APPENDIX D

Aboriginal cultural heritage assessment report

New England Solar Farm

Aboriginal cultural heritage assessment report

Prepared for UPC Renewables Australia Pty Ltd | 16 November 2018

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New England Solar Farm

Final

Report J17300RP1 | Prepared for UPC Renewables Australia Pty Ltd | 16 November 2018

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Date	16 November 2018	Date	16 November 2018

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Acknowledgement of Country

We would like to acknowledge and pay respect to the traditional owners of the land on which the project is proposed. We would like to thank all members of the Aboriginal community who generously gave their time and knowledge in regard to the Aboriginal cultural heritage values associated with the project.

The local Aboriginal community would like to provide an acknowledgement of Country which is expressed in the statement:

> We acknowledge the Anaiwan People as the Traditional Custodians of the land of the Anaiwan Nation; we recognise their continuing connection to land and waters of this region. We pay respect to Elders past, present and emerging Leaders in our community.
>
> We would like to also acknowledge to the cultural protocols of the Anaiwan People when researching Cultural Heritage within the Anaiwan Nation and pay respect to many Male and Female Elders who contributed to this project.

Executive Summary

ES1.1 Overview

UPC Renewables Australia Pty Ltd (UPC) proposes to develop the New England Solar Farm; a significant grid-connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale in the Uralla Shire local government area (LGA) (the project).

The project is a State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). An environmental impact statement (EIS) is a requirement of the approval process. This Aboriginal cultural heritage assessment (ACHA) report forms part of the EIS. It documents the archaeological assessment methods and results and the initiatives built into the project design to avoid and minimise impacts to Aboriginal cultural heritage values. Additionally, it proposes mitigation and management measures to address any residual impacts not able to be avoided.

ES1.2 Assessment methods

This ACHA has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for the project and leading practice guidelines. In summary, the ACHA has involved:

- background research of the study area's environmental, archaeological and ethno-historical context;
- Aboriginal consultation in accordance with the *Aboriginal Consultation Requirements for Proponents* (DECCW 2010c);
- an archaeological survey following the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a); and
- an impact assessment and management recommendations for identified Aboriginal cultural heritage values using the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011).

ES1.3 Aboriginal consultation

The *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010c) were used for the project. Eight Aboriginal parties registered their interest in the project and are referred to as registered Aboriginal parties (RAPs). RAPs were invited to provide cultural information about the study area, provided with draft assessment and fieldwork methods for review, and kept updated about the project by two consultation meetings, letters and emails. RAPs also participated in the archaeological survey.

EMM and UPC have worked closely with RAPs in formulating appropriate management measures for the Aboriginal cultural heritage values identified during the ACHA, which are outlined in Chapter 9 of this report. This involved RAPs review of the draft ACHA and opportunity for input from RAPs during a consultation meeting on 19 October 2018.

ES1.4 Archaeological investigations

Through background research and landscape analysis, EMM predicted that the study area had the potential to feature a range of Aboriginal sites including stone artefacts, scarred trees, quarries and grinding grooves. Based on a search of the Aboriginal Heritage Information Management System (AHIMS) register, no Aboriginal sites had previously been recorded in the study area.

EMM conducted a targeted archaeological survey over 19 days with the support of RAP representatives. GPS track log data indicates that each survey participant walked approximately 247 km, which represents the total length of the survey transects.

The survey focused on the proposed development footprint (ie where project infrastructure will be constructed) and on areas likely to feature Aboriginal sites, but also extensively sampled areas and landscapes less likely to feature sites to test the survey predictions. The survey coverage results indicate that the ground surface visibility conditions during the survey were generally effective to characterise the distribution of archaeological sites across the survey area.

The survey team identified 96 sites during the 19 days of archaeological field survey. Sites were labelled sequentially, with an NE prefix standing for New England. The 96 sites comprise 95 Aboriginal sites and a historical dry wall site that was originally thought to have potential to be an Aboriginal stone arrangement (NE57). The site types and their frequencies are listed in Table E.1.

Table E.1 Sites results summary

Site type	Site frequency	Percentage of total sites
Artefact scatter	16	17%
Artefact scatter, potential archaeological deposit (PAD)	9	9%
Grinding groove	1	1%
Grinding groove, artefact scatter, PAD	4	4%
Grinding groove, PAD	1	1%
Historical site – dry stone wall	1	1%
Isolated find	43	45%
Isolated find, PAD	3	3%
Quarry, artefact scatter, PAD	5	5%
Scarred tree	13	14%
Total	**96**	**100%**

Archaeological and socio-cultural significance values were assessed for the project. The Aboriginal community has identified that heritage values in the study area are directly linked with the Aboriginal sites identified during the survey. No specific historical connection has been linked to the identified sites apart from a broader notion that the study area may have formed part of what was known as Oorala – a meeting place for a number of Aboriginal groups which is likely to extend across Uralla and surrounding localities.

EMM ascribed archaeological (scientific) significance to each Aboriginal site. Four sites are of high significance; 31 of moderate significance; and 60 of low significance. Of particular significance was NE09, a grinding groove, artefact scatter and PAD site, which is a rare site complex on a uniquely prominent landscape feature. At NE09, there are many representative examples of grinding grooves unmatched in size and extent by other known grinding grooves in the local area.

ES1.5 Impact assessment

EMM and UPC have worked closely together and in consultation with RAPs to refine the development footprint from the site boundary presented as part of the preliminary environmental assessment (PEA) with the objective of developing an efficient project that avoids and minimises environmental impacts wherever feasible, whilst still being constructible. Avoidance of significant Aboriginal cultural heritage values has been a key aspect of this refinement process wherever possible.

