to the proposed development Precincts. The intent of the Agon (2021) SESA was to determine which Precincts are suitable, from a contamination perspective, for the proposed redevelopment and if any management and/or remediation strategies are required to render any Precinct suitable for their intended uses.

A total of 11 AECs were identified as being present at the site, these are summarised below in Table 4.

Table 4: Areas of Environmental Concern

AEC	CoCs		Description
AEC#01 Kilns	Metals PAHs TRH	BTEX Dioxins	Sands, dust, surface areas located within the Kilns. This media reported elevated concentrations of Lead and Zinc in excess of the adopted ASC (2013 NEPM HIL D criteria).
AEC#02 Surface Soils Kiln 1 Fan House	Metals		Surface soils west of the fan house for Kiln 1 reported elevated concentrations of Zinc and Lead.
AEC#03 Quarry Fill	Metals TRH BTEX PAHs	OCP/ OPP PCBs Asbestos.	Soil sampling within the infilled quarry has not identified the presence of any gross chemical contamination. However, there is uncertainty in the exact nature, extent and composition of filling activities. Further assessment was recommended to reduce this uncertainty.
AEC#04 Groundwater Quarry Area	Metals TRH BTEX	PAHs PCBs	Defined as the groundwater directly below the former Quarry which has been extensively infilled. Insufficient historical assessment has been performed at this AEC.
AEC#05 Brickworks Soils	Metals TRH BTEX	PAHs PCBs	Defined as general soils around and below the brickworks (i.e., the Heritage Core area). Insufficient historical assessment has been performed at this AEC.
AEC#06 Groundwater Brickworks Area	Metals TRH BTEX	PAHs PCBs	Defined as the groundwater directly below the brickworks (i.e., the Heritage Core area). Insufficient historical assessment has been performed at this AEC.
AEC#07 UST	Metals TRH	BTEX PAHs	A former UST was identified by SMEC (2016).
AEC#08 Asbestos Dump	Metals TRH BTEX PAHs	OCP/ OPP PCBs Asbestos.	A mound of soil, anecdotally identified as containing asbestos building material debris, is present in the northern portion of Precinct 1 and was subject to remedial works by Robson (2015) which removed majority of the asbestos materials.
AEC#09 Fill Whole Site	Metals TRH BTEX PAHs	OCP/ OPP PCBs Asbestos.	Extensive fill material has been identified across the site. There is uncertainty in the exact nature, extent and composition of filling activities. Further assessment was recommended to reduce this uncertainty.
AEC#10 Residential Precincts	Metals TRH BTEX PAHs	OCP/ OPP PCBs Asbestos.	The location of the development areas was not known at the time of SMEC (2016). Accordingly additional targeted locations were proposed.
AEC#11 Benzene in Groundwater	BTEX		SMEC (2016) detected benzene (albeit at low concentrations) in groundwater at monitoring wells M2 and M7.

2.7 Current Status of Environmental Assessments

Overall, the revised CSM presented in the Agon (2021) SESA did not identify any complete contaminant-source-pathway-receptor linkages associated with the AECs with exception of the following discrete areas present in the following development Precincts:

- **Precinct 1 (Medium Density Residential)**
    - Asbestos Dump (AEC#08) – The fill mound identified as the Asbestos Dump contains pockets of anthropogenic inclusions which may contain fragments of bonded asbestos. The fill mound is located in Precinct 1 which is proposed to be bulk excavated for the construction of basement carparking. It is recommended a trial be undertaken to determine if mechanical screening be undertaken to determine if asbestos impacts (and other anthropogenic

inclusions) can be removed to enable the offsite reuse of the soils contained in the mound. Screened soil would be subject to further assessment in accordance with ACT EPA (2020) *Information Sheet 4 Requirements for the reuse and disposal of contaminated soils in the ACT*.

- BH110-1.0 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria. The source of this impact is unclear and could be anomalous; further assessment and delineation of Lead impacts in this area is recommended.

- **Precinct 2 (Medium Density Residential)**
  - TP243 – Contains bonded asbestos impacts and concentrations of B(a)P greater than 2.5x the adopted human health assessment criteria. Accordingly, this sample location is considered to be a hotspot that warrants further assessment, remediation and validation.

- **Individual Housing Block Precinct (Low Density Residential)**
  - TP223 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria. The source of this impact is unclear and could be anomalous, further assessment and delineation of Lead impacts in this area is recommended.

- **Road and Open Space Network**
  - SS6 - Concentrations of Lead were greater than 2.5x the adopted human health assessment criteria. Accordingly, this sample location is considered to be a hotspot that warrants delineation, remediation and validation.
  - UST (AEC#07) – The UST remains a potential source of hydrocarbon impacts to soil and groundwater. The UST must be decommissioned, removed and validation in accordance with ACT EPA (2016) *Information Sheet 1 Decommissioning, assessment and Audit of Sites Containing Above Ground or Underground Fuel Storage Tanks.*

3.0 ROLES AND RESPONSIBILITIES

3.1 Responsible Parties

As it is intended that this DSMP will address the objectives as detailed in Section 1.2, this DSMP has been set up such that the parties will be established at the commencement of each new project. The key roles and responsibilities associated with intrusive works are as follows:

- **Development Manager (DM): DOMA**

  Responsible for initiating projects or authorising any works. This responsibility may be delegated to a primary Project Manager for any related works.

- **Project Manager (PM): TBA**

  DOMA's nominated Project Manager responsible for project management and execution, including but not limited to procurement, design management, contract administration and construction supervision.

- **Principal Contractor (PC) involved with intrusive works: TBA**

  Responsible for the intrusive works, and for ensuring that relevant environmental management measures are implemented during works.

- **Suitably Qualified Environmental Consultant (SQEC): Agon Environmental**

  Responsible for providing environmental consultancy services, as required, to assist with any intrusive works. This may include soil categorisation for reuse and/or disposal, inductions into the requirements of the DSMP and UFP, and management of any unexpected finds.

- **Contaminated Land Auditor: Lange Jorstad of Geosyntec Consultants**

  1. Reviewing and endorsing this DSMP and any revisions thereof, for approval by EPA.
  2. Reviewing and endorsing any proposal to terminate this DSMP, if warranted, for approval by ACT EPA.
  3. Reviewing details of any unexpected find or other contamination issue encountered at the site, if directed by the EPA.

- **ACT EPA, responsible for:**

  1. Approval of this DSMP and any revisions thereof.
  2. Approval for any proposal to terminate this DSMP, if warranted.
  3. Regulating any contamination encountered at the site or requiring assessment by an EPA approved Contaminated Land Auditor.
  4. Reviewing and approving applications for waste disposal and/or beneficial reuse of waste.

Key contact details are to be populated for each new project in Table 5.

Table 5: Contacts

Role	Company	Contact	Phone
DM			
PM			
PC			
Other Contractor(s)			
SQEC			
Contaminated Land Auditor			

3.2 Inductions

All parties involved with intrusive works (e.g. bulk excavation, landscaping, underground service installation/maintenance) must be inducted into the DSMP by the SQEC. Inductions must include specific attention to the UFP (**Section 5.0**) to aid site workers in recognising potentially evidence of contamination including:

- Visually contaminated or odorous soil and/or groundwater.
- Asbestos containing material (ACM).
- Aesthetically unacceptable material such as ash and soils containing waste (including demolition waste).

The DM has primary responsibility for ensuring that inductions to this DSMP are performed for the relevant personnel, however this responsibility may be delegated to the PM or PC. Personnel inducted into the DSMP directly by the SQEC will be considered qualified to induct others into the DSMP. Inductions into this DSMP must be recorded in an induction register (**Appendix A**), and records of inductions must be maintained by the Responsible Party (DM or delegate).

4.0 ASSESSMENT OF ACTIVITIES (DRAFT)

A preliminary assessment of activities has been undertaken with reference to the ACT EPA (2013) '*Environmental Guidelines for preparation of Environmental Management Plan'* and is summarised in Table 6.

Note - The assessment of activities will be revised based further assessment and/or remediation works as they occur at the site prior to redevelopment activities.

Table 6: Assessement of Activities

Consideration	Mitigation/Management Measures	Responsibility
General Site Safety	All workers and visitors to the Site are to comply with project specific safety plans prepared for the project. All contractors are required to provide a copy of Safe Work Method Statement (SWMS) to the Project Manager for review prior to works beginning.	DM PC
Contaminated Soil (General)	• All site personnel involved with intrusive works must be inducted into this DSMP including the UFP in accordance with **Section 3.2**. • Excavated soils must be screened for unexpected finds of contamination by a SQEC or personnel inducted into this DSMP and UFP. • **Unexpected Finds** - if contamination is encountered in an area that was not expected to have contamination, all intrusive works in that location must cease, access to the location must be restricted and advice sought from the SQEC (refer **Section 5.0**). • **Appropriate PPE** may be required if visual/olfactory observations indicate the presence of contamination, or if contamination is suspected of being present at the location (i.e. an unexpected find). The SQEC will provide advice on the PPE requirements. If known or suspected asbestos containing materials are encountered, the PPE advice must be provided by a Worksafe ACT licensed Asbestos Assessor. • Work areas where known or suspected contamination is present must have restricted access, and only be accessed by inducted personnel operating in accordance with (or under the direct supervision of) a SQEC. • All contamination issues must be managed in accordance with the advice from a SQEC. The SQEC must document the management of the contamination issue, including any characterisation, remediation and validation works. The documentation must be provided to the Contaminated Land Auditor for review, or to the EPA directly for works conducted after the Audit is completed.	PM PC SQEC
Waste Handling, Classification and Disposal	Regarding spoil from intrusive works: • Excavated soil that is free of evidence of contamination may be reused in the same excavation from which the soil originated. • Soil with potential evidence of contamination or unexpected finds (refer **Section 5.0**) must be assessed by a SQEC to provide advice as to the suitability of excavated soils for reuse. • Potentially contaminated excavated soil must be stockpiled separately from uncontaminated soil (to the extent practicable), bunded to prevent erosion and sediment transport, and if advised by a SQEC potentially wetted, stabilised and/or covered to prevent potential dust transport of contamination (especially if asbestos contamination is identified or suspected). • If surplus excavated soils cannot be reused on site, waste classification of the material must be performed by a SQEC in accordance with ACT EPA (2019) Information Sheet 4 - Requirements for the Reuse and Disposal of Contaminated Soil in the ACT. The waste classification report must be submitted to EPA for review and approval prior to the removal of any material from the site. • For the purposes of the statutory audit of the contamination issues at the site, a waste tracking protocol must be implemented and documented, including recording the source location and volume of the material removed from site, the waste classification and reuse or disposal approval from EPA, and weighbridge dockets from the landfill (for material disposed at landfill) demonstrating that the amount of material received at the landfill is 1) equivalent to the amount of material removed from the site, and 2) consistent with the amount of material approved for disposal under the EPA approval.	PC SQEC

Dust Generation	Dust management measures to comply with *Environment Protection Guidelines for Construction and Land Development in the ACT (2011*). Nominal measures to include: • Dust generating activities should be limited during unfavourable conditions (e.g. windy days) and dust suppression measures (i.e. water spraying, covering stockpiles) should be used where necessary. • All plant and equipment will be regularly serviced and well maintained to reduce emissions of greenhouse gases. • Water spraying will be utilised as required to dampen dust on working areas and/or access routes, if required. • Monitor wind conditions to assist with daily management of windblown dust from unconsolidated soil surfaces. • All loads/ material arriving onto/ leaving site should be covered.	PM PC Contractors
Dust Generation (Asbestos in Soil)	In the case of soils containing asbestos materials, identified or encountered unexpectedly, a Worksafe ACT licensed Asbestos Assessor must be engaged to advise on mitigation measures during the handling and/or removal of impacted soils. In addition to the general dust generation mitigation measures the following will also apply: • Oversight of all handling and removal of asbestos impacted soils by a Worksafe ACT licensed Asbestos Removalist. • Provision of air monitoring for asbestos fibres is to be in accordance with ACT Work Safety (National Code of Practice for the Safe Removal of Asbestos) Code of Practice 2010 and Guidance Note for Membrane filter method for estimating airborne asbestos dust, 2nd Edition [NOHSC: 3003 (2005)] – the requirement, nature and extent of air monitoring to be advised by the Asbestos Assessor and will be dependent on the nature of asbestos material being handled.	PM PC SQEC Asbestos Assessor
Hazardous Materials	All hazardous materials should be stored and used in accordance with relevant regulation and licensing requirements, noting: • Fuels, chemical and other hazardous materials should be stored in a designated area, which may include an impervious base and surrounded by a bund. • Any spills of hazardous materials should be contained to the extent practicable to minimise the potential for impacts to health and the environment. Spills on unsealed ground should be excavated immediately and placed on an impervious tarp or hardstand for assessment by the SQEC.	PC Contractors SQEC

5.0 UNEXPECTED FINDS PROTOCOL

5.1 Purpose

In general, environmental assessments are based on results from a desktop review of land use history and a statistically designed investigation program; actual conditions may vary from those expected during intrusive excavation works, and evidence of contamination may be encountered where it was not previously reported. Unexpected finds may include soils that are observed to have a visual impact (staining, discoloration), olfactory impact (odour) and/or may be impacted with anthropogenic inclusions (demolition waste, asbestos, etc.).

Previous environmental assessments at the site identified hydrocarbon impacts around a former service station in the northern portions of the site (subsequently remediated, but with potential residual contamination remaining), EPA-reported areas of historical landfilling (still pending investigation to confirm or deny) and uncontrolled filling containing demolition waste has been reported on site. In consideration of the historical observations and data gaps in the investigation of the contamination status of the property, this UFP is to be implemented in the event unidentified or unexpected conditions are encountered during intrusive works to ensure potentially contaminated soil is identified and managed appropriately.

Unexpected finds (typical to Canberra, in general) may include (but are not limited to) the following:

- **Fill incorporating demolition wastes**: Historically, poor demolition and waste disposal practices has led to the unsystematic occurrence of fill incorporating demolition wastes (also known as “builders waste”) being present throughout Canberra. This may be indicated by the presence of anthropogenic material, such as concrete rubble, bricks, plastic, metal, sheeting and other materials associated with demolished built structures.

  Of concern was the prevalence of asbestos in domestic building materials until their use was banned in the 1980s (and later complete ban in 2003 of asbestos in all products). Bonded asbestos (i.e. cement sheeting, eaves, cladding, roof tiles/shingles) and to a lesser extent fibrous asbestos (i.e. pipe lagging, boiler insulation, sprayed insulation) can be co-located with demolition wastes, particularly those from buildings pre-dating the 1980s.

- **Fill incorporating municipal wastes**: The potential presence of municipal wastes in uncontrolled fill, anecdotally reported in EPA records, has not yet been fully assessed. Municipal waste may include domestic, industrial or commercial wastes in addition to “builders waste”. The distinction would typically include organic wastes (such as paper, cardboard, food scraps, green waste), textiles, furniture, household refuse, tyres and car parts, machinery, and potentially drums or other liquid waste containers. Nearby areas to the site (i.e. the Causeway and Railway) were known to have been used for waste disposal, this includes the PCA01 and PCA02 areas of the site which were also identified as potential waste disposal locations.

- **Hydrocarbon-impacted soil and groundwater**: A service station previously operated in the northern portion of the site, and a hydrocarbon release into soil and groundwater was identified. The impact was largely remediated by excavation of hydrocarbon-impacted soil around the storage and filling areas, but it is possible that some residual hydrocarbon contamination remains in soil and groundwater on the periphery of the remediated areas. This material is typically identified by a hydrocarbon odour (which may be subtle due to weathering) and discolouration/staining (typically grey, black or even green).

- **Visual or olfactory signs of soil contamination**: This may include a hydrocarbon odour, ash, cinders or slag, or soil staining. These signs of contamination may be associated with disposal of industrial/ commercial wastes (i.e. incinerator wastes) or spills or leaks (e.g. from storage of hydrocarbon fuels or lubricants).

Typical types of contamination that may be encountered during bulk excavations works are shown below.



Photograph 1: Ash layer in soil



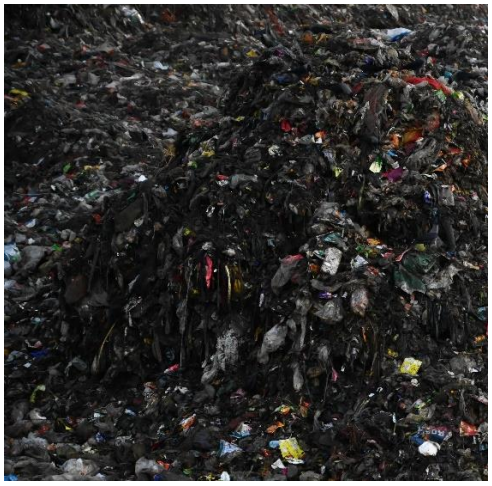
Photograph 2: Stained soils



Photograph 3: Bonded asbestos



Photograph 4: Solid inert wastes in soil



Photograph 5: Landfill wastes



Photograph 6: Landfill wastes

5.2 Protocol

It is the responsibility of the Development Manager to ensure that all personnel involved with intrusive works are inducted to the site-specific DSMP and UFP. Where applicable, additional training to deal with unexpected finds may be required, for example the Asbestos Awareness Course which is mandatory for the construction industry in the ACT.

In the event that unexpected finds of potential contamination are identified during works, the following procedure must be adopted.

