

METROPOLITAN COAL LONGWALL 304

HERITAGE MANAGEMENT PLAN



METROPOLITAN COAL

LONGWALL 304

HERITAGE MANAGEMENT PLAN

Revision Status Register

Section/Page/ Annexure	Revision Number	Amendment/Addition	Distribution	DP&E Approval Date
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Sections 3.3 and 4.3	HMP-R01-B	Minor corrections	OEH, DP&E	-

April 2019

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1 INTRODUCTION

Metropolitan Coal is a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody). Metropolitan Coal was granted approval for the Metropolitan Coal Project (the Project) under section 75J of the New South Wales (NSW) *Environmental Planning and Assessment Act, 1979* (EP&A Act) on 22 June 2009. A copy of the Project Approval is available on the Peabody website (<http://www.peabodyenergy.com>).

The Project comprises the continuation, upgrade and extension of underground coal mining operations (Longwalls 20-27 and Longwalls 301-317) and surface facilities at the Metropolitan Coal Mine (Figure 1). Longwall 304 is situated to the west of Longwalls 301-303, and defines the next mining sub-domain within the Project underground mining area (Figures 1 and 2). Longwalls 305 on will be subject to future Extraction Plans.

1.1 PURPOSE AND SCOPE

In accordance with Condition 6, Schedule 3 of the Project Approval, this Heritage Management Plan (HMP) has been prepared as a component of the Metropolitan Coal Longwall 304 Extraction Plan to manage the potential environmental consequences of the Extraction Plan on Aboriginal heritage sites or values.

The relationship of this HMP to the Metropolitan Coal Environmental Management Structure and to the Metropolitan Coal Longwall 304 Extraction Plan is shown on Figure 3.

This HMP includes post-mining monitoring and management of Aboriginal heritage sites for Longwalls 20-22, 23-27 and 301-303, subject to the previously approved Metropolitan Coal Longwalls 301-303 HMP. Consistent with the recommended approach in the NSW Department of Planning and Environment (DP&E) and NSW Division of Resources and Energy (DRE) (2015) *Guidelines for the Preparation of Extraction Plans*, the Metropolitan Coal Longwalls 301-303 HMP will be superseded by this document following the completion of Longwall 303.

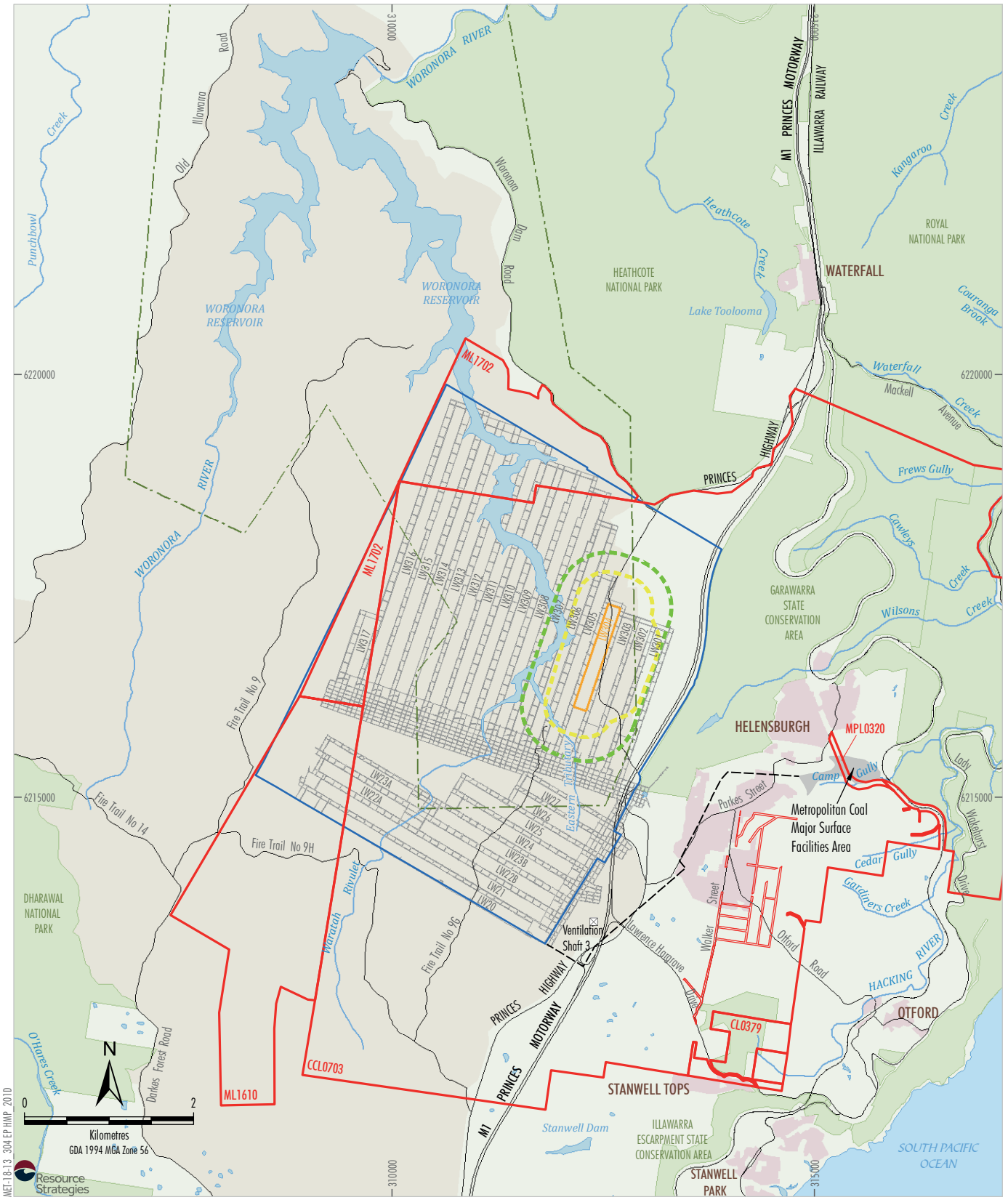
In accordance with Condition 6, Schedule 3 of the Project Approval, this HMP has been prepared by Metropolitan Coal, with assistance from Niche Environment and Heritage and Mine Subsidence Engineering Consultants (MSEC).

1.2 STRUCTURE OF THE HERITAGE MANAGEMENT PLAN

The remainder of this HMP is structured as follows:

- Section 2: Describes the review and update of this HMP.
- Section 3: Outlines the statutory requirements applicable to this HMP.
- Section 4: Provides a revised assessment of the potential subsidence impacts and environmental consequences for Longwall 304.
- Section 5: Describes the consultation protocol.
- Section 6: Details the performance measures and indicators that will be used to assess the Project.
- Section 7: Outlines the baseline data for Aboriginal heritage sites.
- Section 8: Describes supplementary fieldwork and pre-clearance surveys to be undertaken.
- Section 9: Describes the monitoring program and provides the detailed Trigger Action Response Plan (TARP).

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MEF-18-13_304 EP HMP_2010

LEGEND

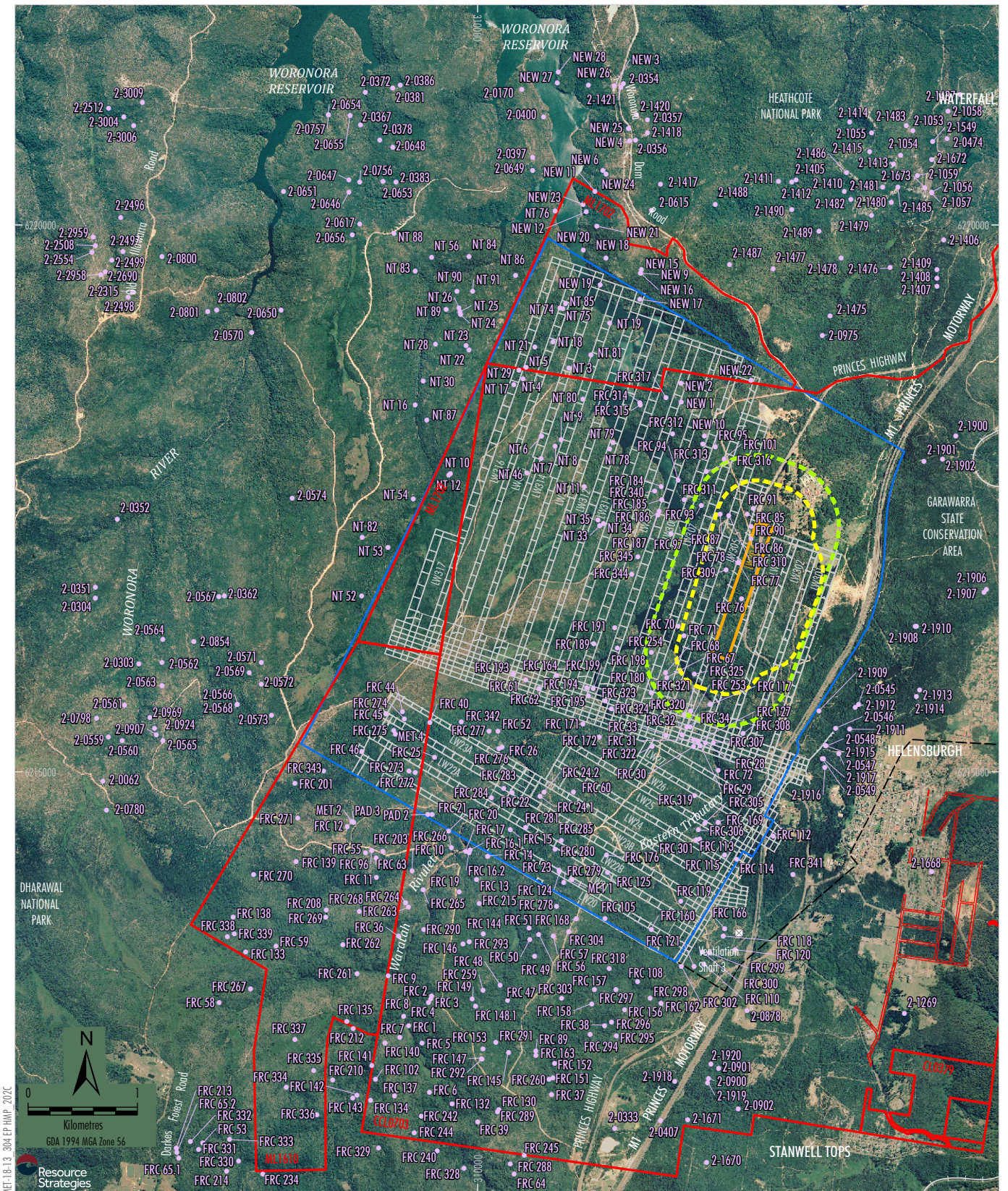
- Mining Lease Boundary
- Woronora Special Area
- Railway
- Project Underground Mining Area
Longwalls 20-27 and 301-317
- Longwall 304 Secondary Extraction
- 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
- 600 m from Secondary Extraction of
Longwall 304
- Woronora Notification Area
- Existing Underground Access Drive (Main Drift)

Source: Land and Property Information (2015); Department of Industry (2015);
Metropolitan Coal (2019); MSEC (2019)

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METROPOLITAN COAL
Longwall 304 and Project Underground
Mining Area

Figure 1



MEF-18-13 304 EP HMP 202C
Resource Strategies

- LEGEND**
- Mining Lease Boundary
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwall 304 Secondary Extraction
 - 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
 - 600 m from Secondary Extraction of
Longwall 304
 - Existing Underground Access Drive (Main Drift)
 - Aboriginal Heritage Site

Source: Land and Property Information (2015); Date of Aerial Photography 1998;
Department of Industry (2015); Metropolitan Coal (2019); MSEC (2019);
Illawarra Prehistory Group (2007; 2008); AHIMS (2007); Kayandel
Archaeological Services (2006; 2007; 2008); Niche Environment and
Heritage (2013)

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Known Aboriginal Heritage Sites
Within Project Underground Mining Area
and Surrounds

Figure 2

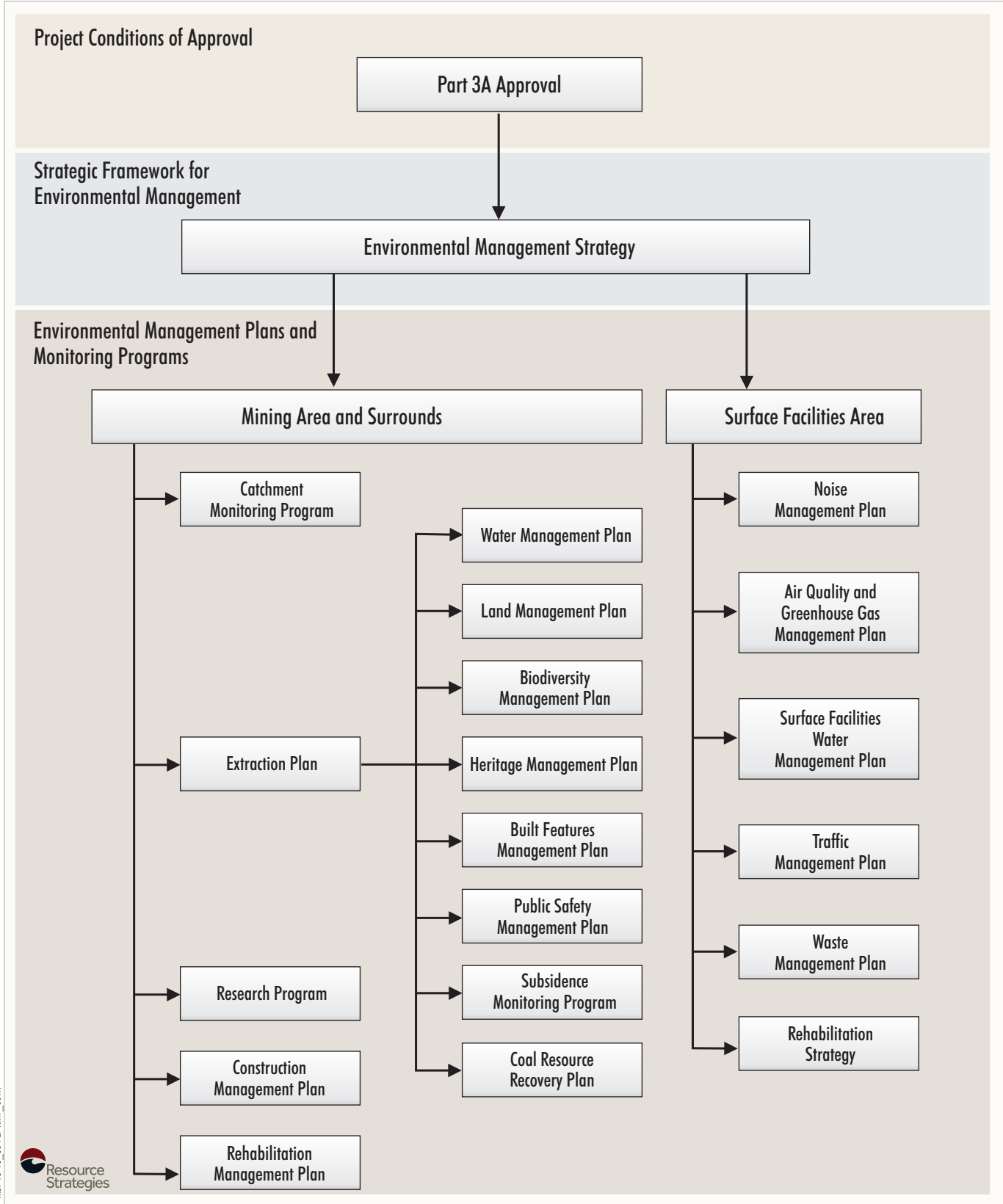


Figure 3

- Section 10: Describes the management, remediation and mitigation measures that will be implemented to reduce potential impacts on Aboriginal heritage.
- Section 11: Provides a Contingency Plan to manage any unpredicted impacts and their consequences.
- Section 12: Describes the program to collect baseline data for future Extraction Plans.
- Section 13: Describes the annual review and improvement of environmental performance.
- Section 14: Outlines the management and reporting of incidents.
- Section 15: Outlines the management and reporting of complaints.
- Section 16: Outlines the management and reporting of non-compliances with statutory requirements.
- Section 17: Lists the references cited in this HMP.

2 HERITAGE MANAGEMENT PLAN REVIEW AND UPDATE

In accordance with Condition 4, Schedule 7 of the Project Approval, this HMP will be reviewed within three months of the submission of:

- an audit under Condition 8, Schedule 7;
- an incident report under Condition 6, Schedule 7;
- an annual review under Condition 3, Schedule 7; and

if necessary, revised to the satisfaction of the Director-General (now Secretary) of the DP&E to ensure this HMP is updated on a regular basis and to incorporate any recommended measures to improve environmental performance.

This HMP will also be reviewed within three months of approval of any Project modification and if necessary, revised to the satisfaction of the DP&E.

The revision status of this HMP is indicated on the title page of each copy. The distribution register for controlled copies of this HMP is described in Section 2.1.

2.1 DISTRIBUTION REGISTER

In accordance with Condition 10, Schedule 7 of the Project Approval, 'Access to Information', Metropolitan Coal will make this HMP publicly available on the Peabody website. A hard copy of the HMP will also be maintained at the Metropolitan Coal Mine.

Metropolitan Coal recognises that various regulators have different distribution requirements, both in relation to whom documents should be sent and in what format.

An Environmental Management Plan and Monitoring Program Distribution Register has been established in consultation with the relevant agencies and infrastructure owners that indicates:

- to whom the Metropolitan Coal plans and programs, such as this HMP, will be distributed;
- the format (i.e. electronic or hard copy) of distribution; and
- the format of revision notification.

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Metropolitan Coal will make the Distribution Register publicly available on the Peabody website.

Metropolitan Coal will be responsible for maintaining the Distribution Register and for ensuring that the notification of revisions is sent by email or post as appropriate.

In addition, Metropolitan Coal employees with local computer network access will be able to view the controlled electronic version of this HMP on the Metropolitan Coal local area network. Metropolitan Coal will not be responsible for maintaining uncontrolled copies beyond ensuring the most recent version is maintained on Metropolitan Coal’s computer system and the Peabody website.

3 STATUTORY REQUIREMENTS

Metropolitan Coal’s statutory obligations are contained in:

- (i) the conditions of the Project Approval;
- (ii) relevant licences and permits, including conditions attached to mining leases; and
- (iii) other relevant legislation.

These are described below.

3.1 ENVIRONMENTAL PLANNING & ASSESSMENT ACT APPROVAL

Condition 6(f), Schedule 3 of the Project Approval requires the preparation of a HMP as a component of Extraction Plan(s) for second workings. Condition 6(f), Schedule 3 states:

SECOND WORKINGS

Extraction Plan

6. *The Proponent shall prepare and implement an Extraction Plan for all second workings in the mining area to the satisfaction of the Director-General. This plan must:*

...

(f) include a:

...

- *Heritage Management Plan, which has been prepared in consultation with OEH and the relevant Aboriginal groups, to manage the potential environmental consequences of the Extraction Plan on heritage sites or values;*

In addition, Condition 2, Schedule 7 and Condition 7, Schedule 3 of the Project Approval outline management plan requirements that are applicable to the preparation of this HMP. Table 1 indicates where each component of the conditions is addressed within this HMP.

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Table 1
Management Plan Requirements

Project Approval Condition	HMP Section
Condition 2, Schedule 7	
2. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:	
a) detailed baseline data;	Section 7
b) a description of:	
• the relevant statutory requirements (including any relevant approval, licence or lease conditions);	Section 3
• any relevant limits or performance measures/criteria;	Section 6
• the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;	Section 6
c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Sections 6, 9, 10 and 11
d) a program to monitor and report on the:	
• impacts and environmental performance of the project;	Sections 9, 10 and 13
• effectiveness of any management measures (see c above);	
e) a contingency plan to manage any unpredicted impacts and their consequences;	Section 11
f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Sections 9 and 13
g) a protocol for managing and reporting any:	
• incidents;	Section 14
• complaints;	Section 15
• non-compliances with statutory requirements; and	Section 16
• exceedances of the impact assessment criteria and/or performance criteria; and	Sections 10, 11 and 16
h) a protocol for periodic review of the plan.	Sections 2 and 13
Condition 7, Schedule 3	
7. In addition to the standard requirements for management plans (see condition 2 of schedule 7), the Proponent shall ensure that the management plans required under condition 6(f) above include:	
a) a program to collect sufficient baseline data for future Extraction Plans;	Section 12
b) a revised assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval;	Section 4
c) a detailed description of the measures that would be implemented to remediate predicted impacts; and	Section 10
d) a contingency plan that expressly provides for adaptive management.	Section 11

3.2 LICENCES, PERMITS AND LEASES

In addition to the Project Approval, all activities at or in association with the Metropolitan Coal Mine will be undertaken in accordance with the following licences, permits and leases which have been issued or are pending issue:

- The conditions of mining leases issued by the NSW Division of Resources and Geoscience (DRG), under the NSW *Mining Act, 1992* (e.g. Consolidated Coal Lease [CCL] 703, Mining Lease [ML] 1610, ML 1702, Coal Lease [CL] 379 and Mining Purpose Lease [MPL] 320).
- The *Metropolitan Coal Mining Operations Plan 1 October 2012 to 30 September 2019* approved by the DRG.
- The conditions of Environment Protection Licence (EPL) No. 767 issued by the NSW Environment Protection Authority (EPA) under the NSW *Protection of the Environment Operations Act, 1997*. Revision of the EPL will be required prior to the commencement of Metropolitan Coal activities that differ from those currently licensed.
- The prescribed conditions of specific surface access leases within CCL 703 for the installation of surface facilities as required.
- Water Access Licences (WALs) issued by the NSW Department of Primary Industries – Water (now the Department of Industry – Water) under the NSW *Water Management Act, 2000*, including WAL 36475 under the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011* and WAL 25410 under the *Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011*.
- Mining and workplace health and safety related approvals granted by the NSW Resources Regulator and WorkCover NSW.
- Supplementary approvals obtained from WaterNSW for surface activities within the Woronora Special Area (e.g. fire road maintenance activities).

3.3 OTHER LEGISLATION

Metropolitan Coal will conduct the Project consistent with the Project Approval and any other legislation that is applicable to an approved Part 3A Project under the EP&A Act.

The following Acts may be applicable to the conduct of the Project (Helensburgh Coal Pty Ltd [HCPL], 2008)¹:

- *Biodiversity Conservation Act, 2016*;
- *Biosecurity Act, 2015*;
- *Contaminated Land Management Act, 1997*;
- *Crown Land Management Act, 2016*;
- *Dams Safety Act, 2015*;
- *Dangerous Goods (Road and Rail Transport) Act, 2008*;
- *Energy and Utilities Administration Act, 1987*;
- *Fisheries Management Act, 1994*;
- *Mining Act, 1992*;

¹ The list of potentially applicable Acts has been updated to reflect changes to the Acts that were in force at the time of submission of the Metropolitan Coal Project Environmental Assessment (Project EA) (HCPL, 2008).

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- *Protection of the Environment Operations Act, 1997;*
- *Rail Safety (Adoption of National Law) Act, 2012;*
- *Roads Act, 1993;*
- *Water Act, 1912;*
- *Water Management Act, 2000;*
- *Water NSW Act, 2014;*
- *Work Health and Safety Act, 2011;* and
- *Work Health and Safety (Mines and Petroleum Sites) Act, 2013.*

Relevant licences or approvals required under these Acts will be obtained as required.

4 REVISED ASSESSMENT OF POTENTIAL ENVIRONMENTAL CONSEQUENCES

4.1 LONGWALL 304 EXTRACTION LAYOUT

Longwall 304 and the area of land within 600 metres (m) of Longwall 304 secondary extraction are shown on Figures 1, 2 and 4. Longwall extraction will occur from north to south. The Longwall 304 layout includes a 163 m panel width (void) and a 45 m pillar width (solid).

Longwall 304 is scheduled to commence in July 2019 and be completed in December 2019.

The total cumulative predicted subsidence effects, subsidence impacts and/or environmental consequences at the completion of the Project are considered in the Metropolitan Coal Project Environmental Assessment (Project EA) (HCPL, 2008) and the Preferred Project Report (HCPL, 2009), and the cumulative subsidence effects, subsidence impacts and/or environmental consequences on Aboriginal heritage will be assessed in future Extraction Plans.

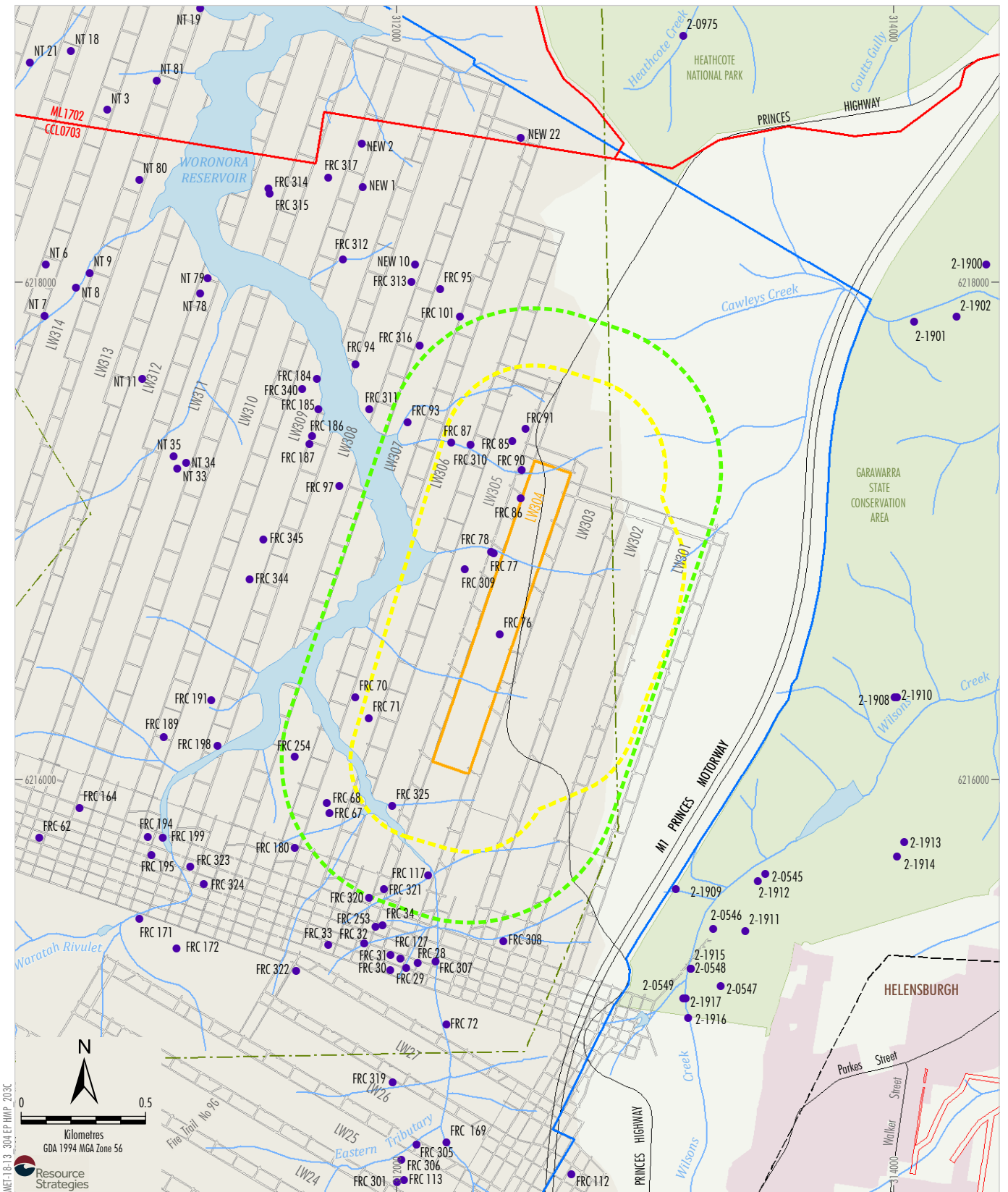
4.2 RELEVANT INFORMATION OBTAINED SINCE PROJECT APPROVAL

Aboriginal heritage monitoring programs have been implemented at Metropolitan Coal for Longwalls 20-22 (from 2010 to 2014; Round 1, 2 and 3 surveys) (Kayandel Archaeological Services, 2012; Niche Environment and Heritage, 2013, 2015) and Longwalls 23-27 (from 2015; Round 1, 2, 3, 4 and 5 surveys) (Niche Environment and Heritage, 2016a, 2016b, 2017a, 2017b, 2017c) to monitor the impacts and environmental consequences of Project related subsidence on Aboriginal heritage sites. The monitoring programs have been undertaken by a suitably qualified archaeologist (with experience in rock art recording and management) and representatives of the Aboriginal stakeholders.

Metropolitan Coal acknowledges that all Aboriginal heritage sites are considered to be culturally significant to the Aboriginal people who have a traditional connection to Country. All Aboriginal heritage sites have been monitored for subsidence impacts by the observation and recording of any and all changes at the sites over the monitoring period.

Of the 52 Aboriginal heritage sites that have been subject to monitoring for Longwalls 20-22 and Longwalls 23-27, 12 have been determined to have changes due to mining induced subsidence.

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Resource Strategies

- LEGEND**
- Mining Lease Boundary
 - Woronora Special Area
 - Project Underground Mining Area Longwalls 20-27 and 301-317
 - Longwall 304 Secondary Extraction
 - 35° Angle of Draw and/or Predicted 20 mm Subsidence Contour
 - 600 m from Secondary Extraction of Longwall 304
 - Woronora Notification Area
 - Existing Underground Access Drive (Main Drift)
 - Aboriginal Heritage Site

Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2019); MSEC (2019); Illawarra Prehistory Group (2007; 2008); AHIMS (2007); Kayandel Archaeological Services (2006; 2007; 2008); Niche Environmental and Heritage (2013)

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METROPOLITAN COAL
Longwall 304
Known Aboriginal Heritage Sites

Figure 4

Five Aboriginal heritage sites (FRC 15, FRC 281, FRC 283, FRC 284 and MET 1) have been determined to have changes due to mining induced subsidence from Longwalls 20-22 (Figure 2). The observed impacts at each site were as follows:

- Site FRC 15 – vertical cracking, not coincident with any art.
- Site FRC 281 – multiple cracks running either through or adjacent to the motifs (although the majority of art showed no damage or changes).
- Site FRC 283 – cracking of the rear wall of the shelter, not coincident with any art.
- Site FRC 284 – fracturing of the rear wall of the shelter and exfoliation, not coincident with any art.
- Site MET 1 – two vertical cracks along the rear wall and ceiling of the shelter, not coincident with any art.

Seven Aboriginal heritage sites (FRC 28, FRC 29, FRC 34, FRC 60, FRC 176, FRC 275 and FRC 301) have been determined to have changes due to mining induced subsidence from Longwalls 23-27 (Figure 2). The observed impacts at each site were as follows:

- Site FRC 28 – vertical cracking of the rear shelter wall, opening of horizontal planes/joints and movement of the rock shelf that is part of the shelter floor, not coincident with any art.
- Site FRC 29 – horizontal crack along the back wall and a joining vertical crack, not coincident with any art.
- Site FRC 34 – horizontal cracking along the roof of the shelter and cracking coincident with the most southern hand stencil on the back panel.
- Site FRC 60 – three vertical cracks along the back wall of the shelter, no art recorded at this shelter, the artefacts could not be relocated.
- Site FRC 176 – vertical cracking along the northern and southern ends of the shelter, not coincident with art.
- Site FRC 275 – opening of horizontal bedding plane at rear of the shelter, five vertical hairline cracks along the back wall of the shelter, not coincident with any art.
- Site FRC 301 – surface cracking on the rock platform, not coincident with the grinding grooves.

The results of the monitoring program have been used to assess the Aboriginal heritage sites subsidence impact performance measure:

Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts.

For the purpose of measuring performance against the Aboriginal heritage subsidence impact performance measure (Section 6), Aboriginal heritage sites are considered to be “affected by subsidence impacts” if they exhibit one or more of the following consequences that cannot be attributed to natural weathering or deterioration:

- overhang collapse;
- cracking of sandstone that coincides with Aboriginal art or grinding grooves; and/or
- rock fall that damages Aboriginal art.

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Of the sites at which changes due to mining induced subsidence have occurred, only sites FRC 34 and FRC 281 have been affected by subsidence impacts as a result of cracking of sandstone that coincides with Aboriginal art. This means that less than 2% of sites within the mining area have been affected by subsidence impacts (Niche Environment and Heritage, 2017c) (Section 6).

In addition to the changes recorded as a result of mining induced subsidence, natural weathering processes can also result in changes/deterioration of Aboriginal heritage sites in the Southern Coalfield (Reeves and Regal, 2017). For example, a large block fall was recorded at the southern end of site FRC 24.1 during the Round 2 monitoring for Longwalls 23-27. This change was observed to be due to natural water seepage and vegetation growth (including *Todea Barbara* and *Microsorium scandens*) along the bedding plane where it joins to the roof of the shelter (Niche Environment and Heritage, 2016b). Other examples of natural weathering include micro- and macro-vegetation growth, chemical erosion, fire damage and exfoliation of surfaces (Niche Environment and Heritage, 2016b).

The results of the monitoring to date are consistent with the potential subsidence impacts and environmental consequences predicted in the Project EA and the Preferred Project Report, where it was expected that the majority of identified Aboriginal heritage sites would experience no significant change, particularly when compared to natural weathering processes unrelated to mining and given the conservative nature of the subsidence predictions.

Aboriginal heritage sites which were observed during previous monitoring (Round 5 survey for Longwalls 23-27) to have continued change due to mining induced subsidence (sites MET 1 and FRC 176) or changes for the first time (sites FRC 28, FRC 29, FRC 34 and FRC 60) will be monitored for Longwalls 301-303 within three months of the completion of Longwall 303 (Figure 4). Sites FRC 76 and FRC 117, located within the 35 degree (°) angle of draw and/or predicted 20 millimetres (mm) subsidence contour of the Longwalls 301-303 Extraction Plan layout (September 2018), will also be monitored for Longwalls 301-303 within three months of the completion of Longwall 303 (Figure 4). At the time of development of this HMP, Longwall 303 was still being mined.

4.3 ENVIRONMENTAL RISK ASSESSMENT

An Environmental Risk Assessment (ERA) was conducted for four of the key component plans of the Metropolitan Coal Longwall 304 Extraction Plan² viz. Water Management Plan, Biodiversity Management Plan, Land Management Plan and this HMP to give appropriate consideration to risk assessment and risk management in accordance with the DP&E and DRE (2015) *Guidelines for the Preparation of Extraction Plans*.

The suitably qualified and experienced experts endorsed by the Secretary of the DP&E for the preparation of the Metropolitan Coal Longwall 304 Extraction Plan participated in the ERA³. The ERA process involved the key steps described below.

² Individual risk assessments have been undertaken separately for the Metropolitan Coal Longwall 304 Built Features Management Plan and the Metropolitan Coal Longwall 304 Public Safety Management Plan, and are reported in their respective documents.

³ Participants included Mr Peter DeBono (Mine Subsidence Engineering Consultants, Subsidence and Land), Dr Noel Merrick (HydroSimulations, Groundwater), Mr Lindsay Gilbert and Mr Tony Marszalek (Hydro Engineering & Consulting, Surface Water), Associate Professor Barry Noller (The University of Queensland, Surface Water Quality), Dr David Goldney (Cenwest Environmental Services, Fauna), Ms Elizabeth Norris (Ecoplanning, Flora), Mr Jamie Reeves (Niche Environment and Heritage, Heritage), Ms Stacey Gromadzki (Resource Strategies), Mr Jon Degotardi (Metropolitan Coal) and Mr Stephen Love (Metropolitan Coal).

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Review of Relevant Documentation

In preparation for the ERA workshop, the ERA participants reviewed a number of documents relevant to the risk assessment. This included (but was not limited to):

- The *Environmental Risk Analysis* (SP Solutions, 2008) conducted for the Project EA (Appendix O of the Project EA).
- The Preferred Project Report (HCPL, 2009). During the NSW Government’s assessment phase of the Project EA, and in recognition of concerns raised by key stakeholders during the formal Planning Assessment Commission (PAC) assessment process, HCPL considered it appropriate to reduce the proposed extent of the original Project longwall mining area (i.e. Longwalls 20-44). This reduction in the extent of longwall mining resulted in a significant reduction to the extent of potential subsidence effects to the Waratah Rivulet and the Eastern Tributary and a reduction in the consequential potential environmental impacts.
- The Longwalls 301-303 Environmental Risk Assessment Report (Metropolitan Coal, 2016)⁴.
- Subsidence predictions and assessments included in Metropolitan Coal’s Longwalls 304-306 First Workings Application (correspondence to the DP&E dated 9 October 2018).
- Information regarding the Longwalls 301-303 layout and requirement to have no further exceedance of the relevant performance measure applicable to the Eastern Tributary.
- Subsidence predictions for the proposed Longwall 304 Extraction Plan layout (including subsidence contours, Eastern Tributary, cliff sites, upland swamps and Aboriginal heritage sites).

Risk Identification

The participants were asked to identify any additional (specific) issues/risks and/or changes to previously assessed levels of risk in preparation for the ERA workshop.

ERA Workshop

The ERA workshop for Longwall 304 was conducted on 23 November 2018, with some participants attending via video conferencing and others attending in person at the Metropolitan Coal Mine. The ERA workshop was facilitated by an independent specialist, Operational Risk Mentoring.