No sites of high significance, namely four grinding groove sites, will be impacted by the project.

No sites of moderate significance are currently designated for impact by the project. However, there are seven sites of moderate significance (namely NE15 [artefact scatter], NE27 [artefact scatter, PAD], NE33 [quarry, PAD], NE45 [scarred tree], NE61 [scarred tree], NE70 [artefact scatter, PAD] and NE83 [isolated find, PAD]) where impacts are currently undetermined. UPC are exploring opportunities to maximise the flexibility of the final PV array layout and associated infrastructure and therefore are in the process of investigating whether impacts to one or more of these sites is appropriate (refer to Section 9.4). The final outcomes for these sites will be determined prior to project approval in accordance with the assessment approach described in Section 9.4 of this ACHA.

The 37 sites currently designated for impact by the project are all of low scientific significance. This comprises a total of 30 isolated artefacts and seven artefact scatters. The impact to three scarred trees of low scientific significance (NE47, NE49 and NE67) is currently undetermined as expert assessment is needed to confirm whether they are Aboriginal made and require management. Depending on the outcomes of expert assessment, UPC may look to remove and mitigate impacts to these sites to maximise the development footprint, wherever possible (refer to Section 9.4.1). It should be noted that these trees are in poor condition: NE47 is a partially felled tree (cut in half) but still standing and NE49 is a felled tree that has its scar cut in half. NE67 has an ambiguous scar and may not be of Aboriginal origin.

ES1.6 Management measures

An Aboriginal heritage management plan (AHMP) will be developed in consultation with the NSW Department of Planning and Environment (DPE), the RAPs and the NSW Office of Environment and Heritage (OEH). The AHMP will detail the management and mitigation of all identified Aboriginal sites along with special procedures and training and reporting protocols. A summary of the management measures are provided in Table E.2.

Table E.2 Site management summary

Management measure/site type	Count
Avoidance	**47**
Artefact scatter	7
Artefact scatter, PAD	7
Grinding groove	1
Grinding groove, artefact scatter, PAD	4
Grinding groove, PAD	1
Historical site - unverified	1
Isolated find	13
Isolated find, PAD	1
Quarry, artefact scatter, PAD	4
Scarred tree	8
Surface collection	**39**
Artefact scatter	8
Isolated find, PAD	1
Isolated find	30
Undetermined - expert assessment/possible relocation	**5**
Scarred tree	5
Undetermined - test excavation if site cannot be avoided	**5**
Artefact scatter	1
Artefact scatter, PAD	2
Isolated find, PAD	1
Quarry, artefact scatter, PAD	1
Total	**96**

Further survey targeting any mature trees not already inspected as part of the ACHA is required. Any new scarred or carved trees identified will be recorded, assessed and managed in a manner consistent with this ACHA. This task will be completed during either public exhibition or the preparation of the RTS report. The results of the assessment, proposed management measures, and evidence of RAP and OEH consultation will be provided prior to or as part of the RTS report to ensure DPE can consider any new information prior to project approval.

The project infrastructure layout within the development footprint is currently undetermined. As such, impacts to 10 sites identified during archaeological survey and the management of those sites is currently unknown. Additional assessment requirements, proposed management measures, and evidence of RAP and OEH consultation will be provided prior to or as part of the RTS report to ensure DPE can consider any new information prior to project approval.

Additional assessment will involve expert assessment of five scar trees that are possibly naturally made rather than Aboriginal made. If any of the five trees are Aboriginal made, UPC will first seek to avoid such examples. If any cannot be avoided because of the high level of constraint they would pose on the project, UPC will explore options with the RAPs and OEH to salvage them. This process will apply to any newly identified ambiguous scar trees that pose a significant constraint to the development footprint. EMM notes that avoidance and protection of scar trees is the most appropriate measure and that approval for the removal of scarred trees is subject to support by RAPs, OEH and DPE.

There are five sites where impacts are currently undetermined that would warrant test excavation. This comprises four stone artefact sites (NE15, NE27, NE70 and NE83) and one quarry site (NE33). If UPC want to explore opportunities to develop all or parts of any of these sites, then test excavation would be required to characterise the archaeological deposit and contribute to updated significance assessments and appropriate management measures. Based on the outcomes of the test excavation and significance of the finds, management options may include conservation, salvage excavation or unmitigated impacts.

To explore opportunities to maximise the development footprint, a test excavation program will be completed during either public exhibition of the EIS or preparation of the RTS report. The scope of test excavation and the selection of sites listed above for sampling (NE15, NE27, NE70, NE83 and NE33) will be determined in consultation with the RAPs and OEH. The results of excavation and subsequent management measures derived from the results will be formulated in consultation with RAPs and will be provided prior to or as part of the RTS report so that DPE and OEH can consider any new information prior to project approval.

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1 Introduction

1.1 Overview

UPC Renewables Australia Pty Ltd (UPC) proposes to develop the New England Solar Farm; a significant grid-connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale in the Uralla Shire local government area (LGA) (the project). Figure 1.1 shows the location of the project in a regional context.

The project is a State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). Therefore, a development application (DA) for the project is required to be submitted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The NSW Minister for Planning (Minister), or the Minister's delegate, is the consent authority.

An environmental impact statement (EIS) is a requirement of the approval process. This Aboriginal Cultural Heritage Assessment (ACHA) report forms part of the EIS. It documents the archaeological assessment methods and results, the initiatives built into the project design to avoid and minimise impacts to Aboriginal cultural heritage values. Additionally, it proposes mitigation and management measures to address any residual impacts not able to be avoided.