Table 7: Unexpected Finds Protocol

Action	Responsibility
AWARENESS All site workers involved with intrusive works are to be inducted into the DSMP and UFP. DSMP inductions may be undertaken by a SQEC, or someone inducted into the DSMP directly by a SQEC.	DM PM PC Contractors SQEC
UNEXPECTED FIND ENCOUNTERED 1. **STOP WORK –** All excavation in the immediate area to cease to minimise further disturbance of any contaminated soil which may increase an exposure risk to nearby workers. **2. MAKE SAFE –** Following cessation of nearby works, the area should be made safe by the implementation of an '**EXCLUSION AREA**'. This must include physical demarcation using safety cones, hazard tape (or similar) at a minimum. If a larger area of contamination is identified, where works will occur over longer timeframes, the area should be protected by fencing. Site workers to be notified and advised not to disturb the find. If safe to do so, the unexpected finds may be covered with clean soil to limit the risk of exposure. This may be discussed with the SQEC on a case by case basis. **3. NOTIFY** – Notify the Site Supervisor, Foreman or similarly responsible persons who will contact the SQEC to inspect the find.	PC Contractors
ASSESSMENT OF THE FIND SQEC to undertake an assessment to determine the nature and extent of the find including any interim management measures.	SQEC
NOTIFICATION Notify the relevant regulatory authorities of the find. **Note**: If asbestos containing materials are encountered, the DM (or delegate) to notify Worksafe ACT and submit a Dangerous Occurrence Report (DS-238) within 48 hours. The SQEC to assist with describing the occurrence and any implemented management measures.	DM PM SQEC
REMEDIATION Manage, remove or treat the contamination in accordance with the applicable EPA regulations, laws, guidelines and industry practice in accordance with advice from the SQEC. Depending on the nature and extent of the find, a Remediation Action Plan (RAP) may need to be prepared and submitted to the Auditor (if still under Audit) or the EPA for review and approval. If the management approach includes off-site disposal of contaminated soil, EPA approval will be required and will be managed by the SQEC.	PC Contractors SQEC
VALIDATION Validation demonstrating the successful removal or management of the find may be required. The SQEC to advise what may be appropriate depending on the nature of the find. The identification, assessment, management and validation of the unexpected find(s) must be documented by the SQEC in the form of a validation report (or letter/memorandum for minor finds), which should be submitted for review by the Contaminated Land Auditor (if still under Audit) or the EPA.	SQEC
RESUME INTRUSIVE WORK Following successful validation, or as advised by the SQEC (and potentially the Auditor/EPA), excavation works can resume subject to the ongoing implementation of the UFP.	PC Contractors SQEC

6.0 DSMP MONITORING AND REVIEW

6.1 Monitoring Responsibility – Internal Auditing

The DM (or delegate) will be responsible for the overall implementation of the DSMP during excavation works, and as part of this will undertake discussions/consultations with the Contractors to ensure all workers involved with intrusive works are inducted into this DSMP.

Agon may conduct audits to ensure that all operations conform to the requirements of the DSMP, in particular that the UFP outlined in **Section 5.0** is being followed.

6.2 Non-Conformance and Corrective Action Reports

Non-conformances must be recorded in a Non-Conformance/Corrective Action Report. An example copy of a Non-Conformance/Corrective Action Report is provided in **Appendix B**. Details of the non-conformance, including any immediate corrective actions undertaken, are to be recorded by the Contractor. Once completed, the Contractor will provide details of the actions undertaken on the Non-Conformance/Corrective Action Report and sign, date and file the report.

6.3 Environmental Complaint and Incident Management Reports

Records will be kept of any complaints, environmental incidents, accidents, hazardous situations, unusual events and unsafe health exposures and the corrective action taken. For environmental aspects the SQEC must be engaged to investigate the cause of any emergency so that necessary changes in work practices can be made to prevent the incident recurring. A copy of all incident reports and subsequent investigations must be provided to the land custodian for filing. It is noted that:

- All notifiable incidents (as required by WorkSafe ACT) require reporting to WorkSafe ACT within the required timeframes for the specific incident.
- All environmental incidents that have the potential to cause pollution (as defined by the ACT EPA) including details on the appropriate corrective actions are to be reported to the EPA, within the EPA specified reporting timeframes.

Details of the environmental complaint and/or incident reports are to be documented in the register provided in **Appendix C**. If an environmental complaint and/or incident identifies a non-conformance, a Non-Conformance and Corrective Action Report must be initiated (**Appendix B**).

6.3 Review and Control of the DSMP

The DSMP will remain present at the site at all times during development works; however, it is a live document and, as such, may require updating based on change in project scope, unexpected finds or to address an unforeseen environmental issue.

Agon will be responsible for reviewing and updating the SMP to the meet the objectives outlined above. Any proposed changes will be agreed and approved by the Development Manager (or delegate), and by the Contaminated Land Auditor (if still under Audit) or the EPA prior to implementation.

Update of the DSMP may occur, under the following circumstances:

- This version of the DSMP does not adequately address the environmental management requirements of the proposed works.
- Construction works are significantly altered, and new environmental risks are identified.
- The site inspections and internal audit process has indicated significant shortcomings in the DSMP or requires changes to be made to ensure better uniformity.

- The DSMP is considered to no longer be necessary, for example based on additional site investigation results or remediation and validation of contamination sources.

Any proposed revisions to the DSMP, including a proposal to terminate the DSMP, must be documented and supported by clear lines of evidence, and must be endorsed by the Contaminated Land Auditor (if the site is still under audit), and/or approved by the EPA prior to implementation.

This DSMP shall remain in force until a proposal to terminate the DSMP is approved by the EPA.

7.0 INDUCTION REGISTER

Project personnel and contractors involved with intrusive works as part of project are required to sign the Induction Register prior to commencement of any works

Agreement and Acknowledgment Sheet prior to conducting activities at this site.

Name	Date	Company	Signature

8.0 COMPLAINTS/NON-CONFORMANCE REGISTER

A Complaints/ Non-Conformance Register has been prepared to record all complaints and/or non-conformances during intrusive works. All complaints to be acknowledged within a reasonable timeframe and a detailed response generated accordingly.

Issue	Description	Response

APPENDIX A: DSMP INDUCTION RECORD

Operational staff must sign the master copy of this document, indicating they have read and understood it. The employee's signature indicates acceptance and compliance with the requirements of the SMP Copies of this document must be made available for their review and readily available at the Site.

Employee Name Employer	Date	Signature	Inductor Name & Company	Signature

APPENDIX B: NON-CONFORMANCE ACTION REPORT

Date:	
Reporter:	Name: Sign:
Time:	
Site / Area:	
Problem:	
Cause:	
Report to:	Project Manager (Name):
Corrective Action:	
Signed by Project Manager upon Completion:	
Feedback Response to Prevent Future Occurrences:	
Date:	

APPENDIX C: COMPLAINT AND ENVIRONMENTAL INCIDENT REGISTER

Date	Details of Incident/Complaint (Type, nature, details, location etc.)	Response to Incident/Complaint (Corrective action, response	Date	Signature / Position



BRICKWORKS

COMMUNITY ENGAGEMENT SUMMARY

REPORT FOR STAKEHOLDERS

2021

DRAFT EDP & CAB DA



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SECTION 1: OVERVIEW

Since lodging the Community Engagement Notice (CEN) for the Concept Estate Development Plan (EDP) at the end of February 2020, DOMA has continued to conduct extensive community engagement activities, over and above those required by the Community Engagement Plan that forms part of the Concept Delivery Deed (CDD) executed with the ACT Government.

DOMA thanks all stakeholders, and the Brickworks Community Panel in particular, for their ongoing time, engagement and constructive contributions to the design development.

Despite the unique challenges posed by the Covid-19 outbreak, and some delays to the program, good progress continues to be made in the design development as DOMA engages with the community along this redevelopment journey.

Consistent with previous feedback, the overall community response to the project remains very positive.

While there has been some limited feedback from a handful of community members who would prefer that no development occur on the site at all, overall, the majority of feedback has been constructive and supportive.



Naturally, there are specific matters of interest to particular sectors of the community, such as parking and interface for immediate site residents (and those on Lane-Poole Place in particular), which DOMA has been addressing in the design development.

DOMA has continued to work consultatively with the Community Panel, the Suburban Land Agency (SLA), Heritage Council and other Government Authorities/Agencies, as well as the wider public.

BACKGROUND

The bulk of significant community engagement outcomes for the Brickworks redevelopment project occurred early in the pre-tender phase.

The pre-tender consultation not only established the Community Panel, it led to the formulation of the "Community Objectives" to guide the ACT Government's tender evaluation process.

Consideration of Community Objectives, among other things, led to a number of significant outcomes for the community including around key issues such as density, ensuring no through traffic from existing road networks into the site and provisions for parking at the site.

While DOMA acknowledges the utility of the Community Objectives in not only guiding the tender process but also in continuing to inform the design development, it is important to note that not all of these objectives were included in the final delivery deed executed between the parties as part of the successful tender.



Some objectives were conflicting while others, such as the attainment of 6 Star Green Star Communities certification, were adjusted down to a 5 Star Green Star Communities rating as part of the commercial negotiations for the sale of the site.

DOMA has been very transparent with the Community Panel (and in broader public forums) throughout the Concept and Draft EDP community engagement phases regarding its contractual obligations in order to best manage expectations about which of the community objectives are contractually deliverable. We note some Community Panel members have expressed their frustration that no mechanism exists for the community to hold the ACT Government to account for delivering the objectives negotiated with them in the pre-tender phase.

DOMA has also sought to manage a number of legacy issues from early consultations between the ACT Government and the community as best as possible within the constraints of the delivery deed.

These include consultations between the SLA's predecessor, the Land Development Agency (LDA), and members of the community regarding a wombat crossing on the new Canberra Brickworks Access Road.

While DOMA has adjusted its traffic and pedestrian flows within the site as much as possible to address these concerns, ultimately the wombat crossing request – having not been supported by the ACT Government Agency responsible for delivering the new Brickworks Access Road (TCCS) – is not one within DOMA's purview to resolve for the community.



Similarly, the Yarralumla Uniting Church has raised issues of impacts on their parking due to DOMA's requirement to deliver a new shared path in the verge of Denman Street. Consultations between DOMA and the Yarralumla Uniting Church regarding the impacts on the Church's existing informal street verge parking have sought to manage this issue.

While unable to fully resolve the Church's concerns, DOMA has engaged meaningfully with them. DOMA has worked to ensure that its obligation to deliver the shared path off-site works do not preclude parking improvements to Denman Street being delivered in the future. DOMA funded the production of plans that demonstrate a realigned shared path that allows parallel parking to be developed by others in the future. The shared path realignment may mitigate some of the Church's concerns. A proposal by DOMA to relocate the shared path to an alternative route behind the Church's property that connected to pedestrian paths being constructed on Dudley St was not supported as a substitute for the agreed Denman Street shared path off-site work delivery requirement.

Ultimately future works to Denman Street to address parking concerns will be a matter requiring resolution between the Church and the ACT Government however DOMA has done everything possible to facilitate a positive outcome on this matter.



SIGNIFICANT OUTCOMES FOR THE COMMUNITY

For matters that sit within DOMA's scope for action, they have been able to engage constructively with the community (including the Community Panel, immediate site neighbours and the wider public) to achieve some very positive outcomes.

These outcomes are summarised in greater detail in Section 4 of this report, however some key highlights are worth noting, these include:

- **Parking**: The CDD requires DOMA to deliver approximately 200 public car parking spaces as part of the project. Car parking has been a constant and significant concern expressed by all stakeholders. In response, DOMA has altered the Draft EDP to now provide for more than 300 public car parking spaces to support commercial uses generating visitors to the site.

- **Building heights/viewlines**: Building heights, together with density, were key issues raised by the community from the pre-tender consultations and continue to be raised by all stakeholders during engagement activities along with views of the new buildings from external vantage points (including Dunrossil Drive, Cotter Road and immediate site neighbours).

  In response, DOMA has altered the Draft EDP (following consultation in the Concept EDP phase) to both break up and relocate some of the proposed buildings thereby ameliorating potential impacts on external viewlines into the site.



DOMA has also chosen to build under the maximum allowable height limits on multiple dwellings/housing typologies throughout the site, which together with the landscape masterplanning, will ensure delivery of a final product true to the 'village in a garden' setting vision outlined in its tender and consistent with the community objectives.

- **Amenity**: Consistent with the Brickworks' standing as a unique site and development within the context of Canberra's architectural history, the community is very much alive to and interested in the design aesthetics of the buildings: both the restoration of the heritage core and the new construction.

  Having engaged multiple architectural practices on the design development, DOMA is leveraging their collective creativity and design expertise to push the design development to new levels of excellence. Early designs were shared with the community (and the Community Panel beforehand) at the second public presentation. While responses to architectural design will always be inherently subjective, DOMA listened and responded to feedback on the designs and were able to present updated designs to a warm reception at the third Public Presentation.

- **Traffic**: The other major change to the Masterplan was the shifting of density to the west of the site away from established houses and reducing the traffic flow on Denman Street by providing access to most buildings through the newly constructed Quarry Drive (Canberra Brickworks Access Road).



SECTION 2: KEY STAKEHOLDERS ENGAGED

- General Public (Yarralumla residents, including business owners/shops and surrounding Canberra residents)
- Community Panel (representing various interest groups and community/resident organisations)
- Immediate site neighbours
- Governor General's Office (site neighbour)
- Royal Canberra Golf Club (site neighbour)
- Uniting Church (site neighbour)
- SLA & relevant authorities including the ACT Heritage Council, agencies, and the Government Architect





SECTION 3: COMMUNITY ENGAGEMENT ACTIVITIES

Concept EDP Phase: recap of community engagement activities and outcomes

Below is a summary of the community engagement activities undertaken as part of the Concept EDP phase that have informed the design development leading into the Draft EDP/CAB DA submission:

- First public presentation and detailed question and answer session at Yarralumla Primary School to outline design thinking and seek public comment, responses to questions.

- Community 'Kiln Conversation' drop-in sessions held at Deakin and Yarralumla shops to raise awareness of the project and respond to questions, capture community feedback.

- Meetings with relevant authorities and agencies including the ACT Heritage Council, National Trust as well as specific stakeholder groups including immediate site neighbours (Lane-Poole Place & Schomburgk St, Government House and the Royal Canberra Golf Club), the Brickworks Community Panel (including the Yarralumla Residents' Association, Inner South Community Council, Pedal Power and the ACT Geological Society).

- A public 'memory call' for hard copy submissions of photographs, written and oral stories and videos was published on the community website.

- Web based poll to gauge support of revisions to RFT masterplan that shift density onsite away from existing residents.



This community engagement during the Concept EDP phase resulted in the following changes to the masterplan/RFT proposal.

- A substantial increase to the number of public car parks to be delivered as part of the development (from 200 to over 300).

- Changes to the masterplan to relocate Building Q and break up originally proposed apartment buildings into smaller blocks, re-siting them and adding further landscaping.

These measures have significantly softened and ameliorated the new dwellings' impacts on external viewpoints of the site as well as helping to alleviate community concerns regarding parking and traffic flows.

Draft EDP Phase Activities

Public presentations

A second (27/10/20) and third (30/3/21) public presentation have been held (copies published on the community website www.brickworkscommunity.com.au), with a fourth scheduled for around September 2021 (TBC depending on approval timeframes of Draft EDP prior to submitting the Final EDP). Two immediate site neighbour public presentations were also held on 22 April (Schomburgk St, Bentham St, Woolls St, Dudley St) and 29 April 2021 (Lane-Poole Place).

Questions and feedback from the public presentations, and DOMA's design responses, are summarised in Section 4 of this report and the accompanying detailed table.



More than 200 people registered to attend the second community information, with 93 attending in person and 47 unique users (in many cases representing couples or families) tuning into the live feed of the event. A video of the 2-hour session and copy of the presentation was subsequently published on the community website.

The detailed presentation by DOMA and lead architecture firm SJB was followed by an extensive Q&A session with all queries responded to (both in person and from the online audience) and feedback on the presentation provided.

No further questions were submitted via the community website and only one piece of additional feedback was received relating to potential design options for the residential dwellings.

More than 190 people registered to attend the third community information evening, including 113 in person and 79 virtually. A video of the 2-hour session and copy of the presentation was subsequently published on the community website.

The detailed presentation by DOMA and DOMA's builder Bloc was followed by an extensive Q&A session with all queries responded to (both in person and from the online audience) and feedback on the presentation provided.

A number of follow up emails were received in response to the presentation providing high level feedback and also from immediate site neighbours requesting further detail.



Immediate neighbour consultations

Subsequently, two public consultations were scheduled with immediate site neighbours on 22 and 29 April 2021 (copies published on the community website www.brickworkscommunity.com.au).

Both meetings were well-attended (approx. 40 and approx. 15 respectively) and well-received. Detailed questions were addressed at length and a number of follow up actions committed to. For example, further details on proposed fencing along shared boundaries, additional 3D view lines for specific neighbours, etc. The additional information will be included in the draft EDP DA submission or Final EDP DA submission for additional works such as the 3D studies.

> *Thanks for the presentation on 28 April. Very impressive and very informative. We are looking forward to the Brickworks development proceeding ASAP.*
>
> - *Lane-Poole Place Resident*

These more recent immediate site neighbour consultations follow earlier small meetings with residents of Schomburgk Street, Lane-Poole Place and staff from the office of the Governor General.



Monthly meetings with the Community Panel have continued during the Draft EDP development phase. As a result of Covid-19, during the period March – June 2020 written reports were provided to the panel in lieu of meetings due both to social distancing requirements and an absence of significant project updates. From July 2020, it was agreed to re-convene meetings via a virtual platform, which continues to be offered even though face-to-face meetings recommenced in July 2020.

The meetings provide an opportunity for DOMA to brief the panel on key milestones ahead of broader public consultation, understand and respond to any concerns that may be expressed within the community but not directly to DOMA and test design thinking and potential solutions prior to further working up ideas.

While the Community Panel raises issues of concern to the broader community, such as parking, they also have a focus on more specific matters, often relating to the Community Objectives.

Multiple presentations have been developed explicitly for the Community Panel to understand and resolve concerns around key issues. These include the infill of the northern spur of the quarry, viewlines, Green Star Communities certification as well as detailed consultation on the Conservation Management Plan and Environmental Impact Statement, which are in addition to the scope of the CEN requirements.



Generally, the wider public has been more interested in understanding the staging and timeframe of the project, the onsite amenities and when they will be able to access and enjoy the new public and commercial facilities (such as the park, restaurants, etc).

The dedicated community website has proven to be an effective tool for communicating updates with interested members of the community as well as providing a conduit for questions to be raised directly with the DOMA.

With almost 2,000 unique visitors to the site in the last 12 months and over 3,300 sessions (occasions when people have spent time on the community website), this is a resource that will continue to facilitate meaningful community engagement throughout the construction phase of the project.