The general consensus of the workshop participants was the additional (specific) issues/risks identified for Longwall 304 were broadly assessed and ranked as part of the 2008 Environmental Risk Analysis and Longwalls 301-303 ERA. It was considered that the five “loss scenarios” identified for the Longwalls 301-303 ERA (within two key topics of discussion viz. Upland Swamps and the Eastern Tributary) were appropriate for the assessment of Longwall 304.

The assessed level of risk for each of the five loss scenarios identified for Longwalls 301-303 were reviewed for Longwall 304, considering the experience to date and using the same probability, consequence and risk rankings tables. A key assumption that was applied to the Longwall 304 ERA was that the Longwall 304 Extraction Plan layout would not result in any further exceedance of the performance measure relevant to the Eastern Tributary.

The assessed levels of risk for Longwalls 301-303 were considered by the participants to remain valid for Longwall 304. The re-assessed risk rankings for Longwall 304 were within the “low” range and consequently the potential outcomes can still be integrated into the existing management systems for effective review and monitoring (Operational Risk Mentoring, 2019).

⁴ This report includes a description of the approved changes made to the first workings layout for Longwalls 301-303 in 2015 and 2016.

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Review of Issues/Risks and Assessed Levels of Risk for Revised Longwall 304 Extraction Plan Layout

Subsequent to the Longwall 304 ERA workshop, Metropolitan Coal proposed a change to the layout of Longwalls 303 and 304 for the Longwall 304 Extraction Plan. The participants were asked to review a number of additional documents relevant to the risk assessment and revised layouts and Longwall 304 risk assessment. This included:

- Metropolitan Coal's Longwall 303 Extension Application (February 2019), which seeks further approval from the Secretary to undertake secondary extraction beyond 1,143 m in Longwall 303 for the first 1,325 m of Longwall 303. This application includes details of Metropolitan Coal's proposed monitoring and adaptive management approach for the Eastern Tributary. The application states that the same monitoring and adaptive management approach for the Eastern Tributary will be applied to Longwall 304.
- Confirmation that the Longwall 304 Extraction Plan will be based on a Longwall 303 extraction length of 1,325 m and a Longwall 304 extraction length of 1,286 m, noting that this layout differs from that assessed in the ERA Workshop (November 2018), with Longwall 303 being extended by 128 m and Longwall 304 being shortened by 42 m.
- A figure showing the revised Longwall 303 and Longwall 304 layouts to be used for the Longwall 304 Extraction Plan compared to the longwall lengths assessed by the ERA workshop.
- The MSEC (2019) *Metropolitan Mine – Longwall 304 Subsidence Predictions and Impact Assessments for the Natural and Built Features in Support of the Extraction Plan* report (Report MSEC1009), detailing the subsidence predictions and impact assessments for the revised longwall layout for the Longwall 304 Extraction Plan.

The ERA participants were asked to identify any additional (specific) issues/risks and/or changes to previously assessed levels of risk associated with the revised Longwall 304 Extraction Plan Layout. The assessed levels of risk were considered to remain valid for the revised Longwall 304 Extraction Plan layout.

ERA Report Review

All ERA participants were asked to review the draft report that was prepared to summarise the outcomes of the risk assessment workshop and risk review as a result of the change in longwall layout. Participants' comments were incorporated into the final Operational Risk Mentoring (2019) report.

This HMP has been prepared to provide for effective management of the identified subsidence risks.

4.4 ABORIGINAL HERITAGE SITES

The Aboriginal heritage sites identified within 600 m of Longwall 304 secondary extraction are shown on Figure 4 and a summary is provided in Table 2⁵.

⁵ Site 2-0346 (AHIMS 52-2-0346) was described and assessed for potential subsidence impacts in the Project EA (HCPL, 2008; Kayandel Archaeological Services, 2008) and was reported as being located over Longwall 302. During the baseline recording for Longwalls 301-303, Niche Environment and Heritage undertook a detailed site inspection. Despite searches of all possible locations (based on descriptions in the AHIMS site card and previous assessment reports) and the surrounding area, the site was unable to be relocated in the area described by its previous recorded location. Niche Environment and Heritage has assessed the site record and determined that it refers to the same site as site FRC 93.

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Table 2
Aboriginal Heritage Sites within 600 m of Longwall 304 Secondary Extraction

AHIMS No.	Site Code	Site Type	Archaeological Significance Rating ¹
52-2-0185	FRC 67	Sandstone overhang with artefacts and deposit	Low
52-2-0186 52-2-0326*	FRC 68	Sandstone overhang with art, artefacts and deposit	High
52-2-0192	FRC 70	Sandstone overhang with art, artefacts and deposit	Moderate
52-2-3510	FRC 71	Sandstone overhang with art only	Low
52-2-0887	FRC 76	Sandstone overhang with art only	Low
52-2-0330 52-2-0886*	FRC 77	Sandstone overhang with art, artefacts and deposit	Low
52-2-0885	FRC 78	Sandstone overhang with art only	Low
52-2-0883	FRC 85	Sandstone overhang with art, artefacts and deposit	Moderate
52-2-0207 52-2-0898*	FRC 86	Sandstone overhang with art only	Low
52-2-0899	FRC 87	Sandstone overhang with art, artefacts and deposit	Low
52-2-0869	FRC 90	Sandstone overhang with artefacts and deposit	Low
52-2-0870	FRC 91	Sandstone overhang with art, artefacts and deposit	Low
52-2-0198 52-2-0346* 52-2-0872*	FRC 93	Sandstone overhang with art only	Low
52-2-0739	FRC 117	Sandstone overhang with art and PAD	Low
52-2-0829	FRC 254	Sandstone overhang with artefacts and deposit	Low
52-2-3501	FRC 309	Sandstone overhang with artefacts and deposit	Low
52-2-3500	FRC 310	Sandstone overhang with art only	Low
52-2-3451	FRC 320	Sandstone overhang with artefacts and deposit	Low
52-2-3452	FRC 321	Sandstone overhang with art, artefacts and deposit	Low
52-2-3466	FRC 325	Sandstone overhang with art only	Low

¹ Sources include: Kayandel Archaeological Services (2006; 2007; 2008) and information available on NSW Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS) Site Cards.

* Single Aboriginal heritage site registered more than once on the AHIMS database (Illawarra Prehistory Group, 2007).

PAD – Potential Archaeological Deposit.

Cultural Significance

Metropolitan Coal acknowledges that all Aboriginal heritage sites are considered to be culturally significant to the Aboriginal people who have a traditional connection to Country.

An extract regarding the cultural significance of the wider Metropolitan Coal Mine area from the Project Aboriginal Cultural Heritage Assessment is provided below (Kayandal Archaeological Services, 2008):

Aboriginal heritage sites within the study area and surrounds that have previously been identified as being of specific cultural interest to some Aboriginal community representatives include FRC 3 and FRC 4 (both located outside the study area), FRC 12, FRC 22, FRC 24.1, FRC 24.2 and FRC 26 (located within the study area) (C. E. Sefton Pty Ltd, 2004; HCPL, 2006). During the various recent surveys and site inspections undertaken in 2006 and 2007 (Sections 3.4 and 4), FRC 12 was noted by members of the Aboriginal community (i.e. representatives of the Woronora Plateau Gundungara Elders Council, La Perouse Botany Bay Aboriginal Corporation, Wadi Wadi Coomaditchie Aboriginal Corporation, Northern Illawarra Aboriginal Collective, KEJ Tribal Elders Corporation, Tharawal Local Aboriginal Land Council, Cubbitch Barta, Illawarra Local Aboriginal Land Council and Mr Gary Caines) as being of particular cultural significance. It was indicated that all Aboriginal heritage sites (both known and unknown), when considered collectively as a 'bundle', are culturally significant.

The Illawarra Local Aboriginal Land Council previously commented (in regard to part of the study area) that: "This Traditional Site is of great importance to Aboriginal people; this land that is visited by our Ancestors must be preserved and protected".

The Northern Illawarra Aboriginal Collective previously commented indicated [sic] that "more than fifty documented traditional stories of country (some from this exact place)" had been recorded nearly a century ago, "making it clear the very landscape itself, its flora and fauna, its water and earth, are all Traditional Materials (as defined in S203FCA of the Native Title Act [Commonwealth] 1993) having spiritual cultural and heritage values for Traditional Owners".

The Tharawal Local Aboriginal Land Council commented that "Aboriginal heritage sites provide evidence of our ancestry and links to past occupation. TLALC considers all Aboriginal heritage to be important to our people".

In addition, it has previously been noted by representatives of Northern Illawarra Aboriginal Collective that some motifs within Aboriginal heritage sites FRC 4 (located outside the area) and FRC 11 (located within the study area) were of fish, molluscs and shells that may indicate a relationship between the previous Aboriginal inhabitants and the ocean. Northern Illawarra Aboriginal Collective representatives previously indicated that this connection was further exemplified by the presence of shells and shell fragments within sites FRC 7 and FRC 265 (both located outside the study area) (ibid).

The Project Aboriginal Cultural Heritage Assessment summarised all of the Aboriginal heritage sites specifically identified by the Aboriginal community representatives as having particular cultural significance as follows (Kayandal Archaeological Services, 2008):

Based on the above, the Aboriginal community consider all sites to be of some cultural significance. However, sites within the study area specifically identified by the Aboriginal community for their cultural significance include FRC 12, FRC 22, FRC 24.1, FRC 24.2, FRC 26, FRC 62, FRC 185, FRC 198, FRC 316, FRC 340, NT 8, NT 9, NT 35, NT 46, NEW 1, NEW 2 and NEW 17.

Although none of the specific sites identified as having particular cultural significance by the Aboriginal community representatives are located within 600 m of Longwall 304 secondary extraction, the broader cultural values described above are considered in relation to the monitoring and management of known Aboriginal heritage sites (e.g. when developing potential remediation or mitigation measures [Section 10]).

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4.4.1 Revised Subsidence Predictions

The subsidence predictions for Longwall 304 in relation to Aboriginal heritage sites within the 35° angle of draw and/or predicted 20 mm subsidence contour have been prepared by MSEC (2019). Table 3 compares the revised subsidence predictions for the Longwall 304 Extraction Plan with the subsidence predictions for the Preferred Project Layout (at the completion of Longwall 304).

There is an increase in the maximum predicted vertical subsidence and tilt at five of the Aboriginal heritage sites based on the Extraction Plan layout, namely FRC 76, FRC 77, FRC 78, FRC 86 and FRC 309 (Table 3). The predicted curvatures based on the Extraction Plan layout are generally similar to or less than those based on the Preferred Project Layout (Table 3).

Whilst the predicted subsidence parameters increase at some Aboriginal heritage sites the maxima are similar to or less than the maxima predicted for other Aboriginal heritage sites located above the previously extracted longwalls at the Metropolitan Coal Mine.

Based on the revised subsidence predictions, Section 4.4.2 provides a revised assessment of predicted subsidence impacts and environmental consequences on Aboriginal heritage sites.

4.4.2 Revised Assessment of Potential Subsidence Impacts and Environmental Consequences

The Project EA Subsidence Assessment (MSEC, 2008) provided a description of the general impacts on Aboriginal heritage sites (including open sites and sandstone overhang sites) in the Southern Coalfield as a consequence of longwall mining. Overhang sites can potentially be impacted by the cracking of sandstone. Where cracking is coincident with an overhang, it is possible there could be an isolated rock fall as the result of mining, or in extreme cases, overhang collapse.

At some locations the predicted subsidence parameters are higher than the parameters for the Preferred Project Layout, however are similar to or less than the maxima predicted for other Aboriginal heritage sites located above the previously extracted longwalls at the Metropolitan Coal Mine. The potential impacts to these sites based on the Extraction Plan Layout do not change the impact assessment provided in the Project EA or the Preferred Project Report.

The following provides a summary of potential impact mechanisms and any changes to the predicted subsidence impacts and environmental consequences due to the revised subsidence predictions for Longwall 304.

There are 12 sandstone overhang sites located within the 35° angle of draw and/or predicted 20 mm subsidence contour of Longwall 304. Of the 12 sites with overhangs, six have art only and six have art and/or artefacts and/or PAD.

The majority of the Aboriginal heritage sites are located above solid coal and based on the low magnitudes of the predicted subsidence parameters, impacts to these sites resulting from the extraction of Longwall 304 are considered unlikely (MSEC, 2019). Surface fracturing of the bedrock can occur outside the longwall layouts, however such fracturing is minor and isolated and the likelihood of fracturing impacting the Aboriginal heritage sites outside the longwall layouts is considered to be low. Site FRC 76 is located above Longwall 304 and potential impacts to this site are similar to those assessed based on the Preferred Project Layout, including potential for fracturing and rock falls within overhangs (MSEC, 2019).

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Table 3
Revised Subsidence Predictions for Longwall 304 Aboriginal Heritage Sites

Aboriginal Heritage Sites ¹	Maximum Predicted Subsidence ² (mm)		Maximum Predicted Tilt ³ (mm/m)		Maximum Predicted Hogging Curvature ⁴ (km ⁻¹)		Maximum Predicted Sagging Curvature ⁴ (km ⁻¹)		Maximum Predicted Conventional Tensile Strain ⁵ (mm/m)		Maximum Predicted Conventional Compressive Strain ⁵ (mm/m)	
	PPL (LW304) ⁶	Extraction Plan Layout (LW304) ⁷	PPL (LW304) ⁶	Extraction Plan Layout (LW304) ⁷	PPL (LW304) ⁶	Extraction Plan Layout (LW304) ⁷	PPL (LW304) ⁶	Extraction Plan Layout (LW304) ⁷	PPL (LW304) ⁶	Extraction Plan Layout (LW304) ⁷	PPL (LW304) ⁶	Extraction Plan Layout (LW304) ⁷
FRC 71	30	<20	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.5	<0.5	<0.5	<0.5
FRC 76	425	700	1.5	4.5	0.01	0.02	0.03	0.03	<0.5	<0.5	<0.5	<0.5
FRC 77	125	200	1.5	2.0	0.02	0.03	<0.01	<0.01	<0.5	<0.5	<0.5	<0.5
FRC 78	125	175	1.0	1.5	0.02	0.02	<0.01	<0.01	<0.5	<0.5	<0.5	<0.5
FRC 85	90	<20	0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.5	<0.5	<0.5	<0.5
FRC 86	175	225	2.0	2.5	0.03	0.03	<0.01	<0.01	<0.5	<0.5	<0.5	<0.5
FRC 87	<20	<20	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.5	<0.5	<0.5	<0.5
FRC 90	125	80	1.0	1.0	0.01	0.01	<0.01	<0.01	<0.5	<0.5	<0.5	<0.5
FRC 91	125	<20	1.0	<0.5	<0.01	<0.01	<0.01	<0.01	<0.5	<0.5	<0.5	<0.5
FRC 309	60	100	0.5	1.0	<0.01	<0.01	<0.01	<0.01	<0.5	<0.5	<0.5	<0.5
FRC 310	20	<20	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.5	<0.5	<0.5	<0.5
FRC 325	225	30	2.5	<0.5	0.03	<0.01	0.01	<0.01	<0.5	<0.5	<0.5	<0.5

Source: after MSEC (2019).

¹ Aboriginal heritage sites within the Longwall 304 35° angle of draw and/or predicted 20 mm subsidence contour.

² Subsidence refers to vertical displacements of the ground.

³ Tilt is the change in the slope of the ground as a result of differential subsidence, and is calculated as the change in subsidence between two points divided by the distance between those points.

⁴ Curvature is the second derivative of subsidence, the rate of change of tilt, and is calculated as the change in tilt between two adjacent sections of the tilt profile divided by average length of those sections.

⁵ Conventional strain based on 15 times curvature. Strain is the relative differential horizontal movements of the ground. Tensile strains occur where the distance between two points increases and compressive strains occur when the distance between two points decreases.

⁶ PPL – after completion of Longwall 304 of the Preferred Project Layout.

⁷ Extraction Plan Layout – after completion of Longwall 304 of the Extraction Plan layout.

mm = millimetres; mm/m= millimetres per metre; km⁻¹ =1/kilometres

5 CONSULTATION PROTOCOL

5.1 IDENTIFICATION OF ABORIGINAL STAKEHOLDERS

For the purpose of this HMP, Aboriginal stakeholders are defined as being those Aboriginal groups/parties who have previously registered an interest in being consulted in relation to the Project or who have been involved on an ongoing basis at Metropolitan Coal. These Aboriginal stakeholders include the following:

- Cubbitch Barta Native Title Claimants;
- Illawarra Local Aboriginal Land Council;
- Korewal Elouera Jerrungurah Tribal Elders Corporation;
- Mr Gary Caines;
- La Perouse Botany Bay Aboriginal Corporation;
- Woronora Plateau Gundungara Elders Councils;
- Northern Illawarra Aboriginal Collective, including representatives from:
 - Wadi Wadi Coomaditchie Aboriginal Corporation;
- Tharawal Local Aboriginal Land Council; and
- Wodi Wodi Elders Corporation.

5.2 ABORIGINAL STAKEHOLDER PARTICIPATION

Metropolitan Coal is committed to maintaining ongoing consultation with Aboriginal stakeholders throughout the life of the Project; however, it is the responsibility of Aboriginal stakeholders to ensure that up-to-date contact details (full name, postal address, telephone number, and where possible, email address) are provided to Metropolitan Coal.

5.2.1 Involvement of Aboriginal Stakeholders in Fieldwork

The number of participants in an effective field team is governed by a number of safety, logistic and access considerations, including:

- **Safety:** a large group can be difficult to keep together when moving through dense vegetation in steep terrain as is the case across the majority of the Project underground mining area. Large groups move slowly (especially through dense vegetation and in steep terrain) and can prevent a rapid response (i.e. evacuation) to imminent dangers that can often be encountered in the Project underground mining area (e.g. bush fire warnings and electrical storms).
- **Logistics:** Participant numbers are limited by vehicle availability and safety restrictions. The isolated nature of the area above the Project underground mining area requires the use of vehicles for efficient field work.
- **Access Restrictions:** Areas within the Project underground mining area are located within a WaterNSW Schedule One special area. Public access is controlled in this area to protect water quality and ecological integrity (WaterNSW and OEH, 2015). Excessive access into this area is not consistent with the WaterNSW's *Special Areas Strategic Plan of Management* (WaterNSW and OEH, 2015).

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Aboriginal stakeholders will be invited to attend relevant scheduled fieldwork in consideration of the above.

Scheduled fieldwork to which Aboriginal stakeholders may be invited to attend includes:

- Aboriginal heritage monitoring (Section 9);
- supplementary fieldwork (Section 8); and
- the planning for and/or implementation of management and mitigation measures (Section 10).

Invitations to attend scheduled fieldwork will be provided in writing with at least 5 business days' notice. Dates for undertaking fieldwork will be subject to consultation with Aboriginal stakeholders and archaeologists.

Prior to undertaking fieldwork, all participating Aboriginal stakeholders and archaeologists will be required to comply with Metropolitan Coal's workplace health and safety requirements. These requirements include the provision of copies of current relevant insurances (i.e. public liability and workers compensation) and appropriate personal protection equipment.

All Metropolitan Coal staff and contractors (including Aboriginal stakeholders and archaeologists) may be subject to random drug and alcohol testing. All Metropolitan Coal staff and contractors (including Aboriginal stakeholders and archaeologists) must be able bodied and fit to undertake the work required.

5.2.2 Ongoing Consultation with Aboriginal Stakeholders

Metropolitan Coal will maintain a consultation log to record all correspondence with Aboriginal stakeholders (e.g. emails, telephone calls, letters, meeting minutes, etc.).

Aboriginal stakeholders will be invited to comment on relevant draft documentation regarding the management of Aboriginal cultural heritage, if and when required.

Aboriginal stakeholders will be notified of any material changes to the HMP. In the context of this HMP, a material change would include any change that affects the management of Aboriginal cultural heritage associated with Metropolitan Coal. Examples of a material change in the context of this HMP include:

- Any change to the monitoring program methodology (e.g. monitoring frequency or parameters).
- Any change to the available remediation or mitigation measures (e.g. proposed use of a new engineering technology to reduce potential consequences).
- Any change to the surface disturbance protocol.

5.3 ABORIGINAL STAKEHOLDER ACCESS PROTOCOL

In addition to scheduled field activities, Aboriginal stakeholders may apply to WaterNSW or other landholders for access to Aboriginal heritage sites within the larger Project area (e.g. for personal, spiritual or cultural reasons). Metropolitan Coal will endeavour to facilitate the requested access, consistent with personnel workplace health and safety requirements and associated landholder requirements.

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6 PERFORMANCE MEASURES AND INDICATORS

The Project Approval requires Metropolitan Coal to achieve the Aboriginal heritage sites subsidence impact performance measure outlined in Table 1 of Condition 1, Schedule 3 of the Project Approval:

Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts.

Metropolitan Coal will assess the Project against the following performance indicator to allow early recognition of mining impacts:

Less than 7% of Aboriginal heritage sites within the mining area are affected by subsidence impacts.

Aboriginal sites are subject to ongoing natural deteriorating processes unrelated to mining, including impacts from tree roots, natural weathering or deterioration, natural cracking of sandstone and inappropriate visitor behaviour (Lambert, 1989; Reeves and Regal, 2017). Limited long term studies have been undertaken on subsidence impacts to overhangs in the NSW Southern Coalfields and as the internal structures of overhangs (e.g. existing bedding, cracking and seepage) are not always observable, not all risks to shelters from mining can be identified. This makes it problematic to clearly differentiate between subsidence impacts and natural impacts.

Section 9 describes the monitoring program and detailed TARP that will be used to assess the Project against the Aboriginal heritage sites performance indicator and Aboriginal heritage sites subsidence impact performance measure. As described in Section 9, a Heritage Management Plan – Subsidence Impact Register (provided in Appendix 2) will be used to progressively monitor the cumulative number and percentage of Aboriginal heritage sites affected by subsidence impacts.

For the purpose of measuring performance against the Aboriginal heritage sites performance indicator and subsidence impact performance measure, sites are considered to be “affected by subsidence impacts” if they exhibit one or more of the following consequences that cannot be attributed to natural weathering or deterioration:

- overhang collapse;
- cracking of sandstone that coincides with Aboriginal art or grinding grooves; and
- rock fall that damages Aboriginal art.

There are 143 Aboriginal heritage sites (142 sites identified in the Project EA and one new site [MET 4] identified during Round 2 monitoring for Longwalls 20-22) within the mining area. The mining area is defined by the Project Approval and is shown on Figure 1 of this HMP (labelled as Project Underground Mining Area Longwalls 20-27 and 301-317).

As described in Section 10, in the event that any subsidence impact is recorded, consideration would be given to implementing appropriate management, remediation and/or mitigation measures in consultation with the OEH and the Aboriginal stakeholders. In the event the Aboriginal heritage sites subsidence impact performance measure is exceeded, Metropolitan Coal will notify the DP&E, OEH and Aboriginal stakeholders as soon as practicable after Metropolitan Coal becomes aware of the exceedance and the Contingency Plan (Section 11) will be implemented.

As indicated in Section 4.2, Metropolitan Coal acknowledges that all Aboriginal heritage sites are considered to be culturally significant to the Aboriginal people who have a traditional connection to Country.

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7 BASELINE DATA

Baseline recording of Aboriginal heritage sites for Longwalls 20-27 and 301-303 has been conducted by Kayandel Archaeological Services or Niche Environment and Heritage. The sites that were subject to detailed baseline recording (where the sites were able to be relocated) are listed in Table 4.

A number of the Aboriginal heritage sites that have been subject to baseline recording for Longwalls 23-27 or 301-303 are located within 600 m of Longwall 304 secondary extraction. These sites are shaded in Table 4. Only one site within 600 m of Longwall 304 secondary extraction (site FRC 254) had not been subject to previous baseline recording.

**Table 4
Aboriginal Heritage Sites Subject to Previous Baseline Recording**

Sites Subject to Baseline Recording for Longwalls 20-22				
FRC 10	FRC 12	FRC 13	FRC 14	FRC 15
FRC 16.1	FRC 16.2	FRC 17	FRC 19	FRC 20
FRC 21	FRC 22	FRC 23	FRC 24.1	FRC 24.2
FRC 25	FRC 26	FRC 40	FRC 44	FRC 45
FRC 46	FRC 49	FRC 50	FRC 51	FRC 52
FRC 55	FRC 56	FRC 57**	FRC 60	FRC 63
FRC 96	FRC 105	FRC 108	FRC 110	FRC 113
FRC 114	FRC 115	FRC 118	FRC 119	FRC 120
FRC 121	FRC 124	FRC 125	FRC 156	FRC 157
FRC 160	FRC 162	FRC 166	FRC 168**	FRC 176
FRC 203	FRC 215	FRC 265	FRC 266	FRC 272
FRC 273	FRC 274	FRC 275	FRC 276	FRC 277
FRC 278	FRC 279	FRC 280	FRC 281	FRC 283
FRC 284	FRC 285	FRC 297	FRC 298	FRC 299
FRC 300	FRC 301	FRC 302	FRC 304	FRC 306**
FRC 318	FRC 342	FRC 343	MET 1	MET 2
PAD 2	PAD 3	MET 4*		
Sites Subject to Baseline Recording for Longwalls 23-27				
FRC 62	FRC 112	FRC 169	FRC 171	FRC 172
FRC 305	FRC 319	FRC 322	FRC 28	FRC 29
FRC 30	FRC 31	FRC 32	FRC 33	FRC 34
FRC 67	FRC 68	FRC 72**	FRC 117	FRC 127
FRC 180**	FRC 194	FRC 195	FRC 199	FRC 253
FRC 307	FRC 308	FRC 320	FRC 321	FRC 323
FRC 324				
Sites Subject to Baseline Recording for Longwalls 301-303				
FRC 70	FRC 71	FRC 76	FRC 77	FRC 78
FRC 85	FRC 86	FRC 87	FRC 90	FRC 91
FRC 93	FRC 309	FRC 310	FRC 325	

Sites located within 600 m of Longwall 304 secondary extraction.

* Site MET 4 was recorded during Round 2 monitoring for Longwalls 20-22. This site has been registered on AHIMS and has been subject to monitoring.

** Despite extensive searches, this site was unable to be relocated during baseline recording.

Baseline recording has been conducted by Niche Environment and Heritage of 22 Aboriginal heritage sites (including site FRC 254) located within 600 m of Longwalls 304-306 that have not been subject to previous baseline recording. The sites subject to baseline recording for Longwalls 304-306 are listed in Table 5.

**Table 5
Aboriginal Heritage Sites Subject to Baseline Recording for Longwalls 304-306**

Sites Subject to Baseline Recording for Longwalls 304-306				
FRC 94	FRC 95	FRC 97	FRC 101	FRC 180*
FRC 184	FRC 185	FRC 186	FRC 187	FRC 191
FRC 198	FRC 254	FRC 311	FRC 312	FRC 313
FRC 316	FRC 340	FRC 344	FRC 345	NEW 1
NEW 10	NEW 22			

Sites located within 600 m of Longwall 304 secondary extraction.

* Despite extensive searches, this site was unable to be relocated during baseline recording for Longwalls 23-27 and additional survey effort was not undertaken during baseline recording for Longwalls 304-306.

The baseline record for the 22 Aboriginal heritage sites is provided in Appendix 1. The baseline record includes:

- a photographic record of each Aboriginal heritage site;
- detailed scaled plans of each site including physical characteristics and features; and
- detailed information regarding the dimensions, composition and features of the site.

8 SUPPLEMENTARY FIELDWORK AND PRE-CLEARANCE SURVEYS

8.1 SUPPLEMENTARY FIELDWORK/INVESTIGATION

Supplementary Aboriginal heritage fieldwork may be undertaken over the life of the Project to inform the management and monitoring of Aboriginal heritage sites.

8.2 PRE-CLEARANCE SURVEYS

Pre-clearance surveys may be required to be undertaken in the Project underground mining area to identify the most appropriate location for required Project infrastructure. Pre-clearance surveys will involve the following:

1. Developing an inventory of surface infrastructure required and conducting an initial desktop risk assessment based on the location of known sites.
2. Undertaking a pre-clearance survey (if required⁶) of the proposed site(s) for surface infrastructure by an appropriately qualified and experienced archaeologist.
3. Assessing potential impacts to nearby Aboriginal heritage site(s) based on the results of the pre-clearance surveys and determining the most appropriate location for required surface infrastructure.

⁶ A pre-clearance survey would not be required if the area has been previously surveyed or if, in the opinion of an appropriately qualified archaeologist, it contains limited archaeological potential.

4. Where practicable, surface infrastructure will be located so as to avoid or minimise impacts to Aboriginal heritage sites. If impacts cannot be avoided, appropriate management and/or mitigation measures will be undertaken (Section 10).

Where Aboriginal heritage sites are located close to required surface disturbance works, the surface disturbance protocol (described in Section 10.3) will be undertaken.

8.3 RECORDING AND REGISTERING NEW ABORIGINAL HERITAGE SITES

Any previously unrecorded Aboriginal heritage sites identified during fieldwork (e.g. baseline recording, supplementary fieldwork, pre-clearance surveys, monitoring, follow-up inspections to assess the effectiveness of mitigation/management/remediation measures, etc.) would be recorded using the standard OEH site card. This information would be submitted to the OEH for registration on the AHIMS database. Any previously unrecorded sites would also be subject to archaeological and cultural significance assessment, in consultation with Aboriginal stakeholders. Any previously unrecorded sites would be managed in accordance with the requirements of this HMP.

9 MONITORING

A monitoring program will be implemented to monitor subsidence impacts and environmental consequences of Project related subsidence on Aboriginal heritage sites.

Monitoring of the Longwalls 20-27 and 301-303 Aboriginal heritage sites, at which previous monitoring indicates continued change due to mining induced subsidence, will be monitored as a component of this HMP.

As indicated in Section 4.2, sites FRC 28, FRC 29, FRC 34, FRC 60, FRC 76, FRC 117, FRC 176 and MET 1 will be monitored within three months of the completion of Longwall 303. Sites that show continued change due to mining induced subsidence during this monitoring will also be monitored within three months of the completion of Longwall 304.

Six of the 12 sites located within the Longwall 304 35° angle of draw and/or predicted 20 mm subsidence contour are predicted to experience maximum tilts, curvatures and strains that are less than typical magnitudes of subsidence survey accuracy (i.e. conventional tilt of less than 0.5 mm/m and conventional curvature of less than 0.01 km⁻¹ hogging and sagging). These sites will be monitored as a component of the next Extraction Plan.

Monitoring of the following Aboriginal heritage sites will be undertaken for Longwall 304, within three months of the completion of Longwall 304 (Figure 4):

- FRC 76 (sandstone overhang with art only).
- FRC 77 (sandstone overhang with art, artefacts and deposit).
- FRC 78 (sandstone overhang with art only).
- FRC 86 (sandstone overhang with art only).
- FRC 90 (sandstone overhang with artefacts and deposit).
- FRC 309 (sandstone overhang with artefacts and deposit).

Monitoring of these sites will also be undertaken as a component of the next Extraction Plan (i.e. Longwalls 305 on).

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The monitoring team will include a suitably qualified archaeologist (with experience in rock art recording and management) and representatives of the Aboriginal stakeholders (where available) (Section 5.1). Specific details that will be recorded during the monitoring program include (but are not limited to):

- the date of monitoring;
- the location of longwall extraction (i.e. the longwall chainage) at the time of monitoring;
- comparison of the physical characteristics of the site at the time of monitoring against the previous monitoring and the baseline record (detail/quantify any changes observed);
- inspections of rock surfaces for cracking and/or exfoliation and/or blockfall since the previous monitoring and against the baseline record;
- inspection of art motifs for damage or deterioration since the previous monitoring and against the baseline record;
- identification of any natural weathering processes that may result in deterioration (e.g. fire, vegetation growth and water seepage);
- detailed description and quantification of any changes noted during the completion of the above tasks;
- a photographic record of any changes noted during monitoring (taken at the same position and distance as baseline record to allow comparison over time);
- whether any follow-up actions are required to be considered (e.g. implementation of management or initiation of the Contingency Plan, etc.); and
- any other relevant information.

An example monitoring *pro forma* detailing the minimum recording requirements during monitoring is provided as Table 6.

A summary of the information collected during monitoring will be recorded in the Heritage Management Plan – Subsidence Impact Register (provided in Appendix 2) and reported in accordance with the Project Approval conditions. At the completion of monitoring, a report will be prepared and distributed to the OEH and each of the Aboriginal stakeholders. The report will include the following:

- a map of the area and the location of Aboriginal heritage sites monitored;
- a table outlining the dates on which each site was monitored and which Aboriginal stakeholders were present;
- a table outlining sites at which change has been noted and the nature and degree of change;
- a summary of comments made by Aboriginal stakeholders present during monitoring regarding:
 - the degree and nature of change to sites; and
 - proposed recommendations;
- general observations made during the monitoring; and
- recommendations for future monitoring.

Table 6
Monitoring Pro-forma

Site Details					
Site Name				AHIMS Site Number	
Site Type					
GPS Details (GDA94)	Easting		Northing		
Recording Details					
Baseline Recording				Date/time	
Previous Monitoring				Date/time	
Current Monitoring				Date/time	
Archaeological Features					
Previously Identified					
Re-recorded					
Additional Located	(attach recording form)				
Site Condition					
Overall					
Rock surfaces					
Archaeological Feature/s					
Change in vegetation, erosion, soil level or hydrological features					
Observed Change					
Change Type	(e.g. cracking, collapse, exfoliation, segmented detachment, step cracking, platform separation, increased moisture flow)				
Location	(map location of damage within site)				
Dimensions (mm)	Length		Width		Depth/Height
Comments	(e.g. has the archaeological feature been affected? is the damage new? has damage increased since previous monitoring?)				
Observed Natural Disturbance Processes					
Insects				Weathering	
Animals				Water-wash	
Vegetation				Exfoliation	
Microvegetals				Salts	
Siltation					
Comments					
Recommendations					
Further Monitoring					
Management					
Attach photographs and drawings of changes in site condition, subsidence damage, natural damage and any additional archaeological features. Photos should be taken from the same position and distance as the baseline record to allow comparison over time.					

The monitoring results will be used to assess the Project against the Aboriginal heritage sites performance indicator and subsidence impact performance measure (described in Section 6) in accordance with the detailed TARP provided in Table 7. The Heritage Management Plan – Subsidence Impact Register (provided in Appendix 2) will be used to progressively monitor and document the total number and cumulative percentage of Aboriginal heritage sites against the Aboriginal heritage sites performance indicator and subsidence impact performance measure (Table 7 and Section 6).

Table 7
Trigger Action Response Plan – Aboriginal Heritage Sites Monitoring

Performance Measure	Performance Indicator	Monitoring Sites	Parameters	Frequency/ Sample Size	Analysis Methodology	Error Types	Baseline	Significance Levels/ Triggers	Action/Response	
Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts	<i>Less than 7% of Aboriginal heritage sites within the mining area are affected by subsidence impacts¹.</i>	<ul style="list-style-type: none"> Monitoring of the Longwall (LW) 23-27 and 301-303 Aboriginal heritage sites at which LW301-303 monitoring of sites FRC 28, FRC 29, FRC 34, FRC 60, FRC 76, FRC 117, FRC 176 and MET 1 indicates continued change due to mining induced subsidence. Monitoring of Aboriginal heritage sites with the potential to be impacted by subsidence related to the extraction of LW304, namely, FRC 76, FRC 77, FRC 78, FRC 86, FRC 90 and FRC 309. 	<ul style="list-style-type: none"> Cracking of sandstone at open sites. Cracking and/or exfoliation of sandstone, blockfall, displacement, breakage and/or collapse of sandstone overhang sites. Damage or deterioration of art motifs. 	Survey of Aboriginal heritage sites within three months of the completion of LW304.	<ul style="list-style-type: none"> Visual inspection. The Heritage Management Plan – Subsidence Impact Register will be used to progressively monitor the cumulative number and percentage of Aboriginal heritage sites affected by subsidence impacts. 	<ul style="list-style-type: none"> Misidentification of Natural weathering processes that may result in deterioration (e.g. fire, vegetation growth and water seepage) attributed to subsidence. 	<ul style="list-style-type: none"> Aboriginal heritage sites in variable condition, and in states of constant natural change. Some sites exhibit varying degrees of natural cracking, erosion, seepage, weathering etc. Two sites, FRC 281 (over LW20-22) and FRC 34 (to the north of LW27) have been affected by subsidence impacts. Baseline record for sites listed in Section 7 and documented in reports for LW20-22, LW23-27, LW301-303 and/or LW304^{2, 3, 4, 5}. 	Level 1	Monitoring results indicate sites FRC 281 and FRC 34 have been affected by subsidence impacts.	Continue monitoring. Six monthly reporting.
								Level 2	Monitoring results indicate less than 7% of Aboriginal heritage sites within the mining area are affected by subsidence impacts.	Consider the implementation of appropriate management, remediation and/or mitigation measures in consultation with the OEH and Aboriginal stakeholders. Six monthly reporting.
								Level 3	Monitoring results indicate greater than 7% of Aboriginal heritage sites within the mining area are affected by subsidence impacts.	Assess against the performance measure. Consider the implementation of appropriate management, remediation and/or mitigation measures in consultation with the OEH and Aboriginal stakeholders.

¹ Sites are considered to be “affected by subsidence impacts” if they exhibit one or more of the following consequences that cannot be attributed to natural weathering or deterioration: overhang collapse; cracking of sandstone that coincides with Aboriginal art or grinding grooves; and rock fall that damages Aboriginal art. There are 143 Aboriginal heritage sites (142 sites identified in the Project EA and one new site [MET 4] identified during Round 2 monitoring for Longwalls 20-22) within the mining area. The mining area is defined by the Project Approval and is shown on Figure 1 of this HMP (labelled as Project Underground Mining Area Longwalls 20-27 and 301-317). Metropolitan Coal acknowledges that all Aboriginal heritage sites are considered to be culturally significant to the Aboriginal people who have a traditional connection to Country.