1.2 Site description

The project will be developed within the Uralla Shire LGA. At its closest point, the project boundary is approximately 6 km east of the township of Uralla, and the northern array area starts approximately 8.6 km south of Armidale. The study area for this ACHA is illustrated in Figure 1.2.

The project boundary, which is defined as the entirety of all the involved lots, encompasses a total area of 8,380 ha. The project boundary encompasses 61 lots, the majority of which have been modified by historical land use practices and past disturbances associated with land clearing, cropping and intensive livestock grazing. The properties within the project boundary are currently primarily used for sheep grazing for production of wool and lambs, with some cattle grazing for beef production.

The development footprint is the area within the project boundary on which infrastructure will be located. The development footprint encompasses a total area of 2,787 ha, which includes 1,418 ha within the northern array area, 625 ha within the central array area and 653 ha within the southern array area. Within the development footprint, approximately 1,000 ha will be required for the rows of PV modules. The remaining area is associated with power conversion units (PCUs), space between the rows, internal access tracks and associated infrastructure (including substations BESSs). The development footprint also includes land required for connection infrastructure between the three array areas as well as land required for new internal roads to enable access to the three array areas from the surrounding road network. Subject to detailed design and consultation with the project landholders, security fencing and creek crossings may be required on land outside of the development footprint, but within the project boundary.

The land within the project boundary is zoned RU1 Primary Production under the Uralla Local Environmental Plan 2012 (Uralla LEP).

The project is ideally located close to Transgrid's 330 kilovolt (kV) transmission line, which passes through the northern and central array areas (Figure 1.2). It also has access to the regional road network; including the New England Highway and Thunderbolts Way (Figure 1.2).

A number of local roads traverse the array areas and their surrounds, including Gostwyck Road, Salisbury Plains Road, The Gap Road, Carlon Menzies Road, Munsies Road, Saumarez War Service Road, Hillview Road, Elliots Road and Big Ridge Road, and will provide access to the three array areas from the regional road network throughout the construction and operation of the project (Figure 1.2).

The primary site access points will be from The Gap Road, Salisbury Plains Road, Hillview Road, Munsies Road and Big Ridge Road (Figure 1.2).

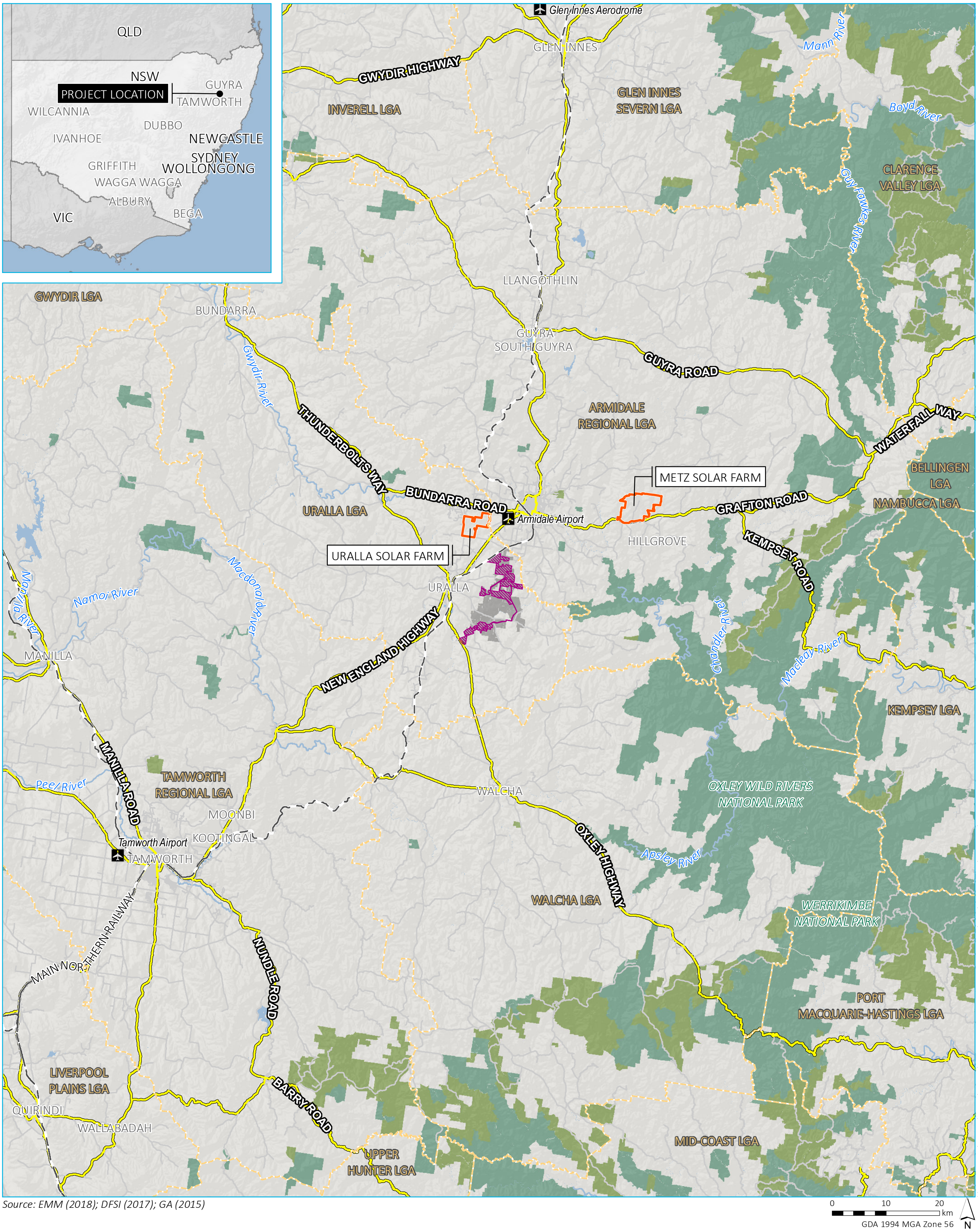
1.3 Project boundary terms and definitions

The **project boundary** referred to in this report encompasses the 61 Lot/DPs that make up the development footprint. It is shown in Figure 1.2 and includes the involved lots beneath each of the three array areas as well as potential connection infrastructure and access corridors.