Open and direct lines of communication with both the Community Panel and the broader public directly through the Concept and Draft EDP stages of the approvals process should give both DOMA and the Authorities & Approving Agencies confidence that the community has been heard, issues of concern identified, considered and addressed. Reciprocally, this also gives the community confidence in the project moving forward.



Strong attendance at the public presentations and subsequent feedback demonstrates:

- a strong interest in the project;
- a clear desire (and in some cases impatience) to see it progress expeditiously;
- an appreciation of the additional amenity this will bring to Yarralumla and Canberra more broadly; and
- a sense of anticipation and excitement at the restoration of this iconic site and the ability for all to enjoy it in the near future.





SECTION 4: KEY THEMES FROM ENGAGEMENT & INFLUENCE ON DESIGN DEVELOPMENT

Authorities & Approving Agencies

In addition to monthly progress meetings with the SLA, DOMA has engaged with Authorities & Approving Agencies at relevant points throughout the Concept and Draft EDP development phases.

While submitting the project to the Design Review Panel was not a requirement, DOMA has met with and presented to the ACT Government Architect. DOMA identified that it has commissioned multiple architectural practices to work on the site, including specialist heritage architects to work on the Heritage Core. DOMA is confident that the design development process using multiple experienced architectural firms is effective and will produce positive and high-quality outcomes for the Brickworks development.

Following its reconstitution, DOMA also commenced monthly meetings with the ACT Heritage Council thereby enabling their feedback to be incorporated progressively during design development.

The engagement on the design of the Heritage Core with the Heritage Council has occurred in parallel with the consideration of the Conservation management Plan that has been revised and updated by DOMA.



A key outcome from this process was the Heritage Council's support for DOMA's proposal to remove the existing dominant tin roof at the entrance to the Brickworks, opening up this critical site entry space and enabling better views to the heritage core beyond, allowing additional verdure to be introduced, and exposing the historic railway rails that are such an iconic feature of this structure.

DOMA has also undertaken a wholesale update of the EIS prior to lodgement to better reflect the design development of the master plan evolution since the tender stage.

Public and stakeholders

Throughout the myriad public and community consultation activities undertaken during the Draft EDP development phase, as detailed in the CEN, a number of common, key themes have engaged across diverse stakeholder groups. Other matters raised have been specific to certain stakeholders. These common themes, and DOMA's response to them including information about how this feedback has influenced the design development, are contained in the *Detailed Community Engagement Activities & Impact on Design Development* summary table on the following pages.



The common themes (in order of importance as expressed by the community) were:

- **Parking and traffic flows**: Car parking and traffic flows have been a constant and significant concern expressed by all stakeholders. In response, DOMA has altered the Draft EDP to now provide for more than 300 public car parking spaces to support commercial uses generating visitors to the site. Consistent with the requirements in the CDD, and reflecting the community objectives, there will be no through traffic from existing road networks in Yarralumla to the Brickworks development. Vehicular access (other than emergency vehicles) will be restricted to the new Brickworks Access Road currently under construction, except for a small number of new dwellings that will be serviced off Bentham and Denman Streets. Density on the site has been moved west, away from existing residents, resulting in the number of dwellings to be serviced off these two existing roads being reduce from 76 in the RFT masterplan to 23 in the Draft EDP.

- **Dwelling density, height and viewlines**: Building heights, together with density, were key issues raised by the community from the pre-tender consultations and continue to be raised by all stakeholders during engagement activities along with views of the new buildings from external vantage points (including Dunrossil Drive, Cotter Road and immediate site neighbours).

  In response, DOMA has altered the Draft EDP (following consultation in the Concept EDP phase) to both break up and relocate some of the proposed buildings thereby ameliorating potential impacts on external viewlines into the site.



DOMA has also elected to build under the maximum allowable height limits on multiple dwellings/housing typologies throughout the site, which together with the landscape masterplanning, will ensure delivery of a final product true to the 'village in a garden' setting vision outlined in its tender and consistent with the community objectives.

- **Amenity**: Consistent with the Brickworks' standing as a unique site and development within the context of Canberra's architectural history, the community is very much alive to and interested in the design aesthetics of the buildings: both the restoration of the heritage core and the new construction.

  Having engaged multiple architectural practices on the design development, DOMA is leveraging their collective creativity and design expertise to push the design development to new levels of excellence. Early designs were shared with the community (and the Community Panel beforehand) at the second public presentation. While responses to architectural design will always be inherently subjective, DOMA listened and responded to feedback on the designs and were able to present updated designs to a warm reception at the third Public Presentation.

  Individual concerns received by DOMA relating to the design development are summarised below. Other questions (such as around site security, whether there will be childcare facilities etc.) are canvassed in supporting documents and FAQs.



Detailed community engagement activities & impact on design development summary table

THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
Parking & Traffic flows	- General Public - Community Panel - Office of the Governor General - Immediate Site Neighbours (Lane-Poole Place and Denman St in particular) - Uniting Church Yarralumla	Parking and traffic flows have been by far the most commonly raised issue by stakeholders relating to the Brickworks project. The nature of the concern varies depending on the specific stakeholder group but broadly it is that visitors to the Brickworks will clog surrounding existing streets with their vehicles. There are also safety, noise and light pollution concerns from increased traffic flows. The Governor General's office is concerned from a security perspective as regards Dunrossil Drive, resourcing of AFP to check parked cars and the threats increased circulation and parking might potentially pose to visiting heads of state and other senior government representatives. Residents of Bentham St (specifically 46-48) noted safety concerns relating to existing traffic to and from the Royal Canberra Gold Course and turning into the new cul-de-sac. Residents of Denman St expressed concern about vehicles parking	DOMA has responded to these concerns by increasing onsite parking from the 200 (non-residential) places required in the tender to over 300. DOMA has outlined how the paid parking will be set up to incentivise a high turnover of short-term parking (similar to the Realm precinct in Barton). DOMA has confirmed that there will be no through access from existing road networks to the site, with access to be provided by the new access road currently under construction. DOMA has also confirmed generous resident parking arrangements, in excess of minimum requirements and plans to activate cycling and walking networks into and around the site. DOMA has confirmed there will be generous provisions for end of trip facilities (for commercial) as well as public bike parking, noting also the increased use of e-scooters in the ACT.



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
		on their street, the new cul-de-sac and people seeking to access the Brickworks via Denman turning around at all hours of the day and night (as currently happens they report). The Uniting Church is concerned about the impact of offsite works(the construction of a shared cycle and pedestrian path) on their current informal parking arrangements in the verge of Denman St. Residents of Lane-Poole Place are concerned that visitors to the Brickworks will park on their street as a short cut to access the site.	DOMA has commissioned additional parking and traffic (including temporal) analysis and shared this with all stakeholders. DOMA has confirmed landscaping will be used to disincentivise parking and access (on foot) from Dunrossil Drive into the site. The issue of 46-48 Bentham St driveway safety is being further examined and will be addressed in the Draft EDP. DOMA has commissioned and shared (at its cost outside of required obligations) drawings to indicate potential alternative solutions (by others) to deliver on street parking for the Uniting Church. Doma have moved (realigned) the position of the shared path off-site work to allow parallel parking by others in the future. DOMA has shared feedback with ACT Government authorities in terms of potential signage and increased parking restrictions that they could implement in existing surrounding streets. While DOMA has taken every action to



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
			ameliorate these concerns, they have also been transparent with the community about what is inside, and outside, their purview as regards traffic and parking management in existing streets.
Sustainability	- General Public - Community Panel	The sustainability features of the project have been raised in questions by the community, both at public forums and in direct queries via the community website, as well as via the Community Panel. In particular, the Community Panel has questioned the need to have gas connections on the site as well as the decision to target 5 Star instead of 6 Star Green Star Communities Certification and a range of other specific elements outlined in the Community Objectives. Community members have also asked about solar power use on the site.	DOMA is committed to delivering the Yarralumla Brickworks development as a 5-star Greenstar Communities project, as rated by the Green Building Council of Australia (GBCA). This will mean that the development will be considered as Australian Excellence when assessed against governance, liveability, economic prosperity, environment and innovation by the GBCA. DOMA had offered to deliver 6 Star rating during the tender phase, however this was amended to 5 Star at the ACT Government's request as part of the contract negotiations balancing the financial and non-financial benefits of Green Star Communities rating. DOMA has engaged specialist consultants (ARUP) to examine the specific features that will be incorporated towards achieving the 5 Star rating. Details of



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
			this have been shared with the Community panel. Solar installations will feature on the site, the extent of this is yet to be determined but will include on some of the heritage buildings. Through the EIS, DOMA and its consultants have identified and addressed all ecological, biological and environmental issues arising as a result of the development. DOMA is also exploring innovative rainwater harvesting from the apartment buildings to work in conjunction with the quarry park lake using natural filtration and encouraging biodiversity. DOMA has explained that while there will be no gas connections to the apartment buildings, it is a requisite feature for the success of commercial kitchens planned as part of the heritage core retail and hospitality precinct.
Accessibility	- Community Panel	- Accessibility of design for both buildings and surrounding parks/walkways	DOMA is committed to ensuring Brickworks is an active, wellness precinct. While not seeking formal certification, DOMA will naturally



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
		- Facilitation of walk, cycle and pram ways	build to all applicable National Construction Code and Building standards while going above this in terms of accessibility. Footpaths and walkways will comply with requirements regarding grade, width etc. DOMA has taken on board Community Panel suggestion to consult with specialist accessibility groups e.g. COTA, Living Streets. DOMA is also working through potential options/solutions for accessible access to Quarry Park from the northern end (near Bentham St) despite topographical challenges. DOMA is also looking at innovative barrier options to protect the public from the quarry cliff edges and ensuring accessible access to all public spaces.
Viewlines	- Community Panel - Office of the Governor General - Immediate Site Neighbours (Schomburgk St in particular)	The Community Panel has expressed concern about which of the new residential buildings will be visible from outside the site including in particular: - From the Arboretum	DOMA has listened to these concerns and made adjustments to the site masterplan in response. DOMA has noted, however, that views of the site from external vantage points fall outside the scope of



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
Viewlines cont.		- From the southern approach (noting that the ridge provides a barrier delineating the inner south from Woden and surrounding region - The Office of the Governor General is concerned to maintain the dignified and verdant aspect of Dunrossil Drive for convoys approaching Government House - Immediate site neighbours along the eastern side of the site have expressed concern about oversight and overshadowing of their properties from the new freestanding dwellings	its development responsibilities. Specifically, following consultation during the Concept EDP phase, DOMA has amended the masterplan to relocate Building Q (the one causing most concern to the CP), break up originally proposed apartment buildings into smaller blocks, re-siting them and adding further landscaping. These measures have significantly softened and ameliorated the new dwellings' impacts on external viewpoints of the site. DOMA has undertaken detailed view line analysis to clearly show the impact on external vantage points of the project along its eastern and southern boundaries (please refer Annexures F and M) and shared this with stakeholders, demonstrably lessening their concerns. DOMA has also worked closely with its consultants to best manage the topography, dwelling siting and design along the Eastern border of the site in a way that minimises oversight and overshadow for existing residents. Additional measures



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
			have been discussed with individual residents relating to landscaping and fencing. Staff from the Office of the Governor General have been shown detailed plans including landscape) to address both their security and amenity concerns relating to the interface with Dunrossil Drive, with engagement to continue. Importantly, both landscaping and setbacks around the site serve to substantively ameliorate the concerns that have been raised.
Quarry northern spur infill	- Community Panel	The Community Panel – and ACT Geological Society in particular have consistently raised concerns about the permissibility of filling in the northern spur of the quarry. Concerns centre on the heritage impacts and need to preserve geological features of significance.	DOMA examined the issue and concerns raised at length and in consultation with experts. The ACT Heritage Council expressed no concerns with the proposed infill. DOMA also commissioned ACT Geotechnical Engineers to conduct a detailed geological fossil study. Their report was shared with the Community Panel



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
			Their report found that "Therefore, it is our assessment that there are no fossils of scientific value in the proposed Fill Areas 1 and 2, and hence is no geological reason to prevent the filling to occur." The infill proposal is based on DOMA's concern to ensure community safety in this part of the site. The expert advice DOMA has sought to inform its proposals relating to the quarry – both infill and protection of significant fossils – has resolved the Community Panel's concerns on this issue.
Asbestos remediation	- General Public - Community Panel - Immediate Site Neighbours	Concerns have been raised by all stakeholders as to how any asbestos waste on the site will be managed.	DOMA has reassured stakeholders that it has extensive experience dealing with asbestos remediation which is not uncommon in Canberra. The minor amounts of asbestos that will be removed from the site, such as old switchboards, eaves, and conduits in the ground, will be done so in accordance with strict guidelines, by licensed contractors



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
Asbestos remediation cont.			and environmental engineers. The portion of building material that was previously dumped on the site has, after several extensive investigations, been found to contain only small amounts of asbestos material. This material will be contained and buried on the site. DOMA is obliged not to transport any asbestos waste through the existing neighborhood. All asbestos found onsite will be managed in accordance with the Environmental Protection Agency and WorkSafe ACT's requirements. As part of the approval process, DOMA is required to have an Independent Contaminated Land Auditor approve the site for its intended use and these audit findings are subsequently endorsed by the EPA. DOMA will complete a Remedial Action Plan to address all contamination issues which will be approved by both the independent Auditor and the EPA prior to the commencement of any work.



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
Building height/density	- General Public - Community Panel - Office of the Governor General - Immediate Site Neighbours (Schomburgk, Bentham and Denman Sts in particular)	All stakeholders are sensitive to building heights and density, to oversight and viewlines (addressed above) as well as the impacts of an influx of new residents will have on the existing suburb. This relates to everything from traffic to parking at the Yarralumla shops (which was identified as an existing issue).	Per the results of the pre-tender community consultations, Brickworks will be a low-density development and be developed in accordance with the Territory Plan and the Yarralumla Precinct Map and Code, with a maximum of 380 dwellings spread over the large 16.1ha site. The maximum height limit in the precinct code is which also permits attics when integrated into the roofline. Across the precinct, heights will vary within the limits. It's a considered design approach that ensures a modulation of height throughout the site. DOMA has confirmed the maximum height for the 18 proposed freestanding homes will be two stories (no attic), below the maximum allowable. In response to community consultation throughout the Concept and Draft EDP phases, DOMA has made multiple variations to the masterplan so that the new residential dwellings sit lightly on the site, emphasising the village in a garden vision.



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
			DOMA has relocated Building Q, breaking it and other initially proposed buildings up originally into smaller blocks, re-siting them and adding further landscaping.
Landscaping/Trees	- General Public - Community Panel - Office of the Governor General - Immediate Site Neighbours	Concerns have been raised by all stakeholders regarding plans to remove some existing trees around the site and questions asked about what they will be replaced with.	DOMA has communicated to all stakeholders that the removal of existing trees is being done in accordance with a tree survey, which relates primarily to end of life issues and is not unique to the Brickworks site. DOMA has shared its landscape masterplan, which has been well received, and committed to ensuring maturity in new trees planted. The design of the terrace houses also takes this into account with provision made for deep planters in between residences that will act to create both privacy and an overall sense of a garden setting. Similarly, along the Southern, North-Western and Eastern borders, landscaping will be used to offer both privacy and visual amenity. DOMA has also undertaken to work with immediate site neighbours, including Lane Poole Place as it



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
			further refines its landscape plans.
Bushfire management	- Community Panel - Office of the Governor General - Immediate Site Neighbours	In the context of previous fires in the area, a number of stakeholders have asked about DOMA's bushfire management plan.	DOMA has worked with authorities to develop a bushfire management plan for the site that works in an integrated way with the landscaping masterplan, setbacks and viewline issues noted above. Stakeholders have been receptive to the approach and to how DOMA plans to also maintain emergency vehicle access points to the site while also delivering on the requirement not to permit through (vehicular) traffic from the existing roads network.
Cycling and walking trails	- General Public - Community Panel - Office of the Governor General - Immediate Site Neighbours - Uniting Church Yarralumla	Like vehicular movements, cycling and pedestrian links to and within the site have been consistently raised by all stakeholders. The Office of the Governor General's concerns are separate to those of other stakeholders and relate to safety and security vis-à-vis official convoys and any increased pedestrian and cycling activity in the vicinity of Dunrossil Drive. Other stakeholders are more concerned with ensuring that existing (informal) walking tracks around the site are maintained.	DOMA has been very conscious in the design development to maximise the site's potential as an active, wellness hub with strong walking and cycling connections. Feedback from stakeholders has, and continues to be, considered in the design. While DOMA has acknowledged that there are some limitations in the scope of its ability to influence outcomes outside the site boundaries it is maximising opportunities for



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
Cycling & walking trails cont.			pedestrian connections where possible. Some existing informal trails, such as the one that runs behind the Uniting Church, will not be impacted. Others may be enhanced by activities relating to the bushfire management strategy implementation and landscape masterplan. DOMA has committed to bike parking within the site at multiple locations, including close to Quarry park and the commercial hub. DOMA is seeking feedback from existing residents regarding other potential pedestrian access points, for example the Governor General's office has asked DOMA to ensure no pedestrian access from Dunrossil to the terrace homes fronting that road (to dissuade parking) through fencing/landscaping on the site border. Lane-Poole Place residents have provided mixed feedback about whether or not they would like to see pedestrian access to the site from their street. While some residents are keen to have easy access to



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
			the new commercial and public amenities onsite, others are worried this may incentivise illegal parking in their street by visitors to the site. DOMA continues to liaise with them on these matters, noting a preference for connectivity. DOMA is working with Schomburgk St residents on the new path that will skirt their rear property boundaries and has confirmed they will be able to maintain direct access to this path from existing (or potential new) gates in their rear fences. DOMA will also using landscaping to provide a privacy and visual amenity buffer in this area.
Noise and light pollution	- Community Panel - Immediate Site Neighbours (Lane-Poole Place in particular)	Residents of Lane-Poole Place and the Community Panel have expressed concern over noise and light pollution from the proposed new swimming pool and tennis court for Brickwork's residents.	DOMA has acknowledge and responded to these concerns, altering placement of the swimming pool and amending plans for the tennis court from 2 courts to 1. DOMA has also confirmed that there will be no lighting on the tennis courts, thereby limiting noise to daytime hours.
Commercial activity	- General Public - Community Panel	Stakeholders have been anxious to understand the size of the commercial space and	DOMA has confirmed that it is still finalising potential tenancies.