² Kayandel Archaeological Services (2010) *Longwalls 20-22 – Heritage Management Plan Baseline Record - Aboriginal Heritage Sites*. Report prepared for Metropolitan Coal.

³ Niche Environment & Heritage (2013; 2016) *Longwalls 23-27 Metropolitan Colliery - Baseline Recording*. Report prepared for Metropolitan Coal.

⁴ Niche Environment & Heritage (2016c) *Longwalls 301-303 Metropolitan Colliery - Baseline Recording*. Report prepared for Metropolitan Coal.

⁵ Niche Environment & Heritage (2018) *Longwalls 304-306 Metropolitan Colliery - Baseline Recording*. Report prepared for Metropolitan Coal.

As described in Section 10, in the event that any subsidence impact is recorded during monitoring, consideration will be given to implementing appropriate management, remediation and/or mitigation measures in consultation with the OEH and the Aboriginal stakeholders. In the event the subsidence impact performance measure is exceeded, the Contingency Plan outlined in Section 11 will be implemented.

10 MANAGEMENT, REMEDIATION AND MITIGATION MEASURES

10.1 MANAGEMENT AND REMEDIATION MEASURES

Following monitoring within three months of the completion of Longwall 303 and within three months of the completion of Longwall 304 (Section 9), Metropolitan Coal will assess the need for implementation of appropriate management and/or remediation measures.

Examples of potential management and remediation measures are provided in Table 8. Development and implementation of these measures will be assessed on a case-by-case basis and will acknowledge that whilst the measures may reduce the risk of impact and consequence, they can also have the potential to cause substantial damage to Aboriginal heritage sites and their settings.

Table 8
Potential Management and Remediation Measures

Consequence	Potential Management and Remediation Measures	
	Measure	Description
Increased seepage with the potential to impact art.	Seepage control techniques.	<ul style="list-style-type: none"> Installation of an artificial dripline (e.g. silicone dripline) to direct increased moisture/water seepage away from art panels.
Reduction in the stability of a sandstone overhang due to substantial cracking or block fall.	Stabilisation techniques.	<ul style="list-style-type: none"> Installation of artificial rock support (e.g. rock bolts, cable bolts, cement sprays [e.g. shotcrete], injection of a binding agent [PUR or similar]). Installation of standing supports (e.g. timber props, timber cogs, sandbags and metal [hydraulic] props). Scaling/dislodgement/removal of remaining loose rock.
	Salvage.	<ul style="list-style-type: none"> Salvage of artefacts for safekeeping and storage and/or display at a suitable location in consultation with the Aboriginal community.
Impacts on aesthetic values due to cracking.	Restoration of aesthetic values.	<ul style="list-style-type: none"> Use of cosmetic treatments (e.g. in the form of coloured grout or similar) to restore aesthetic values.
Cracking of sandstone at open sites, threatening grinding grooves or engraved art.	Strain reduction techniques.	<ul style="list-style-type: none"> Installation of a stress relief slot or stress focus notch.

The development of management and/or remediation measures will be determined in consultation with the OEH and the Aboriginal stakeholders and with regard to the specific circumstances of the subsidence impact (e.g. the location, nature and extent of the impact) and the assessment of consequences.

If proposed, the implementation of any invasive techniques (e.g. stabilisation, stress relief/focus slots, use of material for aesthetic restoration, etc.) will also be developed in consultation with WaterNSW or other relevant landowners.

Follow-up inspections will be conducted to assess the effectiveness of implemented management and/or remediation measures and the requirement for any additional measures. The specific timing and nature of follow-up inspections/additional monitoring will be dependent on the nature of the management and/or remediation measures implemented. Any management and/or remediation measures implemented will be reported in the Annual Review (Section 13).

10.2 MITIGATION MEASURES

10.2.1 Mitigation Measure Consideration and Implementation Process

As part of the development of Extraction Plans (and on an ongoing basis during mining), Metropolitan Coal will consider the requirement for development and implementation of Aboriginal heritage mitigation measures. The aim of the mitigation measures is to reduce the potential for substantial impacts and consequences to Aboriginal heritage sites of high archaeological significance and/or particular cultural significance.

Previous monitoring, studies and experience from the Woronora Plateau and greater Southern Coalfield have identified several site characteristics/features as being most relevant when assessing the risk of environmental consequence to an Aboriginal heritage site from subsidence impacts. These characteristics include (Sefton, 2000 and 2004; Biosis Research 2007 and 2009; MSEC, 2007 and 2008):

- overhang volume – >50 cubic metres (m³) increases the risk of negative consequence;
- presence of existing water seepage – damage to art from water is more likely if existing seepage is present;
- location in relation to a drainage line – sites located in valley bottoms can experience valley closure mechanisms and increased risk of cracking;
- location in relation to goaf – location of sites relative to the goaf influences the level of subsidence impacts experienced;
- overhang formation process – block-fall type overhangs are more likely to have roof or rear wall damage due to subsidence impacts;
- depth of cover – increased depth of cover reduces subsidence impacts and consequences; and
- presence of existing joints and bedding planes – subsidence movements may be dissipated through existing joints and bedding planes rather than the creation of new cracks.

The development of mitigation measures will be determined with regard to the specific circumstances of individual sites, including accessibility, size and spatial extent, nature of predicted subsidence impacts and consequences, and level of damage or disturbance (to the site or its setting) associated with implementing the measure(s). The consideration of mitigation measures will acknowledge that while they may reduce the risk of consequence to the site, they also have the potential to cause substantial damage to the site and its settings (including impacts to cultural setting). Other potential environmental impacts associated with implementation of mitigation works (e.g. vegetation clearing) will also be considered.

Examples of potential mitigation measures currently available are provided in Table 9.

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Table 9
Potential Consequences and Mitigation Measures

Consequence	Potential Mitigation Measures	
	Measure	Description
Existing seepage with the potential to increase and threaten art due to subsidence movements.	Seepage control techniques.	<ul style="list-style-type: none"> Installation of an artificial dripline (e.g. silicone dripline) to direct increased moisture/water seepage away from art panels if it eventuates.
Reduction in the stability of an overhang due to substantial cracking or block fall.	Stabilisation techniques.	<ul style="list-style-type: none"> Installation of artificial rock support (e.g. rock bolts, cable bolts, cement sprays [e.g. shotcrete], injection of a binding agent [PUR or similar]). Installation of standing supports (e.g. timber props, timber cogs, sandbags and metal [hydraulic] props). Scaling/dislodgement/removal of remaining loose rock.
Potential cracking of sandstone associated with art or grinding grooves.	Strain reduction techniques.	<ul style="list-style-type: none"> Installation of a stress relief slot or stress focus notch.

Any proposed mitigation measures will be developed and implemented (if considered appropriate) in consultation with OEH, Aboriginal stakeholders and the relevant landowner (e.g. WaterNSW).

If mitigation measures are implemented, follow-up inspections will be conducted to assess the effectiveness of mitigation measures and to determine the requirement for any additional measures. The specific nature of follow-up inspections/additional measures will be dependent on the specific nature of the mitigation measure(s) implemented and their success.

A summary of the development process and success of implemented mitigation measures will be reported in the Annual Review (Section 13).

10.2.2 Consideration of Mitigation Measures for Longwall 304

No Aboriginal heritage sites of high archaeological significance are located within the 35° angle of draw and/or predicted 20 mm subsidence contour of Longwall 304 (Figure 4).

Metropolitan Coal acknowledges that all Aboriginal heritage sites are of cultural significance to the Aboriginal people who have a traditional connection to Country.

Consultation with representatives of the Aboriginal community regarding the cultural significance of the Project area and known Aboriginal heritage sites was undertaken during the surveys and inspections for the Project EA (Kayandel Archaeological Services, 2008). Aboriginal heritage sites that have previously been identified as being of special cultural interest or of particular cultural significance within the Project underground mining area are described in Appendix H of the Project EA. It is noted that at the time of the Project EA no sites or areas of particular cultural significance were identified within the area bound by the Longwall 304 35° angle of draw and/or predicted 20 mm subsidence contour.

Based on the above, and in consideration of potential damage caused by the implementation of the above described techniques, mitigation measures are not proposed for Aboriginal heritage sites within the Longwall 304 35° angle of draw and/or predicted 20 mm subsidence contour.

Future longwalls have the potential to result in additional subsidence movements at Aboriginal heritage sites associated with Longwall 304 or the previous mining areas (i.e. Longwalls 23-27 and 301-303). As part of the development of the future Extraction Plans, Metropolitan Coal will review the potential impacts and environmental consequences to Aboriginal heritage sites and re-consider the development and implementation of mitigation measures if required.

As described above, the development and implementation of any mitigation measures will be undertaken in consultation with OEH, the Aboriginal stakeholders and relevant landowners (e.g. WaterNSW).

10.3 SURFACE DISTURBANCE PROTOCOL

The surface disturbance protocol aims to avoid accidental damage to Aboriginal heritage sites located in close proximity to surface disturbance works. As described in Section 8, pre-clearance surveys will be undertaken (as needed) to identify the most appropriate location for required Project infrastructure.

This protocol will apply to surface disturbance works (e.g. exploration works, installation/operation/maintenance of surface infrastructure, construction/maintenance of access tracks, monitoring and stream restoration) proposed to be located close to any known Aboriginal heritage site(s).

Surface disturbance works will be undertaken in consideration of the following:

1. Avoidance of impact to Aboriginal heritage sites will be the primary management measure, where practicable.
2. To avoid accidental damage to Aboriginal heritage sites located close to surface disturbance works, appropriate demarcation will be implemented (e.g. fencing, sign-posting or temporary flagging).
3. Where avoidance is not practicable, a comprehensive baseline record will be developed and consideration of salvage will be undertaken in consultation with Aboriginal stakeholders prior to disturbance.

10.4 HUMAN SKELETAL MATERIAL PROTOCOL

Burial sites can have high cultural significance to Aboriginal communities and culturally appropriate management of burial sites is a high priority for the Aboriginal community. “Aboriginal remains” are defined in the *National Parks and Wildlife Act, 1974* as:

... the body or the remains of the body of a deceased Aboriginal person, but does not include:

- (a) *a body or the remains of a body buried in a cemetery in which non-Aboriginal persons are also buried, or*
- (b) *a body or the remains of a body dealt with or to be dealt with in accordance with a law of the State relating to medical treatment or the examination, for forensic or other purposes, of the bodies of deceased persons.*

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No burial or potential burial sites have been identified in the Project underground mining area. Nor are they considered likely to be identified in the future due to the shallow soil profiles present on the Woronora Plateau. Notwithstanding, the following steps will be carried out in the event that suspected Aboriginal human skeletal material is encountered within the Project underground mining area:

- surface works in the immediate vicinity of the skeletal material will cease;
- the DP&E, OEH, NSW Police and Aboriginal stakeholders will be informed as soon as practicable; and
- the identified skeletal remains will not be disturbed until the NSW Police and OEH have inspected the remains and authorised their disturbance.

10.5 CULTURAL AWARENESS PROGRAM

Metropolitan Coal will include a cultural awareness program as part of inductions aimed at minimising the potential for accidental damage to Aboriginal heritage. The cultural awareness program will provide:

- an overview of the cultural heritage management program;
- an overview of the consultation protocol (Section 5);
- an overview of the pre-clearance surveys (Section 8) and surface disturbance protocol (Section 10.3);
- an overview of mitigation, management and remediation measures (Section 10);
- simple criteria and procedures for artefact and human bone recognition;
- actions to follow if human skeletal material is encountered (Section 10.4); and
- personnel to contact for more information or assistance.

11 CONTINGENCY PLAN

In the event the Aboriginal heritage sites subsidence impact performance measure detailed in Section 6 of this HMP is considered to have been exceeded, Metropolitan Coal will implement the following Contingency Plan:

- The exceedance will be reported to the Manager – Technical Services and/or the Environment & Community Superintendent within 24 hours.
- The exceedance will be recorded in the Heritage Management Plan – Subsidence Impact Register (provided in Appendix 2) consistent with the monitoring program described in Section 9 of this HMP.
- Metropolitan Coal will report the exceedance to the DP&E, OEH and Aboriginal stakeholders as soon as practicable after Metropolitan Coal becomes aware of the exceedance.
- Metropolitan Coal will conduct an investigation to evaluate the potential contributing factors. The investigation will:
 - compare and critically analyse measured versus predicted subsidence parameters;
 - review measured subsidence parameters against the observed impact; and
 - review the subsidence monitoring program and update the program where appropriate, in consultation with OEH and the Aboriginal stakeholders.

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- Metropolitan Coal will identify an appropriate course of action with respect to the identified impact(s), in consultation with specialists, relevant agencies and Aboriginal stakeholders, as necessary. For example:
 - proposed management and/or mitigation measures (Section 10); and
 - a program to review the effectiveness of the management and/or mitigation measures.
- Metropolitan Coal will submit the proposed course of action to the DP&E for approval.
- Metropolitan Coal will implement the approved course of action to the satisfaction of the DP&E.

In accordance with Condition 6, Schedule 6 of the Project Approval, Metropolitan Coal will provide a suitable offset to compensate for the impact to the satisfaction of the Secretary of DP&E if either the contingency measures implemented by Metropolitan Coal have failed to remediate the impact or the Secretary of the DP&E determines that it is not reasonable or feasible to remediate the impact.

A Contingency Plan Check List has been developed and is provided in Appendix 3.

12 FUTURE EXTRACTION PLANS

In accordance with Condition 7, Schedule 3 of the Project Approval, Metropolitan Coal will collect baseline data for future Extraction Plans. The collection of baseline data will include:

- photographic records;
- detailed scaled plans including physical characteristics and features; and
- detailed information regarding the dimensions, composition and features.

As described in Section 7, detailed baseline recording has been completed for 22 sites located within 600 m of Longwalls 304-306 not previously subject to baseline recording, namely sites FRC 94, FRC 95, FRC 97, FRC 101, FRC 180, FRC 184, FRC 185, FRC 186, FRC 187, FRC 191, FRC 198, FRC 254, FRC 311, FRC 312, FRC 313, FRC 316, FRC 340, FRC 344, FRC 345, NEW 1, NEW 10 and NEW 22. The baseline record for these sites is provided in Appendix 1.

Prior to the commencement of secondary extraction associated with the next Extraction Plan (i.e. Longwalls 305 on), baseline data will be obtained for Aboriginal heritage sites located within the relevant 35° angle of draw and/or predicted 20 mm subsidence contour of the Extraction Plan longwall layout.

In addition to the baseline data collection, consideration of the environmental performance and management measures in accordance with the review(s) conducted as part of this HMP will inform the appropriate type and frequency of monitoring of the Aboriginal heritage sites relevant to the next Extraction Plan.

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13 ANNUAL REVIEW AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

In accordance with Condition 3, Schedule 7 of the Project Approval, Metropolitan Coal will conduct an Annual Review of the environmental performance of the Project by the end of March each year.

The Annual Review will specifically address the environmental performance of the HMP and will:

- describe the works that were carried out in the past calendar year, and the works that are proposed to be carried out over the current calendar year;
- include a comprehensive review of the monitoring results and complaints records of the Project over the past year, including a comparison of these results against the:
 - relevant statutory requirements, limits or performance measures/criteria;
 - monitoring results of previous years; and
 - relevant predictions in the Project EA, Preferred Project Report and Extraction Plan;
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the Project;
- identify any discrepancies between the predicted and actual impacts of the Project, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next year to improve the environmental performance of the Project.

As described in Section 2, this HMP will be reviewed within three months of the submission of an Annual Review, and revised where appropriate.

The Annual Review will be made publicly available on the Peabody website in accordance with Condition 10, Schedule 7 of the Project Approval.

14 INCIDENTS

An incident is defined as a set of circumstances that causes or threatens to cause material harm to the environment, and/or breaches or exceeds the limits or performance measures/criteria in the Project Approval.

The reporting of incidents will be conducted in accordance with Condition 6, Schedule 7 of the Project Approval. Metropolitan Coal will notify the Secretary of the DP&E and any other relevant agencies of any incident associated with the Project as soon as practicable after Metropolitan Coal becomes aware of the incident. Within seven days of the date of the incident, Metropolitan Coal will provide the Secretary and any relevant agencies with a detailed report on the incident.

15 COMPLAINTS

A protocol for the managing and reporting of complaints has been developed as a component of Metropolitan Coal’s Environmental Management Strategy and is described below.

The Environment & Community Superintendent is responsible for maintaining a system for recording complaints.

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Metropolitan Coal will maintain public signage advertising the telephone number on which environmental complaints can be made. The Environment & Community Superintendent is responsible for ensuring that the currency and effectiveness of the service is maintained. Notifications of complaints received are to be provided as quickly as practicable to the Environment & Community Superintendent.

Complaints and enquiries do not have to be received via the telephone line and may be received in any other form. Any complaint or enquiry relating to environmental management or performance is to be relayed to the Environment & Community Superintendent as soon as practicable. All employees are responsible for ensuring the prompt relaying of complaints. All complaints will be recorded in a complaints register.

For each complaint, the following information will be recorded in the complaints register:

- date and time of complaint;
- method by which the complaint was made;
- personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- nature of the complaint;
- the action(s) taken by Metropolitan Coal in relation to the complaint, including any follow-up contact with the complainant; and
- if no action was taken by Metropolitan Coal, the reason why no action was taken.

The Environment & Community Superintendent is responsible for ensuring that all complaints are appropriately investigated, actioned and that information is fed back to the complainant, unless requested to the contrary.

In accordance with Condition 10, Schedule 7 of the Project Approval, the complaints register will be made publicly available on the Peabody website and updated on a monthly basis. A summary of complaints received and actions taken will be presented to the Community Consultative Committee as part of the operational performance review.

16 NON-COMPLIANCES WITH STATUTORY REQUIREMENTS

A protocol for the managing and reporting of non-compliances with statutory requirements has been developed as a component of Metropolitan Coal’s Environmental Management Strategy and is described below.

Compliance with all approvals, plans and procedures will be the responsibility of all personnel (staff and contractors) employed at or in association with the Metropolitan Coal Mine, and will be developed through promotion of Metropolitan Coal ownership under the direction of the General Manager.

The Manager – Technical Services and/or Environment & Community Superintendent will undertake regular inspections, internal audits and initiate directions identifying any remediation/rectification work required, and areas of actual or potential non-compliance.

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As described in Section 14, Metropolitan Coal will notify the Secretary of the DP&E and any other relevant agencies of any incident associated with Metropolitan Coal as soon as practicable after Metropolitan Coal becomes aware of the incident. Within seven days of the date of the incident, Metropolitan Coal will provide the Secretary of the DP&E and any relevant agencies with a detailed report on the incident.

A review of Metropolitan Coal's compliance with all conditions of the Project Approval, mining leases and all other approvals and licences will be undertaken prior to (and included within) each Annual Review. The Annual Review will be made publicly available on the Peabody website.

Additionally, in accordance with Condition 8, Schedule 7 of the Project Approval, an independent environmental audit was undertaken by the end of December 2011, and is undertaken a minimum of once every three years thereafter. A copy of the audit report will be submitted to the Secretary of the DP&E and made publicly available on the Peabody website. The independent audit will be undertaken by an appropriately qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary of the DP&E.

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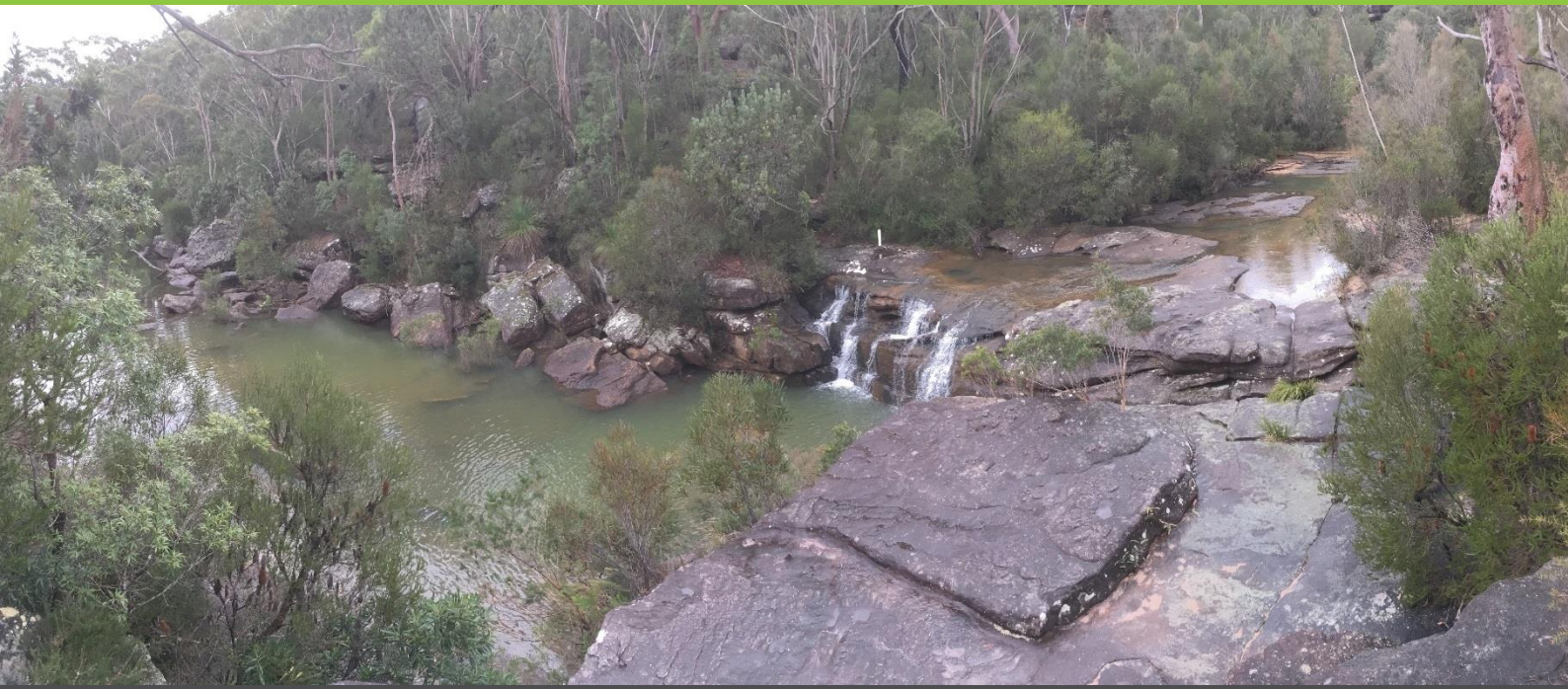
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APPENDIX 1

LONGWALLS 304-306 BASELINE RECORD – ABORIGINAL HERITAGE SITES

Metropolitan Coal – Heritage Management Plan		
Revision No. HMP-R01-B		
Document ID: Heritage Management Plan		



Longwalls 304 to 306 Metropolitan Colliery

Baseline recording

Prepared for Metropolitan Coal Pty Ltd

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Cover photograph: unnamed tributary that feeds into the Woronora dam stored water, facing north towards FRC 325.

Executive summary

Project outline

This report presents the baseline recording of 22 Aboriginal heritage sites by Niche Environment and Heritage in September 2018 for Longwalls 304 to 306 and surrounds. These sites were previously considered in the Aboriginal Cultural Heritage Assessment prepared by Kayandel Archaeological Services to support the Metropolitan Coal Project Environmental Assessment.

In accordance with Condition 7, Schedule 3 of the Project Approval (08_0149), and as required by the Metropolitan Coal Longwalls 301-303 Heritage Management Plan, these sites have been subject to baseline recording prior to secondary extraction of Longwall 304 at the Metropolitan Colliery, located near Helensburgh, New South Wales.

In accordance with Condition 2, Schedule 7 of Project Approval (08_0149), the baseline data will inform the Metropolitan Coal Heritage Management Plans prepared in relation to Longwalls 304-306.

Further baseline information such as additional photos, field notes and drawings is also kept in an electronic format by Metropolitan and Niche Environment and Heritage.

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1. Introduction

1.1 Background

Metropolitan Coal is a wholly owned subsidiary of Peabody Energy Australia Pty Ltd. The Metropolitan Coal Project (the Project) comprises the continuation, upgrade and extension of underground coal mining operations and surface facilities at the Metropolitan Colliery, near Helensburgh, New South Wales (NSW). Metropolitan Coal was granted approval for the Project under Section 75J of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) on 22 June 2009.

In accordance with Condition 7, Schedule 3 of the Project Approval (08_0149), and as required by the Metropolitan Coal Longwalls 301-303 Heritage Management Plan, these sites have been subject to baseline recording prior to secondary extraction of Longwall 304.

In accordance with Condition 2, Schedule 7 of Project Approval (08_0149), the baseline data will inform the Metropolitan Coal Heritage Management Plans prepared in relation to Longwalls 304-406.

Metropolitan Coal commissioned Niche Environment and Heritage Pty Ltd (Niche) to complete these works for the colliery. This report describes the methods and results of the baseline recording program that was undertaken on 5, 6, 7, 10, 11, 12, 13, 14, 17, 18, 19, 20 and 25 September 2018 by Jamie Reeves (Director), Renée Regal (Senior Heritage Consultant), Sam Richards (Archaeologist) and Kathleen Tannerhill (Archaeologist) of Niche. This report has been prepared by Renée Regal with the internal review being undertaken by Jamie Reeves (Senior Heritage Consultant/Director, Niche).

1.2 Project methods

An intensive pedestrian survey was undertaken to relocate known Aboriginal heritage sites requiring baseline recording for Longwalls 304-306. Once known sites were identified, they were checked against the original Aboriginal Heritage Information Management System (AHIMS) site card details to confirm their accuracy, their current condition noted, photographed, together with any additional features and/or artefacts.

The methods undertaken for the baseline recording program were consistent with the requirements outlined in the Metropolitan Coal Longwalls 301-303 Heritage Management Plan, and were as follows:

- A photographic record of each of the Aboriginal heritage sites.
- Detailed scaled plans of each site including physical characteristics and features.
- Detailed information regarding the dimensions, composition and features of the site.

The baseline recording undertaken for Longwalls 304 to 306 included the use of the following methods:

- Shelter setting and context photography.
- Shelter and art panel panorama photography.
- Art panel detail off-set distance photography.
- Art panel key sketches and motif identification.
- Preparation of scale plans – sections and plans (multiple cross sections for complex sites).
- Shelter characteristic, features and monitoring points recording – position and detail photography.
- Post-processing including photo interpretation.
- Post-processing including compilation of site records.

1.3 Project outcomes and sites subject to baseline recording

The Aboriginal heritage sites subject to baseline recording for Longwalls 304-306 are presented in Table 1.

Table 1: Sites subject to baseline recording for Longwalls 304-306.

Site name	AHIMS number	Site features	Archaeological significance ¹
Flat Rock Creek 94 (FRC 94)	52-2-0873	Shelter with Art and Deposit	Low
Flat Rock Creek 95 (FRC 95)	52-2-0347/52-2-0874 ²	Axe Grinding Grooves	Low
Flat Rock Creek 97 (FRC 97)	52-2-0220/52-2-0337 ²	Shelter with Art and Deposit	Moderate
Flat Rock Creek 101 (FRC 101)	52-2-0875	Axe Grinding Groove	Low
Flat Rock Creek 180 (FRC 180) ³	52-2-0828	Shelter with Art and Deposit	Low
Flat Rock Creek 184 (FRC 184)	52-2-0222	Shelter with Deposit ⁴	Low
Flat Rock Creek 185 (FRC 185)	52-2-0223/52-2-0307 ²	Shelter with Art and Deposit ⁴	High
Flat Rock Creek 186 (FRC 186)	52-2-0224	Shelter with Art and Deposit	Low
Flat Rock Creek 187 (FRC 187)	52-2-0225	Shelter with Art	Low
Flat Rock Creek 191 (FRC 191)	52-2-0183	Shelter with Art and Deposit	High
Flat Rock Creek 198 (FRC 198)	52-2-0268/52-2-0404 ²	Shelter with Art and Deposit ⁴	Low
Flat Rock Creek 254 (FRC 254)	52-2-0829	Shelter with Deposit ⁴	Low
Flat Rock Creek 311 (FRC 311)	52-2-3502	Shelter with Deposit ⁴	Low
Flat Rock Creek 312 (FRC 312)	52-2-3503	Shelter with Deposit ⁴	Low
Flat Rock Creek 313 (FRC 313)	52-2-3444	Shelter with Deposit ⁴	Low
Flat Rock Creek 316 (FRC 316)	52-2-3447	Shelter with Deposit ⁴	Low
Flat Rock Creek 340 (FRC 340)	52-2-3471	Shelter with Art and Deposit	Low
Flat Rock Creek 344 (FRC 344)	52-2-3475	Shelter with Deposit ⁴	Low
Flat Rock Creek 345 (FRC 345)	52-2-3476	Shelter with Deposit ⁴	Low
North East Woronora 1 (NEW 1)	52-2-0219	Axe Grinding Groove	Low
North East Woronora 10 (NEW 10)	52-2-0530	Shelter with Art and Deposit	Moderate
North East Woronora 22 (NEW 22)	52-2-3518	Shelter with Deposit ⁴	Low

1. Sources include: Kayandel Archaeological Services (2006, 2007, 2008) and information available on NSW Office of Environment and Heritage AHIMS site cards.

2. Single Aboriginal heritage site registered more than once on the AHIMS database (Illawarra Prehistory Group, 2007).

3. Site not relocated during baseline recording.

4. Artefacts listed on site card but not relocated during baseline recording.

AHIMS – Aboriginal Heritage Information Management System

Of the 22 sites listed in Table 1, 21 were relocated and subject to detailed baseline recording during this assessment. One site, namely FRC 180 (shelter with art), could not be relocated during the baseline surveys undertaken for Longwalls 23-27 and additional survey effort was not undertaken during baseline recording of Longwalls 304-306 to relocate this site. This is because extensive efforts were made by the team to relocate this site during the longwall 23-27 assessment, including confirming the recording data with the original AHIMS recording form, checking that the correct datum was being used and cross-checking against the information and descriptions provided in previous surveys and assessments. Team members also walked along the ridgelines within close proximity to confirm that the shelter had not been recorded at the wrong location. At the registered location there was no rock shelter formation present. The survey effort undertaken to attempt to relocate FRC 180 is presented in Appendix 1.

Because FRC 180 could not be relocated despite the extensive survey effort, it is recommended that this site be removed from any future baseline recording or monitoring programs.

Monitoring point photographs depicting the horizontal bedding planes, as well as natural weathering processes present within each shelter have also been taken for relevant sites. Copies of these photographs are held by the colliery as well as Niche and will be used in conjunction with the below report for the future monitoring of these sites.

The baseline records for each of the sites listed in Table 1 are presented in Section 2 of this report.

2. Archaeological site baseline recording

2.1 Flat Rock Creek 94 (FRC 94, AHIMS # 52-2-0873)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering. The art located at this shelter is in very poor condition and heavily faded. The charcoal outline and infill bird drawing originally identified by Sefton (during the initial recording of the site) was relocated during this baseline recording. However, it was very faded and three of the charcoal indeterminate lines also could not be identified.

2.1.1 FRC 94 baseline recording data

Table 2: Baseline recording data for FRC 94.

Overview					
Site type	Shelter with Art and Deposit	Corrected MGAE	0311833	Corrected MGAN	6217659
Previous Recording	Site card – Caryl Sefton, Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	24m	Depth	3m	Height	2m
Orientation	W-SW	Floor area	1 m ²	Floor condition	Moderate
Location in Landscape	Eastern side of stored water. 20m east of Woronora Dam				
Shelter exterior/formation	Base of lower slope of ridgeline. Cavernous weathering, block fall from roof of shelter. Chemical weathering on roof and back panel.				
Shelter interior	Chemical weathering on back panel and roof. Extreme exfoliation on back panel. Macro vegetation growing out of bedding planes. Granular loss at base of back panel. Seepage visible from bedding panel.				
Distance to water	20m	Landform	Sandstone shelter		
Setting	Continuous overhang				
Archaeological Deposit					
Deposit	Yes	Describe	Sandy loam, approximately 30cm deep.		
Visible artefacts?	No	Where?	N/A	How many?	N/A
Art					
Art surfaces	Poor, moderate to heavy exfoliation, chemical weathering. Charcoal outline of bird on back panel at southern end of shelter. Charcoal lines to the left of motif have faded since last recording, sections of the right side of bird also.				
Art Condition	Poor				
Art Overview	Lower rear wall, 1 charcoal outline and infill of bird. Motif 1: a line not visible – missing/faded, Motif 2: varying levels of quality – very faded, lines missing due to exfoliation.				
Damage/threats					
Water wash	Yes	Graffiti	No	Macro vegetals	Yes – Algal and ferns on roof and back panel
Animals	Yes - wallaby	Salt/granular loss	Yes – base of back panel	Fissuring	Roof and missing panels
Insects	Yes – spider and wasp nest	Spalling/exfoliation	Yes	Other	N/A
Fire	No	Block fall	Yes		

Table 3: Baseline recording data for art surfaces present within FRC 94.

Motif No.	Type	Form	Media	Colour	Measurement
Panel 1					
1	Bird	Outline/infill	Charcoal	Black	60 cm x 35 cm
2	Indeterminate	Infill/ Lines	Charcoal	Black	20 cm x 15 cm

2.1.2 Baseline recording images – site overview



Plate 1: External context image of FRC 94. View from East of shelter.



Plate 2: External context image of FRC 94. View from West of shelter.

2.1.3 Baseline recording plans – site overview

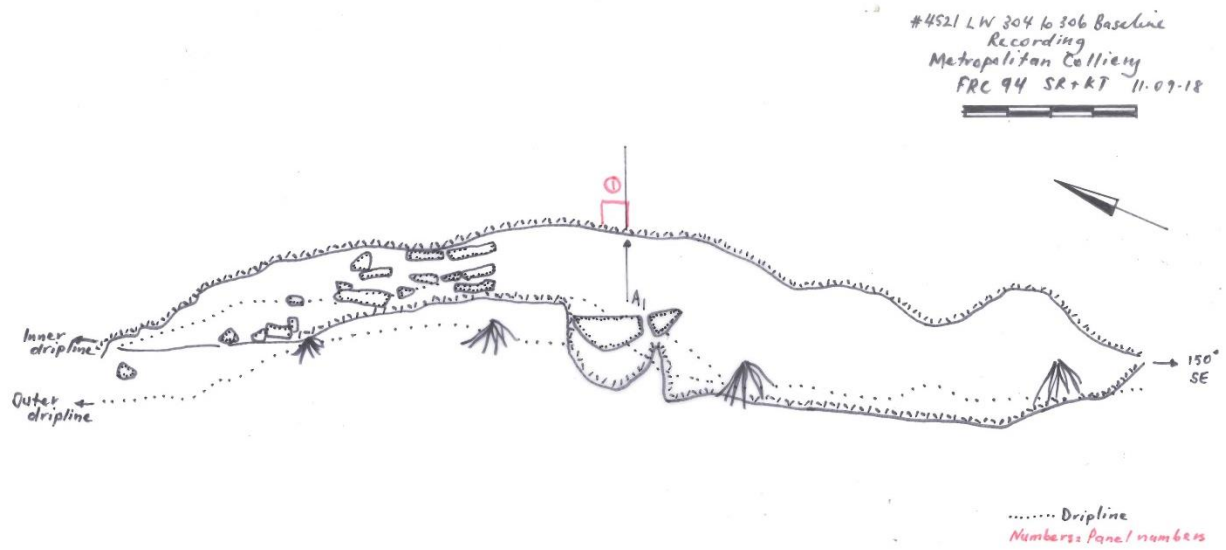


Figure 1: Plan of FRC 94.

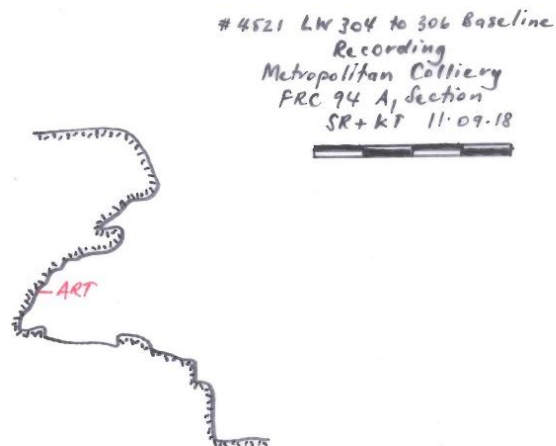


Figure 2: A1 Section of FRC 94.

FRC 94 - Reproduced using site card



Figure 3: Art panel of FRC 94. Reproduced from the AHIMS site card.

2.1.4 Baseline recording images – detailed panel recording

Panel 1



Plate 3: FRC 94 Overview of Panel 1, view of Motif 1 and 2.

2.2 Flat Rock Creek 95 (FRC 95, AHIMS# 52-2-0347 / 52-2-0874)

These axe grinding grooves are located on a flat outcrop of exposed Hawkesbury sandstone surrounded by swamp. The axe grinding grooves located at this site are worn and in poor condition since being recorded by Sefton (during initial recording of the site). All five grooves were relocated during this baseline recording, however they appeared less distinct and worn.

2.2.1 FRC 95 baseline recording data

Table 4: Baseline recording data for FRC 95.