The **study area** referenced throughout this report is shown in Figure 1.2. This represents the area presented in the preliminary environment assessment (PEA) that supported the request for the Secretary's Environmental Assessment Requirements (SEARs). The study area encompasses approximately 4,244 ha and is referenced primarily in the background chapters of this report as it represents the area considered prior to completion of the archaeological survey for the ACHA.

The **development footprint** referred to in this report is shown in Figure 1.2 and represents the potential disturbance footprint of the three solar array areas and associated infrastructure. As noted in Section 1.2, the development footprint also includes land required for connection infrastructure between the three array areas (ie electricity transmission line (ETL) easements and underground or overhead cabling), as well as land required for new internal roads to enable access to the three array areas from the surrounding road network (ie site access corridors). Ground disturbance will occur in these areas; however, only discrete areas of disturbance are anticipated, particularly along ETL easements namely to facilitate power pole placement.

The **survey area** referenced in Chapter 6 of this report represents the geographic extent of survey completed for the ACHA. A survey area boundary is not defined in this report as it evolved throughout the fieldwork period to accommodate various refinements to the project's development footprint. Notwithstanding, the survey area generally represents an area slightly larger than the development footprint. The development footprint (described above) represents the survey area after it was refined to avoid environmental constraints including identified Aboriginal cultural heritage sites.



Source: EMM (2018); DFSI (2017); GA (2015)

KEY

- Development footprint
- Project boundary
- Other SSD solar development
- Airport
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody
- Local government area
- NPWS reserve
- State forest

Regional context

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 1.1

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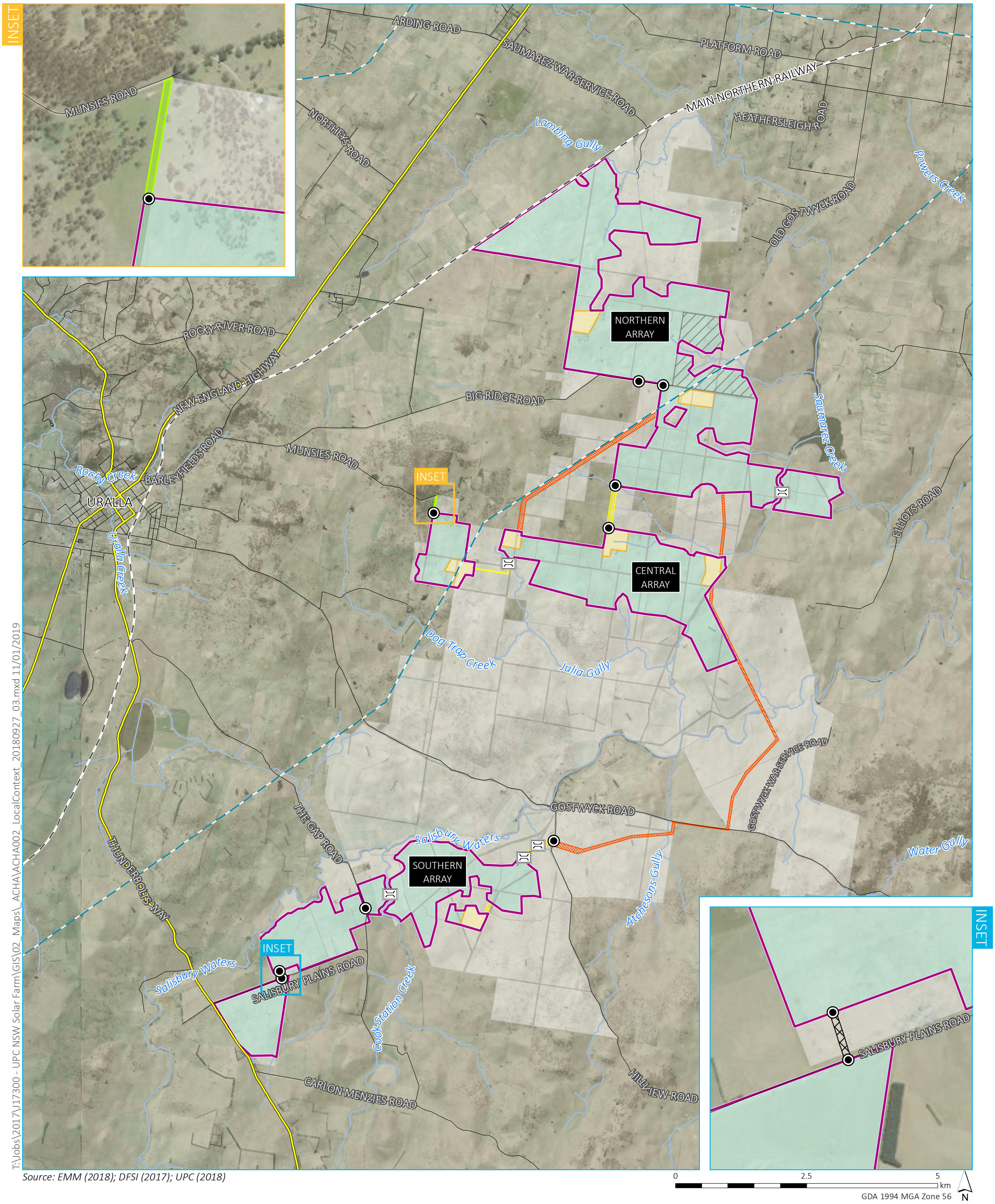