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
Commercial activity cont.	- Office of the Governor General - Immediate Site Neighbours	proposed composition of businesses.	The masterplan includes 7,000sqm of non-residential space including 1,500sqm of commercial office space and up to five retail venues. including a proposed bakery, all day café, bar, and restaurant. A large area is also proposed to be dedicated to a day spa, gym, and health and wellness facilities. DOMA has confirmed there's no intention to provide a general medical practice on the site. Instead, the aim is to deliver a complementary health service offering, such as a sports physiotherapist, associated with keeping people moving and active. DOMA did consider a GP practice in its first iteration of the plan, along with a childcare centre, however both are high-intense uses and can take away from the atmosphere they are looking to create and vastly increase traffic. Established medical and childcare services in Deakin West, Yarralumla, Curtin and Woden are well equipped to absorb future growth and in many cases will be more convenient for existing residents to



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
			access than locating these at the Brickworks. Proposed commercial uses and their associated parking requirements are all being factored into the planning.
Visual amenity of buildings	- General Public - Community Panel - Office of the Governor General - Immediate Site Neighbours	At the second public presentation a number of stakeholders expressed concern about the visual amenity of some of the residential dwelling designs (concerns followed up by the Community Panel) primarily relating to façade articulation and material selection. Lane-Poole Place residents (echoed by the Community Panel) also expressed some concern about the interface with residential dwellings and their properties.	While noting that architectural design and visual amenity are inherently subjective, DOMA has listened and responded to these matters in the third public presentation. Early CGIs have been refined to give a more accurate appraisal of the design thinking. Further creative collaboration between the multiple architectural practices commissioned to work on the project has also been encouraged. DOMA is pursuing a strategy of ensuring there is interest and difference in the visual amenity of the dwellings and different housing typologies onsite while also ensuring they work together in a complimentary fashion. DOMA has also addressed the material selection, façade articulation and sizing of key elements such as dormer windows.



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
Visual amenity of buildings cont.			DOMA has outlined how material selection will highlight the history of the site, through the use of brick and other complimentary materials, while also explaining that an overuse of red brick on larger residential buildings would produce an adverse outcome in terms of amenity (leaning too heavily to industrial and distracting from the heritage core). DOMA has been generous in its application of permissible building heights and roof forms to create visual interest and modulate density throughout the site. DOMA has also revisited the interface with Lane-Poole Place leveraging the setback and re-siting buildings to create generous buffer with existing residents. The masterplan includes a 20-metre setback to the north of the site, plus a six-metre strip of Territory Land between Brickworks and the Lane-Poole Place townhouses (Block 21 Section 102 Yarralumla).



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
			A lot of work has been done to consider the integration between the Brickworks site and each neighbouring property. The updated designs presented at the third public presentation attracted widespread support and previously expressed concerns appear to have now been resolved as a result of this further design development work.
Electrical substation	- Community Panel - Immediate Site Neighbours (Lane-Poole Place in particular)	The location of a new electrical substation servicing the site has drawn opposition from the Community Panel and Lane-Poole Place residents over concerns regarding low-level noise.	DOMA has listened to these concerns and the location of the electrical substation for the site is still under consideration and DOMA is looking at how to make it work best for all parties.
Water/sewage infrastructure	- General Public - Community Panel - Immediate Site Neighbours	Existing residents in the surrounding suburb have expressed concern about the impacts of the development on their water pressure and the existing sewer system.	DOMA commissioned a study to understand the demand for domestic water use and fire-fighting operations. As a result, they will be connecting to the water supply in three different places across the site to ensure they can provide adequate pressure without reducing the performance of the overall network. DOMA has completed studies to ascertain the anticipated total load on the sewer network, which



THEME	STAKEHOLDER/S	FEEDBACK	RESPONSE
			assesses residential and other commercial uses. Based on the total load ascertained by the study, the project requires a 150mm diameter sewer tie to connect to Icon Water's infrastructure, which is already in place. DOMA has been advised by Icon Water that they can proceed with the existing connection. The final decision rests with the electrical infrastructure owner.
Wombat crossing	- Community Panel	The issue of a wombat crossing for the new Brickworks access road continues to be raised by the Community Panel.	At the April 2021 Community Panel meeting it was confirmed that the wombat crossing falls outside of DOMA's purview and is a matter for ACT Government. This proposal had been previously considered and rejected. SLA has followed up with Roads ACT and the Community Panel indicated that they would continue to pursue the matter separately to the DOMA-led consultation process.

Memorandum

Date:	Wednesday, 16 February 2022	**Pages:**	14
To:	Alex Moulis	**Copy:**	
From:	Nicholas Holmes, Brendan Hogan	**Ref:**	

Subject: **Transport Summary Report – Yarralumla Brickworks**

1. Introduction

In October 2021, DOMA Group (DOMA) engaged Calibre to prepare a Transport Summary Memo for the Yarralumla Brickworks development, Yarralumla to resolve outstanding questions raised during the EIS submission.

1.1 Background

A Traffic Impact Assessment for the Yarralumla Brickworks development was completed by AECOM in April 2021 to support the approval process for the site. This report was included with the EIS submission that also occurred within April 2021. During this submission process, several questions were raised surrounding the traffic conditions within and adjacent to the site.

1.2 Scope of Works

This memorandum aims to review the previous AECOM report along with the current site plans and block yields to identify any changes to the layout that have occurred. All changes and the expected impact traffic conditions of the site will be detailed as part of this memo. This includes but is not limited to:

- Land usage
- Traffic volumes
- Road and intersection operation (based upon previous AECOM Aimsun assessments)
- Parking requirements
- Commentary on rat-runs

In addition to detailing the changes in the site layout and impact on traffic, this report also aims to address the comments raised within the EIS submission to provide greater clarity on these items. As per the entity comments a detailed transport impact assessment report with update land use and network information is proposed to be submitted as part of the EDP.

2. The Site

2.1 Site Location & Current Use

The site of the Yarralumla Brickworks development is located within Block 1, 7 and 20 of Section 102, Yarralumla. Currently, Blocks 7 and 20 are unoccupied while Block 1 is occupied by the Old Canberra Brickworks site. Canberra Brickworks is currently not in operation and so traffic to and from the site should be minimal. Access to the Brickworks is currently provided off Denman Street.

Under the Territory Plan, all three blocks are classified as CZ6: Leisure and Accommodation zones. In addition to CZ6, a minor / irregular portion of Block 1 is also classified as a RZ1: Suburban Zone, while Block 7 is also classified as a PRZ2: Restricted Access Recreation Zone. Figure 2.1 identifies the location of the site and classification of each section.

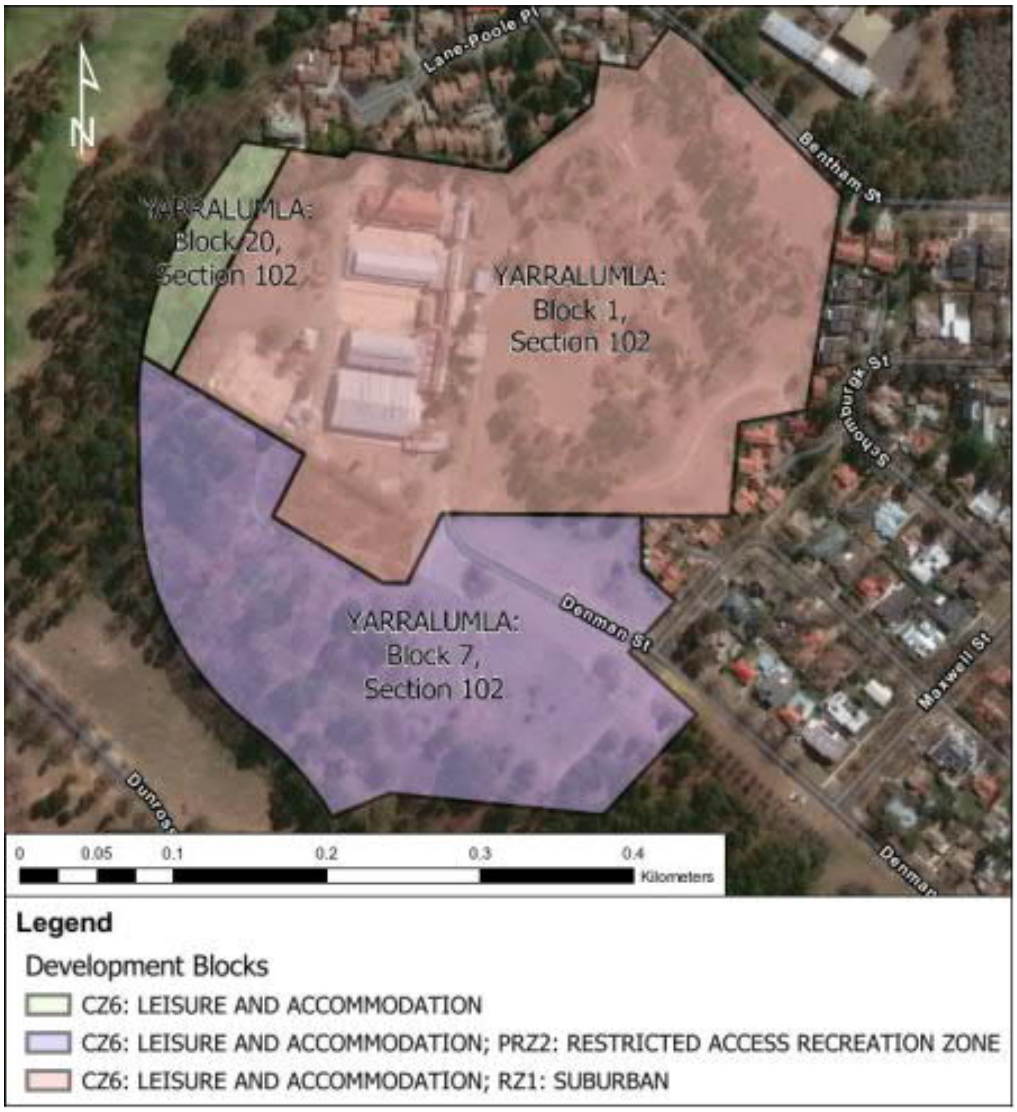


Figure 2.1 Yarralumla Brickworks Development Site Zone

2.2 Current Proposed Yields and Site layout

An updated masterplan for the site has been prepared by DOMA in January 2021. This plan can be seen in Figure 2.2. This masterplan saw several changes to the size and quantity of land uses compared to the plans which were used within the AECOM report. A summary of the changes between the current and previous plans can be seen in Table 2.1.

This updated masterplan maintains the same total number of residential dwellings within the site, noting a cap of 380 dwellings. The key change is within the type of residential dwellings, seeing the new plan favouring the construction of 3-bedroom dwellings over the 1 and 2-bedroom apartments. As per the Area Plans prepared for the site in October 2021, the non-residential land uses within the site are also seen to change, with both type and sizes differing compared to the previous report. The changes to these developments include the removal of the medical centre land use and increase in land usage for office and restaurant uses.

The measurement area for the non-residential land uses has been measured in Net Lettable Area (NLA) as opposed to the traditionally used Gross Floor Area (GFA). This change was adopted due to the thick external walls present within the heritage core buildings, with some walls having a thickness of up to 1m. As GFA is measured from the normal inside face of the exterior walls, the parking generation for the developments were viewed as overly conservative for the proposed land uses. With NLA, measurements are taken from the internal finished surface of the exterior walls. This allowed for the removal of the additional wall area and is viewed to provide a more accurate representation of the land usage. This change only impacts the non-residential components included within the site.

An edge road running along the south-eastern boundary of the development, connecting Denman Street and Brickworks Way is also proposed to be included as part of the development works. A ranger gate is proposed to be installed at the connection of the edge road to Denman Street, and shall remain closed except within an emergency. This physical barrier prevents though traffic from using this link to navigate through the suburbs and prevents any possible rat-running through the site. As through movements are not achievable along this road, the addition of this road to the development is not expected to impact the currently modelled traffic operations or performance through the surrounding road network. As such, no additional traffic assessment around this road has been completed.

Table 2.1 Yarralumla Brickworks Site Yield Comparison – Current vs. Previous

Land Use	Quantity (Current Plan)	Quantity (Previous Plan)	Difference
Houses (3+bed)	20 dwellings	18 dwellings	+2 dwellings
Apartments	258 dwellings	303 dwellings	-45 dwellings
1-bed Apartment	*1 dwelling*	*5 dwellings*	*-4 dwellings*
2-bed Apartment	*150 dwellings*	*196 dwellings*	*-46 dwellings*
3-bed Apartment	*107 dwellings*	*102 dwellings*	*+5 dwellings*
Townhouse (3+bed)	102 dwellings	59 dwellings	+43 dwellings
Sub-Total	**380 dwellings**	**380 dwellings**	**0 dwellings**
Commercial / Office Space	1,500 sqm	1,500 sqm	+0 sqm
Food / Beverage Space	1,740 sqm	1,320 sqm	+420 sqm
Fitness & Wellness Space	2,650 sqm	2,310 sqm	+340 sqm
Medical Health Facility Space	0 sqm	795 sqm	-795 sqm
Specialty Retail	750 sqm	0 sqm	+750 sqm
Sub-Total	**6,640 sqm**	**5,925 sqm**	**+715 sqm**



Figure 2.2 Yarralumla Brickworks Development Masterplan

2.3 Car Parking Provision & Requirements

The changes to the site masterplan have resulted in changes to both the proposed parking spaces within the site, as well as the required spaces for use by residents and visitors. For the private parking spaces, houses and townhouses have been generally assumed to have 3 car garages, while the 2 and 3 bed apartments are presumed to be provided 2 private parking spaces each and the single bed apartment is assumed to be provided a single parking space. A summary of the current total parking spaces and changes from previous plans can be seen in Table 2.2.

Table 2.2 Parking Provisions for Yarralumla Brickworks Development – Current Plan vs. Previous Plan

Parking Type	Quantity (Current Plan)	Quantity (Previous Plan)	Difference
Public Spaces (suitable for all visitors)	321 spaces	327 spaces	-6 spaces
Private Spaces (suitable for residents, staff, and visitors to houses and townhouses)	881 spaces	771 spaces	+110 spaces

The parking requirements for the site have been identified as per the Parking and Vehicle General Access General Code (PVAGC). For this assessment, the parking generation rates specified for commercial CZ6 leisure and accommodation zone within PVAGC (Section 3.4.5) were utilised. Although residential development is permitted in a CZ6 zone, no specific rates for parking are provided in the code. As such, the standard residential parking rates from the PVAGC (Section 3.1.5) were used instead. These rates match what were used during the previous AECOM assessment and are as follows:

Residential

- 1 space per 1-bedroom dwelling
- 1.5 spaces per 2-bedroom dwelling
- 2 spaces per 3+ bedroom dwelling
- 1 visitor space per 4 dwellings

Commercial (Offices)

- 2.5 spaces per 100sqm NLA

Food and Beverage (Restaurant)

- 10 spaces per 100sqm NLA

Fitness and Wellness (Gym)

- 3.5 spaces per 100sqm NLA

Medical (Health Facility)

- 4 spaces per practitioner

Specialty Retail

- 3 spaces per 100sqm NLA

It is noted that both the visitor parking provisions for the single residential lots (houses) and townhouses are expected to be provided internally within each lot. As such, these spaces would not contribute to the external available parking within the site and have not been included within this assessment.

The results of the comparison between parking space requirements can be seen in Table 2.3 below.

Table 2.3 Vehicle Parking Requirements for Yarralumla Brickworks Development – Current Plan vs. Previous Plan

Land Use	Parking Rate	Current Plan		Previous Plan	
		Yield	Spaces	Dwellings	Spaces
Private Parking Spaces					
House (3-bed)	2 spaces / dwelling	20 dwellings	40 spaces	18 dwellings	36 spaces
Apartment (1-bed)	1 space / dwelling	1 dwelling	1 space	5 dwellings	5 spaces
Apartment (2-bed)	1.5 spaces / dwelling	150 dwellings	225 spaces	196 dwelling	294 spaces
Apartment (3-bed)	2 spaces / dwelling	107 dwellings	214 spaces	102 dwelling	204 spaces
Townhouse (3-bed)	2 spaces / dwelling	102 dwellings	204 spaces	59 dwelling	118 spaces
Sub-Total			**684 spaces**		**657 spaces**
Visitor Parking Spaces					
Apartment Visitors	0.25 spaces / dwelling	258 dwellings	65 spaces	303 dwellings	76 spaces
Townhouse Visitors	0.25 spaces / dwelling	102 dwelling	N/A[1]	59 dwelling	15 spaces
Commercial / Office	0.025 spaces / sqm	1,500 sqm	38 spaces	1,500 sqm	38 spaces
Food / Beverage	0.1 spaces / sqm	1,740 sqm	174 spaces	1,320 sqm	132 spaces
Fitness & Wellness	0.035 spaces / sqm	2,650 sqm	93 spaces	2,310 sqm	81 spaces
Medical Health Facility	4 spaces / practitioner	N/A	N/A	795 sqm (~8 practitioners)	32 spaces
Specialty Retail	0.03 spaces / sqm	750 sqm	22 spaces	N/A	N/A
Sub-Total			**392 spaces**		**374 spaces**
Total			**1,076 spaces**		**1,031 spaces**

Note 1: For the Townhouse visitor parking requirements, the current plan allows for visitor parking to be provided internally within the townhouses, as each of these dwellings is proposed to have a 3-4 car garage. Within the previous assessment, visitor parking was required at a rate of 1 space per 4 dwellings.

From the above table, it can be seen that the current development masterplan will result in an increase by 27 parking spaces for private use, and an additional 18 spaces for public use compared to the previously undertaken analysis. The increase of the private land use parking is a result of the shift in dwelling types, with an increase in 3-bedroom townhouses and apartments. For the public parking spaces, the increases are predominantly a result of the increased areas of the Fitness & Wellness land use and Food / Beverage land use.