Overview					
Site type	Axe Grinding Grooves	Corrected MGAE	0312175	Corrected MGAN	6217973
Previous Recording	Site card – Caryll Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	9m	Length	22m	Height	N/A
Orientation	W-SW	Floor area	N/A	Floor condition	Moderate
Location in Landscape	The grinding site is on an upper ridgeline, exposed sandstone platform in a swamp.				
Site context	On an outcrop of rock in an upper swamp.				
Distance to water	270m	Landform	Upper Basin/Axe grinding grooves.		
Setting	Isolated				
Archaeological Deposit					
Deposit	N/A	Describe	N/A		
Visible artefacts?	N/A	Where?	N/A	How many?	N/A
Grinding Groove					
Surfaces	5 grinding grooves in the outlet of a large flat pan				
Condition	Worn, 5x (80cm x 7cm x 2.5cm)				
Damage/threats					
Water wash	N/A	Graffiti	N/A	Macrovegetals	Yes
Animals	N/A	Salt/granular loss	N/A	Fissuring	N/A
Insects	N/A	Spalling/exfoliation	N/A	Other	N/A
Fire	N/A	Block fall	N/A		

Table 5: Baseline recording data for grinding grooves present within FRC95.

Site Context	
Site Dimensions	9m x 22m
Context	Located on an outcrop of rock in a swamp about 80m W of Fire Road 91 and 300m S of the T intersection in the road.
Site Condition	Worn, poor condition
Groove Description	
Number of groups grooves	One Group.
Total number of grooves	5 visible
Type, Profile	Not specified
Function	Axe grinding groove
Condition	Worn, in poor condition.
Orientation	W-SW

2.2.2 Baseline recording images – site overview



Plate 4: External vortex image of FRC 95. View looking West.

2.2.3 Baseline recording plans – site overview

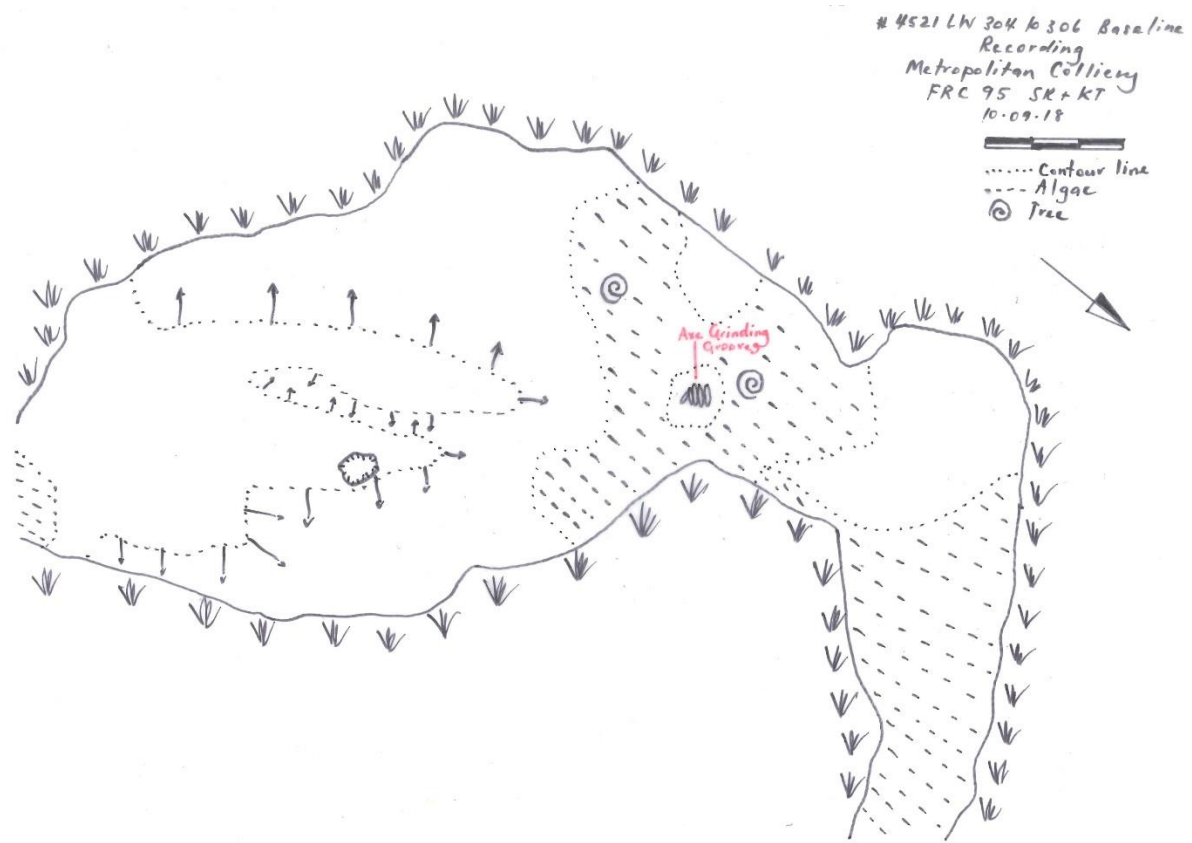


Figure 4: Plan of FRC 95.

2.2.4 Baseline recording images – detailed recording

Axe grinding grooves



Plate 5: Detail of the 5 axe grinding grooves at FRC 95 when wet. View from above.

2.3 Flat Rock Creek 97 (FRC 97, AHIMS# 52-2-0220/ 52-2-0337)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall from the dripline. The art located at Panels 1 through to 3 at this shelter is in poor condition and heavily faded, due to case hardening, cracking, flaking and granular loss occurring on rock surface. Some of the previously identified charcoal indeterminates (during initial site recording) could not be relocated during this assessment.

2.3.1 FRC 97 baseline recording data

Table 6: Baseline recording data for FRC 97.

Overview					
Site type	Shelter with Art and Deposit	Corrected MGAE	0311770	Corrected MGAN	6217180
Previous Recording	Site card – Caryll Sefton Illawarra Prehistory Group	Date	No date specified on site card		
Site Details					
Width	9m	Depth	6m	Height	3m
Orientation	NE	Floor area	15m ²	Floor condition	Good
Location in Landscape	Under the second cliff line from the bottom				
Shelter exterior/formation	Formed by cavernous weathering and block fall from the dripline.				
Shelter interior	Chemical weathering in west, salt granulation loss at base of back panel and on block fall. Fissuring on back panel. Cracking on roof and parts of back panel. Block fall from roof around drawing. Tree growth on roof possible.				
Distance to water	80m	Landform	Lower to bottom slope, second cliff up from bottom slope.		
Setting	Continuous overhang				
Archaeological Deposit					
Deposit	Yes	Describe	Cream loamy sand, approximately 50cm deep.		
Visible artefacts?	No	Where?	N/A	How many?	N/A
Art					
Art surfaces	<p>Panel 1: Partial charcoal outline of a macropod, 1x partial red ochre outline and infill profile of a human, 3x charcoal indeterminates.</p> <p>Panel 2: 3x charcoal outline of fish, 1x charcoal macropod outline, 1 charcoal outline and infill of a bat, 1 large red ochre outline and infill of a kangaroo. Only remnants of the charcoal kangaroo and fish left.</p> <p>Panel 3: 1 charcoal indeterminate drawing and only remnants of 2 others.</p>				
Art Condition	<p>Panel 1: Partially missing (refer to site card)</p> <p>Panel 2: Poor; cracking, flaking, granular loss and case hardening over art. Cracking already visible on art surfaces.</p> <p>Panel 3: Poor: indeterminate and incomplete.</p>				
Art Overview	Art present on outer ceiling, Lower ceiling and back wall.				
Damage/threats					
Water wash	N/A	Graffiti	N/A	Macro vegetals	No
Animals	No	Salt/granular loss	Yes	Fissuring	Yes
Insects	No	Spalling/exfoliation	N/A	Other	N/A
Fire	No	Block fall	Yes		

Table 7: Baseline recording data for art surfaces present within FRC 97.

Motif No.	Type	Form	Media	Colour	Measurement
Panel 1					
1	Macropod	Partial	Charcoal	Black	40 x 70cm
2	Human Figure Profile	Partial, Outline/Infill	Ochre	Red	85 x 50cm
3	Indeterminate	Partial	Charcoal	Black	5 x 3cm
4	Indeterminate	Partial	Charcoal	Black	3 x 3cm
5	Indeterminate	Partial, outline/infill	Charcoal	Black	20 x 3cm
Panel 2					
6	Fish	Partial	Charcoal	Black	40 x 3cm
7	Fish	Partial, outline	Charcoal	Black	65 x 12cm
8	Fish	Partial, outline	Charcoal	Black	66 x 20cm
9	Macropod	Partial, outline	Charcoal	Black	65 x 35cm
10	Macropod	Partial, outline/infill	Ochre	Red	1.25m x 85cm
11	Bat	Partial, outline	Charcoal	Black	32 x 35cm
Panel 3					
12	Indeterminate	Partial	Charcoal	Black	40 x 25cm

2.3.2 Baseline recording images – site overview



Plate 6: External context image of FRC 97. View towards the South.



Plate 7: External context image of FRC 97. View towards the Northwest.

2.3.3 Baseline recording plans – site overview

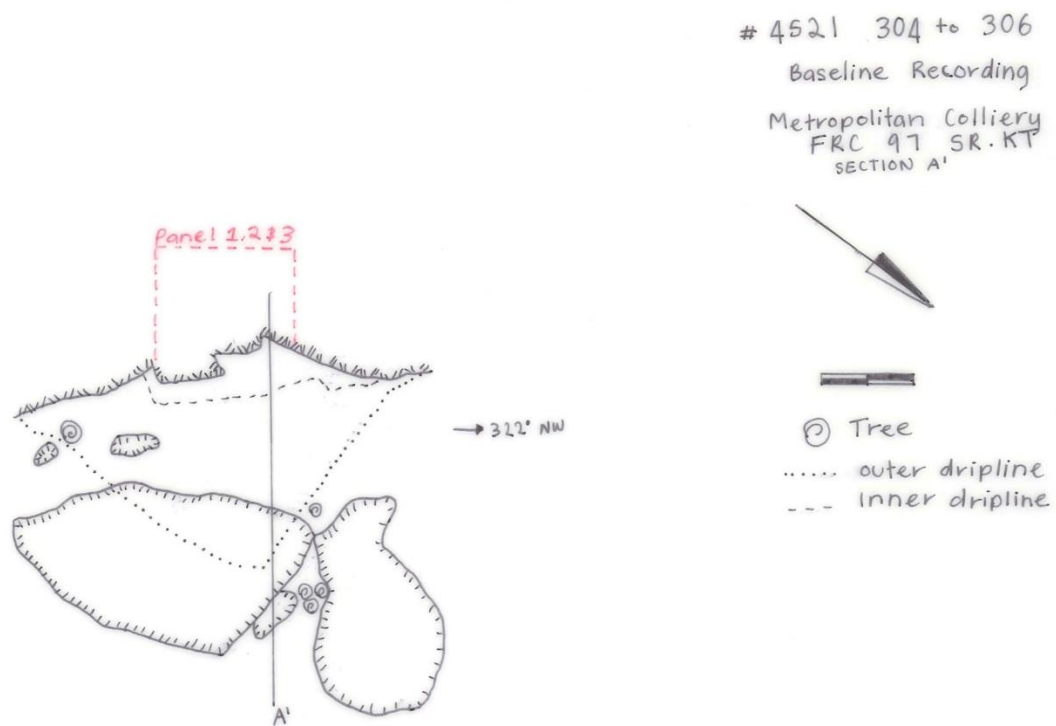


Figure 5: Plan of FRC 97.

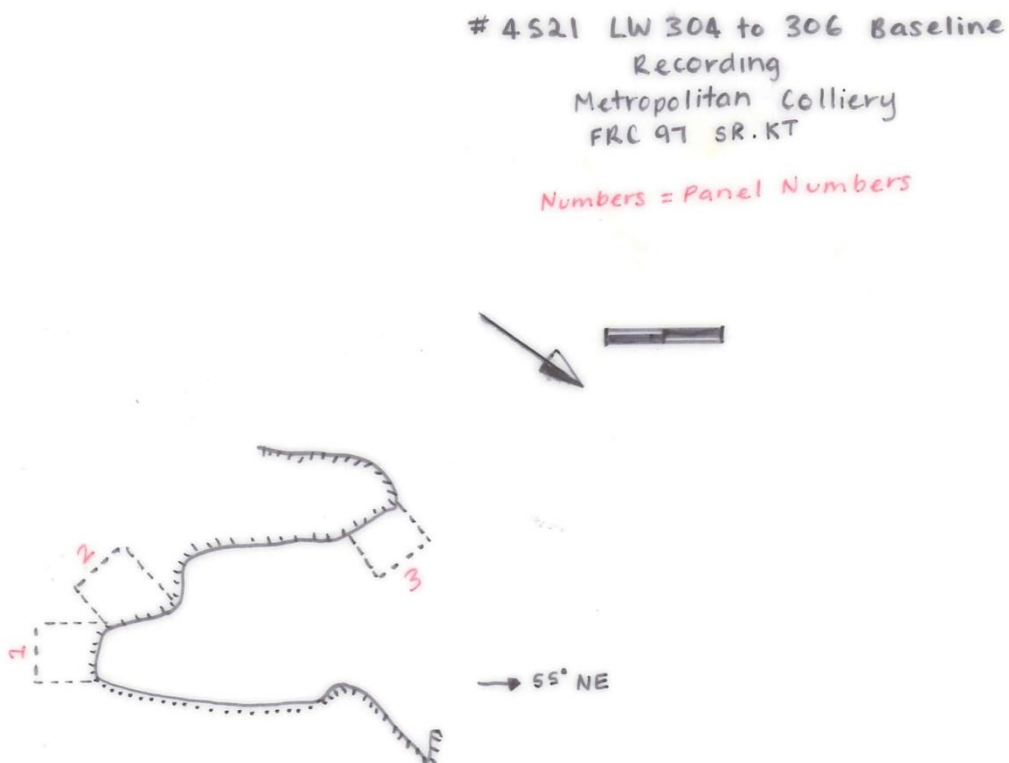


Figure 6: A1 Section of FRC 97.

#4521 LW 304-306
BASELINE RECORDING
METROPOLITAN COLLIEKY
FRC 97

SHELTER CROSS SECTION

SCALE 1:50

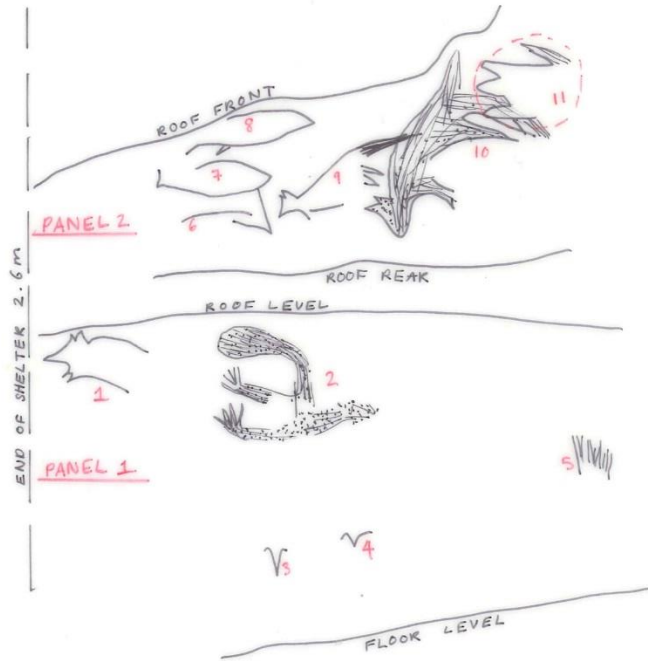
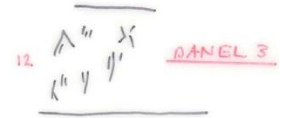
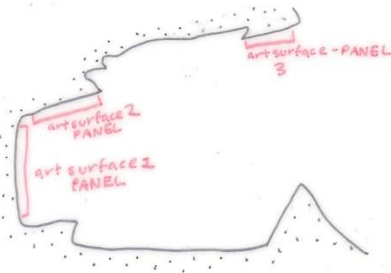


Figure 7: Artform drawing of FRC 97. Reproduced from the AHIMs site card.

2.3.4 Baseline recording images – detailed panel recording

Panel 1



Plate 8: Overview of Panel 1; Motifs 1, 2, 3, 4, 5 at FRC 97. View at a distance of 1.5m



Plate 9: Detail of Motif 1 on Panel 1 at FRC 97. View at 60cm distance.



Plate 10: Detail of Motif 2 on Panel 1 at FRC 97. View at 1m Distance.



Plate 11: Detail of Motif 3 on Panel 1 at FRC 97. View at 20cm distance.



Plate 12: Detail of Motif 4 on Panel 1 at FRC 97. View at 10cm distance.



Plate 13: Detail of Motif 5 on Panel 1 at FRC 97. View at 50cm distance.

Panel 2



Plate 14: Overview of Panel 2; Motifs 6, 7, 8, 9, 10, 11 at FRC 97. View at 1.7m distance.

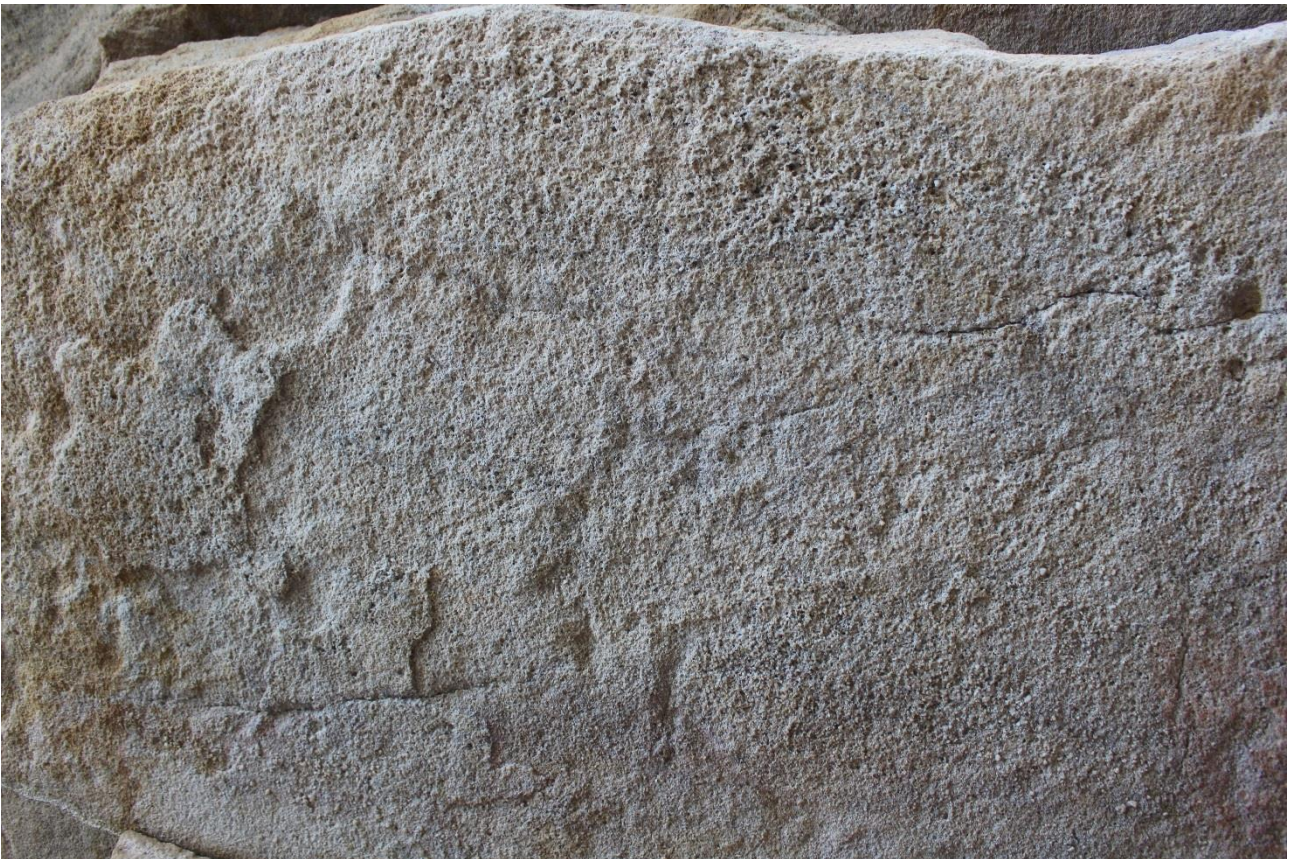


Plate 15: Detail of Motifs 6, 7, 8 on Panel 2 at FRC 97. View at 80cm distance.



Plate 16: Detail of Motifs 9 and Partial 10 on Panel 2 at FRC 97. View at 70cm distance.



Plate 17: Detail of Motif 11 on Panel 2 at FRC 97. View at 1.5m distance.

Panel 3



Plate 18: Detail of Motif 12 on Panel 3 at FRC 97. View at 1m distance.

2.4 Flat Rock Creek 101 (FRC 101, AHIMS# 52-2-0875)

This Axe Grinding Groove site is located on a flat outcrop of exposed Hawkesbury sandstone surrounded by swamp. The axe grinding groove located at this site was found to be in moderate condition since being recorded by Sefton (during initial recording of the site).

2.4.1 FRC 101 Baseline recording data

Table 8: baseline recording data for FRC 101.

Overview					
Site type	Axe Grinding Groove	Corrected MGAE	0312255	Corrected MGAN	6217860
Previous Recording	Site card – Caryll Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	5.20m	Length	17m	Height	N/A
Orientation	NNW	Floor area	N/A	Floor condition	N/A
Location in Landscape	The grinding site is 40m W of the N-S section of Fire Road 9l, top of the ridgeline on an exposed sandstone outcrop.				
Site context	On an outcrop within swamp				
Distance to water	<100m	Landform	Flat swamp at top of ridgeline.		
Setting	Isolated; Outcrop in swamp.				
Archaeological Deposit					
Deposit	No	Describe	N/A		
Visible artefacts?	N/A	Where?	N/A	How many?	N/A
Grinding Groove					
Surfaces	1 grinding groove present, at the NW end of a sandstone outcrop in a swampy area.				
Condition	Moderate condition 28cm x 7cm x <1cm				
Damage/threats					
Water wash	N/A	Graffiti	N/A	Macrovegetals	N/A
Animals	N/A	Salt/granular loss	N/A	Fissuring	N/A
Insects	N/A	Spalling/exfoliation	N/A	Other	N/A
Fire	N/A	Block fall	N/A		

Table 9: Baseline recording data for art surfaces present within FRC 101.

Site Context	
Site Dimensions	5.2m x 17m
Context	Located 40m W of the N-S section of Fire Rd 9I, on a sandstone outcrop in the middle of a swamp
Site Condition	Moderate condition
Groove Description	
Number of groups grooves	1 group
Total number of grooves	1 visible
Type, Profile	Not Specified
Function	Axe grinding groove
Condition	Moderate condition.
Orientation	East – West orientation.

2.4.2 Baseline recording images – site overview



Plate 19: Overview of FRC 101. View looking East.



Plate 20: Overview of FRC 101. View looking west.

2.4.3 Baseline recording plans – site overview

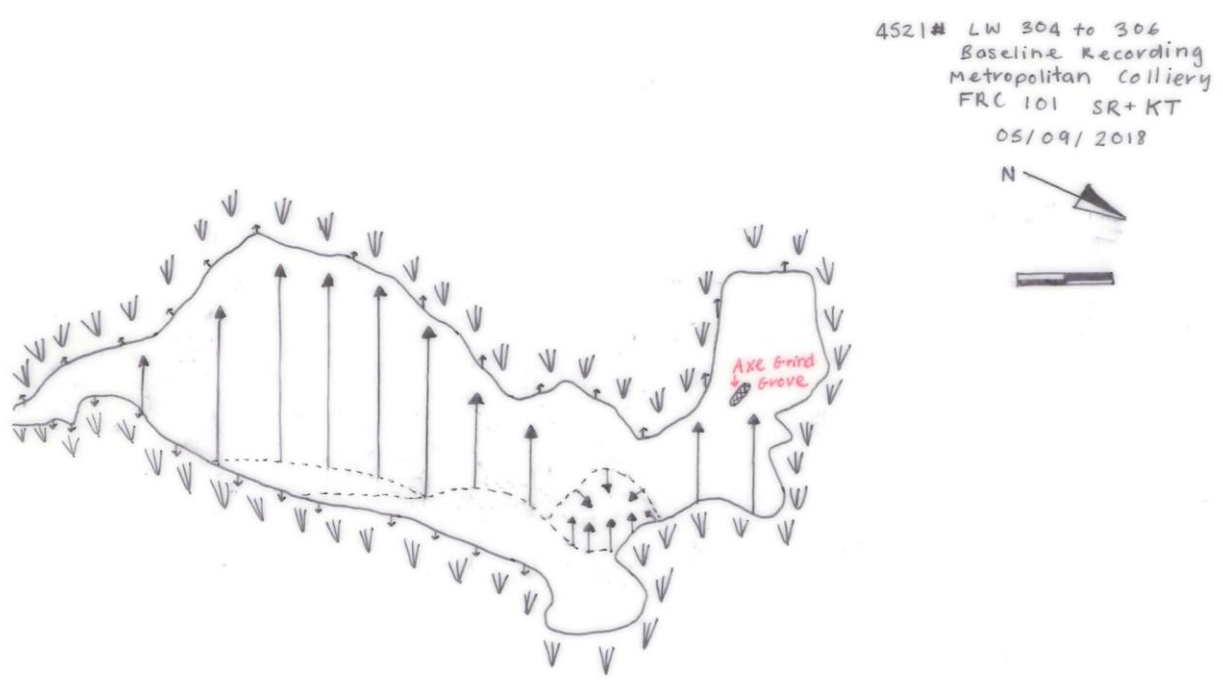


Figure 8: Plan of FRC 101.

2.4.4 Baseline recording images – detailed panel recording

1 Axe grinding groove

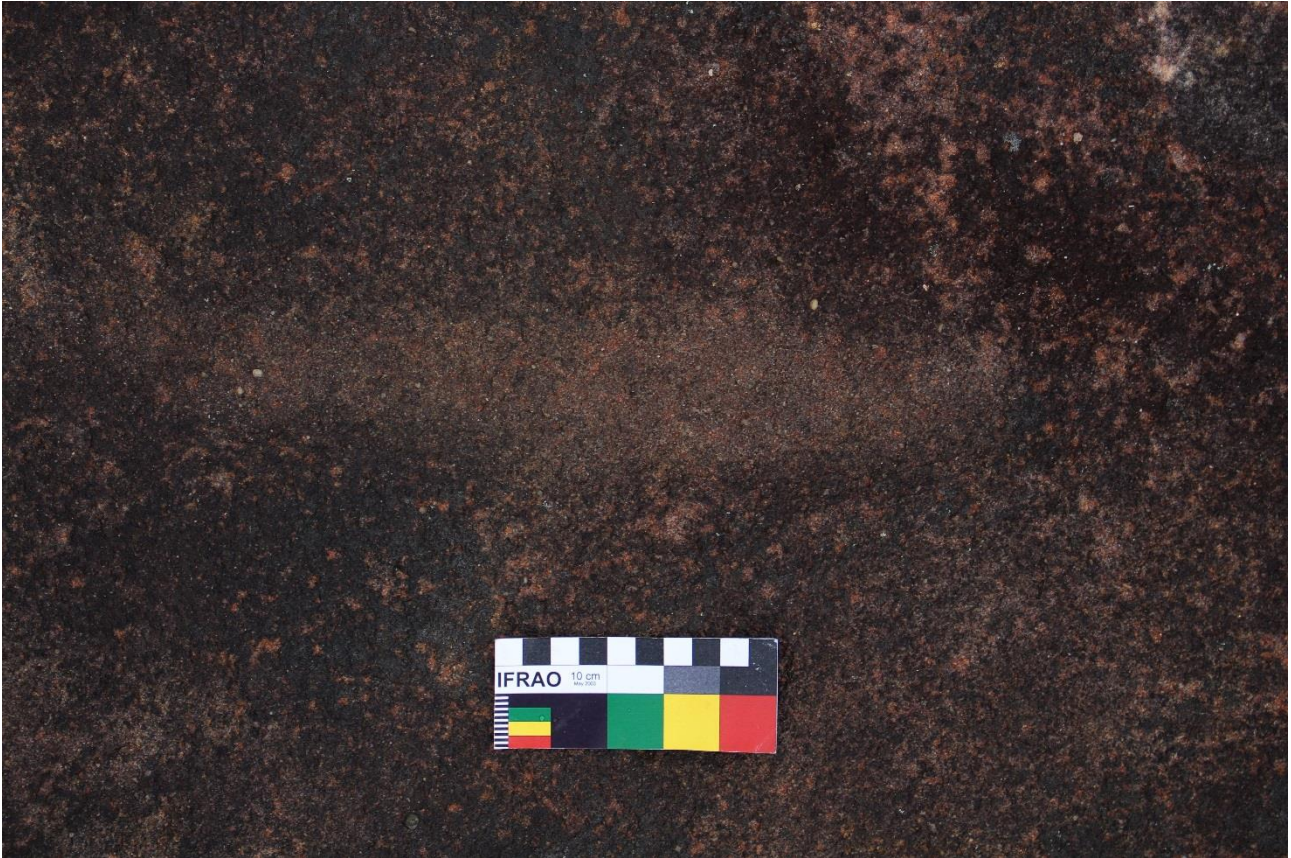


Plate 21: Detail of Axe grinding groove at FRC 101. View from above.

2.5 Flat Rock Creek 180 (FRC 180, AHIMS# 52-2-0828)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The art located at this shelter is in very poor condition, and comprises of a single charcoal indeterminate. This site could not be relocated during this assessment- all details have been taken from Kayandel 2008 and the AHIMS site recording.

2.5.1 FRC 180 baseline recording data

Table 10: Baseline recording data for FRC 180.

Overview					
Site type	Shelter with Art and Deposit	Corrected MGAE	0311590	Corrected MGAN	6215725
Previous Recording	Site card- Caryl Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	7m	Depth	1.8m	Height	1.6m
Orientation	E	Floor area	1m ²	Floor condition	
Location in Landscape	On the Northern side of the last small tributary on the Western side of the main eastern arm of the stored water.				
Shelter exterior/formation	Cavernous weathering and block fall in antiquity.				
Shelter interior	Not described on the site card.				
Distance to water	20m	Landform	Upper Valley Slope		
Setting	Moderate Slope				
Archaeological Deposit					
Deposit	Yes	Describe	Grey loamy sand of 20cm depth		
Visible artefacts?	No	Where?	N/A	How many?	N/A
Art					
Art surfaces	Not described as this site could not be relocated during this assessment				
Art Condition	Poor				
Art Overview	On rear wall on the northern end of shelter is 1 charcoal indeterminate drawing				
Damage/threats					
Water wash	Not described on the site card.	Graffiti	Not described on the site card.	Macro vegetals	Not described on the site card.
Animals	Not described on the site card.	Salt/granular loss	Not described on the site card.	Fissuring	Not described on the site card.
Insects	Not described on the site card.	Spalling/exfoliation	Not described on the site card.	Other	
Fire	Not described on the site card.	Block fall	Yes		

Table 11: Baseline recording data for art surfaces present within FRC 180.

Motif No.	Type	Form	Media	Colour	Measurement
Panel 1					
1	Indeterminate	Not described on the site card.	Charcoal	Black	Not described on the site card.

2.6 Flat Rock Creek 184 (FRC 184, AHIMS # 52-2-0222)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The shelter has experienced chemical weathering, honey combing and there is exfoliation of the back rock surface. There is also macro vegetal growth on the roof and back rock surface, and evidence of bird and wallaby footprints. The artefact described in the AHIMS recording was not relocated during this assessment. The artefact was described as:

- One brown chert flake (19mm x 12mm x 7mm).

2.6.1 FRC 184 baseline recording data

Table 12: Baseline recording data for FRC 184.

Overview					
Site type	Shelter with Deposit	Corrected MGAE	0311680	Corrected MGAN	6217610
Previous Recording	Site card – Caryl Sefton Illawarra Prehistory Group	Date	Not specified on site card.		
Site Details					
Width	20m	Depth	2.5m	Height	3.5m
Orientation	NE	Floor area	8m ²	Floor condition	Good
Location in Landscape	Site is on the W side of Waratah Rivulet, 10m up from the high water level in Woronora Dam.				
Shelter exterior/formation	Cavernous weathering and block fall				
Shelter interior	Chemical weathering, honey combing, and macro vegetation/algae growth on back panel and roof, as well as exfoliation in progress in same area. Block fall visible from roof and dripline along the length of shelter. Bird and wallaby foot prints evident in deposit of shelter.				
Distance to water	10m	Landform	Lower Valley Slope/Base of ridgeline.		
Setting	Continuous overhang.				
Archaeological Deposit					
Deposit	Yes	Describe	Yellow loamy sand of 10cm depth		
Visible artefacts?	No – recorded on site card but not relocated on site assessment.	Where?	N/A	How many?	N/A
Art					
Art surfaces	N/A				
Art Condition	N/A				
Art Overview	N/A				
Damage/threats					
Water wash	No	Graffiti	N/A	Macro vegetals	Yes
Animals	Yes	Salt/granular loss	No	Fissuring	Yes
Insects	Yes - spiders	Spalling/exfoliation	Yes	Other	Bedding planes on Back wall
Fire	No	Block fall	Yes		

2.6.2 Baseline recording images – site overview



Plate 22: Overview of the exterior of FRC 184. View looking North.



Plate 23: Overview of the exterior of FRC 184. View looking South.

2.6.3 Baseline recording plans – site overview

#4521 LW 304 to 306
Baseline Recording
Metropolitan Colliery
FRC 184 SR.KT 13/09/18
SECTION A'

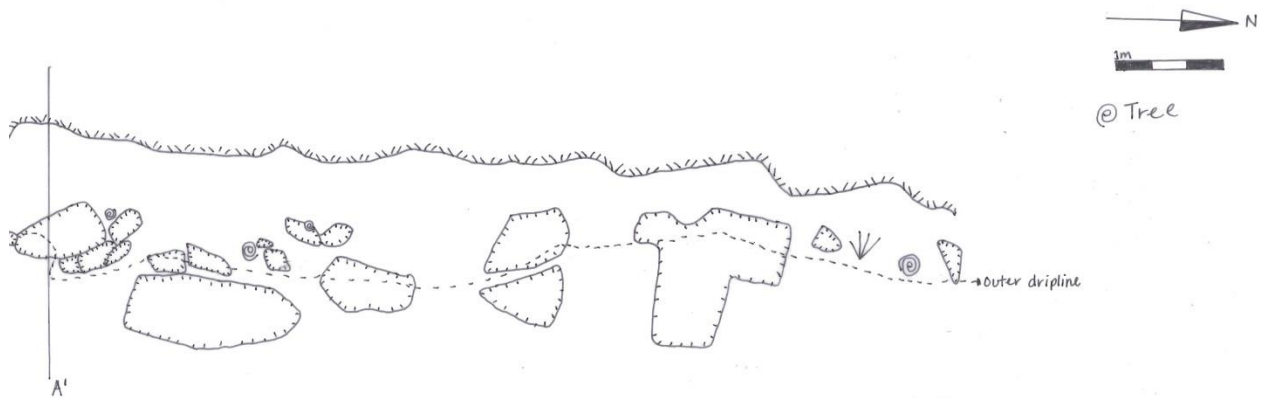


Figure 9 Plan of FRC 184.

#4521 304 to 306
Baseline Recording
Metropolitan Colliery
FRC 184 SR.KT 11/09/2018
A1 Section

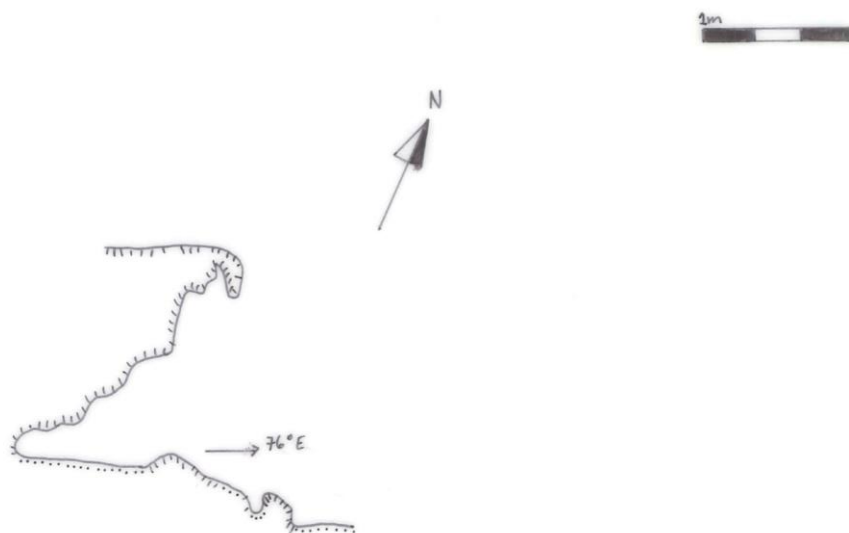


Figure 10: A1 Section of FRC 184.

2.7 Flat Rock Creek 185 (FRC 185, AHIMS# 52-2-0223/ 52-2-0307)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The art located at this shelter is in poor condition and has been affected by heavy exfoliation and water wash since it was recorded by Sefton (during the initial site recording). The artefacts recorded on the AHIMS site card were not relocated during this assessment. They were listed as:

- 1 flake broken into two (33x18x10mm)
- 1 complete flake (54x39x18mm)
- 1 broken pebble (104x84x32mm).

2.7.1 FRC 185 baseline recording data

Table 13: Baseline recording data for FRC 185.