Source: EMM (2018); DFSI (2017); UPC (2018)

KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Project boundary

Development footprint

- Solar array
- Potential ETL easement
- Potential site access corridor
- Potential site access/ETL easement
- Potential substation/BESS footprint
- Potential electrical cabling/site access corridor
- Potential creek crossing

- Proposed primary site access point
- Potential site for construction accommodation village

Location of the New England Solar Farm

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 1.2

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1.4 Assessment guidelines and requirements

This ACHA has been prepared in accordance with the relevant government assessment requirements, guidelines and policies, and in consultation with the relevant government agencies.

The ACHA was prepared with reference to the methods outlined in:

- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (the Code) (DECCW 2010a); and
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (DECCW 2010b).

Aboriginal consultation undertaken as part of the assessment has followed the *Aboriginal Consultation Requirements for Proponents* (DECCW 2010c).

The ACHA was prepared in accordance with the requirements of the NSW Department of Planning and Environment (DPE), which are set out in the SEARs for the project, issued on 8 May 2018. The SEARs identify matters which must be addressed in the EIS.

Revised SEARs were issued for the project on 11 October 2018 in response to UPC's request for a revision to the project description to include a temporary construction accommodation village in the northern array area (should it be required).

A copy of the revised SEARs is attached to the EIS as Appendix A, while Table 1.1 lists the individual requirements relevant to this ACHA and where they are addressed in this report.

Table 1.1 Aboriginal cultural heritage – relevant SEARs issued by DPE

Requirement	Section addressed
Heritage – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community	This report. Note: This report only includes matters relating to Aboriginal cultural heritage and not historical heritage, which is addressed in a separate report (Appendix E of the EIS).

To inform preparation of the SEARs, DPE invited other government agencies to recommend matters to be addressed in the EIS. These matters were taken into account by the Secretary for DPE when preparing the SEARs. Copies of government agency advice to DPE were attached to the SEARs.

The NSW Office of Environment and Heritage (OEH) raised matters relevant to the ACHA. The matters raised include standard requirements for a project of this nature and are listed in Table 1.2.

Table 1.2 Relevant OEH comments on SEARs

OEH requirement	Section addressed
6. The EIS must identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the development and document these in an Aboriginal Cultural Heritage Assessment Report (ACHAR). This may include the need for surface survey and test excavation. The identification of cultural heritage values must be conducted in accordance with the *Code of Practice for Archaeological investigations of Aboriginal Objects in NSW* (OEH 2010), and guided the *Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW* (DECCW, 2011) and consultation with OEH regional branch officers.	This report
7. Consultation with Aboriginal people must be undertaken and documented in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW). The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in ACHAR.	Chapters 2 and 7 and Appendix A
8. Impacts on Aboriginal cultural heritage values are to be assessed and documented in the ACHAR. The ACHAR must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the ACHAR must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH.	Chapters 8 and 9

1.5 Objectives of the assessment

The objectives of the ACHA were to:

- identify Aboriginal cultural heritage values relevant to the study area which include:
  - Aboriginal objects and sites;
  - Aboriginal socio-cultural or historic values which might not be related to Aboriginal objects; and
  - areas of archaeological sensitivity.
- assess the significance of Aboriginal objects, sites and locations identified in the course of the archaeological investigations and through Aboriginal community consultation;
- assess the impact of the project on identified Aboriginal cultural heritage values; and
- propose appropriate management measures for potentially impacted Aboriginal cultural heritage values in response to their assessed significance.

1.6 Authorship and acknowledgements

This report was prepared by EMM Senior Archaeologist Ryan Desic (BA (Hons) Prehistoric and Historical Archaeology, University of Sydney).

EMM would like to thank registered Aboriginal parties (RAPs) for their involvement in ongoing consultation, knowledge sharing and fieldwork assistance. This includes RAP site officers Steven Ahoy, Colin Ahoy Jnr., Bruce Cohen, Rhonda Kitchener, Anthony Simons, and Jocelyn Blair and RAP contacts Cheryl Kitchener, Les Ahoy, Colin Ahoy Snr., Hazel Green, Kevin Green, Les Townsend, Tom Briggs and Aaron Broad. Special thanks are extended to Steven Ahoy for providing EMM with ethno-historical and oral sources for inclusion in this report.

EMM would also like to thank archaeologists Dr. Graham Knuckey for advice, reporting and fieldwork assistance and Pamela Kottaras for fieldwork assistance. EMM would also like to thank archaeologist John Appleton for his knowledge sharing and technical advice.

EMM would like to thank UPC for assistance throughout the ACHA process and to the project landholders who allowed the survey team to access their properties during the archaeological survey.

1.7 Project description

The project involves the development, construction and operation of a solar PV electricity generation facility, which consists of PV modules, inverters and associated infrastructure.