2.4 Adequacy of Parking Supply

The summary of the suitability of the current masterplan parking supply is outlined in Table 2.4 below. Calculation of car parking requirements does not include any car parks for visitors to the Quarry Park or Railway Remnants Park. Parkland is not included in parking numbers from the Transport impact assessment. The PVAGC lists parkland as “subject to individual assessment”. The brickworks development is not specifically required to provide parking supply for community parklands.

Table 2.4 Land Use Parking Supply and Demand

Land Use	Car Park Requirement	Car Park Supply	Difference
Private Parking	684 spaces	881 spaces	+197 spaces
Public Parking	392 spaces	321 spaces	-71 spaces
Sub-Total	**1,076 spaces**	**1,202 spaces**	

As seen in the above table, there is a deficit of 71 parking spaces within the proposed development for the publicly available parking spaces.

There are however 197 excess parking spaces for residential apartments and townhouses, which is a commercial decision to supply more storage space for cars, bicycles, and other uses. As mentioned earlier, the excess storage of the houses and townhouses that is provided by their garages will be acceptable for use by visitors to these dwellings. As such, these visitors have not been included in the total public parking requirements.

There are 71 less public parking spaces than required as per the PVAGC. Given the temporal nature of parking demand for the non-residential land uses, a temporal profile analysis was conducted for all parking spaces expected to service the non-residential land uses. The expected parking demand for these sites was calculated hourly over a typical day based on trends on parking usage observed for similar previous jobs. The temporal profile for non-residential parking on the site can be seen in Figure 2.3.

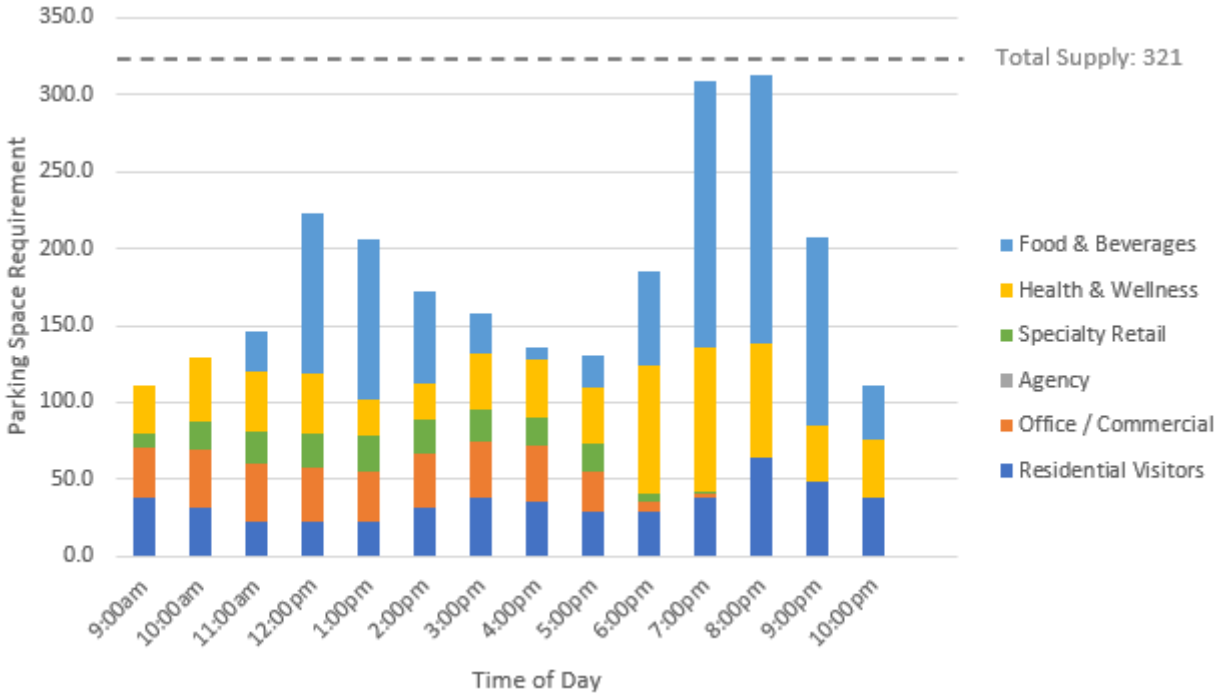


Figure 2.3 Temporal Profile for Non-Residential Parking Requirements within the Development

When considering the temporal parking demand, it is estimated that the peak demand will occur at 8:00pm for the site and require a total of 312 public parking spaces across the site. This results in a surplus of 9 public parking spaces during the peak hour period.

2.4.1 Accessible Parking Provision

Accessible parking needs to be provided within the site as per the ACT Parking and Vehicular Access General Code (PVAGC). From this document, a rate of 3% of the applicable parking spaces are required to be suitable for disabled parking. This requirement does not apply to any of the residential parking or visitor parking for houses or townhouses, as these spaces are subject to the adaptable housing requirements. As such, a total of 12 parking spaces are required to be suitable for this use. At present, 10 accessible parking spaces have been allowed, meaning an additional 4 spaces are required to comply with the PVAGC. Given that there are 9 public parking spaces available during the peak hour, and standard parking spaces can be converted into accessible parking spaces at a rate of 3:2, it is expected that 2 additional accessible parking spaces can be provided while still maintaining suitable parking requirements.

2.4.2 Motorcycle Parking Provision

The PVAGC states that parking for motorcycles must be provided at a rate of 3% with a minimum provision of 1 motorcycle parking space within a carpark with 30 or more car spaces.

For residential parking on site, each dwelling has been allowed dedicated parking spaces which could be utilised for storing either a car or a motorcycle. As such, no dedicated motorcycle parking is deemed as required in addition to the current proposed parking spaces.

For non-residential parking, the parking allowance of 3% was used and 12 motorcycle parking spaces are required in the development.

2.4.3 Bicycle Parking and End of Trip Facilities

As part of the initial assessment, the Bicycle Parking General Code (BPGC) for the ACT was used to determine the required supply of bicycle parking spaces. Due to the changes in residential development provisions, the required bicycle parking allowances have changed slightly. The rates used to calculate bicycle parking have been adapted from the BPGC where possible and match the rates used by AECOM. They can be found below:

Houses

- No minimum bicycle parking requirement (all parking assumed to be accounted for within the dwelling)

Apartments

- 1 per apartment per residents
- 1 per 12 apartment apartments after the first 12 apartments for visitors

Townhouses

- Nil for residents and guests

Commercial Offices

- 1 space per 250sqm NLA after the first 250sqm for employees
- 1 space per 950sqm NLA after the first 400sqm for visitors

Food & Drink

- 1 space per 400sqm after the first 400sqm for employees
- 1 space per 200sqm after the first 200sqm (min 2) for visitors

Medical

- 1 space per 8 practitioners after the first 8 practitioners for employees
- 1 space per 4 practitioners for visitors

Fitness and Wellness Centre

For the Fitness and Wellness centre, the classification of an "Indoor Recreation Facility" is the closest match within the BPGC. As the rates for this type of development are subject to individual assessment. As such, an allowance of 10% of the total car spaces for this land use has been allowed as the visitor bicycle parking rate. No specific rate has been allowed for staff.

Specialty Retail

- 1 space per 500 sqm NLA after the first 500 sqm NLA for employees
- 1 space per 300 sqm NLA for visitors (minimum 2)

A comparison of the bicycle parking requirements under the current layout and previous layout can be seen in Table 2.5.

Table 2.5 Bicycle Parking Requirements for Yarralumla Brickworks Development – Current Plan vs. Previous Plan

Land Use	Parking Rate	Current Plan		Previous Plan	
		Yield	Spaces	Dwellings	Spaces
Private Use Bicycle Parking Spaces					
Apartments	1 per apartment	258 dwellings	258 spaces	303 dwellings	303 spaces
Commercial / Office	1 per 250sqm after first 250sqm NLA	1,500 sqm	5 spaces	1,500 sqm	5 spaces
Food / Beverage	1 per 400sqm after first 400sqm NLA	1,740 sqm	4 spaces	1,320 sqm	3 spaces
Medical Health Facility	1 per 8 practitioners after first 8 practitioners	0 practitioners	0 spaces	795 sqm	1 space
Specialty Retail	1 per 500sqm after first 500sqm NLA	750 sqm	1 space	0 sqm	0 spaces
Sub-Total			**268 spaces**		**312 spaces**
Visitor Bicycle Parking Spaces					
Apartment Visitors	1 per 12 apartments after first 12 apartments	258 dwellings	21 spaces	303 dwellings	25 spaces
Commercial / Office	1 per 950sqm after first 400sqm NLA	1,500 sqm	2 spaces	1,500 sqm	2 spaces
Food / Beverage	1 per 200sqm after first 200sqm NLA	1,740 sqm	8 spaces	1,320 sqm	6 spaces
Fitness & Wellness	10% of total parking spaces	93 car spaces	10 spaces	81 car spaces	10 spaces
Medical Health Facility	1 per 4 practitioners	0 practitioners	0 spaces	8 practitioners	2 spaces
Specialty Retail	1 per 300sqm (min. 2)	750 sqm	3 spaces	0 sqm	0 spaces
Sub-Total			**44 spaces**		**45 spaces**

From this table, it can be seen that the new proposed layout reduces the requirement for private use bicycle spaces by 44 spaces and visitor parking by 1 space. As the Brickworks is being developed to encourage active travel through the area, there is a commitment for the development to contain additional parking allocations for bicycles over the required generation listed above.

3. Impact of Development

3.1 Traffic Generation

Traffic generation for this development has been calculated based on the aforementioned development yields combined with trip generation rates provided within the *ACT Estate Development Code* Table 2A notes. This documents states that for residential and CZ5 zones, a generation rate of 6 vehicles per day per dwelling is expected for multi-unit developments, a generation rate of 7 vehicles per day per dwellings where the blocks are less than 360sqm is expected, and a generation rate of 8 vehicles per day per dwelling for dwellings where block size exceeds 360sqm. Although the zoning for this site is primarily classified as a CZ6: Leisure and Accommodation Zone, the high quantity of residential dwellings proposed within this estate is expected to operate in a similar manner to residential zones, and as such these rates were deemed as acceptable.

A 10% peak hour factor was adopted for these developments in both commuter peak periods, as identified in *RTA Guide to Traffic Generating Developments (2002)*. As such, in both AM and PM peak periods, hourly trip generation rates of 0.6 and 0.7 vehicles per dwelling were adopted for apartments and townhouses respectively. It is noted that rates for townhouses and houses adopted within the initial AECOM assessment are slightly higher than what has been assumed within this assessment. The previously adopted generation rate was 0.85 vehicles per hour per dwelling for both houses and townhouses. This rate is taken from Section 3.3.1 of the *RTA Guide to Traffic Generating* Developments, which details the rate for dwelling houses. This rate was viewed as conservative given the expected behaviour of vehicles from the houses and townhouses, and as such the rates outlined in the *ACT Estate Development Code* were adopted instead. The apartment rate was the same between assessments.

The traffic generation for the non-residential development areas was determined based upon rates RTA Guide to Traffic Generating Developments version 2.2. These rates match what was used within the previous assessment

- A trip rate of 2 vehicles per 100 sqm NLA in a peak hour was applied to the commercial/office NLA as per the RTA Guide.
- A trip rate of 5 vehicles per 100 sqm NLA in a peak hour was applied to the food and beverage NLA as per the restaurant rate in the RTA Guide.
- A trip rate of 3 vehicles per 100 sqm NLA in a peak hour was applied to the fitness and wellness NLA as per the gymnasium rate in the RTA Guide.
- A trip rate of 10.4 vehicles per 100 sqm NLA in a peak hour was applied to the health facility NLA as per the extended hours medical centre rates in the RTA Guide.

The traffic generation for each of the land uses being developed can be seen in Table 3.1.

Table 3.1 Daily Development Traffic Generation – Current Layout vs Previous Layout

Land Use		Current Plan			Previous Plan		
	Units	Yield	Hourly Rate	Trips	Yield	Rate	Trips
Houses	dwellings	20	0.8	16 vph	18	0.85	15 vph
Townhouse	dwellings	102	0.7	72 vph	59	0.85	50 vph
Multi-Unit (Apartments)	dwellings	258	0.6	155 vph	303	0.6	182 vph
Commercial / Office	sqm	1,500	0.02	30 vph	1,500	0.02	30 vph
Food / Beverage	sqm	1,740	0.05	87 vph	1,320	0.05	66 vph
Fitness & Wellness	sqm	2,650	0.03	80 vph	2,310	0.03	69 vph
Medical Health Facility	sqm	0	N/A	0	795	0.104	83 vph
Speciality Retail	sqm	750	0.046	35 vph	0	N/A	0
Total				**475 vph**			**495 vph**

The changes in the development layout and utilised rates results in a decrease of 20 vehicles per hour in the current plan compared the previous yields and assessment. As the volume of traffic within the network has decreased overall, the expected performance of the network is not expected to worsen and it was not deemed as necessary to undertake additional traffic impact modelling for the surrounding road network.

The assumptions surrounding traffic distribution and route selection from the site through the network are consistent with the previous AECOM report, as no major changes to the road network or conditions surrounding the site are expected.

3.2 Performance Summary

While the yields and distribution of traffic throughout the network were originally detailed and modelled within the Yarralumla Brickworks Traffic and Parking Report by AECOM, it is noted that a more recent traffic assessment has been completed for the road network surrounding Dudley Street. The later report is also written by AECOM, and is a Traffic Options and Analysis Report for the Kent Street / Novar Street Intersection Upgrade. Although the commentary of the report was focussed on different areas of the road network, the completed modelling for both includes much of the same network extents and so are comparable.

While both reports were last updated at similar times, around mid to late 2021, we understand that updates to the traffic models were not undertaken for either project as part of this update. It is understood that the Yarralumla Brickworks traffic modelling was completed in Oct 2020 and has not been updated since. As such, this modelling predates the revised layout of the intersections along Kent Street, which were finalised and modelled as part of the Kent Street / Novar Street Intersection report in March 2021. Therefore, it appears that the adopted layout for the Kent Street intersections upgrade may not fully represent the layout that was finally adopted for the Kent Street project. This is supported by Figure 29 of the Yarralumla Brickworks Report (see Figure 3.1 of this report) showing the Kent Street design option with a single southbound lane on the Kent Street bridge as compared to the two full lanes adopted within the Kent Street / Novar Street Report (see Figure 3.2). As such, the performance results for the road network have been taken from the Kent Street / Novar Street Report.

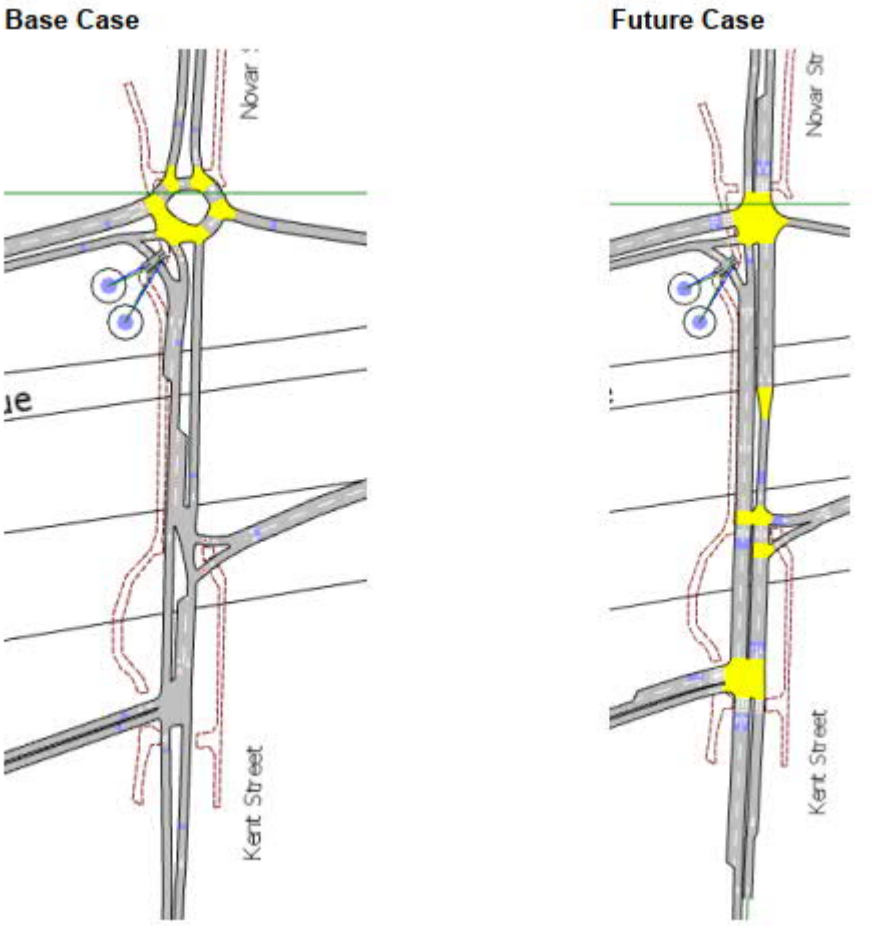


Figure 3.1 Kent Street Proposed Future Design from the Yarralumla Brickworks Report

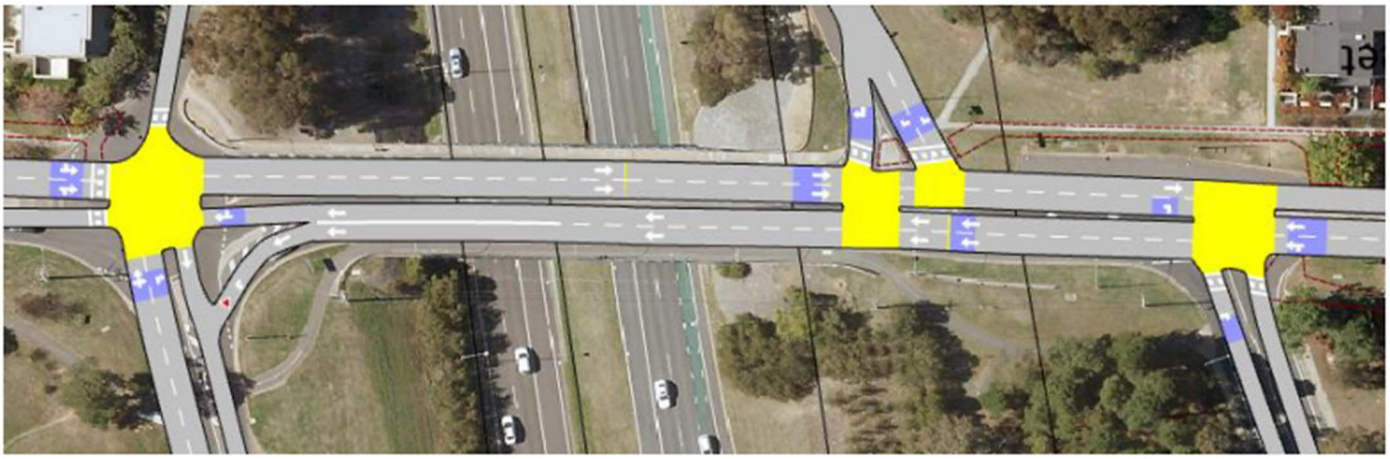


Figure 3.2 Kent Street Proposed Future Design from the Kent Street / Novar Street Report

The performance of the network as reported in the Kent Street / Novar Street Report shows the majority of the intersections in the network operating at acceptable levels. The key intersections are the ones along Kent Street, which showed significant improvements along most legs compared to the undeveloped conditions, as can be seen in Figure 3.3 and Figure 3.4.