Overview					
Site type	Shelter with Art and Deposit	Corrected MGAE	0311685	Corrected MGAN	6217490
Previous Recording	Site Card- Caryll Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	21m	Depth	5m	Height	3m
Orientation	NE	Floor area	24m ²	Floor condition	Good
Location in Landscape	First ridgeline above stored water in Waratah Rivulet section of Woronora Dam, opposite Garrawarra under a large cliffline.				
Shelter exterior/formation	Cavernous weathering and block fall				
Shelter interior	Water wash, chemical weathering, exfoliation.				
Distance to water	<100m	Landform	Lower ridgeline		
Setting	Continuous overhang				
Archaeological Deposit					
Deposit	Yes	Describe	Yellow loamy sand of 10cm depth		
Visible artefacts?	No- Artefacts on site card, not relocated during assessment	Where?	N/A	How many?	
Art					
Art Surfaces	Poor, heavy exfoliation, water wash				
Art Condition	Poor				
Art Overview	Two panels: 5 human figures, 12 macropods, 1 kangaroo track motif, 21 indeterminate, 1 eel, 2 fish, 1 possum.				
Damage/threats					
Water wash	Yes	Graffiti	No	Macro vegetals	Yes
Animals	Yes - wallaby	Salt/granular loss	Yes	Fissuring	No
Insects	Yes - spider	Spalling/exfoliation	Yes	Other	
Fire	No	Block fall	Yes		

Table 14: Baseline recording data for art surfaces present within FRC 185.

Motif No.	Type	Form	Media	Colour	Measurement
Panel 1					
1	Macropod	Partial/line	Charcoal	Black	123 x 150cm
2	Indeterminate	Line	Charcoal	Black	7 x 0.5cm
3	Indeterminate	2x lines	Charcoal	Black	8 x 1cm/L9x 1cm
4	Indeterminate	Infill	Charcoal	Black	35 x 14cm
5	2x Indeterminate	Infill x2	Charcoal	Black	54 x 2cm/20 x 2cm
6	Indeterminate	Infill line	Charcoal	Black	9 x 26cm
7	Indeterminate	Line	Charcoal	Black	30 x 1cm
8	Kangaroo Tracks	Infill	Charcoal	Black	25 x 20cm
9	Indeterminate	Infill	Charcoal	Black	20 x 7cm
10	Fish	Outline/infill	Charcoal	Black	20 x 10cm
11	Indeterminate/Claw	Line/infill	Charcoal	Black	13 x 4cm
12	Indeterminate	Line	Charcoal	Black	20 x 10cm
13	Eel	Line/infill	Charcoal	Black	40 x 13cm
14	Human top half upside down	Line/infill	Charcoal	Black	30x 38cm
15	Macropod front legs	Line/infill	Charcoal	Black	44x 19cm
16	Half fish	Line/infill	Charcoal	Black	19 x 7cm
17	Indeterminate	Line	Charcoal	Black	60 x 33cm
18	Macropod	Infill	Ochre	Orange	105 x 196cm
19	Macropod/partial top	Line	Ochre	Orange	20 x 33cm
20	Bottom half macropod	Line/infill	Charcoal	Black	120 x 25cm
21	Bottom half macropod	Line/infill	Charcoal	Black	79 x 26cm
22	Frontal male hands raised	Line/hatching	Charcoal	Black	80 x 21cm
23	Kangaroo print	Line/infill	Charcoal	Black	10 x 5cm
24	Eel	Red ochre outline, charcoal infill	Ochre/charcoal	Orange/Black	150 x 30cm
25	Indeterminate	Infill	Charcoal	Black	35 x 12cm
26	Indeterminate	Infill	Charcoal	Black	10 x 10cm
27	Indeterminate	Line	Charcoal	Black	30 x 15cm
28	Frontal female	Line	Charcoal	Black	42 x 16cm
29	Indeterminate	Lines	Charcoal	Black	22 x 13cm
30	Possum	Line/infill	Charcoal	Black	63 x 38cm
31	Macropod?	Line/infill	Charcoal	Black	10 x 60cm
32	Macropod?	Line/infill	Charcoal	Black	55 x 25cm
33	Macropod?	Line/infill	Charcoal	Black	59 x 23cm
34	Indeterminate	Line/infill	Charcoal	Black/red	29 x 67cm

Motif No.	Type	Form	Media	Colour	Measurement
35	Macropod	Line/infill	Charcoal	Black	49 x 72cm
36	Bottom half macropod	Line/infill	Charcoal	Black	26 x 43cm
37	Bottom half macropod	Line/infill	Charcoal	Black	35 x 54cm
Panel 2					
1	Indeterminate	Lines	Charcoal	Black	17 x 24cm
2	Indeterminate	Lines	Charcoal	Black	10 x 5cm
3	Frontal male, head remaining	Lines	Charcoal	Black	20 x 15cm
4	Frontal male, head remaining	Lines	Charcoal	Black	15 x 10cm
5	Indeterminate humans?	Lines	Charcoal	Black	24 x 17cm
6	Indeterminate humans?	Lines	Charcoal	Black	15 x 17cm
7	Indeterminate	Lines	Charcoal	Black	6 x 4cm

2.7.2 Baseline recording images – site overview



Plate 24: Overview of shelter at FRC 185. View looking North.

2.7.3 Baseline recording plans – site overview

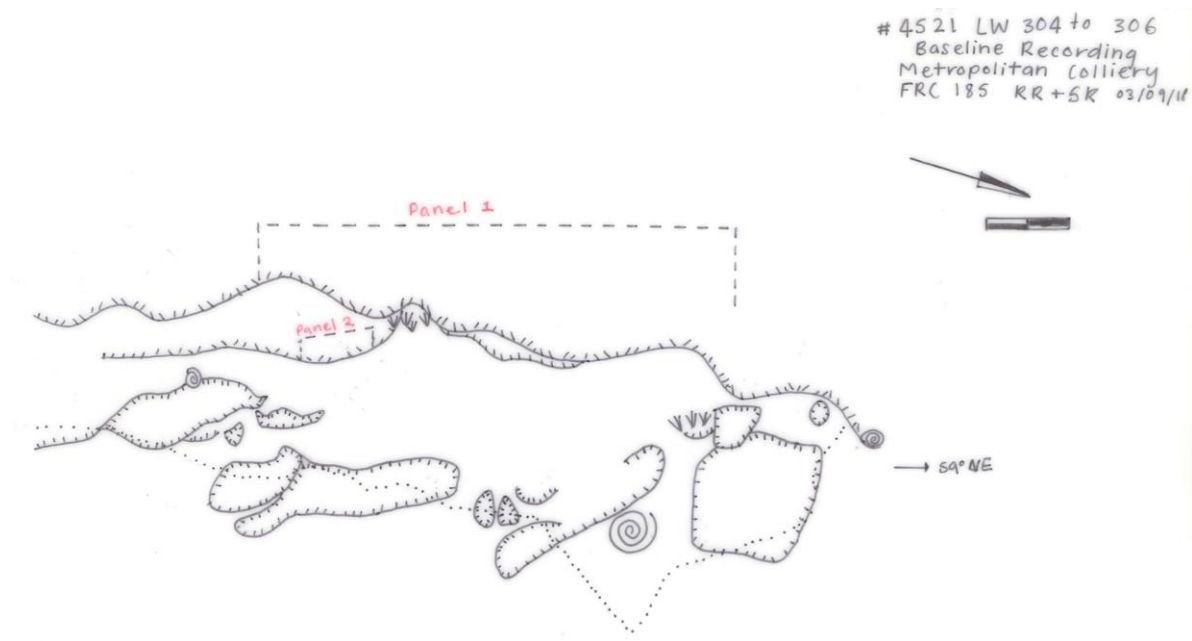


Figure 11: Plan of FRC 185.

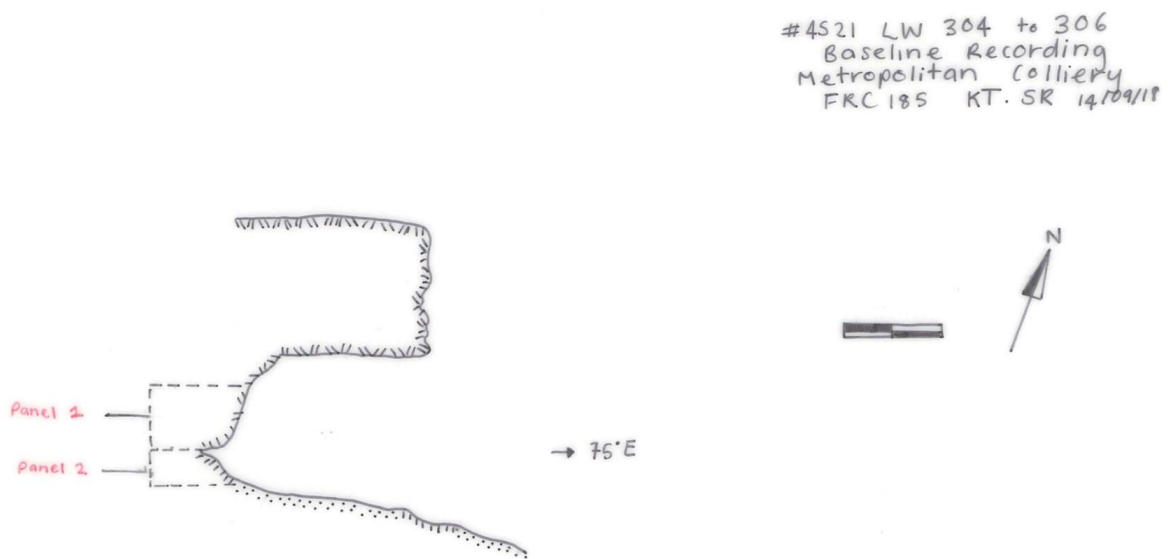


Figure 12: A1 Section of FRC 185.

SECTION 2 ADJOINS TO SECTION ONE

#4521 LW 304-306
BASELINE RECORDING
METROPOLITAN COLLIERY
FRC 185 FLAT ROCK CREEK

SECTION 2



Figure 13: Artform drawing of FRC 185, Panel 1. Reproduced from the AHIMS site card.

SECTION 1 ADJOINS TO SECTION 2

SECTION 1

#4521 LN 304-306
BASELINE RECORDING
METROPOLITAN COLLIERY
FRC 185 FLAT ROCK CREEK

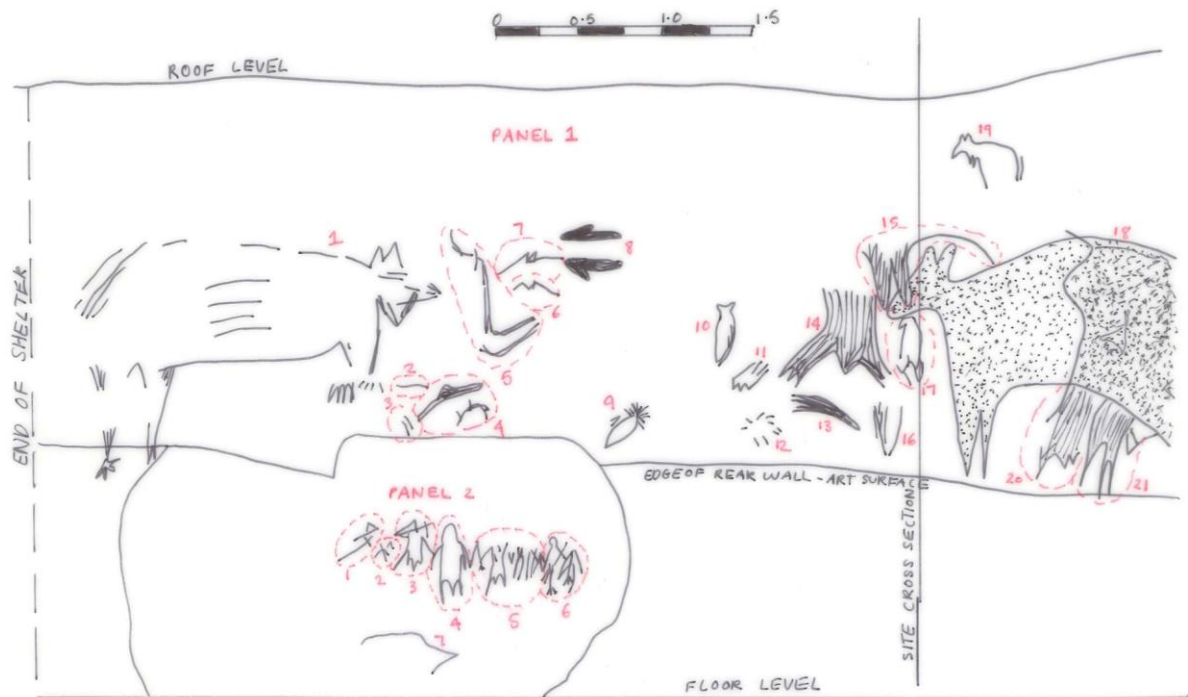


Figure 14: Artform drawing of FRC 185, Panel 1, 2. Reproduced from the AHIMS site card

2.7.4 Baseline recording images – detailed recording

Panel 1



Plate 25: Overview of Panel 1 at FRC 185. Panel 1, Motif 1.



Plate 26: Overview of Panel 1 at FRC 185. Panel 1; Motifs 2, 3, 4.



Plate 27: Overview of Panel 1 at FRC 185. Panel; Motifs 5, 6, 7, 8.

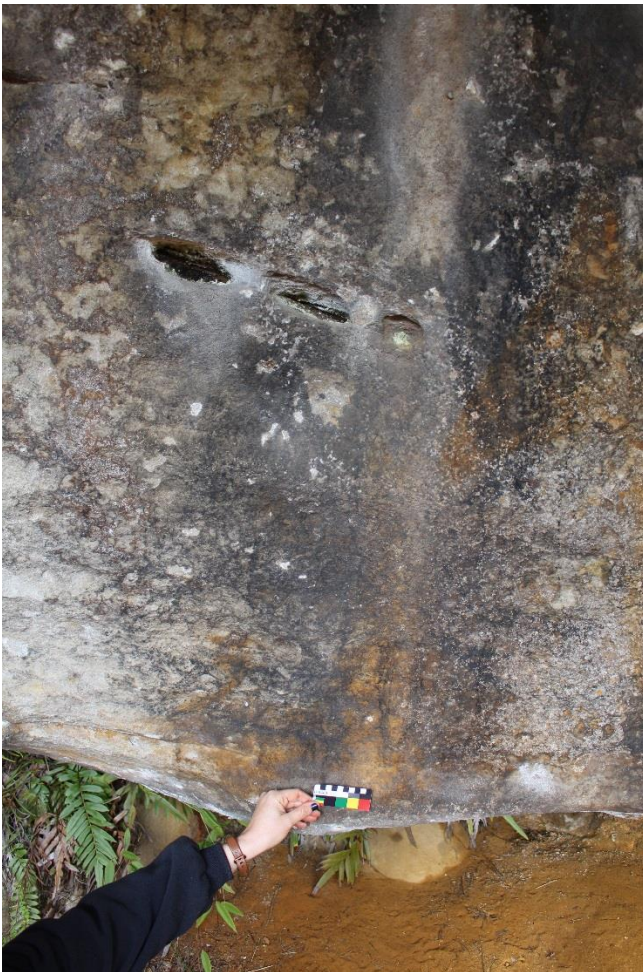


Plate 28: Overview of Panel 1 at FRC 185. Panel 1; Motifs 10, 11, 12, 13, 14, 16.



Plate 29: Overview of Panel 1 at FRC 185. Panel 1; Motifs 18, 15, 20, 21.



Plate 30: Overview of Panel 1 at FRC 185. Panel 1; Motifs 10, 24, 23, 27, 25, 26.



Plate 31: Overview of Panel 1 at FRC 185. Panel 1; Motifs 33, 34, 35, 36, 37.

Panel 2

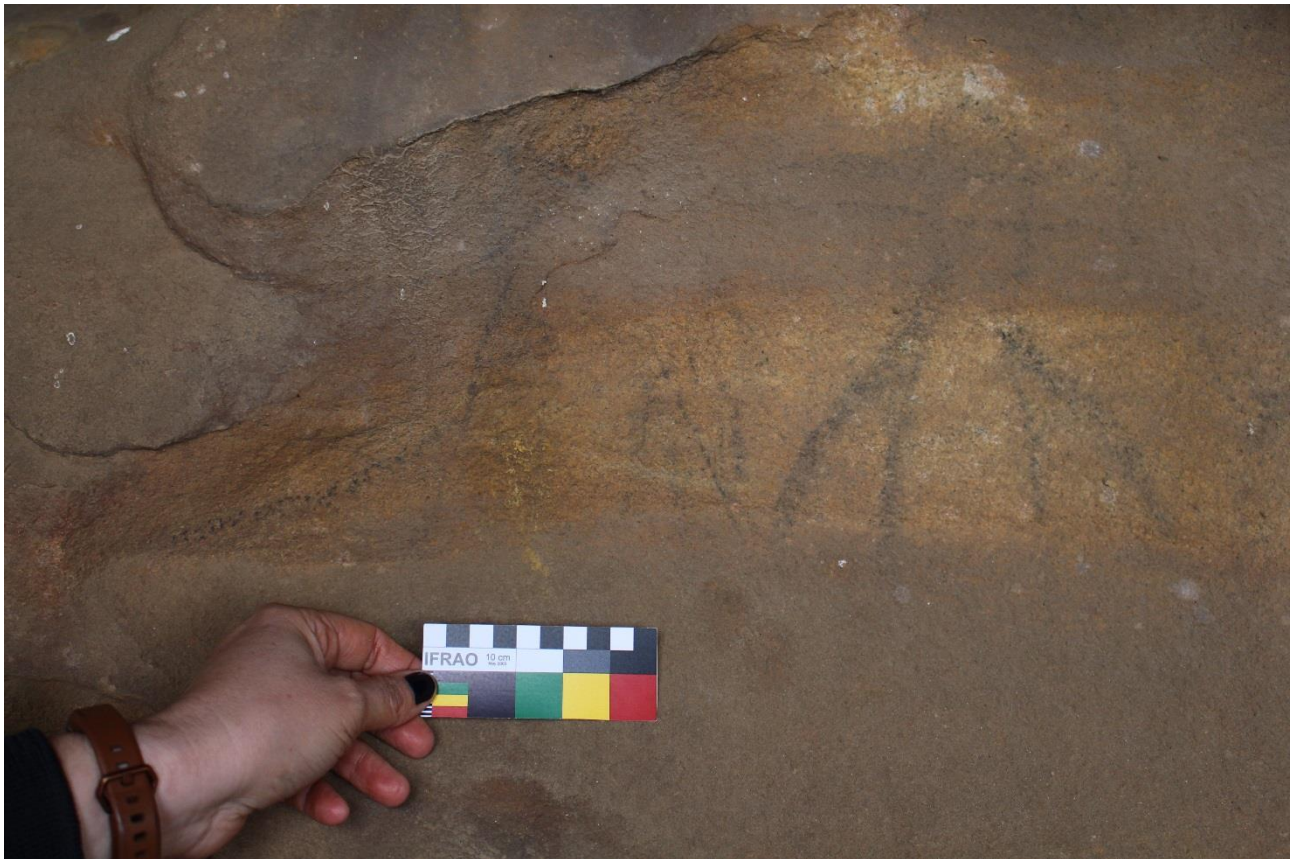


Plate 32: Overview of Panel 2 at FRC 185. Panel 2; Motif 1 to 4.



Plate 33: Overview of Panel 2 at FRC 185. Panel 5 to 6.

2.8 Flat Rock Creek 186 (FRC 186, AHIMS# 52-2-0224)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The art that was recorded by Sefton during the initial site recording are in poor condition and is extremely faded and partially missing. The art has been affected by case hardening, water wash and silica and chemical weathering is visible around the motifs.

2.8.1 FRC 186 baseline recording data

Table 15: Baseline recording data for FRC 186.

Overview					
Site type	Shelter with Art and Deposit	Corrected MGAE	0311660	Corrected MGAN	6217380
Previous Recording	Site card – Caryl Sefton Illawarra Prehistory Group	Date	November 1985		
Site Details					
Width	15m	Depth	4m	Height	2.6m
Orientation	E-NE	Floor area	32m ²	Floor condition	good
Location in Landscape	130m west of the stored water of Woronora Dam and 200m east of the end of Fire Rd 9E; Under the second cliff line from base of ridgeline.				
Shelter exterior/formation	Formed by cavernous weathering and block fall, and chemical weathering on roof. Block fall above dripline. Salts and granular loss on base of back art panel.				
Shelter interior	Chemical weathering and exfoliation in progress in roof. Macro vegetation in roof of shelter, Algae growth on roof. Animal scat noted on floor of shelter. Fissuring on back panel to roof.				
Distance to water	150m from Waratah Rivulet.	Landform	Mid slope, two cliff lines from base of ridgeline.		
Setting	Continuous overhang				
Archaeological Deposit					
Deposit	Yes – 1 mussel shell fragment	Describe	Brown/yellow loamy sand approximately 25cm deep		
Visible artefacts?	N/A	Where?	N/A	How many?	N/A
Art					
Art Surfaces	Poor, water wash, extremely faded with sections of the right of motif missing. Case hardening visible over back panel. Silica and chemical weathering noticed around the peripheries of the motif.				
Art Condition	Poor				
Art Overview	One charcoal outline of macropod in fragmentary condition.				
Damage/threats					
Water wash	Yes	Graffiti	Yes – one steel nail	Macro vegetals	Yes
Animals	Yes	Salt/granular loss	Yes	Fissuring	Yes
Insects	N/A	Spalling/exfoliation	Yes	Other	N/A
Fire	N/A	Block fall	Yes		

2.8.2 Baseline recording images – site overview



Plate 34: General photograph of FRC 186. View looking North.



Plate 35: General photograph of FRC 186. View looking South.

2.8.3 Baseline recording plans – site overview

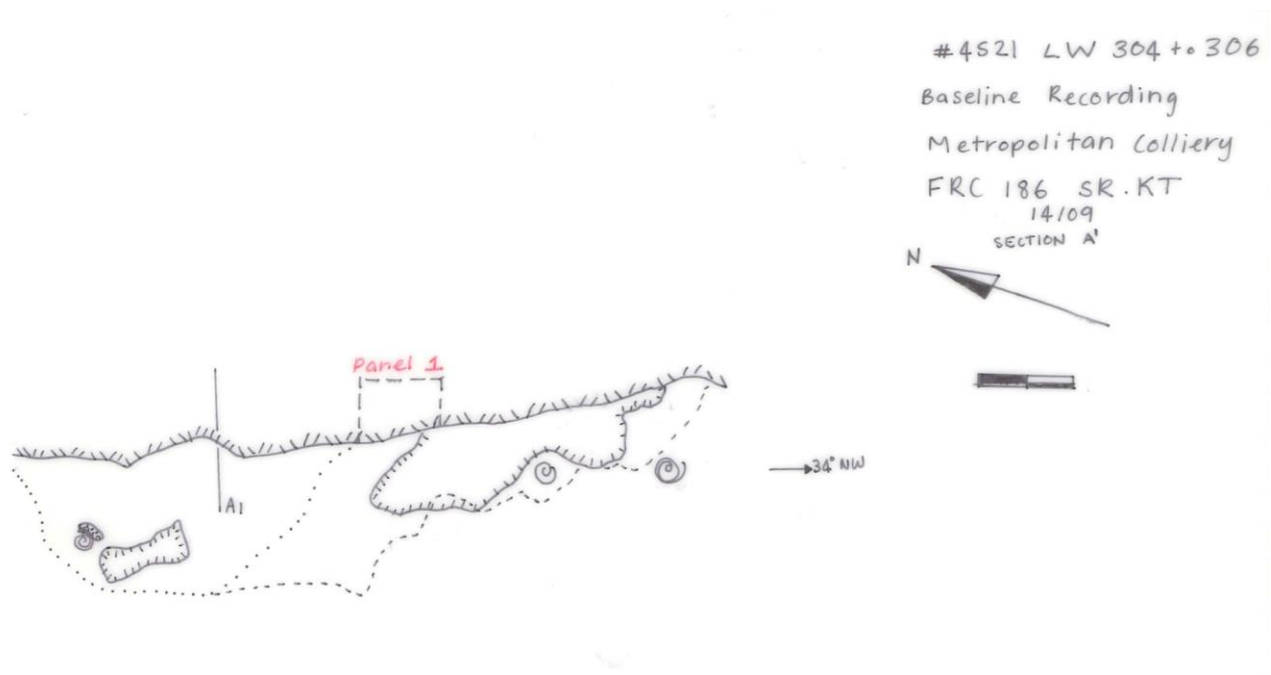


Figure 15: Plan of FRC 186.

#4521 LW 304-306
BASELINE RECORDING
METROPOLITAN COLLIERY
FRC 186 FLAT ROCK CREEK

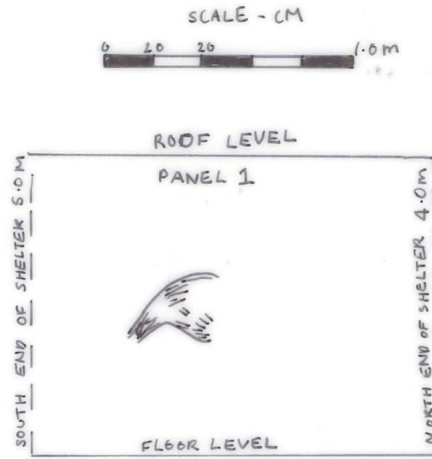


Figure 16: Artform Drawing of FRC 186, Panel 1. Reproduced from the AHIMS site card.

2.8.4 Baseline recording images – detailed panel recording

Panel 1



Plate 36: Detail of Panel 1 at FRC 186. Panel 1; Motif 1.

2.9 Flat Rock Creek 187 (FRC 187, AHIMS # 52-2-0225)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The art recorded by Sefton was relocated, however it was faded and the surface was undergoing active exfoliation and had experienced water wash.

2.9.1 FRC 187 baseline recording data

Table 16: Baseline recording data for FRC 187.

Overview					
Site type	Shelter with Art	Corrected MGAE	0311658	Corrected MGAN	6217354
Previous Recording	Site card- Caryl Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	15m	Depth	3m	Height	4.6m
Orientation	NE	Floor area	2m ²	Floor condition	
Location in Landscape	Continuous ridgeline 100m up from the stored water of Woronora Dam and 300m east of the end of Fire Road 9E.				
Shelter exterior/formation	Cavernous weathering/block fall, active exfoliation of blockfall.				
Shelter interior					
Distance to water	105m from Waratah Rivulet.	Landform	Ridgeline.		
Setting	Continuous – attached to Site FRC 186				
Archaeological Deposit					
Deposit	No	Describe	N/A		
Visible artefacts?	No	Where?	N/A	How many?	N/A
Art					
Art surfaces	Water wash, Algae growth and progressing exfoliation over Panel 1				
Art Condition	Faded and exfoliating				
Art Overview	On the rear wall in the open end of the shelter is 1 charcoal outline stingray 1230mm x 360mm.				
Damage/threats					
Water wash	Yes- over art	Graffiti	N/A	Macro vegetals	Yes – coral fern in bedding planes
Animals	N/A	Salt/granular loss	Yes – over art panel	Fissuring	Yes – multiple along the back wall
Insects	Yes – spiders and paper wasps	Spalling/exfoliation	Yes	Other	
Fire	N/A	Block fall	Yes – looks recent		

2.9.2 Baseline recording images – site overview



Plate 37: Overview of shelter at FRC 187. View looking Northwest



Plate 38: Overview of shelter at FRC 187. View looking Southeast

2.9.3 Baseline recording plans – site overview

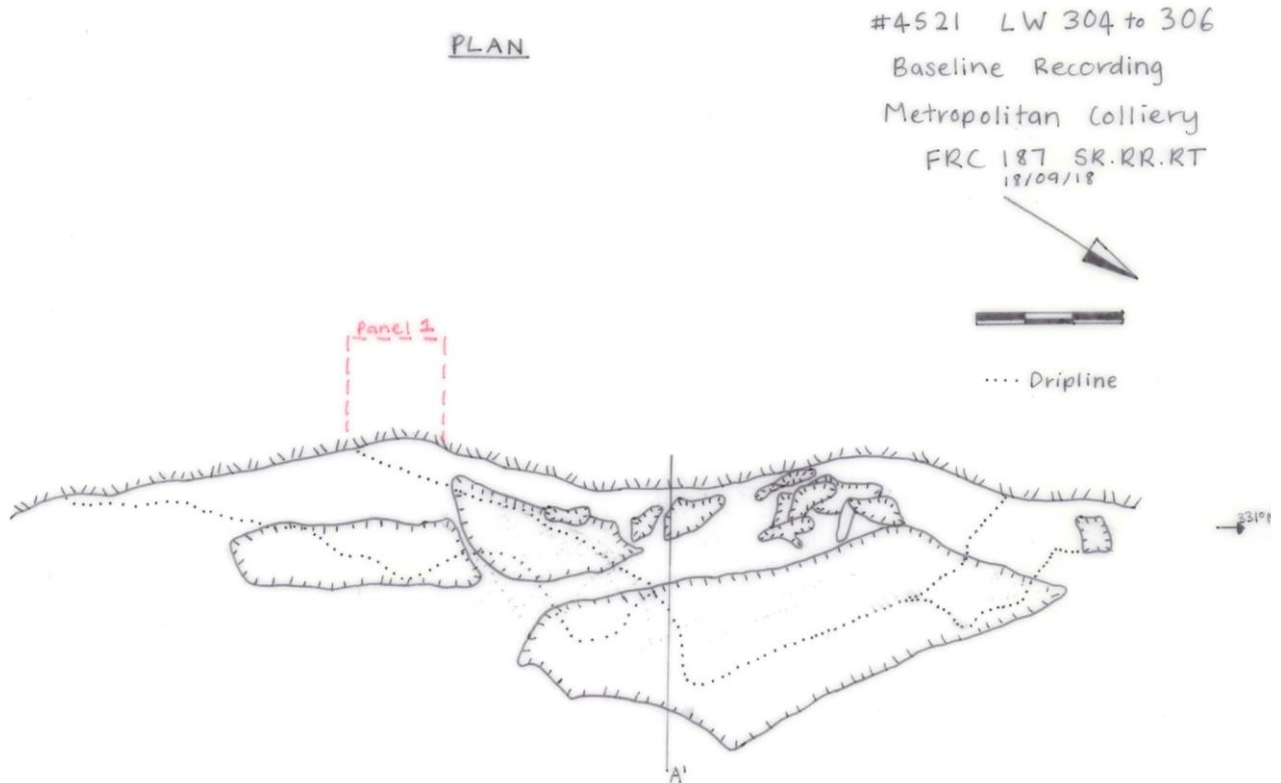


Figure 17: Plan of FRC 187.

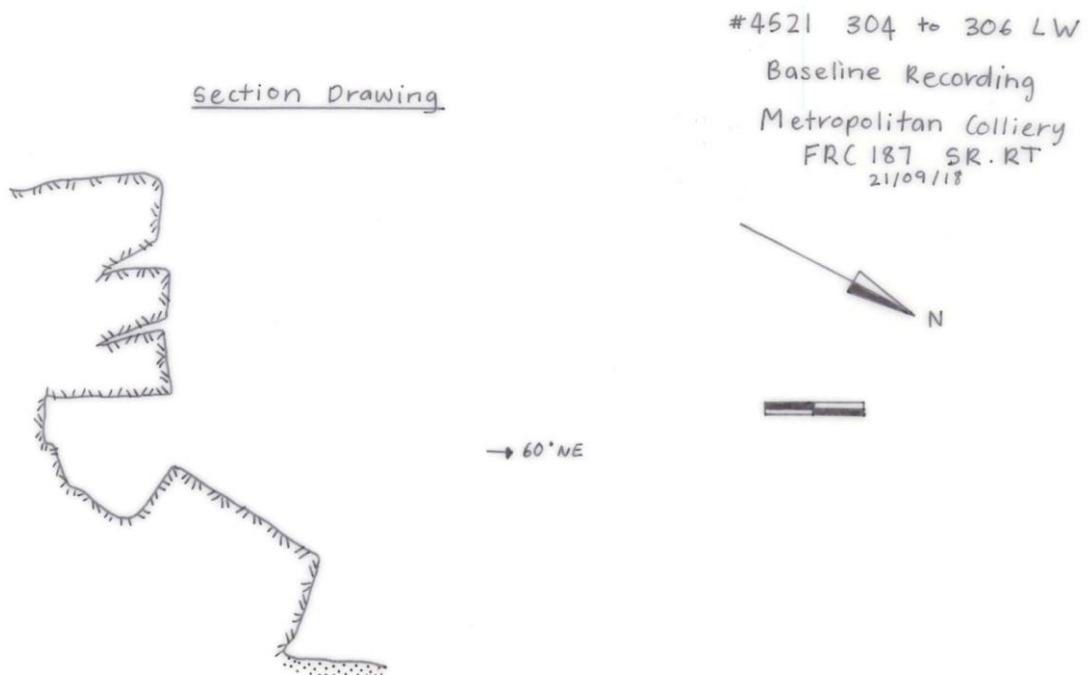


Figure 18: A1 Section of FRC 187.

#4521 LW 304-306
BASELINE RECORDING
METROPOLITAN COLLIERY
FRC 187 FLAT ROCK CREEK

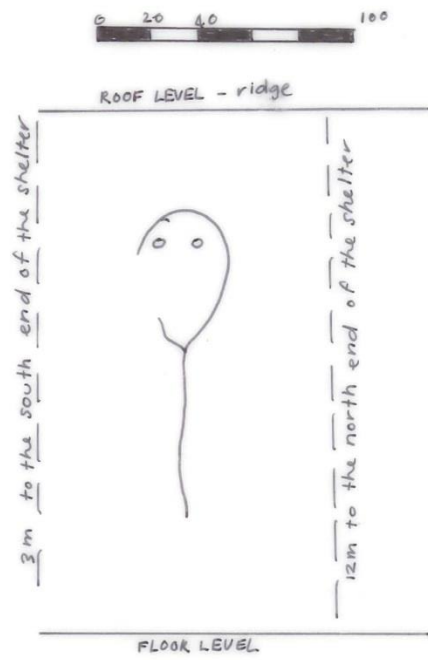


Figure 19: Artform drawing of FRC 187, Panel 1. Reproduced from the AHIMS site card.

2.9.4 Baseline recording images – detailed panel recording

Panel 1



Plate 39: Detail of Panel 1 at FRC 187. Panel 1; Motif 1.

2.10 Flat Rock Creek 191 (FRC 191, AHIMS# 52-2-0183)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and heavy blockfall in antiquity. The art recorded by Sefton were relocated during this baseline recording, however the condition was very poor. The art has been impacted by granular loss, and exfoliation of the rock surface, and there is evidence of block fall from the roof and outside the shelter. Algae growth is also present.

2.10.1 FRC 191 baseline recording data

Table 17: Baseline recording data for FRC 191.

Overview					
Site type	Shelter with Art and Deposit	Corrected MGAE	0311298	Corrected MGAN	6216248
Previous Recording	Site card – Caryl Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	21.5m	Depth	1.8m	Height	2m
Orientation	NNW	Floor area	21.5m x 2m	Floor condition	Good
Location in Landscape	On the southern side of a small unnamed tributary running E-W on the western side of the stored water of Woronora Dam, on the first ridgeline up from the creek.				
Shelter exterior/formation	The shelter has been formed by cavernous weathering and heavy blockfall.				
Shelter interior	Chemical weathering on roof of shelter, exfoliation and algae growth on back panel. Block fall out of dripline. Salt/granular loss on back wall. Wombat scat noticed on floor of shelter.				
Distance to water	30m North	Landform	First ridgeline up from creek line on the side of a small gully.		
Setting	Continuous overhang				
Archaeological Deposit					
Deposit	Yes	Describe	Grey sand approximately 50cm deep		
Visible artefacts?	None visible	Where?	N/A	How many?	N/A
Art					
Art surfaces	<p>Panel 1: Motif 1: has completely faded. Motif 2: the total of the macropod is barely visible and very patchy. Motif 3: Partial lines only visible, Motif 4: one complete macropod has faded and partial outline and the legs of the other macropod are visible. Motif 5: the head of the macropod is barely visible and the rest has faded and not visible. Motif 6: Partial line visible. Motif 7: partial lines visible. Motif 8: is completely gone.</p> <p>Panel 2: Motif 9: barely visible, nearly faded away. Motif 10: heavy fading since last recording barely visible. Motif 11: heavy fading since last recording barely visible. Motif 12 comprises of a human figure, Motif 13 through to 16 are heavily faded since their original recording.</p>				
Art Condition	Very poor				
Art Overview	1 human figure frontal, 2 kangaroo, 1 snake, 3 indeterminate and 1 fish.				
Damage/threats					
Water wash	No	Graffiti	N/A	Macro vegetals	Yes – Algae growth
Animals	Yes	Salt/granular loss	Yes – Back panel	Fissuring	N/A
Insects	No	Spalling/exfoliation	Yes – Back panel	Other	N/A
Fire	No	Block fall	Yes – from roof and outside of dripline.		

Table 18: Baseline recording data for art surfaces present within FRC 191.