The development footprint provided on Figure 1.2 incorporates the land required for:

- the three solar array areas;
- up to three internal solar array substations and a single grid substation;
- associated BESS(s);
- operations and maintenance (O&M) infrastructure including:
    - O&M buildings (namely meeting facilities, a temperature-controlled spare parts storage facility, supervisory control and data acquisition (SCADA) facilities, a workshop and associated infrastructure); and
    - car parking facilities.
- connection infrastructure between the three array areas (including ETLs and underground or overhead cabling); and
- a new internal road network to enable access from surrounding local roads to the three array areas during construction and operations.

In addition, security fencing and creek crossings (should they be required) will be placed within the project boundary.

The project will have a targeted ‘sent out’ electricity generating capacity of up to 800 MW (AC) and up to 200 MW (AC) two-hour energy storage. The final number of PV modules within the three array areas will be dependent on detailed design, availability and commercial considerations at the time of construction.

Electricity generated by the project will be injected into the grid via a new cut-in to TransGrid’s 330 kV transmission line that traverses the northern and central array areas (refer Figure 1.2). Further details about the proposed network connection are provided in Section 1.8.3 (refer Figure 1.2).

The infrastructure associated with the project will cover an area within the development footprint (Figure 1.2). During the preparation of the EIS, the development footprint within the project boundary has been refined on the basis of environmental constraints identification, stakeholder engagement, community consultation and design of project infrastructure with the objective of developing an efficient project that avoids and minimises environmental impacts.

1.8 Project infrastructure

1.8.1 Solar arrays, PV modules, medium voltage cable network and power conversion units

The project will involve the development of three separate arrays of PV modules and PCUs. The number of PV modules and PCUs required will be dependent on the final detailed design of the project.

PV modules will be installed in a series of rows to maximise the energy yield that is achievable given the solar resource and the ground area available within the three array areas. The modules will be fixed to, and supported by, a ground-mounted framing structure, aligned in rows. Assuming single axis tracking technology is used, the rows of PV modules will be aligned in a north-south direction and spaced out approximately 5-8 m apart. The use of single axis tracking technology would enable the PV modules to rotate from east to west during the day tracking the sun's movement.

An alternative configuration for the PV modules may be considered for the project, namely a fixed tilt system, with the rows aligned east-west and the PV modules facing north. However, it is noted that single axis tracking is considered more likely due to the recent fall in technology costs and the superior energy yield associated with this technology.

The PV modules will be supported on mounting frames consisting of vertical posts ('piles') and horizontal rails ('tracking tubes'). Rows of piles will be driven or screwed into the ground, depending on the geotechnical conditions, and the supporting racking framework will be mounted on top. Pre-drilling and/or cementing of foundations will be avoided if allowed by the geotechnical conditions.

The height of the PV modules at their maximum tilt angle (typically up to 60 degrees) will be up to 4 m. Additional site-specific clearance of up to around 300 mm may be required to avoid flooding risk or to allow sheep to graze underneath the PV modules.

DC cables will connect the PV modules to the PCUs.

The PCUs consist of three key components, namely inverter(s), transformer(s) and a ring main unit. The purpose of each PCU is to convert the direct current (DC) electricity generated by the PV modules into alternating current (AC), compatible with the electricity network. PCUs also increase the voltage of the electricity to 11-33 kV. The exact dimensions of the PCUs will be determined during detailed design; however, it is anticipated that each PCU will be approximately 8 m in length by 2.6 m wide by 2.7 m high.

A medium voltage (MV) cable reticulation network will be required to transport the electricity around each of the three arrays. If underground, cables of either 11 kV, 22 kV or 33 kV will be installed at a depth of at least 600 millimetres (mm) and will be designed and fitted in accordance with relevant Australian industry standards. Electricity from the MV cable network will be stepped up to high voltage (HV) at each of the internal solar array substations (up to three in total).

A small corridor for MV cabling may be required between two land parcels in the southern array area. The indicative alignment of this cabling is presented in Figure 1.2. The exact alignment will be determined during detailed design.

1.8.2 Solar array substations

Up to three substations will be required (potentially one within each of the three solar arrays) to step the MV up to HV. Based on preliminary designs, each substation will require transformers to step up from 33 kV to 132 kV. Each substation will likely consist of an indoor switch room, to house MV circuit breakers, and an outdoor switch yard to house the transformer(s), gantries and associated infrastructure. The total pad area for each solar array substation is likely to be in the order of approximately 3-4 ha. Indicative locations for the solar array substations are provided in Figure 1.2.

The indicative locations for the solar array substations are provided in Figure 1.2. A larger footprint than what will likely be required has been provided at each location to allow for flexibility for placement of this infrastructure during the detailed design stage of the project.

1.8.3 Collector network and grid substation

Up to three new overhead transmission lines will transport electricity from each of the internal solar array substations to the grid substation. Based on preliminary designs, the anticipated voltage is 132 kV.

The alignment of the overhead transmission lines and design, height and style of the structures required to support them will be determined during the detailed design stage of the project; however, it is unlikely that the height of the structures will exceed 45 m. Based on preliminary designs, single concrete, wood, or steel poles are anticipated rather than steel lattice towers. The easement required for the overhead transmission lines will be dependent on the type of structure selected but is likely to be approximately 45 m in width. The distance between each structure will also be dependent on the type of structure selected. Where possible, structures will avoid identified constraints on the land parcels between the three array areas. Complete clearance of vegetation within each of the proposed easements may be required.

Indicative alignments for each of the overhead transmission lines are presented in Figure 1.2. As illustrated in Figure 1.2, three options are being considered for the transmission line between the northern and central array areas.