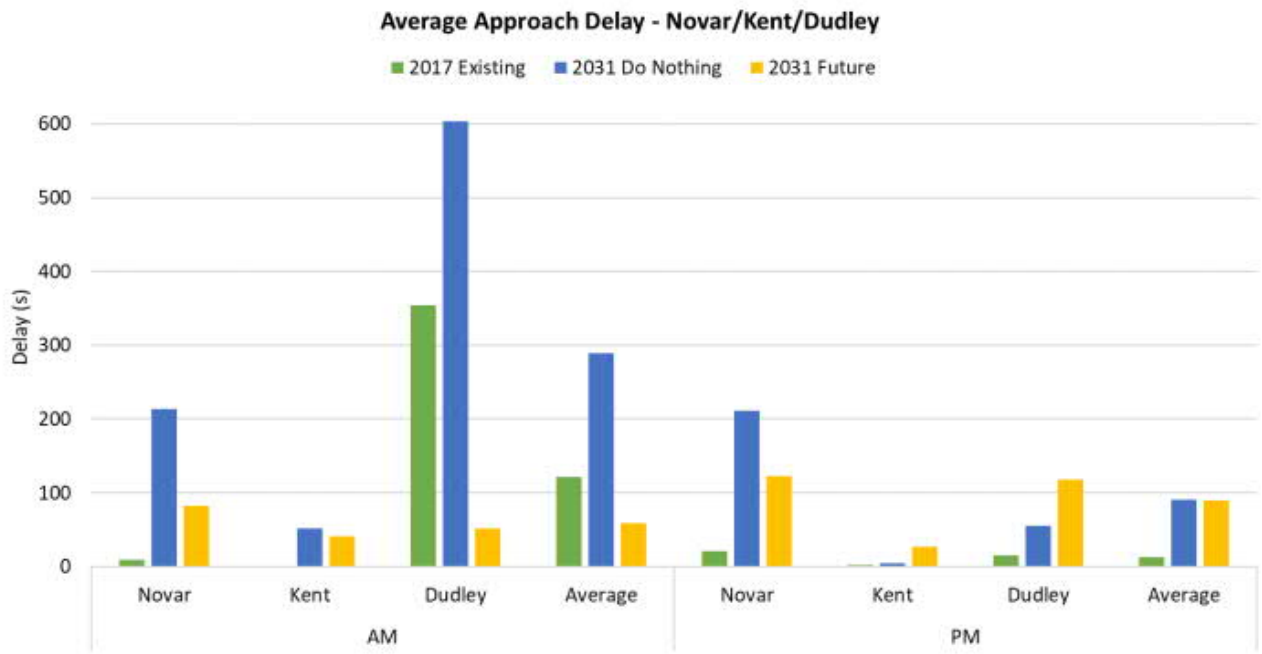


Figure 3.3 Performance Summary of Key Intersections – Novar / Kent / Dudley

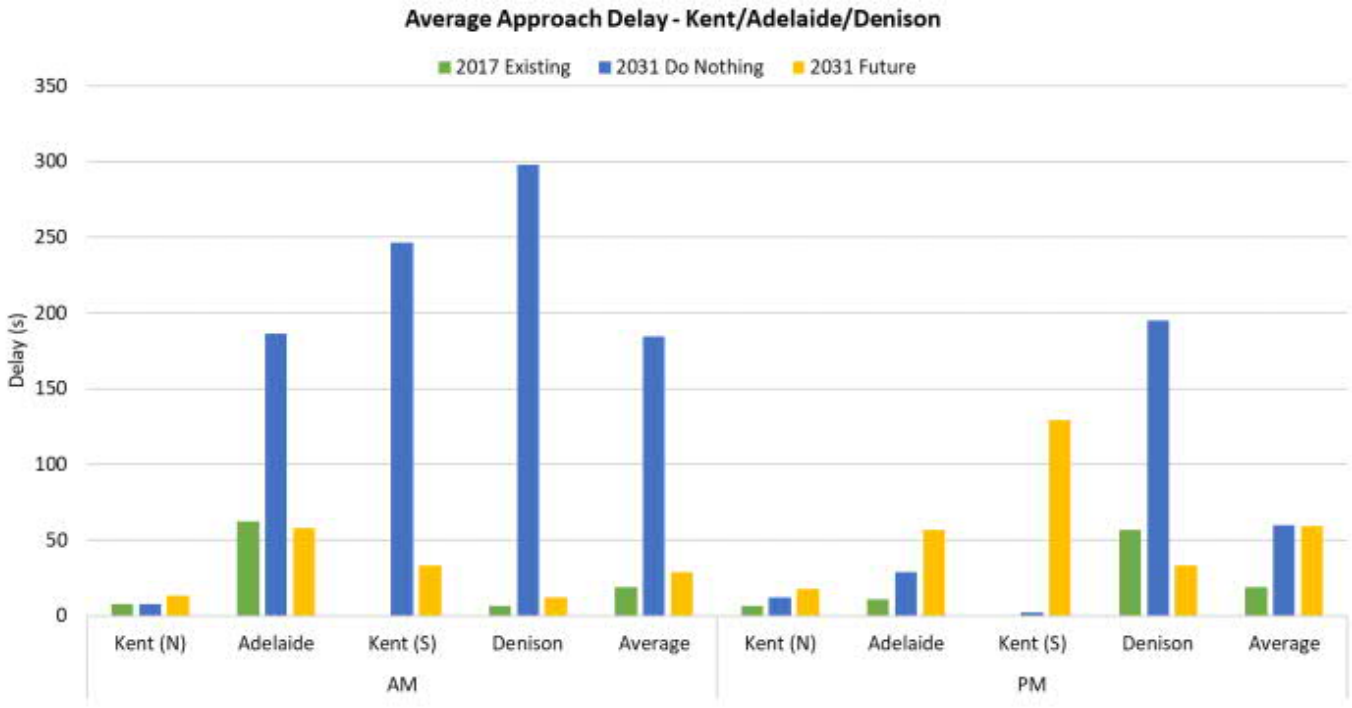


Figure 3.4 Performance Summary of Key Intersections – Kent / Adelaide / Denison

3.3 Wider Network Impacts

The increase in Yarralumla's population due to the inclusion of the Brickworks development is expected to put additional pressure on several existing land uses, including the Yarralumla Shops. The main access to the Yarralumla Brickworks will be via the new access road onto Dudley Street and it is anticipated that many residents of the site will see the Curtin Shops as an attractive alternative from the Yarralumla shops, particularly if driving. This behaviour is expected to increase the traffic volume slightly along McCulloch Street, as along Cotter Road and down McCulloch Street is the most direct route. Although the increase in traffic along McCulloch hasn't been quantified at this stage, it is noted that McCulloch Street is classified as a major collector road and operates in a traffic carrying capacity. As such, the increase in volumes are considered appropriate for this type of road.

The introduction of the Cotter Road Upgrade stage 3 and Mint Interchange which is assumed in the 2031 AM Canberra Strategic Transport Model changes demand drastically in this area. This causes large fluctuations in the distribution of vehicles and therefore unusual growth rates compared to the current conditions without the Mint Interchange.

Two scenarios were analysed in the CSTM, one with the Mint Interchange and one without the Mint Interchange. The average growth rate between the two scenarios was approximately 1.25%.

Note that the light rail stage 2 project may alter the timing and configuration of the Mint Interchange project from the assumptions included in the CSTM. However, this detail is not available and the future demand forecasts therefore had to be based on the current CSTM.

3.4 Construction Access

The primary construction access route will be via the new stub of the Dudley Street Brickworks Way roundabout. Construction of this link has largely been completed and should offer minimal impact to the operation. Traffic volumes for construction are typically expected to occur outside of the peak hour.

In the civil works stage of the project, construction access will be via Denman Street whilst Brickworks Way is being completed. There will be low volumes of workers in this stage of the project and no impact on the existing road network is expected.

The recently completed Dudley Street is built to cater for bus and other heavy vehicle moments. Construction traffic is not expected to deform or damage the pavement.

4. Active Travel Considerations

The current masterplan for the Yarralumla Brickworks incorporates a number of active travel allowances, including shared paths and road crossings throughout the site. These paths are proposed to connect into the external path networks along Bentham Street, Denman Street, and Brickworks Way to Dudley Street. These connections will provide a superior outcome to the existing amenity and allow active travel options to key nearby locations including nearby bus stops, Yarralumla Shops, and the Yarralumla Uniting Church. The current proposed path layout within the site can be seen in Figure 2.2.

The location of the nearest bus stops to the site are located along Dudley Street, approximately a 650m walk from the site. The location of the Dudley Street bus stops was largely prescribed by TCCS and provide stops as close as practical to the new development. The active travel amenities mentioned above connect into these bus stops for ease of access, and pedestrian crossing islands are present along Dudley Street to facilitate pedestrian amenity and safety.

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Our ref: JM/C11596
24 June 2021

BLOC
via email: david.murphy@bloc.com.au

Attention: David Murphy

CANBERRA BRICKWORKS REDEVELOPMENT - QUARRY PIT BACKFILLING
GUIDELINES FOR CONSTRUCTION OF CONTROLLED FILL

1 Introduction

At the request of BLOC, ACT Geotechnical Engineers Pty Ltd are pleased to provide guidelines for the construction of controlled fill to meet the requirements of AS2870 "Residential slabs and footings" and AS3798 "Guidelines on Earthworks for Commercial & Residential Developments". The controlled fill will support the residential structures. It is understood that up to 7m height of controlled fill is to be placed to backfill some sections of the old quarry pit, and the site is expected to be a "M" (moderately reactive) site classification to AS2870.

2 Fill Construction Procedure

To enable an "M" classification to AS2870 and meet the requirements of AS2870 and AS3798 "Guidelines on Earthworks for Commercial & Residential Developments", the following procedure is recommended for the construction of controlled fill on the site:

(1) Areas be fully stripped of any debris on the base and sides of the quarry pit, and any moisture-affected soils, to expose in-situ weathered bedrock. As the sides of the quarry pit are quite steep, terraces will have to be cut into the sloping sides to enable proper compaction close to the sides of the old pit.

(2) Soil foundations must be proof-rolled by a heavy vibratory pad-foot roller (preferably of not less than 9 tonne static mass) to check for any weak or wet areas that would require replacement. The proof-rolling must be viewed by a geotechnical engineer prior to placing fill **(hold point)**. In-situ weathered bedrock foundations do not need to be proof-rolled, but must be inspected by a geotechnical engineer to confirm suitability. It is recommended that spot levels or a survey be taken of the stripped foundation. If the foundation is dry, it may have to be cross-ripped, sprayed with water, and compacted with a pad-foot roller to ensure lamination between the natural ground and newly placed fill does not occur.

(3) Controlled fill comprising suitable on-site excavated or imported materials of not greater than 75mm maximum particle size, be compacted in not greater than 150mm layers to not less than 95%ModMDD at about OMC.

(4) The fill material must be inspected by a geotechnical engineer for prior approval, and ideally comprise a low to medium plasticity sandy clay, gravelly sandy clay, clayey sand, gravelly clayey sand, or sandy clayey gravel, with a maximum particle size of 75mm. Suitable materials would classify as CL, SC, or GC in accordance with the USCS. One sample from each source of the placed fill material should be lab tested for soil classification (particle size distribution and Atterberg limits).

(5) A geotechnical engineer should overview the fill placement (regular engineering inspections and Level 1 supervision), to ensure that correct compaction equipment/methods are employed and to check material properties and moisture content.

(6) Field density testing should be carried out at a frequency of 1 test per 500m^3. The locations of the density tests should be noted and marked on a plan.

(7) Fill placement and control testing be overviewed and certified by a geotechnical engineer at Level 1 involvement of AS3798 - 1996 "Guidelines on Earthworks for Commercial & Residential Developments".

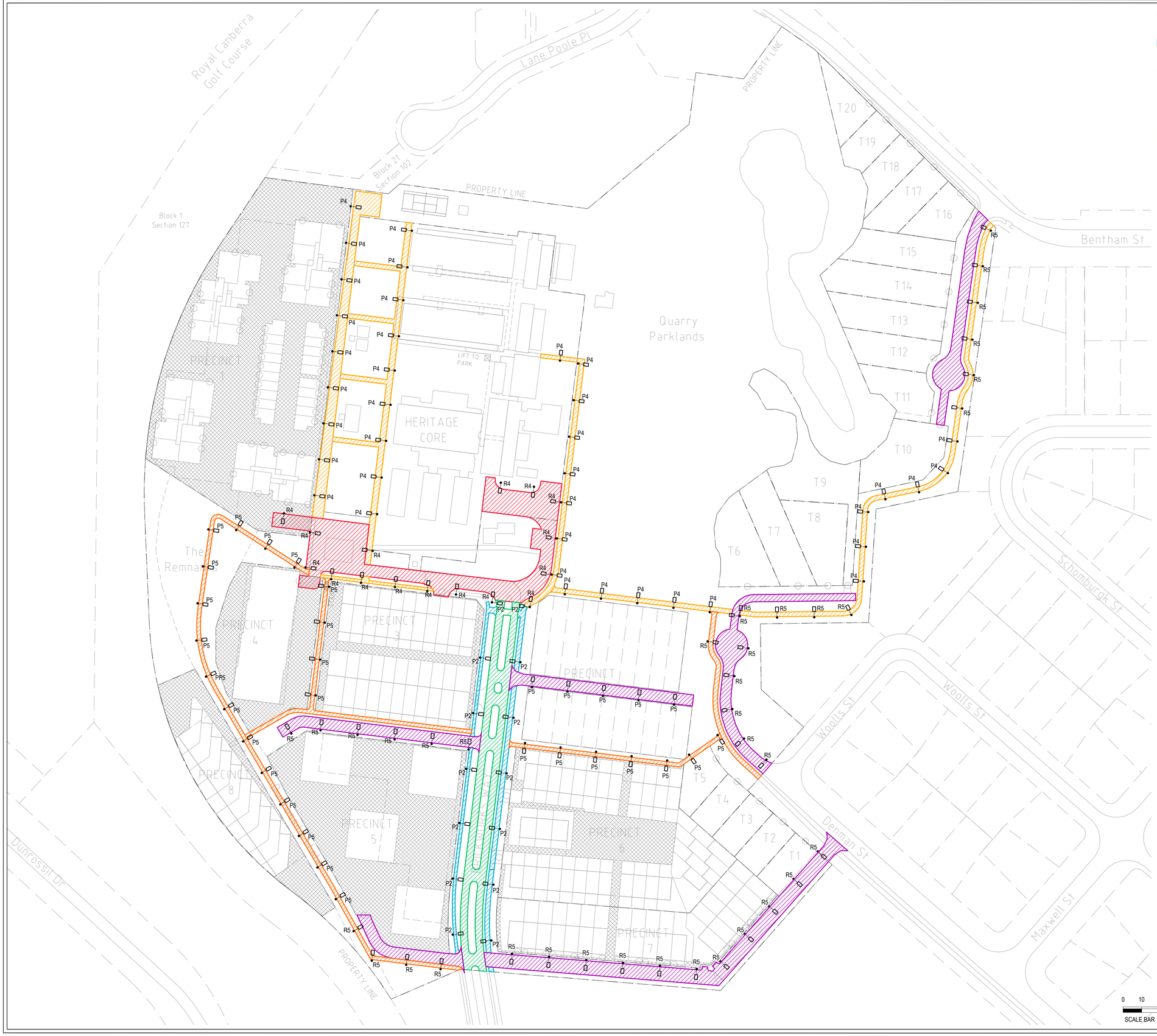
(8) Pad and/or strip footings for the new building, as well as groundslabs and access roads/driveways, can then be founded in the controlled fill. The site would be a Class "M" for slab and footing design (provided only low-reactive fill material is used).

(9) Fill batters must be formed at no steeper than 2(H):1(V), and protected against erosion by grassing, vegetation, geofabric (such as 'jute mesh), or similar. If the fill batters are stabilised (by stone pitching, reinforced shotcrete, 'Geoweb', or similar, then the batters could be steepened to 1(H):1(V). Steeper slopes could be supported by retaining walls, gabions, crib walls, or similar.