Motif No.	Type	Form	Media	Colour	Measurement
Panel 1					
1	Completely faded	N/A	N/A	N/A	N/A
2	Partial macropod (only tail showing – rest is faded)	Infill – partial	Charcoal	Black	30 x 7 cm
3	Indeterminate	Outline – partial	Charcoal	Black	12 x 1 cm
4	Legs of macropod	Outline – partial	Charcoal	Black	80 x 1cm
5	Head of macropod (poor condition)	Outline – partial	Charcoal	Black	10 x 25cm
6	Macropod	Outline – partial	Charcoal	Black	25 x 25cm
7	Macropod	Infill of back – partial	Charcoal	Black	25 x 15cm
Panel 2					
9	Indeterminate	Partial	Charcoal	Black	15 x 25cm
10	Indeterminate	Partial	Charcoal	Black	10 x 20cm
11	Indeterminate	Infill – partial	Charcoal	Black	9 x 12cm
12	Human figure	Outline – complete	Charcoal	Black	32 x 23cm
13	Snake	Outline/infill - complete	Charcoal	Black	2.15 x 9cm
14	Indeterminate	Outline/infill – partial	Charcoal	Black	46 x 22cm
15	Macropod	Outline - partial	Charcoal	Black	22 x 13cm
16	Indeterminate	outline/infill - complete	Charcoal	Black	20 x 11cm

2.10.2 Baseline recording images – site overview



Plate 40: Overview of site FRC 191. View looking East.



Plate 41: Overview of site FRC 191. View looking Southwest.

2.10.3 Baseline recording plans – site overview

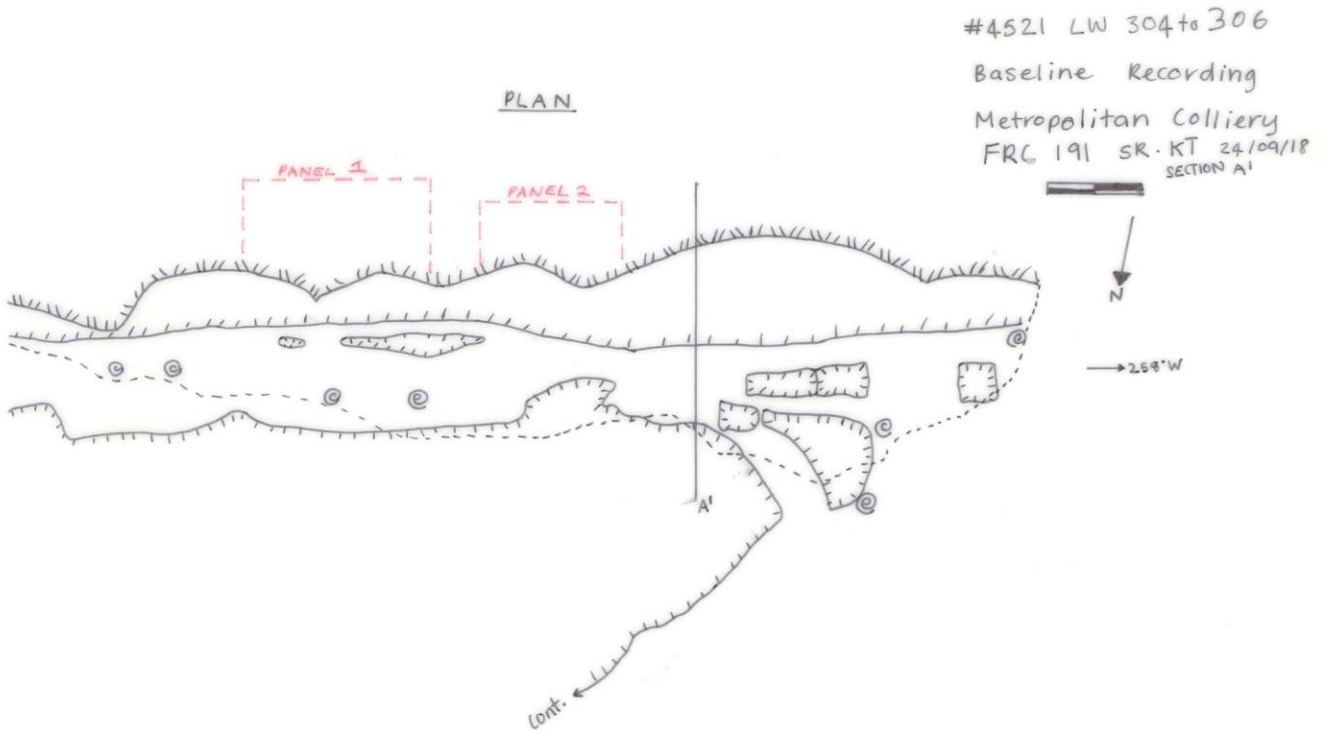


Figure 20: Plan of FRC 191.

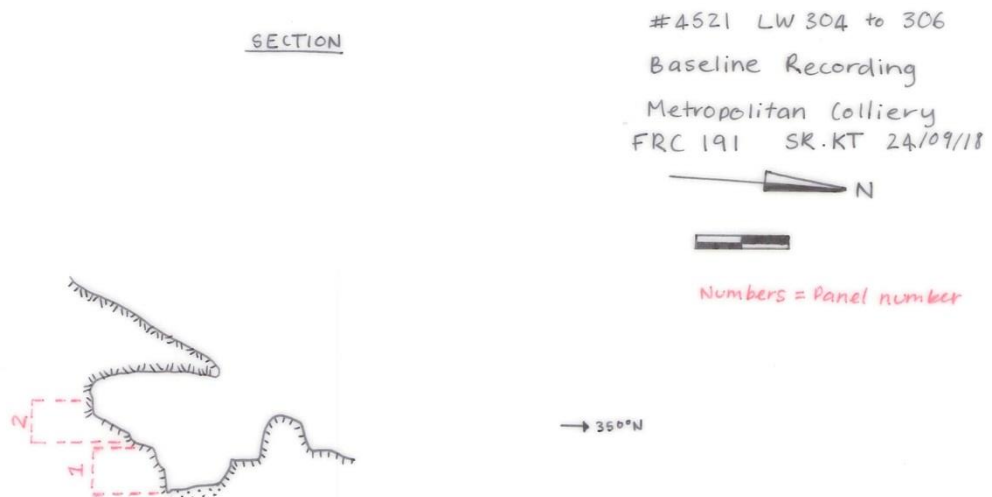


Figure 21: A1 Section of FRC 191.

2.10.4 Baseline recording images – detailed panel recording

Panel 1



Plate 42: Detail of Panel 1 at FRC 191. Panel 1, Motif 2.



Plate 43: Detail of Panel 1 at FRC 191. Panel 1, Motif 3.



Plate 44: Detail of Panel 1 at FRC 191. Panel 1, Motif 4.



Plate 45: Detail of Panel 1 at FRC 191. Panel 1, Motif 5.



Plate 46: Detail of Panel 1 at FRC 191. Panel 1, Motif 6.



Plate 47: Detail of Panel 1 at FRC 191. Panel 1, Motif 7.

Panel 2



Plate 48: Detail of Panel 2 at FRC 191. Panel 2; Motif 9, 10.



Plate 49: Detail of Panel 2 at FRC 191. Panel 2; Motif 11.



Plate 50: Overview of Panel 2 at FRC 191. Panel 2; Motif 10, 12, 13, 14, 15.

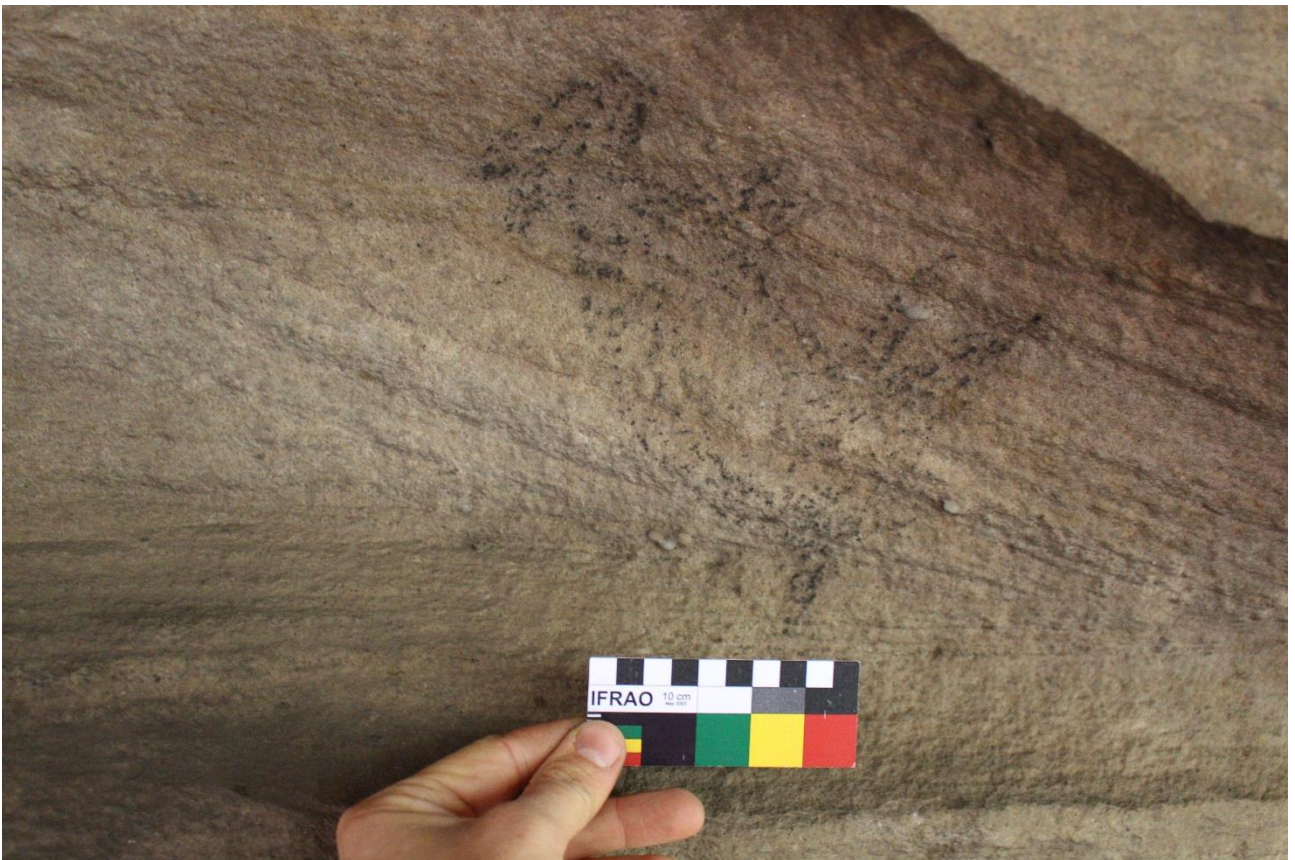


Plate 51: Detail of Panel 2 at FRC 191. Panel 2; Motif 16.

2.11 Flat Rock Creek 198 (FRC 198, AHIMS # 52-2-0268/ 52-2-0404)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The art is in poor condition and has been impacted by water wash, fading, white algae, silica accretion since it was first described by Sefton on the AHIMS site card. There was evidence of a person occupying the shelter, with fire damage and rubbish present. Fissuring was also present on the roof of the shelter.

2.11.1 FRC 198 baseline recording data

Table 19: Baseline recording data for FRC 198.

Overview					
Site type	Shelter with Art and Deposit	Corrected MGAE	0311280	Corrected MGAN	6216135
Previous Recording	Site card – Caryl Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	78m	Depth	6m	Height	1.4m
Orientation	S-SE	Floor area	4m x 78m	Floor condition	Good
Location in Landscape	Shelter is on Waratah Rivulet at the high water level of Woronora Dam. It is on the northern side of the rivulet facing SE and 500m from the start of the stored water				
Shelter exterior/formation	Block fall and cavernous weathering. Chemical weathering on roof. Algae growth on roof and back panel. Block fall from roof and outside of dripline.				
Shelter interior	Fissure line on roof. Disturbance from person living in shelter: fire damage, rubbish. Water wash on back panel around art surfaces. Exfoliation on roof through shelter. Wombat scat throughout shelter.				
Distance to water	20m	Landform	Lower slope: base of ridgeline, first overhang from the stored water.		
Setting	Continuous overhang.				
Archaeological Deposit					
Deposit	Yes	Describe	Brown loamy sand approximately 15cm deep		
Visible artefacts?	No – Noted on site card (though not described) but not found during site assessment.	Where?	N/A	How many?	N/A
Art					
Art surfaces	Art sample in very poor condition and very faded. Panel 1: water wash, white algae and silica over motif 1 and 2. Panel 2: water wash, white algae and silica over motif – extremely faded. Panel 3 – extremely faded, algae growth. Panel 4: faded, white algae.				
Art Condition	Poor condition.				
Art Overview	2 charcoal indeterminate drawings, 1 kangaroo charcoal drawing and 1 fish charcoal drawing. Panel 1: Motif 1 and 2 are drawn upside-down on site card. Panel 2 – multiple sections of motif 3 are faded and missing/two additional indeterminate lines noticed on return – (panel in wrong location on site drawing). Multiple indeterminate lines missing from motif 4. Indeterminate lines partially faded on motif 5. Fish partially faded on motif 6. Part of motif 7 is missing and one indeterminate line has completely faded.				
Damage/threats					
Water wash	Yes	Graffiti	N/A	Macro vegetals	Yes
Animals	Yes	Salt/granular loss	No	Fissuring	Yes
Insects	No	Spalling/exfoliation	Yes	Other	N/A
Fire	Yes	Block fall	Yes		

Table 20: Baseline recording data for art surfaces present within FRC 198.

Motif No.	Type	Form	Media	Colour	Measurement
Panel 1					
1	Indeterminate (14 parallel lines)	Partial	Charcoal	Black	25 x 15cm
2	Indeterminate	Partial - infill	Charcoal	Black	15 x 25cm
Panel 2					
3	Indeterminate (7 parallel lines)	Partial	Charcoal	Black	1.5m x 60cm
4	Indeterminate	Partial – outline/infill	Charcoal	Black	20 x 15cm
5	Indeterminate (5 parallel lines)	Partial	Charcoal	Black	15 x 10cm
6	Fish	Partial – outline/infill	Charcoal	Black	35 x 20cm
7	Indeterminate (4 lines)	Partial	Charcoal	Black	20 x 10cm

2.11.2 Baseline recording images – site overview



Plate 52: Overview of site FRC 198. View looking east.



Plate 53: Overview of site FRC 198. View looking west.

2.11.3 Baseline recording plans – site overview

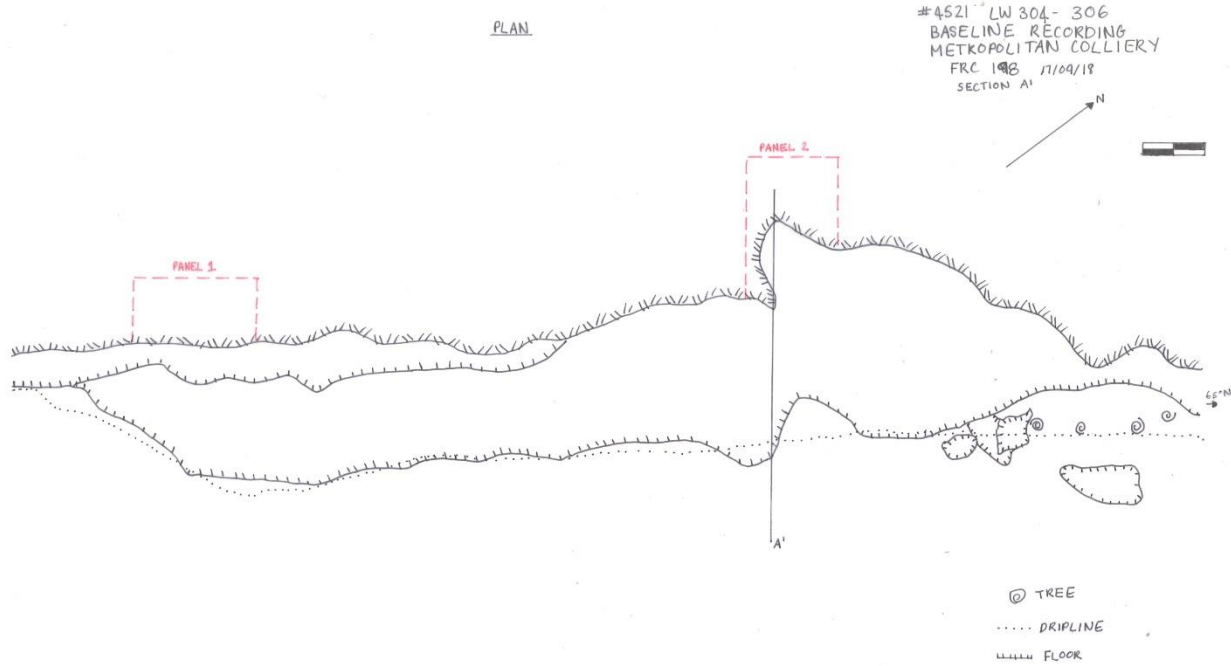


Figure 22: Plan of FRC 198.

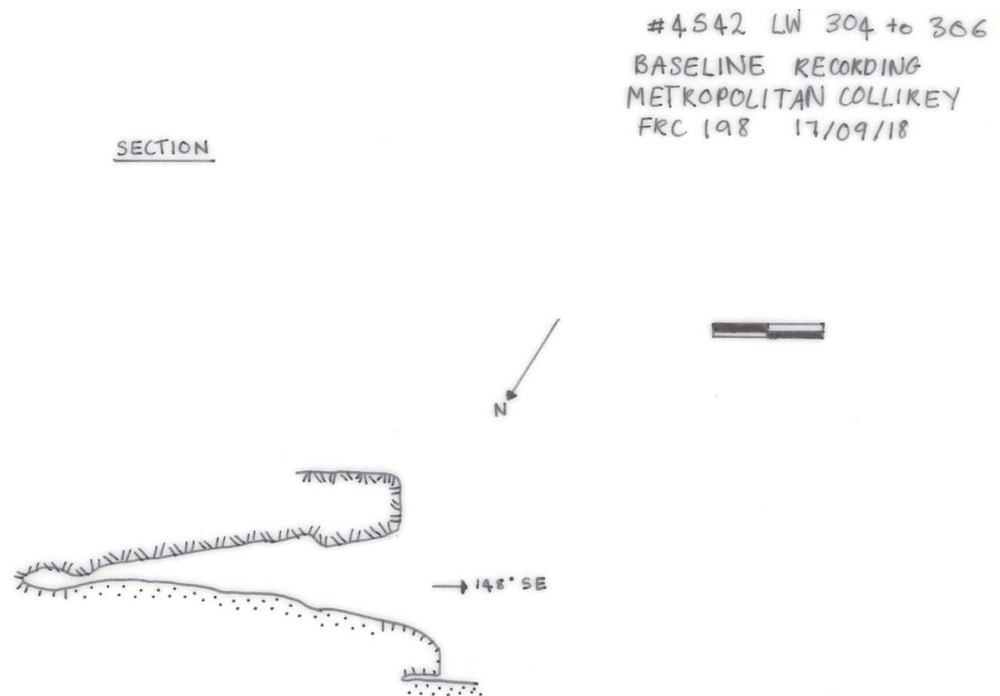


Figure 23: A1 Section of FRC 198.

4521 LW 304-306
BASELINE RECORDING
METROPOLITAN COLLIERY
FRC 198 FLAT ROCK CREEK

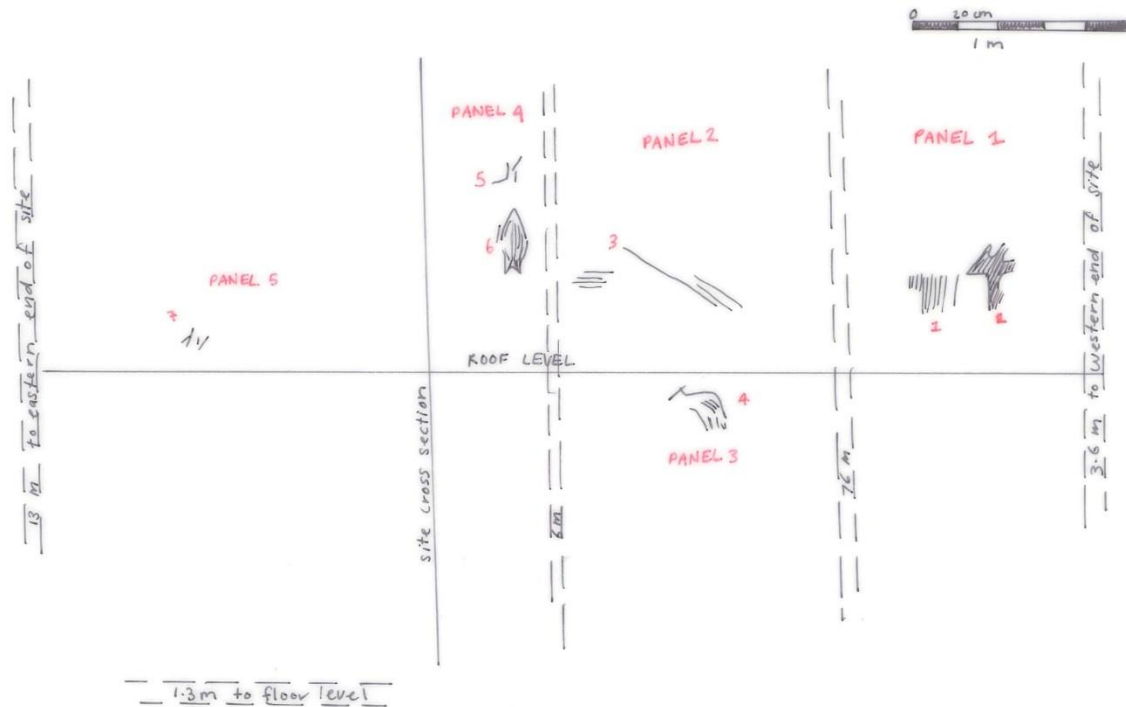


Figure 24: Artform drawing of FRC 198. Reproduced from the AHIMS site card.

2.11.4 Baseline recording images – detailed panel recording

Panel 1



Plate 54: Detail of Panel 1 at FRC 198. Panel 1, Motif 1, 2.

Panel 2



Plate 55: Detail of Panel 2 at FRC 198. Panel 2, Motif 3.

Panel 3



Plate 56: Detail of Panel 3 at FRC 198. Panel 3, Motif 4.

Panel 4



Plate 57: Detail of Panel 4 at FRC 198. Panel 4, Motif 5, 6.

Panel 5



Plate 58: Detail of Panel 5 at FRC 198. Panel 5, Motif 7.

2.12 Flat Rock Creek 254 (FRC 254, AHIMS# 52-2-0829)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The shelter showed evidence of chemical weathering, algae growth, honeycombing, block fall and also evidence of recent habitation due to discarded bag. The artefacts recorded by Sefton (in the AHIMS site card) within the shelter's dripline were not relocated during this baseline recording. The following artefacts were listed on the site card:

- 1 bipolar core (fossil wood, 22x22x11mm)
- 1 bipolar flake (chert, 11x11x4mm)
- 1 bipolar flake (fossil wood, 17x19x4mm)
- 1 flake (chert, 19x11x3mm)
- 1 flake (quartz, 22x16x4mm).

2.12.1 FRC 254 baseline recording data

Table 21: Baseline recording data for FRC 254.

Overview					
Site type	Shelter with Deposit	Corrected MGAE	0311585	Corrected MGAN	6216095
Previous Recording	Site card- Caryl Sefton Illawarra Prehistory Group	Date	7 July 2005		
Site Details					
Width	15m	Depth	6m	Height	2.4m
Orientation	W	Floor area	6m x 15m	Floor condition	Good
Location in Landscape	150m south of stored water, under second cliff down from the ridgetop.				
Shelter exterior/formation	Cavernous weathering block fall. (Photos on site card showing art are incorrect.)				
Shelter interior	Chemical weathering on roof of shelter, honey combing. Algae growth on back panel. Block fall from roof at dripline from roof. Evidence of habitation in the form of a rouge duffel bag.				
Distance to water	115m East of unnamed creek line.	Landform	Upper valley slope, second ridgeline down from the ridgetop.		
Setting	Steep Slope/continuous overhang.				
Archaeological Deposit					
Deposit	Yes	Describe	Cream loamy sand approximately 10cm deep		
Visible artefacts?	No – recorded on site card but not visible on assessment.	Where?	N/A	How many?	N/A
Art					
Art surfaces	N/A				
Art Condition	N/A				
Art Overview	N/A				
Damage/threats					
Water wash	N/A	Graffiti	N/A	Macro vegetals	Yes
Animals	No	Salt/granular loss	No	Fissuring	No
Insects	No	Spalling/exfoliation	No	Other	Chemical weathering.
Fire	No	Block fall	Yes		

2.12.2 Baseline recording images – site overview



Plate 59: Overview of site FRC 254. View looking Southeast.



Plate 60: Overview of site FRC 254. View looking Northwest.

2.12.3 Baseline recording plans – site overview

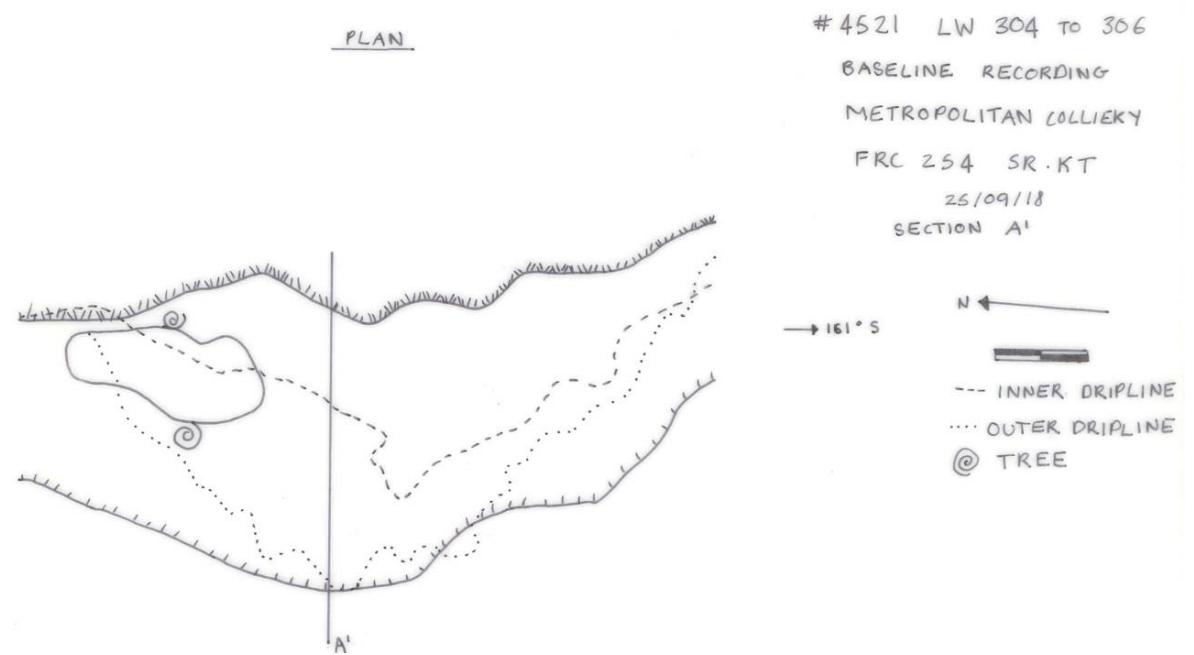


Figure 25: Plan of FRC 254.

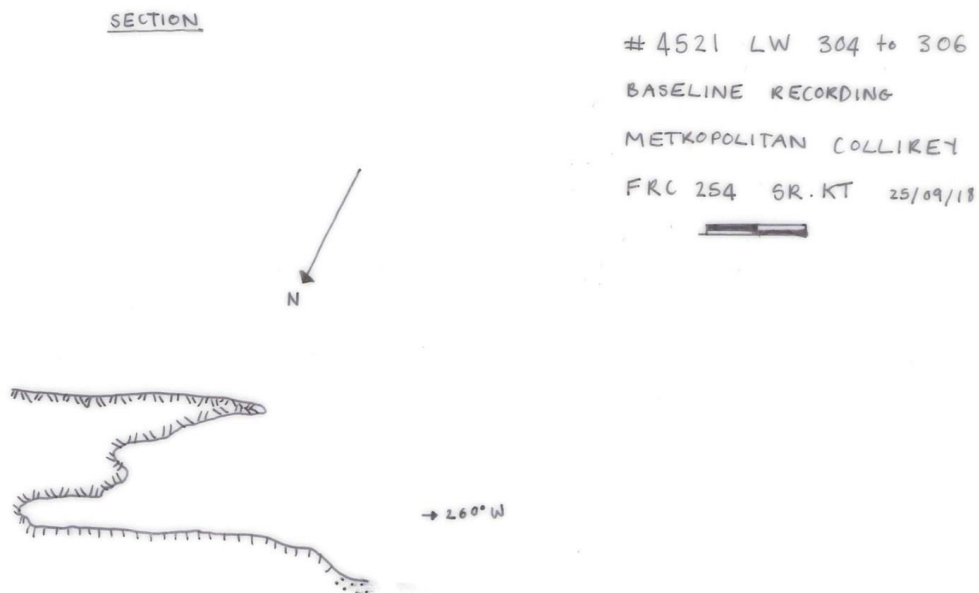


Figure 26: A1 Section of FRC 254.

2.13 Flat Rock Creek 311 (FRC 311, AHIMS# 52-2-3502)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The shelter shows evidence of chemical weathering, algae growth, exfoliation and block fall, and vegetation growth since it was first recorded by Sefton. The artefact recorded on the AHIMS site card was not relocated during this baseline survey. It is noted as:

- 1 pink chert bipolar core (24x15x10mm).

2.13.1 FRC 311 baseline recording data

Table 22: Baseline recording data for FRC 311.

Overview					
Site type	Shelter with Deposit	Corrected MGAE	0311890	Corrected MGAN	6217490
Previous Recording	Site card – Caryll Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	11.2m	Depth	2.5m	Height	2.7m
Orientation	SW facing	Floor area	11.2 x 2.5m	Floor condition	Good
Location in Landscape	Shelter is located 30m east of the stored water under the first ridgeline at the base of the slope.				
Shelter exterior/formation	Cavernous weathering and blockfall				
Shelter interior	Chemical weathering on roof and back panel, Algae growth on back panel and roof, exfoliation on roof and back panel, block fall – minor. Vegetation growth between back panel and floor. Animal scat visible.				
Distance to water	30m from stored water.	Landform	Base of ridgeline, Lower valley slope, first ridge in.		
Setting	Isolated overhang.				
Archaeological Deposit					
Deposit	Yes	Describe	Cream loamy sand approx 50cm deep.		
Visible artefacts?	No – recorded on site card, not on site assessment.	Where?	N/A	How many?	N/A
Art					
Art surfaces	N/A.				
Art Condition	N/A				
Art Overview	N/A				
Damage/threats					
Water wash	No	Graffiti	No	Macro vegetals	No
Animals	Yes – wallaby	Salt/granular loss	No	Fissuring	No
Insects	No	Spalling/exfoliation	Yes	Other	N/A
Fire	No	Block fall	Yes		

2.13.2 Baseline recording images – site overview



Plate 61: Overview of FRC 311. View looking East/Southeast.



Plate 62: Overview of FRC 311. View looking West/Southwest.

2.13.3 Baseline recording plans – site overview

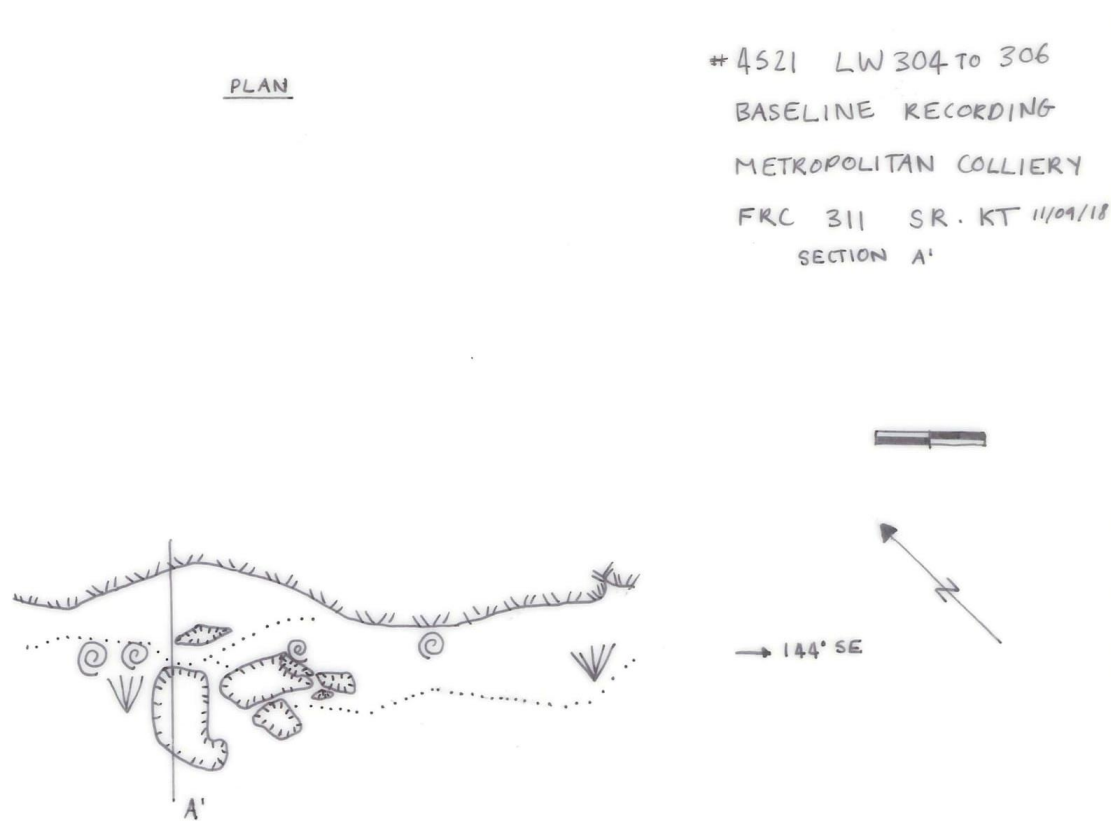


Figure 27: Plan of FRC 311.



Figure 28: A1 Section of FRC 311.

2.14 Flat Rock Creek 312 (FRC 312, AHIMS# 52-2-3503)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The shelter shows evidence of water wash and seepage. There is both macro and micro vegetal growth due to this moisture. Ochre deposits were not visible during the site assessment. The artefacts recorded by Sefton (in the AHIMS site card) on the shelter's dripline were not relocated during this baseline recording. The following artefacts were listed on the site card:

- 1 black chert flake (25x18x5mm)
- 1 white chert quartz flake (30x21x4mm)
- 1 white quartz flake (22x15x5mm).

2.14.1 FRC 312 baseline recording data

Table 23: Baseline recording data for FRC 312.

Overview					
Site type	Shelter with Deposit	Corrected MGAE	0311772	Corrected MGAN	6218105
Previous Recording	Site card – Caryl Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	11m	Depth	31m	Height	7m
Orientation	S facing	Floor area	11 x 31m	Floor condition	Good
Location in Landscape	On the north-western side of the creek gully that starts at the T intersection of Fire Rd 9I, at the base of the ridgeline.				
Shelter exterior/formation	Cavernous weathering and block fall, no ochre deposit visible on inspection.				
Shelter interior	Water wash and seepage on back panel between bedding planes. Seepage on roof between bedding planes. Ferns and macrovegetation growing out of bedding planes on roof and back panel from seepage. Microvegetation growth over back panel and roof from seepage.				
Distance to water	50-100m (Frews gully)	Landform	Creekline.		
Setting	Continuous overhang within edge of creekline.				
Archaeological Deposit					
Deposit	Yes	Describe	Red loamy sand approx. 35cm deep		
Visible artefacts?	No – artefacts recorded on site card, not located on site assessment.	Where?	N/A	How many?	N/A
Art					
Art Surfaces	N/A				
Art Condition	N/A				
Art Overview	N/A				
Damage/threats					
Water wash	Yes – on back panel	Graffiti	N/A	Macro vegetals	Yes – fern and algae growth out of bedding planes from seepage.
Animals	Yes - wallaby	Salt/granular loss	N/A	Fissuring	N/A
Insects	N/A	Spalling/exfoliation	N/A	Other	
Fire	N/A	Block fall	Yes – all throughout shelter close to dripline and eastern end of shelter.		

2.14.2 Baseline recording images – site overview



Plate 63: Overview of site FRC 312. View looking East.



Plate 64: Overview of site FRC 312. View looking West.

2.14.3 Baseline recording plans – site overview

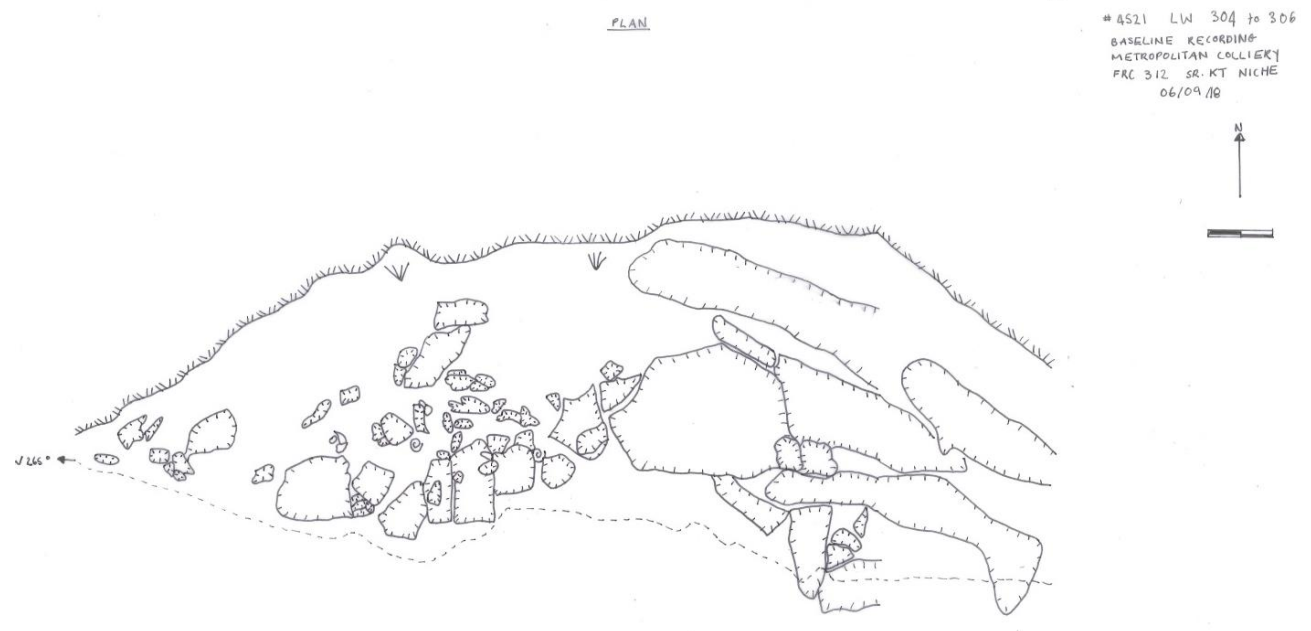


Figure 29: Plan of FRC 312.