The indicative alignment to connect the southern array area to the central array area extends over approximately 9.5 km and covers land owned by two of the project landholders, as well as the southern road easement of a 1 km section of Gostwyck Road. Each of the indicative alignments presented in Figure 1.2 have been surveyed as part of this ACHA.

The grid substation will be adjacent to TransGrid's 330 kV transmission line, which traverses the northern and central array areas (Figure 1.2). At the grid substation, the electricity generated by the three solar arrays will be stepped up to 330 kV and injected into the electricity grid via TransGrid's 330 kV transmission line. The grid substation will require a pad area of up to 10 ha. An envelope providing adequate flexibility for design and siting of the grid substation is provided on Figure 1.2. The exact dimensions will be refined during the detailed design stage of the project.

Three separate areas, one in the northern array and two in the central array, are currently being considered as options for the grid substation. Footprints providing adequate flexibility for design and siting of the grid substation at these three locations are provided on Figure 1.2. The exact dimensions will be refined during the detailed design stage of the project and in consultation with TransGrid.

1.8.4 Battery energy storage system

The purpose of the BESS will be to support the network, introduce a dispatchable capability to the project's energy generation profile and allow for revenue diversification.

The BESS will be adjacent to one or more substations within the development footprint and will be housed within either a number of small enclosures/cabinets or larger battery buildings. The specific design details for the BESS and their respective enclosure types have not been confirmed; however, it is anticipated that the BESS for the project will consist of either one BESS facility at the grid substation or three BESS facilities (one at the grid substation and two at the internal solar array substations).

1.8.5 Construction accommodation village

A construction accommodation village for non-local construction employees (where skills cannot be sourced locally) may be established as part of the early stages of the project's construction.

The construction accommodation village will be on part of Lot 2 of DP 174053 in the northern array area (refer Figure 1.2).

To build the construction accommodation village, topsoil will be stripped where necessary, hardstand constructed and walkways and car parks constructed.

1.8.6 Supporting infrastructure

In addition to the infrastructure described above, the project will also require:

- one or more O&M buildings (namely meeting facilities, a temperature-controlled spare parts storage facility, SCADA facilities, a workshop and associated infrastructure);
- a number of new internal roads to enable access to the three array areas from the surrounding road network including The Gap Road, Salisbury Plains Road, Hillview Road, Munsies Road and Big Ridge Road (refer Figure 1.2);
- emergency access points to enable access to the three array areas from the surrounding road network in the case of an emergency (eg fire or flood);
- parking and internal access roads/tracks within the three areas to allow for construction and ongoing maintenance; and
- fencing and landscaping around the solar arrays, substations and BESSs.

Temporary infrastructure during the construction stage of the project including laydown and storage areas and a site compound are also likely to be required in each of the three solar array areas. Laydown areas will likely be in close proximity to the primary site access points and will be placed away from environmentally sensitive areas, where possible.

Chain mesh security fencing will be installed within the project boundary to a height of up to 2.4 m high. The location of the security fencing will be determined in consultation with the project landholders. Fencing will restrict public access to the development footprint. Where possible, fencing will be positioned to minimise disruption to ongoing agricultural operations on land adjacent to the development footprint.

2 Aboriginal consultation

2.1 Statutory basis

The *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010c) were used for the project. The stages of consultation and their outcomes are provided in the headings below.

Each private Aboriginal organisation or individual who requested to be registered for consultation within the timeframes of the requirements is referred to as a registered Aboriginal parties, or RAPs.

Full documentation of the consultation process is provided in Appendix A of this report.

2.2 Stage 1 — notification and registration of Aboriginal parties

2.2.1 Agency contact

EMM issued a letter to government agencies on 6 April 2018 requesting advice on which Aboriginal parties to invite for consultation. The agencies contacted are listed below:

- OEH North East Branch;
- Armidale Local Aboriginal Land Council (Armidale LALC);
- Uralla Shire Council;
- Northern Tablelands Local Land Services (former catchment management authority);
- National Native Title Tribunal;
- The Office of the Registrar of Aboriginal Owners; and
- NTSCorp.

2.2.2 Newspaper advertisement

A notification was placed in a local newspaper detailing the project name, proponent, project location, project description and a request for Aboriginal knowledge holders to register interest in the project. The advertisement was placed in the *Armidale Express* on 13 April 2018 allowing a 14 day registration period. A copy of the advertisement is included in the consultation documentation provided in Appendix A.

2.2.3 Aboriginal group invitation to register

The Aboriginal parties identified by the government agencies were invited to register their interest in the project on 23 April 2018 via letter and email (where provided). EMM followed up on the letters via telephone to verify if the parties had received their invitation. EMM left voice messages where no answer was received. Only one government agency nominated group, Craig Archibald, was unable to be contacted during the registration period. Aboriginal parties were given 14 days (to May 7 2018) to respond to the invitation.

2.2.4 Registered Aboriginal parties

Eight Aboriginal parties registered their interest in being consulted for the project and are listed in Table 2.1.