ACT Geotechnical Engineers Pty Ltd



Jeremy Murray
Director - Senior Geotechnical Engineer
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LEGEND

- CATEGORY PP2 LIGHTING
  HIGH ACTIVITY
  MEDIUM FEAR OF CRIME
- CATEGORY PP3 LIGHTING
  MEDIUM ACTIVITY
  MEDIUM FEAR OF CRIME
- CATEGORY PP4 LIGHTING
  MEDIUM ACTIVITY
  LOW FEAR OF CRIME
- CATEGORY PP5 LIGHTING
  LOW ACTIVITY
  LOW FEAR OF CRIME
- CATEGORY PR3 LIGHTING
  MEDIUM ACTIVITY
  LOW FEAR OF CRIME
- CATEGORY PR4 LIGHTING
  MEDIUM ENHANCEMENT OF AMENITY
- CATEGORY PR5 LIGHTING
  LOW ACTIVITY
  LOW FEAR OF CRIME
  LOW NEED TO ENHANCE AMENITY

- R4 LED LUMINAIRE ON 6m POLE
- R5 LED LUMINAIRE ON 6m POLE
- P2 LED LUMINAIRE ON 10.5m POLE
- P4 LED LUMINAIRE ON 4m POLE
- P5 LED LUMINAIRE ON 4m POLE

DRAWING TO BE PLOTTED IN COLOUR

0 10 20 30 40 50 60 70 80 90 100
SCALE BAR 1:1000 [m]

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north

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P1	PRELIMINARY ISSUE	30.06.2020

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A-0271	MASTERPLAN	19

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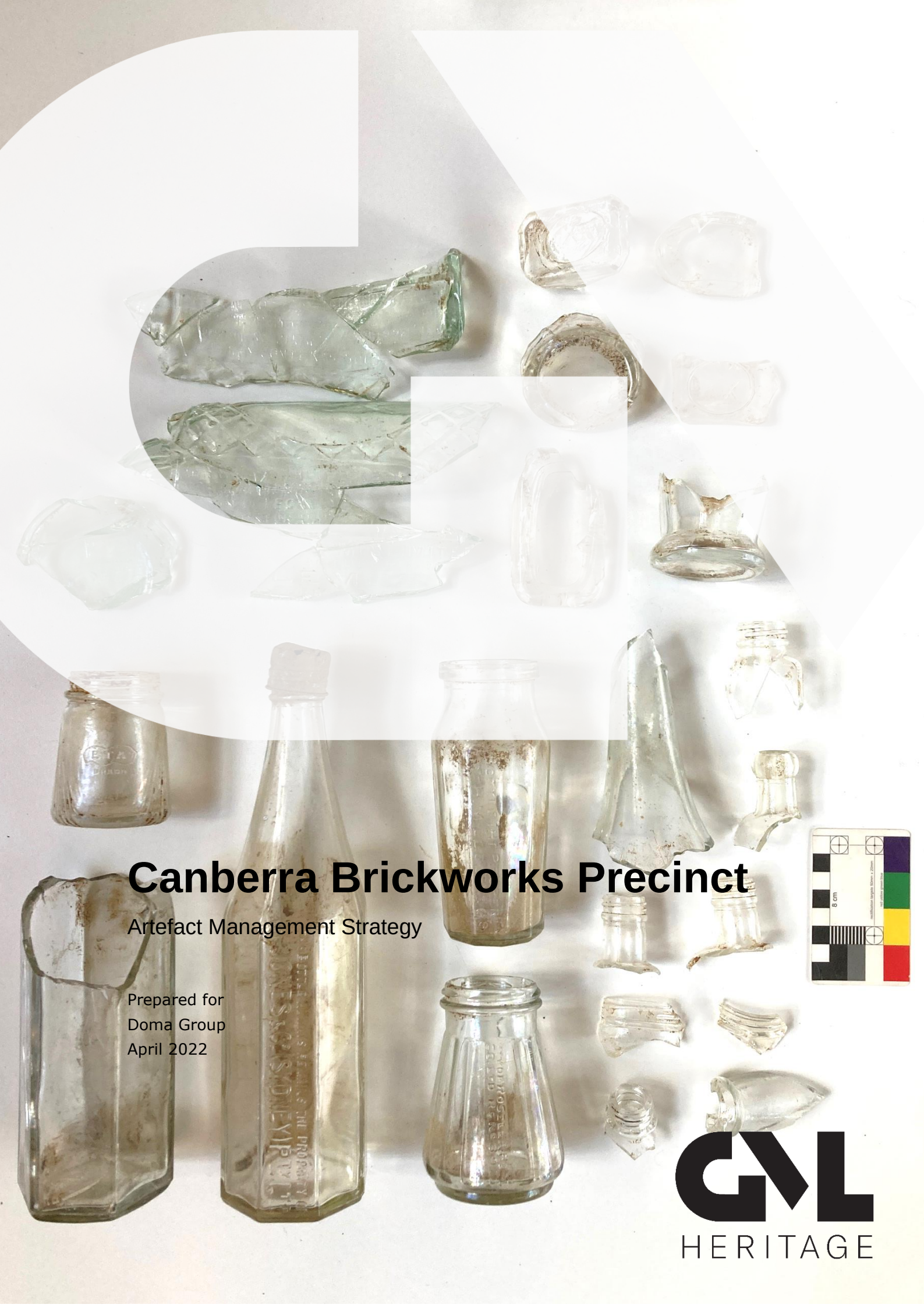
project
YARRALUMLA BRICKWORKS

service
ELECTRICAL SERVICES

title
CONCEPT EXTERNAL PUBLIC LIGHTING PLAN

drawn	date	designed	date	scale
KT	15.06.21	SG	JUNE 21	1:1000@A1

project no	drawing no	rev
S4B20002400	E-101	P2



Canberra Brickworks Precinct

Artefact Management Strategy

Prepared for
Doma Group
April 2022

HERITAGE

Acknowledgement of Country

We respect and acknowledge the Ngunawal and Ngambri people of the lands and waterways on which we live and work, their rich cultural heritage and their deep connection to Country, and we acknowledge their Elders past and present. We are committed to truth-telling and to engaging with Ngunawal and Ngambri people to support the protection of their culture and heritage. We strongly advocate social, cultural and political justice and support the Uluru Statement from the Heart.

GML HERITAGE

Report register

The following report register documents the development of this report, in accordance with GML's Quality Management System.

Project	Issue No.	Notes/Description	Issue Date
19-0443G	1	Draft Report	31 March 2022
19-0443G	2	Revised Draft Report	19 April 2022

Quality assurance

The report has been reviewed and approved for issue in accordance with the GML quality assurance policy and procedures.

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Cover image

Artefacts in catalogue entry CBW_222, excavated from context *222*, Open Area 1, BRW 8. (Source: © GML Heritage 2021)

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1 Introduction

The Canberra Brickworks Precinct (the Precinct or the Brickworks) is a significant historic site with a distinctive industrial character. It has recognised heritage significance through its listing on the ACT Heritage Register as the 'Yarralumla Brickworks' and the associated 'Yarralumla Brickworks Railway Remnants'.

Doma Group (Doma) engaged GML Heritage Pty Ltd (GML) to undertake historical archaeological test excavations at the Precinct across a number of identified areas of archaeological potential. The results of this investigation are detailed in the Archaeological Excavation Report and Statement of Heritage Effects (March 2022, draft).

The following report provides a long term management strategy for the artefacts recovered as part of the archaeological investigations.



Figure 1.1 Location of the Canberra Brickworks Precinct (inclusive of the 'Yarralumla Brickworks' and 'Yarralumla Brickworks Railway Remnants'), in the broader context of Canberra. (Source: Google Earth with GML overlay, 2017)

1.1 Heritage management context

The *Heritage Act 2004* (ACT) (the Heritage Act) aims to represent and protect the rich natural and cultural heritage of the ACT. The legislation establishes a system for the recognition, registration and conservation of natural and cultural heritage places and objects, including Aboriginal places and objects.

As described previously, the 'Yarralumla Brickworks' and the 'Yarralumla Brickworks Railway Remnants' are included on the ACT Heritage Register. The Precinct is also recognised on the non-statutory Australian Institute of Architects (AIA) ACT Chapter Register of Significant Twentieth Century Architecture (RSTCA) (Item No R063) and National Trust of Australia heritage lists.

An Archaeological Research Design (ARD) and Excavation Permit application was submitted to the ACT Heritage Council under Section 61E of the Heritage Act in May 2020. Following amendments made in September 2020, this was approved under Section 61F of the Heritage Act and an Archaeological Excavation Permit (Yarralumla-S102-B1) was granted on 20 October 2020 with the following conditions:

- all excavation and related activities are to be undertaken in accordance with the September 2020 ARD;
- a long term artefact management strategy is to be submitted to the ACT Heritage Council.

1.2 Objectives

The purpose of this management strategy is to:

- identify what types of artefacts and other archaeological material comprise the recovered assemblage;
- identify which artefacts are not significant or are redundant to the research value of the assemblage and can be discarded;
- identify which artefacts are to be retained and provide recommendations for display and interpretation opportunities in accordance with the Conservation Management Plan (CMP) (September 2021) and Interpretation Strategy (December 2020, draft); and
- provide conservation recommendations including those regarding environmental conditions, storage and display, and object handling.

1.3 Authorship

This report has been prepared by Elise Jakeman (GML Consultant and Archaeologist) with input and review by Martin Rowney (GML Principal and Archaeologist).

2 Documentation of the assemblage

This section reviews the compositional nature of the artefactual assemblage, its contribution to the archaeological investigations, and how it has been processed and assessed.

2.1 Recovery and processing

During the archaeological investigations, artefacts were collected according to their context. This included contexts exposed in plan, sondages, and selected surface areas. Artefacts were placed in appropriately labelled bags or buckets and transported off site for temporary storage prior to processing.

The general procedure undertaken for the processing and cataloguing of artefacts was as follows:

- Artefacts recovered from each context were examined and separated according to fabric. They were then systematically catalogued using a Microsoft Excel-based database. This database recorded the following information:
  - the area of archaeological sensitivity, excavation unit, context, and date of excavation of the artefact;
  - the database identification number, and material and object type;
  - the weight, number of individual specimens (NISP), and minimum number of individuals (MNI) where applicable;
  - the description of the artefact, date of manufacture; and
  - interpretation and significance of the artefact or group of artefacts in relation to the archaeological context.
- Once catalogued, artefacts were separated into diagnostic and non-diagnostic items. Diagnostic items were preferentially cleaned over non-diagnostic items.
- Artefacts were then re-bagged with artefact cards identifying the area of archaeological potential, context, and database identification number.

The final artefact assemblage recovered during the archaeological investigations comprised 231 catalogue entries, which included both individual artefacts and typological groups recovered from the same archaeological context. The artefact inventory is provided as part of Appendix H to the archaeological investigation report.[1]

2.2 Archaeological investigation results

The post-excavation assessment of the assemblage determined that the majority of the artefacts had been recovered from demolition or general rubbish deposits, characteristic of the widespread movement of debris around the site.

The catalogue entries were dominated by metal artefacts (29.9 per cent) and building materials (29.4 per cent), followed by glass (17.7 per cent). Smaller numbers of ceramic (7.4 per cent), plastic items (5.2 per cent), and faunal remains (5.2 per cent) and other organic materials (4.8 per cent) were also recorded. When assessed for their function, the catalogue entries predominantly related to subsistence (22.1 per cent) (eg beverage bottles and butchered faunal remains), industrial purposes (13 per cent) and building materials (11.7 per cent) (eg machinery parts, timber pieces, and nails). Few entries were associated with personal items (4.3 per cent).[2]

2.3 Review of significance

The assessment of significance for historical archaeological artefacts is undertaken within a specialised framework that considered their research potential, rarity or representativeness, aesthetic or technical characteristics, and historical association. Consideration must also be given to the significance of the archaeological context from which they originate. Generally, artefacts that contribute to archaeological research and interpretation will be of heritage significance.

The following table outlines the framework that was used to assess the significance of the assemblage.

Table 2.1 Framework for assessing artefact significance.

Significance	Rationale	Example artefact
High	The artefact: • contributes directly to the understanding of the Brickworks and the people who worked and lived at the site; • is rare, either within the context of the Brickworks or the wider Canberra historical landscape; and/or • can be attributed to a clearly identifiable event or theme.	CBW_51
Moderate	The artefact: • contributes some information to the understanding of the Brickworks and the people who worked and lived at the site;	CBW_95

Significance	Rationale	Example artefact
	• is uncommon within the context of the Brickworks; and/or • can be attributed to a clearly identifiable event or theme.	
Low	The artefact: • contributes little information to the understanding of the Brickworks or the people who worked and lived at the site; • is common within the context of the Brickworks; and/or • can be attributed to a clearly identifiable event or theme.	CBW_56
Nil	The artefact: • contributes no information, either due to lack of diagnostic traits or recovery from an insecure context; • is common within the context of the Brickworks; and/or • cannot be attributed to a clearly identifiable event or theme.	CBW_76

2.4 Endnotes

[1] GML Heritage Pty Ltd, Canberra Brickworks Precinct—Archaeological Excavation Report and Statement of Heritage Effects, prepared for Doma Group, March 2022, Appendix H.

[2] GML Heritage Pty Ltd, Canberra Brickworks Precinct—Archaeological Excavation Report and Statement of Heritage Effects, prepared for Doma Group, March 2022, p 166.

3 Artefact management

The following section outlines strategies for the long-term management of the archaeological assemblage. These strategies have been developed with regard to the recommendations outlined in Section 8 of the archaeological investigation report, and the assessed significance and research potential of the assemblage.

3.1 Retention

The following artefacts have been identified as suitable for retention (Table 3.1, photographs of the artefacts are included in Appendix 1). This has been determined based on their rarity, representativeness of the events or themes of the Brickworks, and/or potential to contribute to further research. A total of 51 artefacts (22 per cent) out of the full assemblage of 231 catalogue entries are recommended for retention. These artefacts comprise items of high and moderate significance.

Table 3.1 Artefacts identified for retention.

ID	Context	Material	Description	Significance
CBW_23	34	Brick	Type artefact for common 'CB' frogged brick	Moderate
CBW_25	76	Glass	Type artefacts for 1920s bottles	Moderate
CBW_29	76	Brick	'CANBERRA C'WEALTH' frogged squint brick	Moderate
CBW_30	76	Brick	'Simple' frogged single bullnose brick	High
CBW_31	Topsoil	Brick	Type artefact for common 'CANBERRA' frogged brick	Moderate
CBW_34	29	Paver	Type artefact for paver	Moderate
CBW_37	29	Glass	Type artefacts for 1930s bottles	Moderate
CBW_49	95	Glass	Type artefacts for 1960s bottles	Moderate
CBW_51	95	Metal	Addressograph plate	High
CBW_52	95	Metal	Addressograph plate	High
CBW_54	95	Brick	Type artefact for 'simple' frogged brick	High
CBW_63	Topsoil	Brick	Type artefact for common Type 1 'blank' frogged brick	Moderate
CBW_71	26	Metal	Shovel	High

ID	Context	Material	Description	Significance
CBW_75	25	Brick	Type artefact for ribbed face block	Moderate
CBW_82	7	Brick	Type artefact for common 'C'WEALTH CANBERRA' frogged brick	Moderate
CBW_86	117	Glass	Type artefacts for 1920s bottles	Moderate
CBW_95	49	Marble	Personal object of one of the early workers	Moderate
CBW_96	80	Ceramic	Type artefacts for 1920s ceramics	Moderate
CBW_97	80	Glass	Type artefacts for 1920s bottles	Moderate
CBW_98	80	Shell	Shell button	Moderate
CBW_100	80	Metal	Bed knob from 1920s married quarters	Moderate
CBW_131	28	Brick	Type artefact for concrete tile	Moderate
CBW_132	6	Brick	Type artefact for common unfrogged frogged brick	Moderate
CBW_133	6	Brick	Type artefact for 'air' brick	Moderate
CBW_137	17	Brick	'W' firebrick used in construction of a kiln	Moderate
CBW_143	Topsoil	Glass	Type artefacts for 1960s bottles	Moderate
CBW_148	3	Metal	Railway track portion	Moderate
CBW_155	Topsoil	Metal	Addressograph plate	High
CBW_156	106	Brick	Types artefacts for 'AUSTRALIA' and 'C'WEALTH' roof tiles	High
CBW_157	106	Brick	Type artefact for common 'CANBERRA C'WEALTH' frogged brick	High
CBW_172	Topsoil	Metal	Twenty-two railway joints from 1920s railway track	High
CBW_185	212	Leather	Shoe fragments	Moderate
CBW_186	212	Glass	Type artefacts for 1920s bottles	High
CBW_192	106	Brick	'CANBERRA C'WEALTH' frogged single bullnose brick	High
CBW_196	117	Glass	Type artefacts for 1920s bottles	Moderate
CBW_201	49	Ceramic	Teacup fragments	Moderate

ID	Context	Material	Description	Significance
CBW_202	49	Shell	290g of *Saccostrea glomerata* (Sydney Rock Oyster) shell	Moderate
CBW_203	49	Faunal remains	Butchered faunal remains	Moderate
CBW_209	76	Brick	Type artefact for possible Canberra cream brick	Moderate
CBW_210	76	Brick	Type artefact for common Type 2 'blank' frogged brick	Moderate
CBW_213	222	Metal	Door lock from 1920s married quarters	Moderate
CBW_221	222	Glass	Type artefacts for 1930s bottles	Moderate
CBW_224	222	Metal	Fittings from 1920s married quarters	Moderate
CBW_227	222	Ceramic	Fittings from 1920s married quarters	Moderate
CBW_230	222	Glass	Type artefacts for 1930s bottles	Moderate
CBW_231	222	Ceramic	Teacup fragments	Moderate
CBW_233	172	Glass	Type artefacts for 1930s bottles	Moderate
CBW_236	172	Ceramic	Teacup fragments	Moderate
CBW_240	172	Metal	Fittings and personal objects from 1920s married quarters	Moderate

3.1.1 Storage conditions

Artefacts selected for retention should be stored appropriately according to material type. A list of general approaches to storage—along with specific requirements for specific materials—is provided below (table). This information is based on the *reCollections—Caring for Collections Across Australia* (1998) series developed for the Heritage Collections Council. If required, a professional conservator should be consulted for detailed advice.