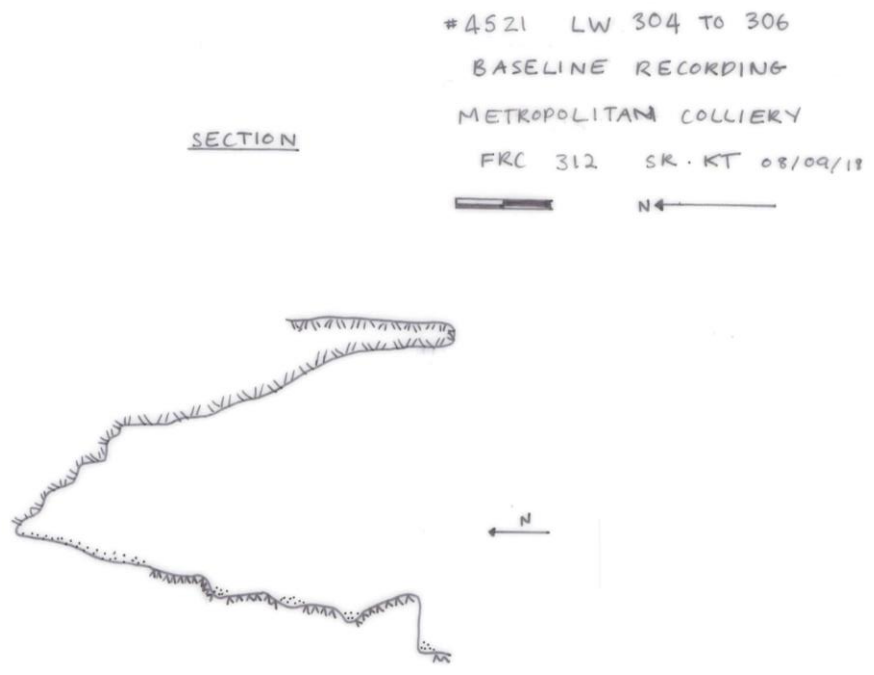


Figure 30: Plan of FRC 312.

2.15 Flat Rock Creek 313 (FRC 313, AHIMS # 52-2-3444)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The shelter shows evidence of block fall and seepage. There is macro and micro vegetal growth and tree roots, algae and ferns are present in the bedding plane. There was also evidence of silica and chemical weathering on the roof and back panel. The artefacts recorded by Sefton (in the AHIMS site card) on the shelter's dripline were not relocated during this baseline recording. The following artefacts were listed on the site card:

- 1 buff chert bipolar flake (25x8x7mm)
- 1 buff chert flake (20x12x5mm)
- 1 buff chert flake (17x11x4mm)
- 1 black chalcedony bipolar flake (20x18x4mm with 5% pebble cortex).

2.15.1 FRC 313 baseline recording data

Table 24 Baseline recording data for FRC 313.

Overview					
Site type	Shelter with Deposit	Corrected MGAE	0312060	Corrected MGAN	6218000
Previous Recording	Site card – Caryl Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	28m	Depth	9.8m	Height	3.5m
Orientation	W-SW	Floor area	90m ²	Floor condition	Moderate/ slight erosion.
Location in Landscape	Shelter under a large cliff line 150m west of Fire trail 9I and 300m SW of the T intersection on this fire trail.				
Shelter exterior/formation	Cavernous weathering and block fall				
Shelter interior	Fern growth in bedding plane on roof and back panel. Algae growth on roof and back panel. Seepage through bedding plane on roof. Silica and chemical weathering on roof and back panel. Exfoliation on roof in progress. Tree growth on roof of shelter and root growth out of bedding plane. Block fall from roof towards outer dripline. Insects were present and wallaby scat was noticed.				
Distance to water	<300m from stored water.	Landform	Mid to Upper valley slope/ridgeline.		
Setting	Continuous overhang, second ridgeline from top of ridge.				
Archaeological Deposit					
Deposit	Yes	Describe	Brown and yellow loamy sand approx. 15cm deep		
Visible artefacts?	No – recorded on site card but not relocated in inspection.	Where?	N/A	How many?	N/A
Art					
Art Surfaces	N/A				
Art Condition	N/A				
Art Overview	N/A				
Damage/threats					
Water wash	N/A	Graffiti	N/A	Macro vegetals	Yes
Animals	Yes	Salt/granular loss	N/A	Fissuring	No
Insects	Yes	Spalling/exfoliation	Yes	Other	N/A
Fire	N/A	Block fall	Yes		

2.15.2 Baseline recording images – Site Overview



Plate 65: Overview of site FRC 313. View looking South-Southeast.



Plate 66: Overview of site FRC 313. View looking Northeast.

2.15.3 Baseline recording plans – Site overview



Figure 31: Plan of FRC 313.

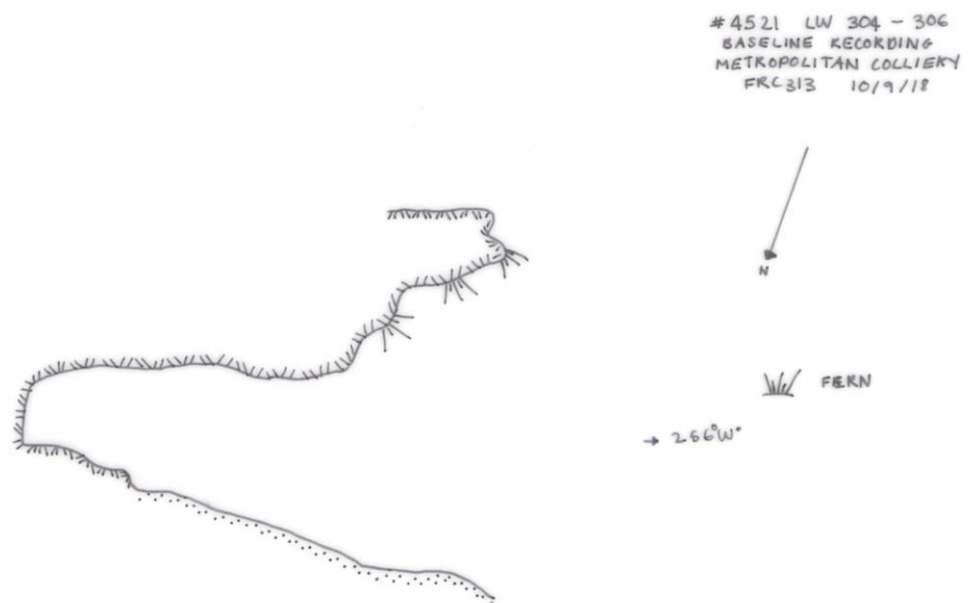


Figure 32: A1 Section of FRC 313.

2.16 Flat Rock Creek 316 (FRC 316, AHIMS # 52-2-3447)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The shelter shows evidence of exfoliation and chemical weathering. The artefacts recorded by Sefton (in the AHIMS site card) on the shelter's dripline were not relocated during this baseline recording. The following artefacts were listed on the site card:

- 1 orange/cream chert flake (20x12x2mm)
- 1 light brown chert flake (17x14x2mm)
- 1 black chert flake (35x17x3mm)
- 1 red chert core (20x15x10mm with 40% pebble cortex)
- 1 grey chert flaked piece (17x8x5mm).

2.16.1 FRC 316 baseline recording data

Table 25 Baseline recording data for FRC 316.

Overview					
Site type	Shelter with Deposit.	Corrected MGAE	0312093	Corrected MGAN	6217745
Previous Recording	Site card – Caryll Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	11m	Depth	3.9m	Height	2.2m
Orientation	W facing	Floor area	4m ²	Floor condition	
Location in Landscape	Top of ridgeline, first ridgeline before proceeding down slope.				
Shelter Exterior/formation	Cavernous weathering and block fall				
Shelter Interior	Exfoliation, chemical weathering.				
Distance to water	>500m	Landform	Top of ridgeline.		
Setting	Isolated overhang.				
Archaeological Deposit					
Deposit	Yes	Describe	Cream Sand of approx. 15cm deep		
Visible artefacts?	No – recorded on site card, not relocated in inspection	Where?	No	How many?	N/A
Grinding Groove					
Surfaces	N/A				
Condition	N/A				
Damage/threats					
Water wash	Yes	Graffiti	N/A	Macrovegetals	Yes
Animals	No	Salt/granular loss	Yes	Fissuring	Yes
Insects	No	Spalling/exfoliation	Yes	Other	N/A
Fire	No	Block fall	Yes		

2.16.2 Baseline recording images – Site Overview



Plate 67: Overview of site FRC 316. View looking South-Southeast.



Plate 68: Overview of site FRC 316. View looking North.

2.16.3 Baseline recording plans – Site overview

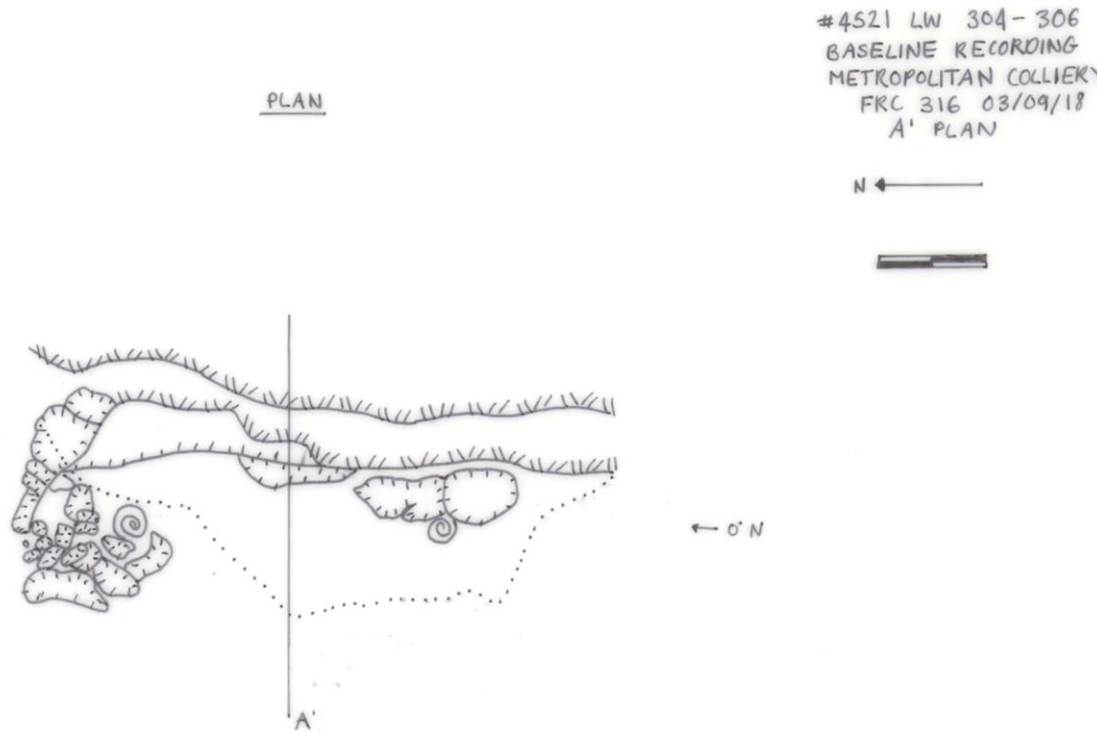


Figure 33: Plan of FRC 316.

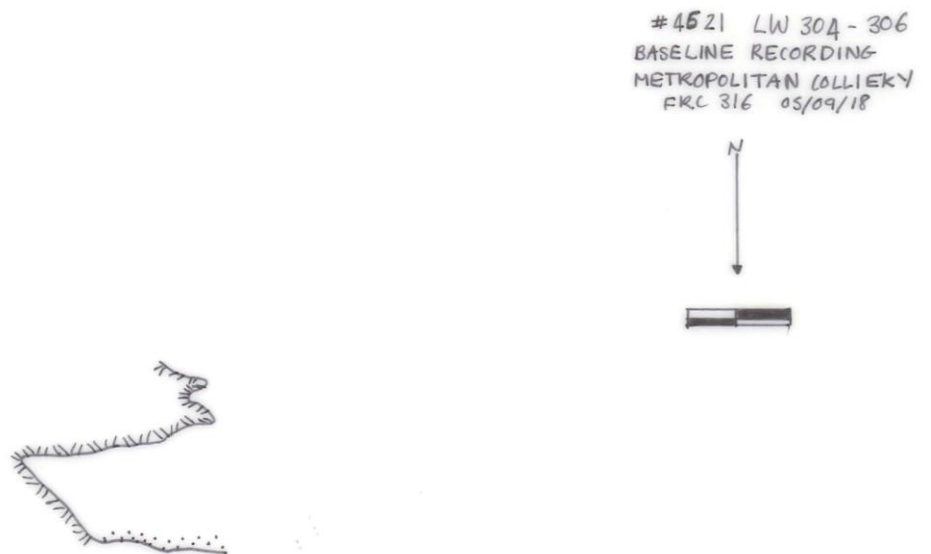


Figure 34: Plan of FRC 316.

2.17 Flat Rock Creek 340 (FRC 340, AHIMS # 52-2-3471)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The art is in poor condition and has been impacted by water wash, and chemical weathering since it was first described by Sefton on the AHIMS site card. There was evident seepage from the bedding planes, exfoliation on the roof, and block fall near the dripline and the southern end of the shelter.

2.17.1 FRC 340 baseline recording data

Table 26 Baseline recording data for FRC 340.

Overview					
Site type	Shelter with Art and Deposit	Corrected MGAE	0311619	Corrected MGAN	6217570
Previous Recording	Site card – Caryl Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	15m	Depth	2.3m	Height	2.3m
Orientation	N-NE	Floor area	15 x 2.3m	Floor condition	Good
Location in Landscape	The shelter is 70m west from the stored water, 210m NE of the Fire Trail 9E – under second cliffline up from stored water.				
Shelter exterior/formation	Cavernous weathering and block fall.				
Shelter interior	Chemical weathering on roof, minimal macro vegetation between bedding plane. Seepage from bedding planes on back panel, exfoliation visible on roof. Block fall near dripline and at southern end of shelter. Water wash on back panel around art surfaces.				
Distance to water	70m	Landform	Mid to Lower Valley Slope, mid ridgeline.		
Setting	Continuous overhang.				
Archaeological Deposit					
Deposit	Yes	Describe	Cream Sand approx. 45cm deep		
Visible artefacts?	N/A	Where?	N/A	How many?	N/A
Art					
Art Surfaces	Poor, seepage points and chemical weathering on back panel between art panels. Some art has been removed by water wash.				
Art Condition	Poor				
Art Overview	Panel 1 comprises of motif 1 stingray, motif 2 and 3 charcoal indeterminates and motif 4 macropod outline with indeterminate lines and infill. Panel 2 comprises of one charcoal indeterminate. Panel 3 comprises of charcoal macropod paw prints.				
Damage/threats					
Water wash	Yes	Graffiti	N/A	Macro vegetals	Yes
Animals	No	Salt/granular loss	No	Fissuring	No
Insects	Yes – spiders	Spalling/exfoliation	Yes	Other	N/A
Fire	No	Block fall	Yes		

Table 27 Baseline recording data for art surfaces present within FRC 340

Motif No.	Type	Form	Media	Colour	Measurement
Panel 1					
1	Stingray	Complete	Charcoal	Black	38 x 26cm
2	Indeterminate infill/outline	Partial?	Charcoal	Black/water wash over	18 x 40cm
3	Indeterminate outline	Partial?	Charcoal	Black/water wash	50 x 20cm
4	Macropod outline/infill with indeterminate lines and indeterminate infill	Partial	Charcoal	Black/water wash	70 x 40cm
5	Indeterminate line/infill	Partial	Charcoal	Black/water wash	32 x 28cm
Panel 2					
6	Indeterminate line/infill	Partial	Charcoal	Black/case hardening	32 x 12cm
Panel 3					
7	Macropod paw prints infill	Complete	Charcoal	Black/case hardening	10 x 8cm

2.17.2 Baseline recording images – Site Overview



Plate 69: Overview of FRC 340. View looking West.



Plate 70: Overview of FRC 340. View looking East

2.17.3 Baseline recording plans – Site overview

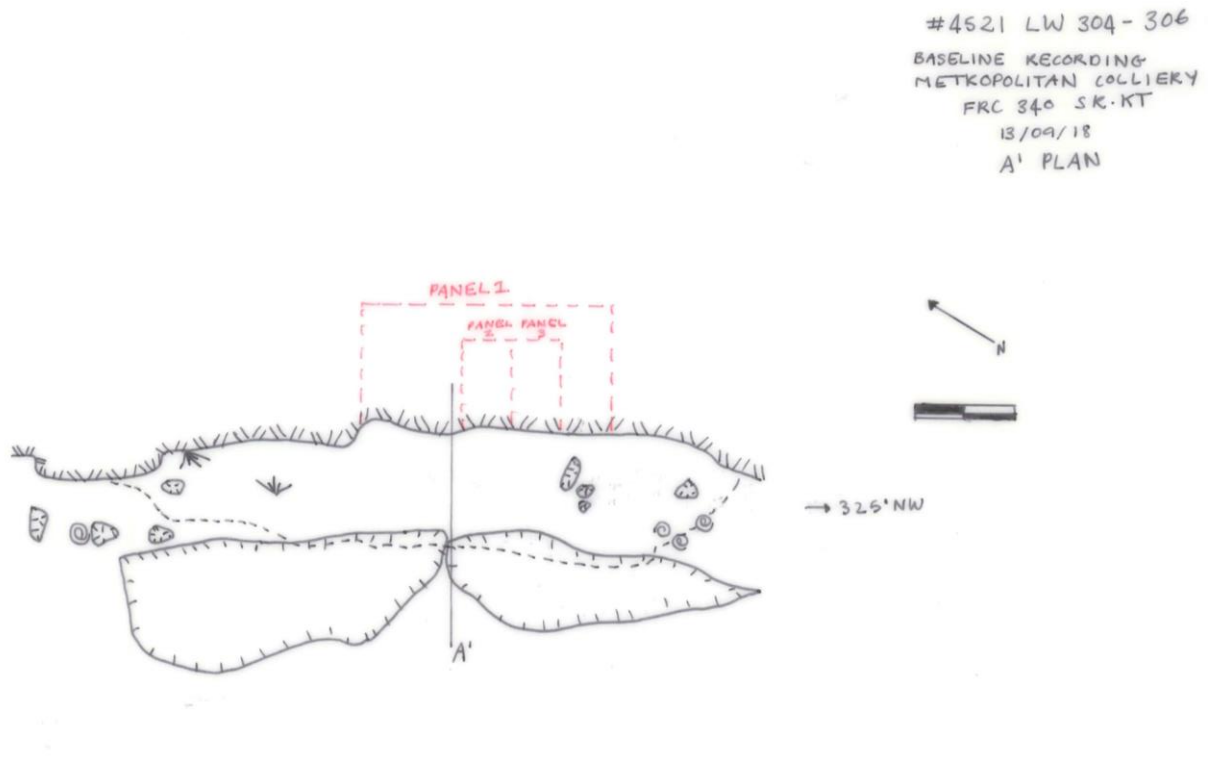


Figure 35: Plan of FRC 340.

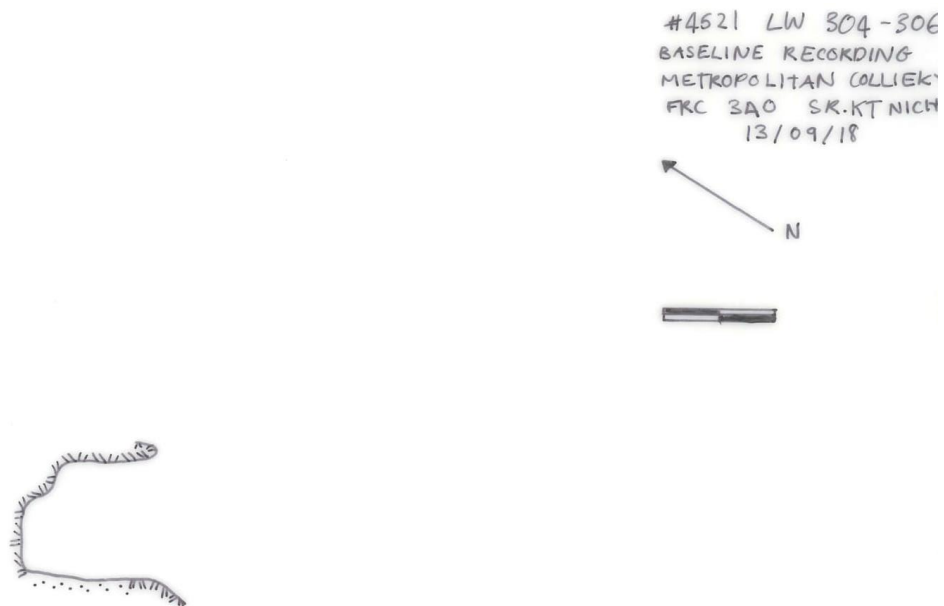


Figure 36: A1 Section of FRC 340.

#4521 LW 304-306
BASELINE RECORDING
METROPOLITAN COLLIERY
FRC 340 SR, KT, RR
18-09-2018

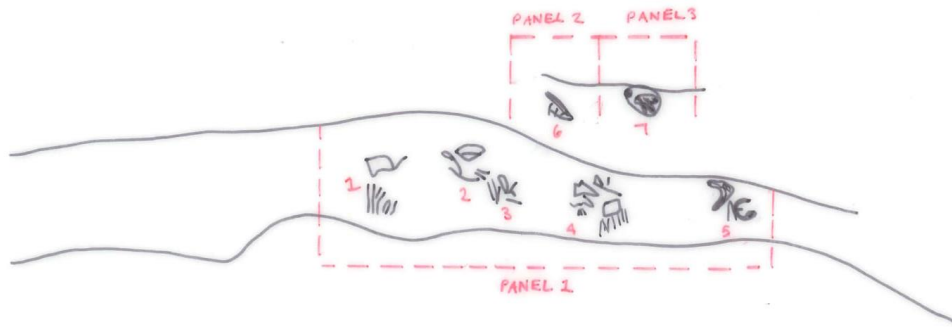
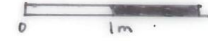


Figure 37: Art at FRC 340. Reproduced from the AHIMS site card.

2.17.4 Baseline recording images – Detailed panel recording



Plate 71: Detail of Panel 1 at FRC 340. Panel 1, Motif 1.



Plate 72: Detail of Panel 1 at FRC 340. Panel 1, Motif 2.

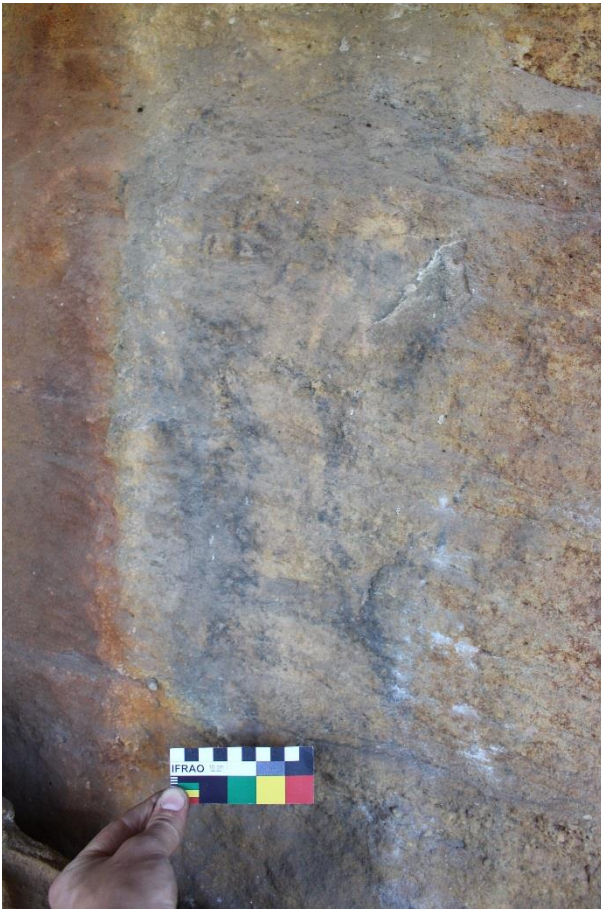


Plate 73: Detail of Panel 1 at FRC 340. Panel 1, Motif 3.



Plate 74: Detail of Panel 1 at FRC 340. Panel 1, Motif 4.



Plate 75: Detail of Panel 1 at FRC 340. Panel 1, Motif 5.



Plate 76: Detail of Panel 2 at FRC 340. Panel 2 Motif 6.



Plate 77: Detail of Panel 3 at FRC 340. Panel 3, Motif 7.

2.18 Flat Rock Creek 344 (FRC 344, AHIMS # 52-2-3475)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The shelter shows evidence of subsidence and water wash. The artefacts recorded by Sefton (in the AHIMS site card) on the shelter's dripline were not relocated during this baseline recording. The following artefacts were listed on the site card:

- 1 pink silcrete flake (24x14x9mm with 50% pebble cortex)
- 1 grey chert core (39x28x28mm with 10% pebble cortex).

2.18.1 FRC 344 baseline recording data

Table 28 Baseline recording data for FRC 344

Overview					
Site type	Shelter with Deposit	Corrected MGAE	0311410	Corrected MGAN	6216805
Previous Recording	Site card – Caryll Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	13m	Depth	2.8m	Height	2.9m
Orientation	E	Floor area	13 x 2.8m	Floor condition	Good
Location in Landscape	Shelter is 310m NW of stored water, 257m SE of Fire Trail 9E from a point 500m from its end, mid to upper slope. Second ridgeline down from top of ridgetop.				
Shelter exterior/formation	The shelter was formed by block fall, the shelter further up the ridgeline has broken off and formed a shelter. Section was formed by cavernous weathering.				
Shelter interior	Algae growth on roof, fern growth out of bedding planes, tree on top of shelter. Wombat burrow at back of shelter. Block fall visible from roof at back of shelter. Further block fall possible from subsidence.				
Distance to water	290m	Landform	Mid to Upper valley Slope, second ridgeline down from ridgetop.		
Setting	Isolated overhang.				
Archaeological Deposit					
Deposit	Yes	Describe	Brown loamy sand approx. 15cm deep		
Visible artefacts?	No – listed on site card but not on inspection.	Where?	N/A	How many?	
Art					
Art Surfaces	N/A				
Art Condition	N/A				
Art Overview	N/A				
Damage/threats					
Water wash	No	Graffiti	No	Macro vegetals	Yes
Animals	Yes	Salt/granular loss	No	Fissuring	No
Insects	Yes	Spalling/exfoliation	No	Other	N/A
Fire	No	Block fall	Yes		

2.18.2 Baseline recording images – Site Overview



Plate 78: Overview of FRC 344. View looking North.



Plate 79: Overview of FRC 344. View looking South.

2.18.3 Baseline recording plans – Site overview

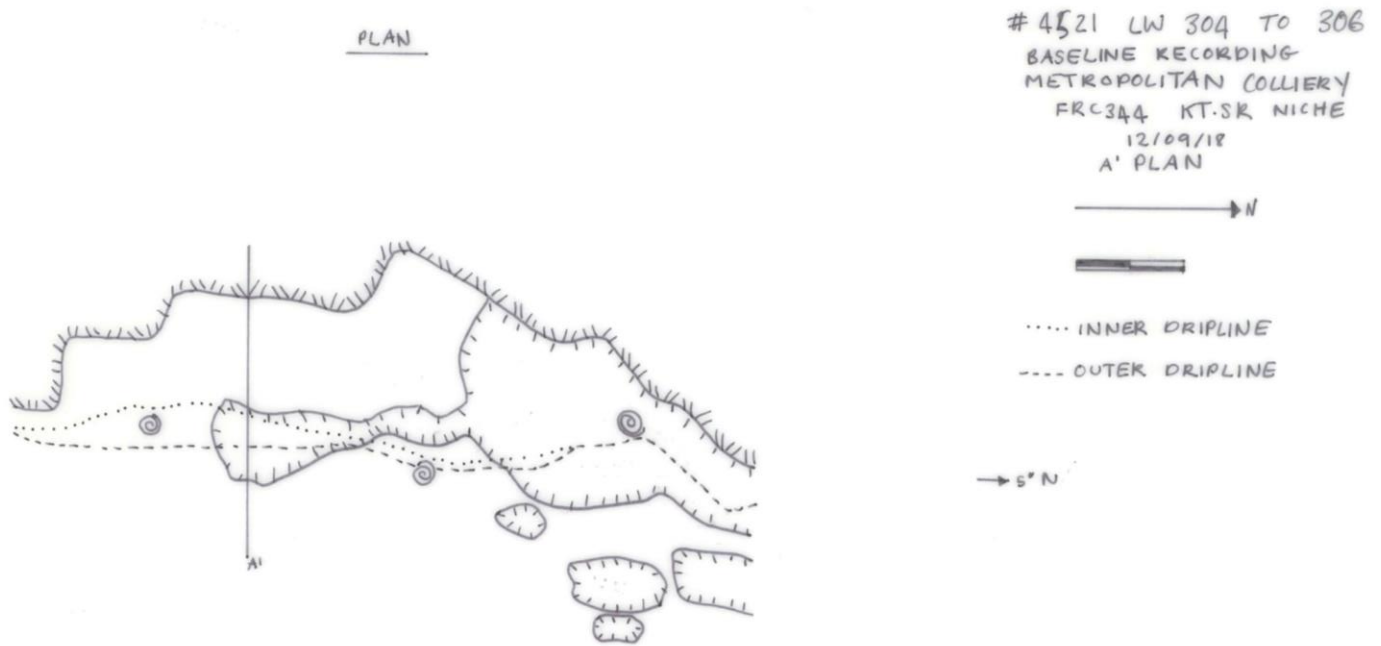


Figure 38: Plan of FRC 344.

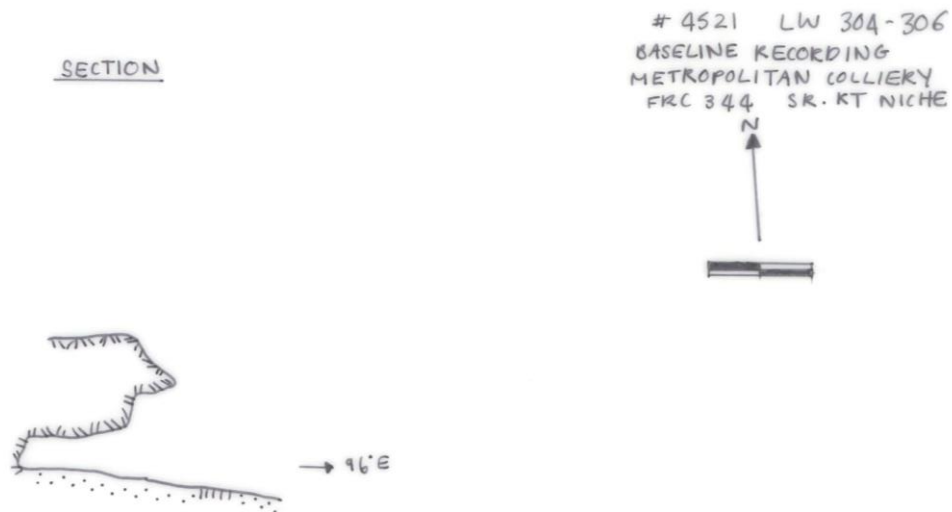


Figure 39: A1 Section of FRC 344.

2.19 Flat Rock Creek 345 (FRC 345, AHIMS # 52-2-3476)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The shelter shows evidence of chemical weathering and algae growth on the roof and back panel, and there is macrovegetal growth and animal scat present on site. There is also evidence of fissures along the full length of the roof of the shelter. The artefacts recorded by Sefton (in the AHIMS site card) on the shelter's dripline were not relocated during this baseline recording. The following artefacts were listed on the site card:

- 1 grey chert thumbnail scraper (19x19x11mm)
- 1 grey chert bipolar flake (14x12x10mm)
- 1 grey silcrete bipolar flake (16x8x3mm)
- 1 grey chert bipolar flake (12x8x2mm)
- 1 white quartz bipolar flake (11x8x3mm).

2.19.1 FRC 345 baseline recording data

Table 29 Baseline recording data for FRC 345

Overview					
Site type	Shelter with Deposit	Corrected MGAE	0311458	Corrected MGAN	6216973
Previous Recording	Site card – Caryll Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	9.7m	Depth	3.2m	Height	1.4m
Orientation	ESE facing	Floor area	9.7 x 3.2m	Floor condition	Good
Location in Landscape	Shelter is 190m south east of Fire Trail and 395m NW of the stored water.				
Shelter exterior/formation	Cavernous weathering and block fall. Tree growth and possible root growth on top of shelter roof.				
Shelter interior	Chemical weathering and algae growth on roof and back panel. Minimal macrovegetation between back panel and bedding plane. Minimal block fall. Fissuring noted along full length of roof. Exfoliation in progress on back panel. Animal scat: possibly Wombat or Wallaby. Seepage points on back panel.				
Distance to water	470m SW of an unnamed creek.	Landform	Upper valley Slope, two ridges down from ridgetop.		
Setting	Isolated overhang.				
Archaeological Deposit					
Deposit	Yes	Describe	Grey Sand approx. 50cm deep		
Visible artefacts?	No- Listed on site card but not visible on assessment.	Where?	N/A	How many?	N/A
Art					
Art Surfaces	N/A				
Art Condition	N/A				
Art Overview	N/A				
Damage/threats					
Water wash	Yes	Graffiti	N/A	Macro vegetals	Yes
Animals	Yes	Salt/granular loss	N/A	Fissuring	Yes
Insects	No	Spalling/exfoliation	Yes	Other	N/A
Fire	No	Block fall	Yes		

2.19.2 Baseline recording images – Site Overview



Plate 80: Overview of FRC 345. View looking Northeast.



Plate 81: Overview of FRC 345. View looking Southeast.

2.19.3 Baseline recording plans – Site overview

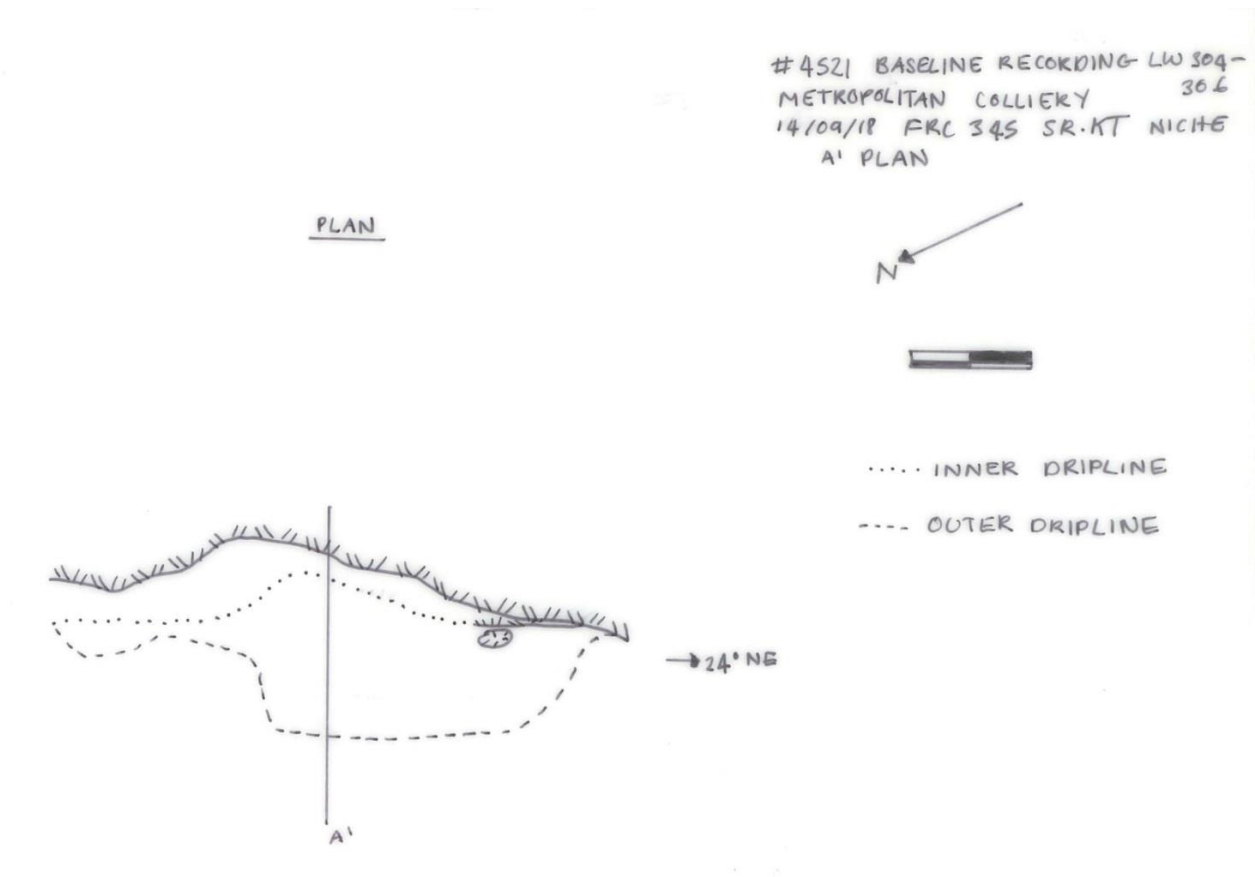


Figure 40: Plan of FRC 345.