Table 3.2 Guidelines for the storage and display of artefacts. (After *reCollections*, 1998)

Category	Guidelines
General	
Storage	Items should not be stored in basements, sheds, or directly on the floor. The storage area should not contain any water, drain, or steam pipes, particularly at ceiling level. There should be reasonable ventilation. Transfer all retained artefacts into archive quality boxes which are properly labelled with: • site name; • area/s of archaeological potential and excavation unit/s; • date; and • context and catalogue numbers. Periodically check all boxes, bags, and labels for degradation. Where there is evidence for degradation, replace the affected item transferring all information across to the replacement to ensure that no information is lost. Maintain accession and location registers. Store the archive logically and keep materials together.
Condition	Periodically check all artefacts in storage for signs of degradation. This may include corrosion, mould, and insect infestations. If an affected item is identified, it (and any accompanying items within the same storage box) should be removed and a professional conservator consulted for advice.
Display	Display areas should be in a central area of a building, where they are buffered from the extremes of climatic fluctuations. The areas should not contain any water, drain, or steam pipes, particularly at ceiling level. There should be reasonable ventilation. Storage cupboards and furniture should be made of painted metal, as these provide a stable and neutral storage environment. If wooden storage or display furniture is used, these should be sealed and lined with impermeable coatings to reduce the risk of reactive chemicals from the wood affecting the enclosed artefacts. Clean and inspect display areas regularly to prevent deterioration caused by dust, mould, or insect activity.
Inorganics—Glass, ceramic, brick	
Storage	Pack in standard zip-lock bags and place in archive quality boxes. Spread the objects evenly in the box to distribute weight, keeping particularly fragile items at the top of the box. Do not over- or under-pack the boxes, add packing materials to fill out a box if necessary. When a large number of fragments are bagged together, a greater amount of damage such as breakage or abrasion is likely. To reduce such damage, consider refining the sorting process to smaller units of fragments.
Display	Artefacts should be displayed in a space that is maintained at a reasonably constant relative humidity of approximately 45 to 55 per cent and

Category	Guidelines
	temperature of 18 to 22 degrees Celsius. These objects are not overly sensitive to light conditions, however, should not be unnecessarily high lighting.
Organics—Shell, bone, leather, wood	
Storage	Pack in standard zip-lock bags that have been perforated. Ensure the perforations are smaller than the stored object so that the object cannot fall through the holes. Place in archive quality boxes. Spread the objects evenly in the box to distribute weight, keeping particularly fragile items at the top of the box. Do not over- or under-pack the boxes, add packing materials to fill out a box if necessary. When a large number of fragments are bagged together, a greater amount of damage such as breakage or abrasion is likely. To reduce such damage, consider refining the sorting process to smaller units of fragments.
Display	Artefacts should be displayed in a space that is maintained at a reasonably constant relative humidity of approximately 45 to 55 per cent and temperature of 18 to 22 degrees Celsius. Accompanying museum lighting should be no brighter than 150 lux. Leather objects on display should be fully supported in their desired shape, to prevent warping or hardening in an undesirable position. Other delicate items should be fully supported to prevent cracking.
Metals	
Environmental conditions	High relative humidity conditions can contribute to the degradation of metal objects. Such conditions can be counteracted by protecting metals by coating them with water repellents such as CRC, WD-40, or waxes. A conservator should be consulted to determine the suitability of the artefact and the appropriate coating material. If metal objects have been sorted in a temperate environment for a considerable period of time and demonstrate stability, the environment should not be altered to meet the recommended ideal conditions.
Storage	Interactions between different metal alloys can cause degradation and require different types of maintenance, so should be separated. Separate objects into the following three categories: • iron alloys; • copper alloys; and • other metals. Pack in standard zip-lock bags that have been perforated. Ensure the perforations are smaller than the stored object so that the object cannot fall through the holes. Pack small and large items, and composite objects in separate boxes. Spread the objects evenly in the box to distribute weight, keeping particularly fragile items at the top of the box. Do not over- or under-pack the boxes, add packing materials to fill out a box if necessary.

Category	Guidelines
Display	Artefacts should be displayed in a space that is maintained at a reasonably constant relative humidity of approximately 45 to 55 per cent and temperature of 18 to 22 degrees Celsius. Accompanying museum lighting should be no brighter than 300 lux. Artefacts on display should be fully supported, with particular care provided for hinged objects to ensure that the hinge is not carrying the weight of the object.

3.1.2 Conservation

The artefacts identified for retention are presently in stable condition and do not require immediate conservation intervention. Ongoing condition review in accordance with

Table 3.2 will be sufficient for these artefacts.

A professional conservator should be consulted for detailed advice.

3.1.3 Interpretation and research opportunities

The artefacts identified for retention include objects that are representative of the events and activities that occurred at the Precinct over its operation. As such, a majority of these artefacts have significance as display items that can assist in the heritage interpretation of the site and its role in the development of Canberra. Example opportunities have been identified in Table 3.3.

Table 3.3 Display opportunities.

Opportunity	Description	Example artefacts
Timeline of production—Bricks	A number of the different brick types and changes in brick-frog style for different bricks produced at the Brickworks between 1913–1976 were demonstrated through the range of bricks recovered. These could be used to develop an informative display about the different brick frog designs and when they were in circulation. This display could be supplemented with further examples of different brick types sourced from elsewhere.	CBW_23, 29, 30, 31, 34, 54, 63, 75, 82, 131, 132, 133, 137, 156, 157, 192, 209, and 210
Administrative	A number of addressograph plates were recovered (discussed in Section 4.2.3 of the archaeological investigation report). These plates display the names, addresses, and other personal details of a number of individuals. Further research could be undertaken to determine how these plates relate to the Precinct (ie whether these individuals were employees or other contractors). If they are determined to be directly related to the Brickworks, they may be used to develop a display documenting the workers of the facility. This display could be supplemented with historical photographs of the workers and personal accounts collected through community consultation.	CBW_51, 52, and 155
Subsistence	The workers and inhabitants of the Brickworks consumed a wide variety of products.	CBW_25, 37, 49, 86, 97, 143, 186, 196, 202, 203, 221, and 233

Opportunity	Description	Example artefacts
	Many of the bottles and jars that these products were packaged in were recovered during the excavation. These include drinks (eg beer, gin, cordial, and soft drink), preserves (eg jams, pasta sauces, and condiments), and oils. In addition to the manufactured goods, the remains of butchered meat cuts and oyster shells were also recovered. These items could be displayed to show the different products that were consumed by the workers over the operation of the Brickworks. This display would have additional value in providing insight into early twentieth century life in Canberra.	
Personal artefacts	In addition to the food products consumed, the workers and inhabitants of the Brickworks also left a number of personal objects. Such personal objects not only include possessions (eg shoes, buttons, and a marble), but also personal toiletries and grooming products (eg bottles for shaving cream, dietary supplements, and medicinal goods). These items could be used to supplement a display about the workers and inhabitants of the Brickworks.	CBW95, 98, 185, 221, 230, and 233

Detailed interpretation opportunities should be incorporated into the Interpretation Strategy prepared for the site.

Given the insight the assemblage provides into a key location in the historical landscape of Canberra, the retained assemblage should be made available for researchers in the future. This research may include typological analysis of early- and mid-twentieth century material culture, comparison to assemblages obtained from other archaeological sites in Canberra and the surrounding region, or other topics of interest.

3.2 Discard

The following artefacts have been identified as suitable for discard (Table 3.4). This has been determined based on their commonness, non-diagnostic or fragmentary nature, unsecure archaeological association, or lack of potential to contribute to further research. These artefacts predominantly comprise items of low and nil significance.

Table 3.4 Artefacts identified for discard.

ID	Context	Material	ID	Context	Material
CBW_2	Topsoil	Brick	CBW_120	90	Metal
CBW_3	Topsoil	Other	CBW_121	17	Brick
CBW_4	Topsoil	Bone	CBW_122	29	Metal
CBW_5	Topsoil	Brick	CBW_123	29	Organic
CBW_7	Topsoil	Other	CBW_124	29	Brick
CBW_8	Topsoil	Metal	CBW_125	29	Brick
CBW_9	Topsoil	Other	CBW_126	99	Metal
CBW_10	Topsoil	Glass	CBW_127	6	Brick
CBW_11	Topsoil	Metal	CBW_128	6	Other
CBW_12	Topsoil	Metal	CBW_129	6	Ceramic
CBW_13	Topsoil	Ceramic	CBW_130	6	Metal
CBW_15	Topsoil	Glass	CBW_132	6	Brick
CBW_16	Topsoil	Metal	CBW_134	6	Brick
CBW_17	34	Metal	CBW_135	17	Brick
CBW_18	34	Glass	CBW_136	17	Metal
CBW_19	34	Metal	CBW_138	17	Brick
CBW_20	34	Ceramic	CBW_139	29	Brick
CBW_21	34	Brick	CBW_140	17	Brick
CBW_22	34	Brick	CBW_141	63	Metal
CBW_24	12	Organic	CBW_142	28	Metal
CBW_26	76	Metal	CBW_144	28	Glass
CBW_27	76	Metal	CBW_145	21	Metal
CBW_28	76	Tile	CBW_146	28	Metal
CBW_32	76	Bone	CBW_147	29	Metal
CBW_33	50	Brick	CBW_150	Topsoil	Metal
CBW_35	29	Brick	CBW_151	Topsoil	Brick
CBW_36	29	Brick	CBW_152	Topsoil	Brick
CBW_38	Topsoil	Brick	CBW_153	29	Brick

ID	Context	Material	ID	Context	Material
CBW_39	Topsoil	Brick	CBW_154	28	Brick
CBW_40	Topsoil	Glass	CBW_156	106	Brick
CBW_41	90	Glass	CBW_158	106	Brick
CBW_43	90	Metal	CBW_159	106	Brick
CBW_44	90	Other	CBW_160	123	Metal
CBW_45	90	Organic	CBW_162	109	Metal
CBW_46	25	Organic	CBW_163	Topsoil	Metal
CBW_47	95	Metal	CBW_164	Topsoil	Brick
CBW_48	95	Glass	CBW_165	90	Metal
CBW_50	95	Ceramic	CBW_166	90	Ceramic
CBW_53	95	Brick	CBW_168	90	Glass
CBW_55	95	Brick	CBW_169	90	Glass
CBW_56	Topsoil	Glass	CBW_170	90	Brick
CBW_58	Topsoil	Glass	CBW_171	91	Glass
CBW_59	Topsoil	Metal	CBW_173	Topsoil	Metal
CBW_60	Topsoil	Organic	CBW_174	129	Brick
CBW_61	Topsoil	Plastic	CBW_175	129	Glass
CBW_62	Topsoil	Metal	CBW_176	129	Metal
CBW_64	29	Brick	CBW_177	129	Glass
CBW_65	12	Brick	CBW_179	41	Glass
CBW_66	29	Brick	CBW_180	41	Metal
CBW_67	17	Brick	CBW_181	41	Ceramic
CBW_68	87	Brick	CBW_182	41	Ceramic
CBW_69	84	Brick	CBW_183	41	Bone
CBW_70	29	Brick	CBW_184	41	Metal
CBW_72	25	Other	CBW_190	214	Metal
CBW_73	25	Glass	CBW_191	212	Bone
CBW_74	25	Glass	CBW_193	220	Glass

ID	Context	Material	ID	Context	Material
CBW_76	25	Metal	CBW_194	220	Ceramic
CBW_77	34	Brick	CBW_195	220	Metal
CBW_78	34	Brick	CBW_196	117	Glass
CBW_79	34	Brick	CBW_197	117	Glass
CBW_80	34	Metal	CBW_198	149	Ceramic
CBW_81	34	Metal	CBW_199	149	Metal
CBW_83	21	Brick	CBW_205	49	Glass
CBW_84	13	Brick	CBW_206	49	Organic
CBW_85	7	Metal	CBW_207	49	Metal
CBW_87	117	Metal	CBW_208	49	Metal
CBW_88	Topsoil	Other	CBW_212	76	Metal
CBW_89	Topsoil	Glass	CBW_214	Topsoil	Metal
CBW_90	49	Bone	CBW_215	129	Glass
CBW_91	49	Metal	CBW_216	129	Glass
CBW_92	49	Metal	CBW_217	129	Other
CBW_94	49	Glass	CBW_218	129	Metal
CBW_99	80	Bone	CBW_219	129	Organic
CBW_100	80	Metal	CBW_220	129	Metal
CBW_101	80	Metal	CBW_223	222	Glass
CBW_102	80	Metal	CBW_225	222	Bone
CBW_103	80	Metal	CBW_226	222	Other
CBW_104	3	Brick	CBW_228	222	Ceramic
CBW_105	3	Brick	CBW_229	222	Ceramic
CBW_106	3	Organic	CBW_232	222	Metal
CBW_107	1	Brick	CBW_236	172	Ceramic
CBW_110	Topsoil	Brick	CBW_237	172	Bone
CBW_111	Topsoil	Glass	CBW_239	172	Metal
CBW_112	Topsoil	Metal	CBW_241	Topsoil	Glass

ID	Context	Material	ID	Context	Material
CBW_113	Topsoil	Ceramic	CBW_242	Topsoil	Metal
CBW_114	Topsoil	Metal	CBW_243	Topsoil	Brick
CBW_115	Topsoil	Metal	CBW_244	6	Brick
CBW_116	Topsoil	Other	CBW_245	Topsoil	Brick
CBW_117	Topsoil	Metal	CBW_246	Topsoil	Brick
CBW_118	Topsoil	Metal	CBW_247	3	Metal
CBW_119	Topsoil	Bone	CBW_248	3	Bone
			CBW_249	3	Ceramic

4 Recommendations

The majority of artefacts were identified as being unsuitable for retention, due to their commonness, non-diagnostic or fragmentary nature, unsecure archaeological association, or lack of potential to contribute to further research. A small subsection of artefacts have been recommended for retention. These artefacts provide insight into the manufacture of bricks and lives of the workers who occupied a key location in the historical landscape of Canberra.

In light of this, the following recommendations are made:

- **Interpretation Strategy**—The artefactual assemblage should be incorporated into the Interpretation Strategy for the Precinct, allowing for the communication of the results of the archaeological investigations to the current residents of Yarralumla and the future residents of the Brickworks development. The Interpretation Strategy should identify opportunities for the public display of select artefacts.
- **Artefact retention**—The artefacts identified as suitable for retention should be accessioned into the Brickworks moveable heritage collection, which has previously been documented in Appendix H of the 2021 CMP. This collection should be managed in accordance with this strategy. This collection should also be made available to researchers.
- **Artefact discard**—The artefacts identified as having no research potential and low interpretative value can be discarded appropriately.

Appendix 1

Photographs of artefacts identified for retention.

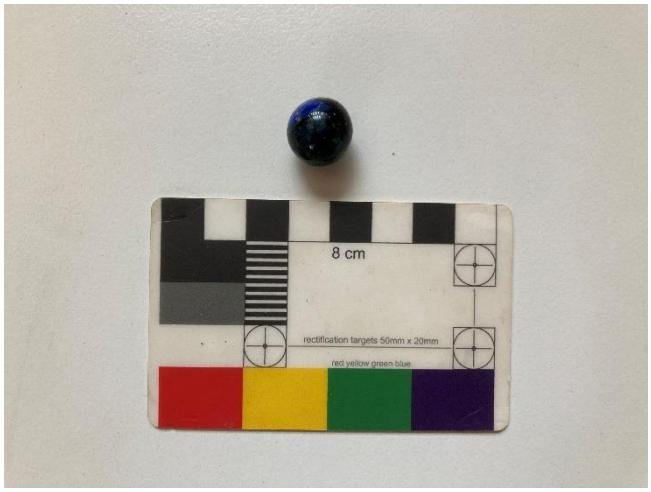
Catalogue number	Photographs
CBW_23	
CBW_25	
CBW_29	

Catalogue number	Photographs
CBW_30	
CBW_31	
CBW_34	

Catalogue number	Photographs
CBW_37	
CBW_49	
CBW_51	

Catalogue number	Photographs
CBW_52	
CBW_54	
CBW_63	

Catalogue number	Photographs
CBW_71	
CBW_75	
CBW_82	

Catalogue number	Photographs
CBW_86	
CBW_95	
CBW_96	

Catalogue number	Photographs
CBW_97	
CBW_98	 

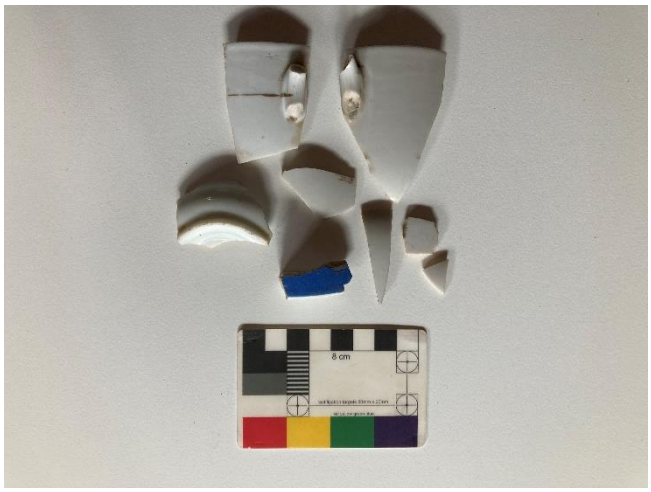
Catalogue number	Photographs
CBW_100	
CBW_131	
CBW_132	

Catalogue number	Photographs
CBW_133	
CBW_137	
CBW_143	

Catalogue number	Photographs
CBW_148	
CBW_155	
CBW_156	

Catalogue number	Photographs
CBW_157	
CBW_172 (one of 22)	
CBW_185	

Catalogue number	Photographs
CBW_186	
CBW_192	
CBW_196	

Catalogue number	Photographs
CBW_201	
CBW_202	
CBW_203	

Catalogue number	Photographs
CBW_209	
CBW_210	
CBW_213	

Catalogue number	Photographs
CBW_221	 
CBW_224	

Catalogue number	Photographs
CBW_230	  

Catalogue number	Photographs
CBW_231	
CBW_233	
CBW_236	
CBW_240	