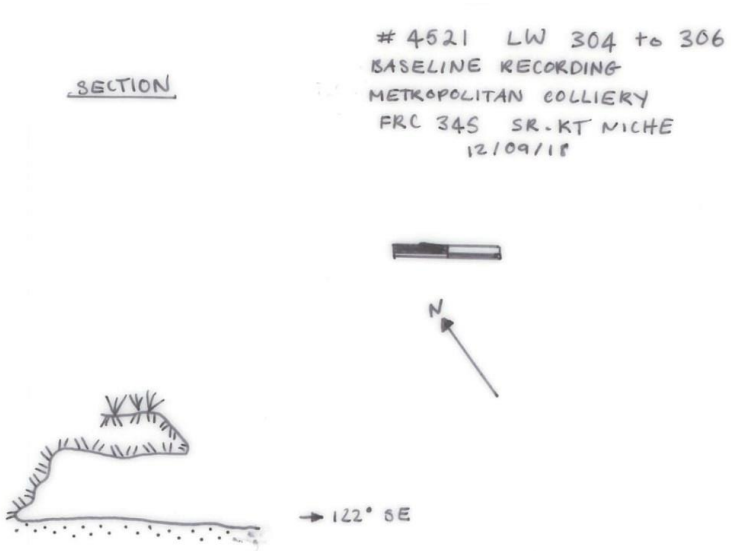


Figure 41: A1 Section of FRC 345.

2.20 North East Woronora 1 (NEW 1, AHIMS # 52-2-0219)

This grinding groove site is located on a large open area of sandstone with many shallow plans. There is one visible groove in the SE end of the outcrop. The condition was noted as per the AHIMS site card (first recorded by Sefton).

2.20.1 NEW 1 baseline recording data

Table 30 Baseline recording data for NEW 1

Overview					
Site type	Axe Grinding Groove	Corrected MGAE	0311864	Corrected MGAN	6218385
Previous Recording	Site card – Caryll Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	35m	Length	20m	Height	N/A
Orientation	N/A	Floor area	N/A	Floor condition	N/A
Location in Landscape	Grinding site is approx. 200m SSE of the large art site at NEW2 and approx. 300m WNW of the intersection on Fire Road 9I				
Site context	On the ridge top				
Distance to water	200m	Landform	Upper Basin		
Setting	Gradual Slope				
Archaeological Deposit					
Deposit	N/A	Describe	N/A		
Visible artefacts?	N/A	Where?	N/A	How many?	N/A
Grinding Groove					
Surfaces	1 grinding groove at the side of a large flat pan at the SE end of the sandstone outcrop				
Condition	Distinct. Grinding groove size, 25x8x1cm				
Damage/threats					
Water wash	N/A	Graffiti	N/A	Macrovegetals	N/A
Animals	N/A	Salt/granular loss	N/A	Fissuring	N/A
Insects	N/A	Spalling/exfoliation	N/A	Other	N/A
Fire	N/A	Block fall	N/A		

Table 31 Baseline recording data for grinding grooves at NEW 1.

Site Context	
Site Dimensions	25 x 8 x 1cm
Context	Located on the ridge top on a large open area of sandstone with many shallow pans
Site Condition	Poor- eroding
Groove Description	
Number of groups grooves	1
Total number of grooves	1
Type, Profile	U shape
Function	Axe Grinding
Condition	Poor- eroding
Orientation	S-SE

2.20.2 Baseline recording images – Site Overview



Plate 82: Overview of NEW 1. View looking North.



Plate 83: Overview of NEW 1. View looking South.

2.20.3 Baseline recording plans – Site overview

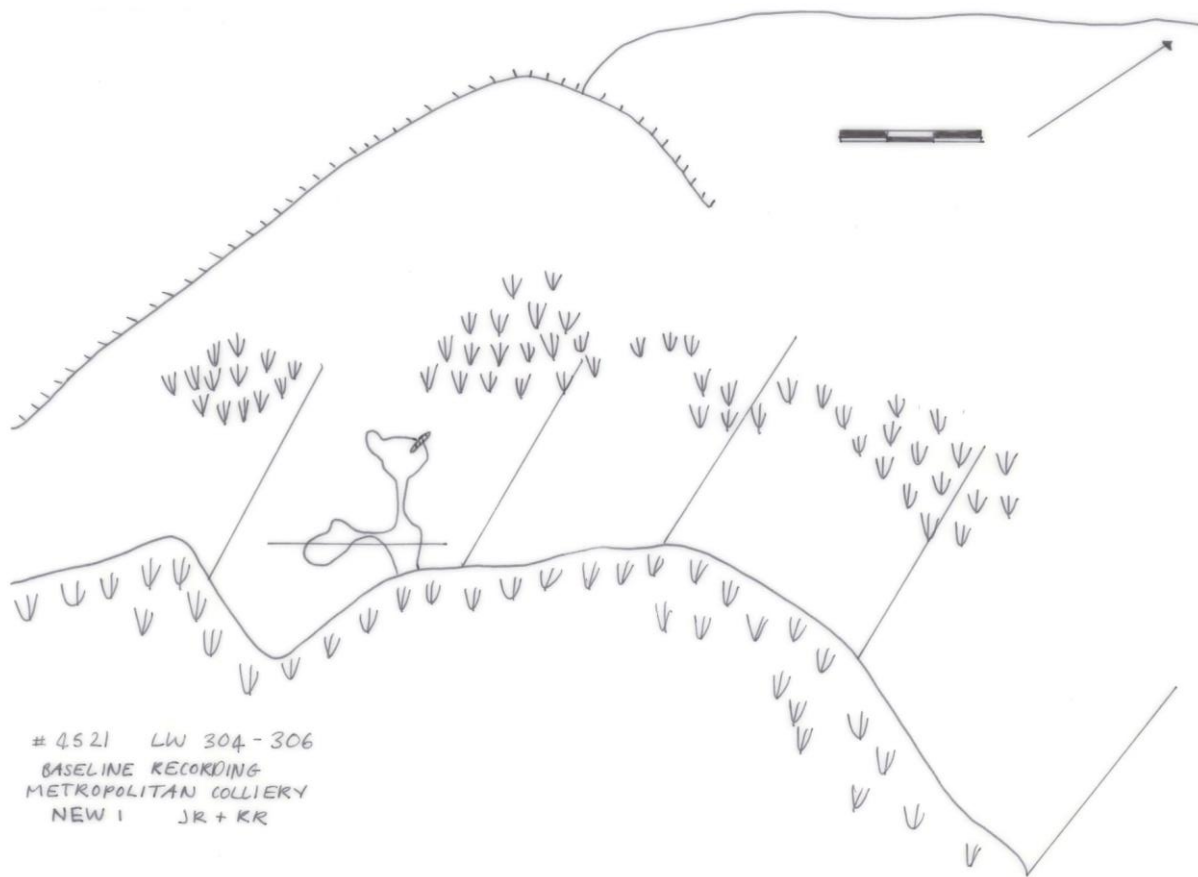


Figure 42: Plan of NEW 1.

2.20.4 Baseline recording images – Detail recording



Plate 84: Detail of NEW 1. Axe Grinding Groove.

2.21 North East Woronora 10 (NEW 10, AHIMS # 52-2-0530)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering and blockfall in antiquity. The art is in very poor condition and has been impacted by water wash, heavy exfoliation, block fall and case hardening since it was first described by Sefton on the AHIMS site card, and some motifs were unable to be relocated on this baseline recording.

2.21.1 NEW 10 baseline recording data

Table 32 Baseline recording data for NEW 10

Overview					
Site type	Shelter with Art and Deposit	Corrected MGAE	0312081	Corrected MGAN	6218064
Previous Recording	Site card – Caryl Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	20m	Depth	1.8m	Height	1.6m
Orientation	SW	Floor area	6m ²	Floor condition	Good
Location in Landscape	Shelter is 120m west of Fire Trail 9I, 400m East of the stored water and under the first cliff line down from the top of the ridgeline.				
Shelter exterior/formation	Cavernous weathering and block fall from the roof of the shelter and the back wall.				
Shelter interior	Chemical weathering on back panel and roof. Block fall from roof and back panel. Exfoliation in progress on roof. Fissuring on back panel. Fire damage on back panel from a modern hearth next to the art.				
Distance to water	128m NNW from unnamed creek.	Landform	Upper to top valley slope, first cliffline down from ridge top.		
Setting	Continuous overhang.				
Archaeological Deposit					
Deposit	Yes	Describe	Cream loamy sand approx. 30cm deep		
Visible artefacts?	N/A	Where?	N/A	How many?	N/A
Art					
Art Surfaces	Heavy exfoliation on roof and back panel around art wall, Water wash, block fall in progress around art. Case hardening over all art surfaces.				
Art Condition	Very poor condition. Panel 1: (Section A on site card) – 2 red ochre indeterminates are missing and were not relocated during this assessment. Panel 3: Motif 6 – is 4 charcoal indeterminates, but could be graffiti as similar to writing. Panel 4: site card notes 5 partial charcoal outlines, however on assessment 7 charcoal outlines were noted. (Section B on site card) 1 charcoal outline kangaroo on lower roof has completely faded and is no longer visible: presume it has deteriorated due to the exfoliation in progress on the roof.				
Art Overview	6 charcoal human figures, 2 charcoal kangaroo figures, 5 charcoal indeterminate figures, 1 red ochre snake, 4 red ochre indeterminate drawings.				
Damage/threats					
Water wash	N/A	Graffiti	Possible	Macro vegetals	Yes
Animals	No	Salt/granular loss	No	Fissuring	Yes
Insects	No	Spalling/exfoliation	Yes	Other	N/A
Fire	Yes	Block fall	Yes		

Table 33 Baseline recording data for art surfaces at site NEW 10.

Motif No.	Type	Form	Media	Colour	Measurement
Panel 1					
1	7x ochre indeterminate	Partial	Ochre	Red	42 x 1cm
Panel 2					
2	Snake outline/infill	Partial	Ochre	Red	40 x 10cm
3	Human outline, arms outstretched	Partial	Charcoal	Black	30 x 15cm
4	1x indeterminate line	Partial	Charcoal	Black	1 x 7cm
5	Macropod charcoal infill	Partial	Charcoal	Black	38 x 10cm
Panel 3					
6	Indeterminate/graffiti	Partial outline	Charcoal	Black	54 x 10cm
Panel 4					
7	1x indeterminate partial; 1x macropod complete.	Partial outline/infill	Charcoal	Red	34 x 15cm
8	3x anthropomorphic figure outlines	Partial		Black	34 x 30cm
9	4x anthropomorphic figures	Partial outline	Charcoal	Black	38 x 30cm

2.21.2 Baseline recording images – Site Overview



Plate 85: Overview of NEW 10. View looking East.



Plate 86: Overview of NEW 10. View looking West.

2.21.3 Baseline recording plans – Site overview

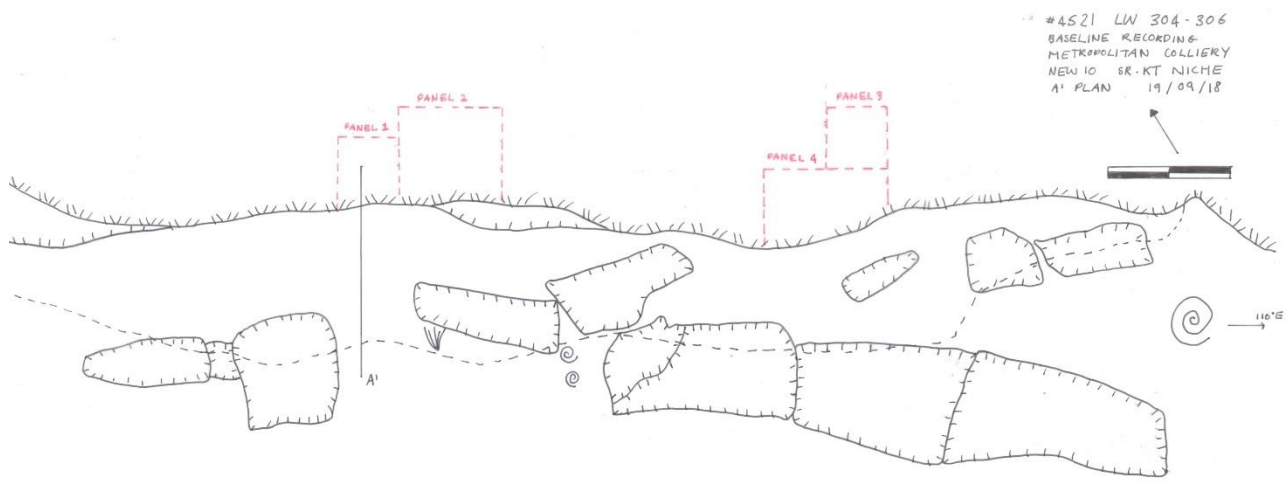


Figure 43: Plan of NEW 10.

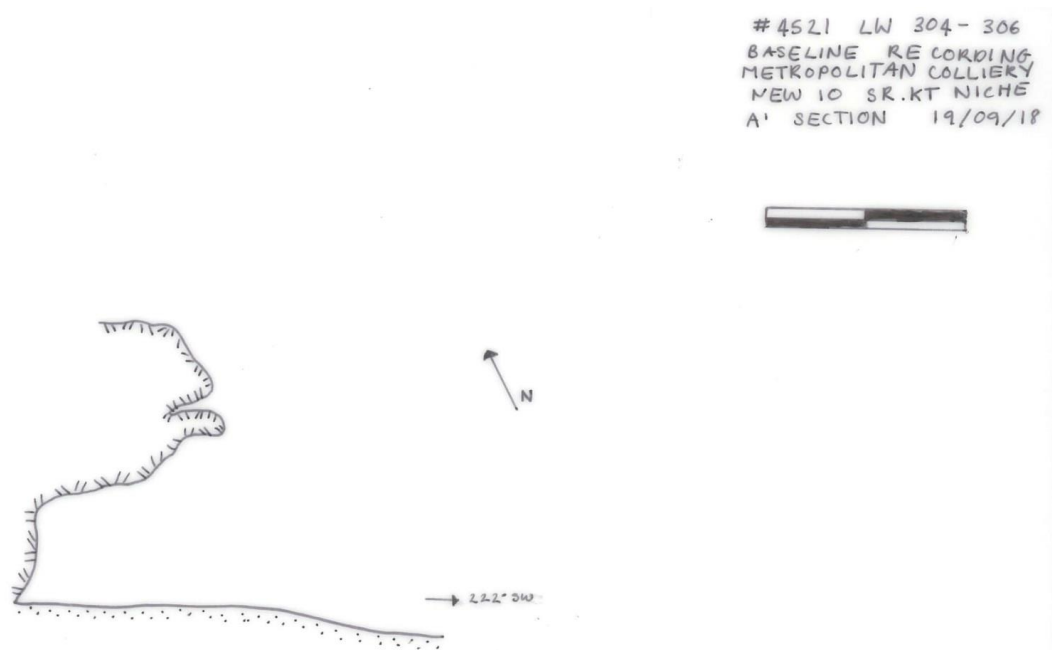


Figure 44: A1 Section of NEW 10.

4521 LW 304-306
BASELINE RECORDING
METROPOLITAN COLLIERY
NEW 10 SR-KT NICHE
19-9-18

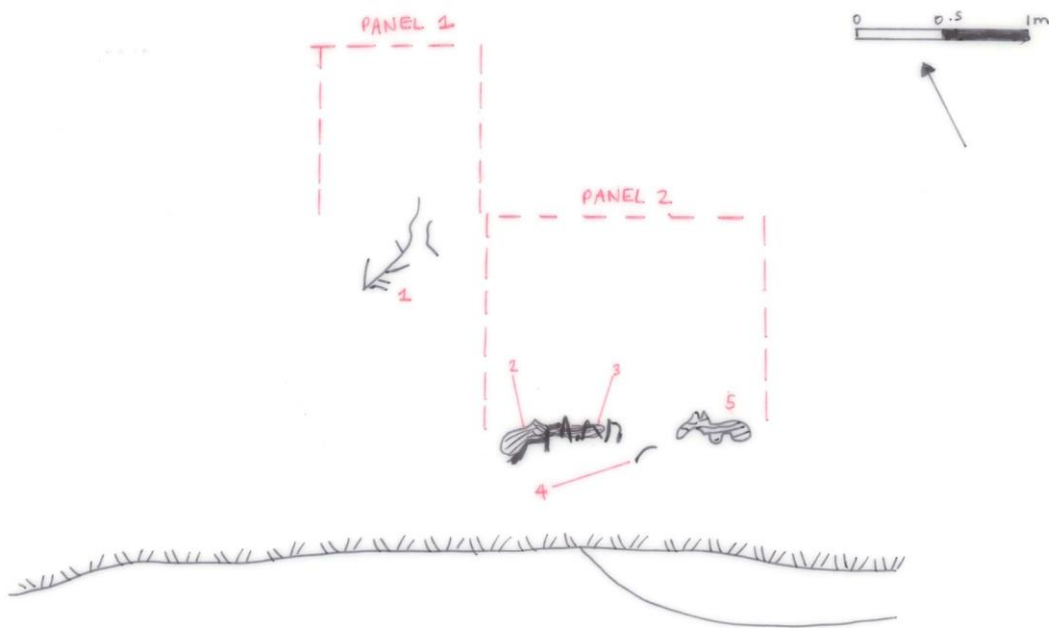


Figure 45: Art form drawing of NEW 10, Panel 1, 2.

#4521 LW 304-306
BASELINE RECORDING
METROPOLITAN COLLIERY
NEW 10 SR.KT NICHE
19-9-18

0 0.5 1m

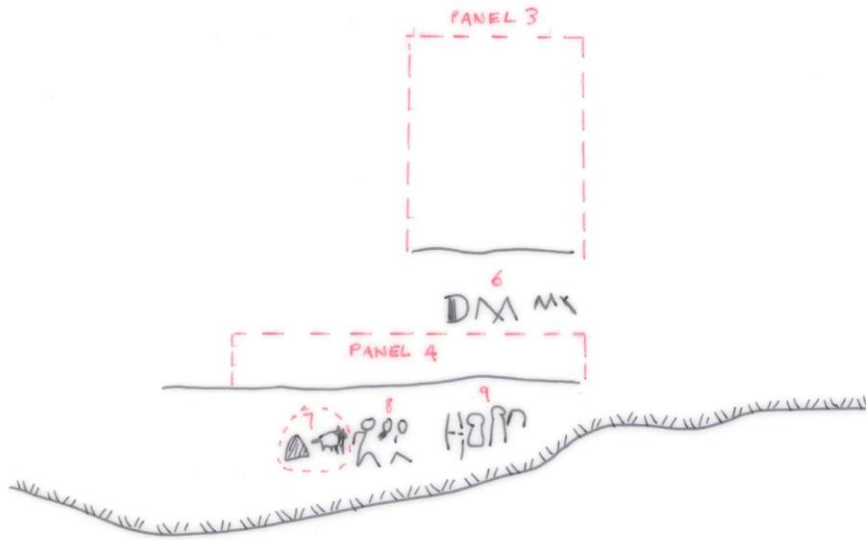


Figure 46: Art form drawing of NEW 10, Panel 3, 4.

2.21.4 Baseline recording images – Detailed panel recording

Panel 1



Plate 87: Detail of Panel 1 at NEW 10. Panel 1, Motif 1.

Panel 2



Plate 88: Detail of Panel 2 at NEW 10. Panel 2, Motif 2, 3.



Plate 89: Detail of Panel 2 at NEW 10. Panel 2, Motif 4.



Plate 90: Detail of Panel 2 at NEW 10. Panel 2, Motif 5.

Panel 3



Plate 91: Detail of Panel 3 at NEW 10. Panel 3, Motif 6.

Panel 4



Plate 92 :Detail of Panel 4 at NEW 10. Panel 4, Motif 7.



Plate 93: Detail of Panel 4 at NEW 10. Panel 4, Motif 8.



Plate 94: Detail of Panel 4 at NEW 10. Panel 4, Motif 9.

2.22 North East Woronora 22 (NEW 22, AHIMS # 52-2-3518)

This shelter is formed out of Hawkesbury sandstone by cavernous weathering in antiquity. The shelter shows evidence of chemical weathering and honeycombing on the roof and back panel, and there is fissuring visible on the roof. The artefacts recorded by Sefton (in the AHIMS site card) on the shelter's dripline were not relocated during this baseline recording. The following artefacts were listed on the site card:

- 1 white quartz flake (13x10x7mm)
- 1 white quartz bipolar flake (8x6x3mm).

2.22.1 NEW 22 baseline recording data

Table 34 Baseline recording data for NEW 22

Overview					
Site type	Shelter with Deposit	Corrected MGAE	0312495	Corrected MGAN	6218627
Previous Recording	Site card – Caryl Sefton Illawarra Prehistory Group	Date	Not specified		
Site Details					
Width	8.2m	Depth	2.7m	Height	2.5m
Orientation	NNW	Floor area	8.2 x 2.7m	Floor condition	Good
Location in Landscape	Shelter is on the eastern side of the northern arm of Fire Road 91. It is 30m up from the road and on a small rocky outcrop third ridge down from the ridge top.				
Shelter exterior/formation	Cavernous weathering. Minimal block fall above dripline.				
Shelter interior	Chemical weathering and honeycombing on roof and back panel. Animal scatter on floor of shelter. Fissuring visible on roof. No algae or macro vegetation visible. Tree growth and block fall on top of shelter.				
Distance to water	180m to North	Landform	Mid to Upper Valley Slope		
Setting	Isolated overhang.				
Archaeological Deposit					
Deposit	Yes - and shell	Describe	Cream loamy sand approx. 20cm deep		
Visible artefacts?	No – listed on site card but not located on assessment.	Where?	Dripline	How many?	Two noted on site card.
Art					
Art Surfaces	N/A				
Art Condition	N/A				
Art Overview	N/A				
Damage/threats					
Water wash	N/A	Graffiti	N/A	Macro vegetals	N/A
Animals	Yes	Salt/granular loss	N/A	Fissuring	Yes
Insects	N/A	Spalling/exfoliation	N/A	Other	N/A
Fire	N/A	Block fall	Yes		

2.22.2 Baseline recording images – Site Overview



Plate 95: Overview of NEW 22. View looking West.



Plate 96: Overview of NEW 22. View looking East.

2.22.3 Baseline recording plans – Site overview

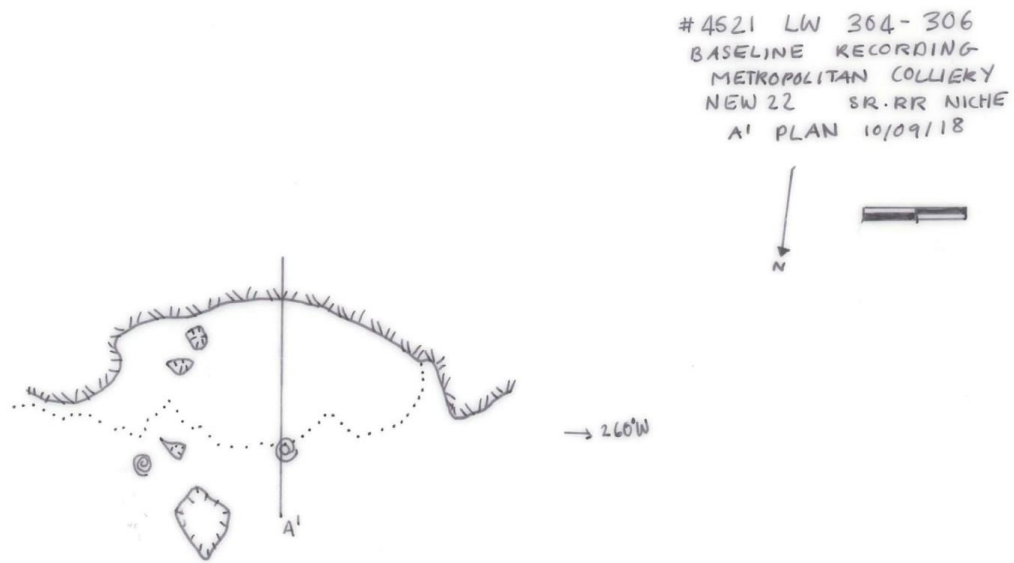


Figure 47: Plan of NEW 22.

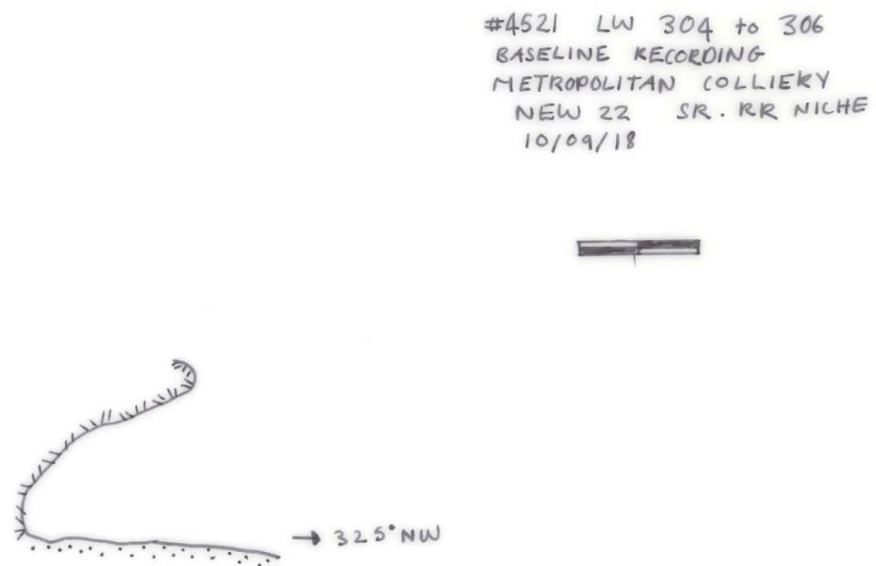


Figure 48: A1 section of NEW 22.

Reference List

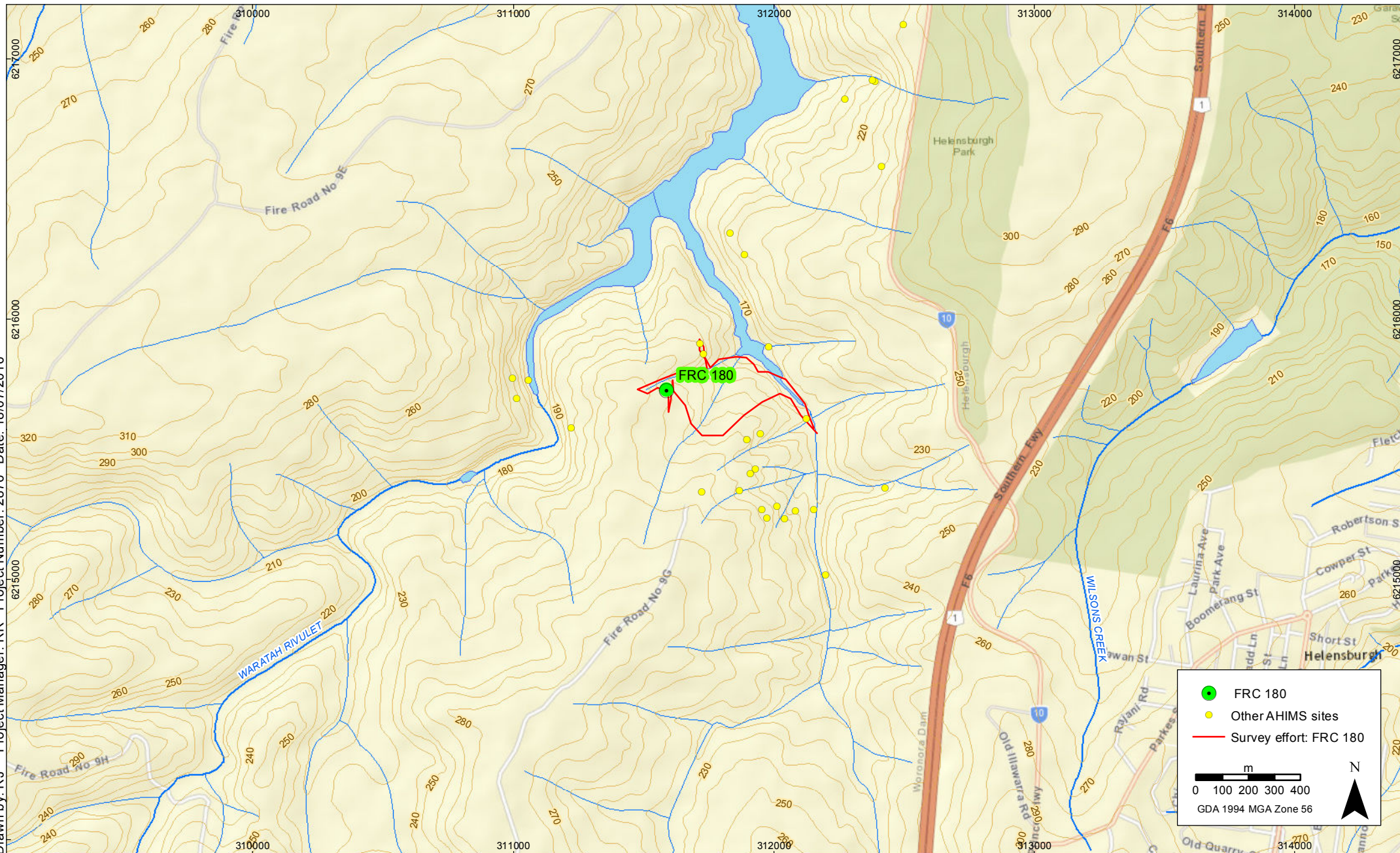
Illawarra Prehistory Group (2007) *Information from an archaeological survey of parts of the Woronora Plateau to identify and record previously un-recorded Aboriginal heritage sites and to re-record previously recorded Aboriginal heritage sites*. Unpublished data provided to Helensburgh Coal Pty Ltd, January 2007.

Kayandel Archaeological Services (2006) *Longwalls 14-17 Metropolitan Colliery, Helensburgh, NSW, Supplement Report – Archaeological Significance Assessment*.

Kayandel Archaeological Services (2007) *Aboriginal Cultural Heritage Assessment for Longwalls 18-19A*.

Kayandel Archaeological Services (2008) *Aboriginal Cultural Heritage Assessment, Appendix H of the Metropolitan Coal Project Environmental Assessment*.

Appendix 1



Survey efforts to relocate FRC 180
LW 23 to 27 Baseline recording of Aboriginal Heritage

FIGURE 2

Niche Environment and Heritage

A specialist environmental and heritage consultancy.

Head Office

Niche Environment and Heritage

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All mail correspondence should be through our Head Office

APPENDIX 2

HERITAGE MANAGEMENT PLAN
SUBSIDENCE IMPACT REGISTER AND ASSESSMENT FORM

Metropolitan Coal – Heritage Management Plan		
Revision No. HMP-R01-B		
Document ID: Heritage Management Plan		

Heritage Management Plan - Subsidence Impact Register

Impact Register Number ¹	Aboriginal Heritage Site	Description of changes due to mine subsidence ²	Cumulative number of sites with changes due to mine subsidence ³	Has the site been affected by subsidence impacts? ⁴	Cumulative number of sites affected by subsidence impacts ⁵	Cumulative percentage of sites affected by subsidence impacts ^{6,9}	Management or Contingency Measures Implemented? (Yes/No) ⁷	Were Measures Effective? (Yes/No) ⁸
1	FRC 281	Multiple cracks ranging from large, medium and small recorded in the shelter wall either running through or next to motifs (Longwalls 20-22 Round 1 Survey)	1	Yes	1	1/142 sites = <1%	No	N/A
2	FRC 284	Fractured corner or a buttress like formation on the rear wall (Longwalls 20-22 Round 1 Survey)	2	No	1	1/142 sites = <1%	No	N/A
3	FRC 284	Exfoliated section associated with the cracking has slumped (Longwalls 20-22 Round 2 Survey)	2	No	1	1/143 sites = <1%	No	N/A
4	FRC 15	Cracking of shelter wall (Longwalls 20-22 Round 2 Survey)	3	No	1	1/143 sites = <1%	No	N/A
5	FRC 15	Increased cracking of shelter wall (Longwalls 20-22 Round 3 Survey)	3	No	1	1/143 sites = <1%	No	N/A
6	MET 1	Cracking in roof of shelter and vertical cracking (Longwalls 20-22 Round 3 Survey)	4	No	1	1/143 sites = <1%	No	N/A
7	FRC 283	Opening of joints and silica forming over art panel (Longwalls 20-22 Round 3 Survey)	5	No	1	1/143 sites = <1%	No	N/A
8	FRC 176	Vertical cracking observed along the northern and southern ends of the shelter (Longwalls 23-27 Round 1 Survey)	6	No	1	1/143 sites = <1%	No	N/A

Notes:

- 1: Fill out all details in the Subsidence Impact Register Assessment Form and record the register number here.
- 2: Description of changes observed due to mine subsidence. (e.g. cracking of shelter wall, opening of joints).
- 3: Cumulative number of sites with changes due to mine subsidence.
- 4: Has the site been affected by subsidence impacts? Sites are considered to be 'affected by subsidence impacts' if they exhibit one or more of the following consequences that cannot be attributed to natural weathering or deterioration: overhang collapse; cracking of sandstone that coincides with Aboriginal art or grinding grooves; and rock fall that damages Aboriginal art).
- 5: Cumulative number of sites affected by subsidence impacts.
- 6: If the cumulative percentage of sites affected by subsidence impacts equals or exceeds 10%, notify General Manager. If less than 10%, notify the Technical Services Manager or Environment and Community Manager of the cumulative percentage.
- 7: Indicate whether management or contingency measures were implemented (yes or no).
- 8: Indicate whether the implemented management or contingency measures were considered to be effective (yes or no).
- 9: The total number of sites within the mining area (as defined by Appendix 3 of the Project Approval) changed from 142 sites to 143 sites due to the identification of a new site within the mining area during Round 2 monitoring (MET 4).

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**Heritage Management Plan – Subsidence Impact Register
Assessment Form**

Date:

Observer (Name and position):

Register Number (i.e. Number 1, 2, etc.):

Longwall Number and Chainage:

Location of Observed Change Due to Mine Subsidence:

Description of Change Due to Mine Subsidence:

Description of Potential Consequences:

Examples:

- cracking through art or grinding groove;
- burial of artefacts and deposit; and
- complete loss of site due to collapse.

Attach photographs

Description of Photographs:

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Has the site been affected by subsidence impacts?

What is the cumulative percentage of sites affected by subsidence impacts?

Person Notified:	Manager – Safety & Environment	<input type="checkbox"/>
	Manager – Technical Services	<input type="checkbox"/>
	General Manager	<input type="checkbox"/>

Actions Required:	Management/Remediation Measures	<input type="checkbox"/>
	Contingency Plan Initiated	<input type="checkbox"/>
	Incident Notification	<input type="checkbox"/>
	Safety Measures/Public Safety	<input type="checkbox"/>
	Management Plan Requirements	<input type="checkbox"/>

Management/Remediation Measures Implemented:

Contingency Measures Implemented:

Effectiveness of Contingency or Management Measures:

APPENDIX 3
CONTINGENCY PLAN CHECK LIST

Metropolitan Coal – Heritage Management Plan		
Revision No. HMP-R01-B		
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Contingency Plan Check List

Contingency Plan Component	Yes/No	Comment
Observation reported to the Manager – Technical Services Manager or the Manager – Safety & Environment (within 24 hours).		
Observation recorded in the Heritage Management Plan - Subsidence Impact Register.		
Reporting of any Aboriginal heritage performance measure exceedance to DP&E and OEH (as soon as practicable after Metropolitan Coal becomes aware of the exceedance).		
<p>Conduct investigation to evaluate the potential contributing factors. Investigation to:</p> <ul style="list-style-type: none"> • compare and critically analyse measured versus predicted subsidence parameters; • review measured subsidence parameters against the observed impact; and • review the Subsidence Monitoring Program and update the program where appropriate. 		
<p>Identification of appropriate course of action with respect to the identified impact(s) in consultation with specialists, relevant agencies and Aboriginal stakeholders, as necessary. For example:</p> <ul style="list-style-type: none"> • proposed management/mitigation measures; • a program to review the effectiveness of the management/mitigation measures. 		
Submission of the proposed course of action to the DP&E for approval.		
Implementation of the approved course of action to the satisfaction of the DP&E.		
Provision of a suitable offset - if either the contingency measures implemented by Metropolitan Coal have failed to remediate the impact or the Secretary of the DP&E determines that it is not reasonable or feasible to remediate the impact.		