Table 2.1 List of registered Aboriginal parties for the project

Organisation	Contact	
Armidale Local Aboriginal Land Council	Tom	Briggs
Nunawanna Aboriginal Corporation	Colin	Ahoy
Armidale and New England Gumbaynggirr Descendents	Hazel	Green
Les Townsend	Les	Townsend
Steven Ahoy Consultants	Steven	Ahoy
Culturally Aware Aboriginal Heritage Consultancy	Cheryl	Kitchener
Nyakka Aboriginal Culture Heritage Corporation Archaeological and Cultural Heritage Consultants	Rhonda	Kitchener
Aaron Broad	Aaron	Broad
Nganyawana Clan Group	Les	Ahoy

2.3 Stages 2 and 3 – presentation of information and gathering cultural information

2.3.1 Presentation of project information and assessment methods

On 9 May 2018, EMM issued a letter to all RAPs registered within the timeframe. The letter included an overview of the project, the proposed assessment methods and the consultation process, as well as the results of a preliminary desktop assessment and details about gathering cultural information. RAPs were given 28 days to respond to the proposed assessment method, but were informed that cultural information could be provided throughout the duration of the assessment.

Nganyawana Clan Group (Les Ahoy) expressed their interest in the project on 14 May 2018 and was provided with the letter (including the same response timeframes) on the same day.

2.3.2 Meeting 1 – 21 May 2018

UPC and EMM held an on-site consultation meeting with RAPs on 21 May 2018 prior to commencing the first day of the archaeological survey. The meeting was held at the end of Big Ridge Road overlooking parts of the northern array area to provide visual context for where the project is proposed. The purpose of the meeting was to present information about the project and assessment methods, allow Aboriginal parties to identify, raise and discuss their cultural concerns, perspectives and assessment requirements, and gather any cultural information prior to the survey that may have guided the fieldwork.

During the meeting, RAPs expressed that additional Aboriginal fieldworker presence was desired to support the archaeological survey. UPC acknowledged this point and agreed to engage three Aboriginal site officers for each day of the survey (as opposed to two).

2.3.3 Consultation during and after fieldwork

EMM discussed various assessment and management options with RAPs during the fieldwork program to gauge the suitability of certain measures. After the survey program was completed, the topics discussed informally in the field were summarised and issued to RAPs with the aim of receiving preliminary feedback so that UPC could further refine their development footprint based on potential Aboriginal site management options. The primary topics for consideration were:

- Determining the suitability of collecting stone artefact sites of low significance within potential impact areas (ie the development footprint). RAPs supported this approach and noted the value it would provide if placed in a keeping place as an educational tool.

- Les Ahoy provided an email emphasising the importance of the Aboriginal community maintaining a cultural connection to the local area (dated 6 August 2018). Les requested further discussion about providing RAPs with access arrangements to certain sites of high cultural significance.

Each matter summarised by EMM and RAP responses are provided in Appendix A.

2.4 Stage 4 – review of draft Aboriginal cultural heritage assessment

2.4.1 Distribution of draft report and interactive web map

A draft version of this report, which included all background information, results, draft significance assessments and draft management recommendations, was issued to all RAPs on 28 September 2018 accompanied by an email specifying a 28 day timeframe for review. The draft report included highlighted text indicating sections where RAP input was sought in regard to Aboriginal heritage values, significance assessment and management measures.

Additionally, EMM provided access to an interactive web map to accompany the draft ACHA. The web map is an interactive online resource that allowed RAPs to view Aboriginal site information additional to the figures provided in the draft ACHA. The web map includes landscape data, Aboriginal site locations, site summary details, photos linked to each site and the management measures proposed for each site during the draft ACHA review period. The web map provided RAPs with a better understanding about specific site contents, location and their proposed management.

2.4.2 Meeting 2 – 19 October 2018

UPC and EMM held a consultation meeting at Armidale Bowling Club on Friday 19 October 2018 and invited all RAPs to attend. The primary aims of the meeting were to provide a summary of the results of the ACHA, outline the impact assessment and discuss the management measures presented in the draft ACHA. It also gave RAPs the opportunity to ask any outstanding questions about the project. EMM presented project information using a slide show and the interactive web map that accompanied the draft ACHA.

A summary of the key discussion points and outcomes relating to the ACHA are presented in Table 2.2. The commitments outlined in Table 2.2 are reflected in the management measures (Chapter 9) of this report. The meeting presentation slides and meeting minutes with more detailed discussion are provided in Appendix A.

Table 2.2 Meeting 19 October 2018: key discussion points and outcomes

Topic	Discussion and outcomes
1. Management and access arrangements for grinding groove sites NE09 and NE68.	The meeting attendees discussed the management of the grinding groove, artefact scatter and PAD site, NE09, as it is the most significant find and requires attention. The following outcomes were agreed to by UPC and RAPs (subject to project approval): • A boundary fence will be erected around site NE09 to protect it from livestock or farming damage. • UPC will explore opportunities to employ RAPs for vegetation, weed and pest management at NE09 after fencing is erected. • UPC will work with the RAPs and its O&M contractors to provide scheduled access to site NE09 once project construction activities are complete. Site visits will be primarily for educational purposes. Site access will be subject to strict notification requirements, scheduling of on-site activities and WHS procedures. • UPC will also work with the RAPs and its O&M contractors to provide scheduled access to another grinding groove site, NE68, for educational purposes. This will be subject to the same notification, scheduling and WHS procedures. The details of fencing, maintenance and site access for NE09 and site access for NE68 will be discussed further as part consultation with the RAPs during the development of the Aboriginal heritage management plan (AHMP).
2. Collection of Aboriginal objects and keeping place for recovered Aboriginal objects (refer Section 9.3.1).	The RAP meeting attendees supported the collection of surface artefacts within the development footprint for storage and curation at the Armidale and Region Aboriginal Cultural Centre and Keeping Place. However, it was also noted that McCrossins Mill Museum and the Uralla Visitor Information Centre may also be appropriate places for some of the collection. Separate to the meeting, Cheryl and Rhonda Kitchener requested that any additional collected objects not placed on display should be reburied on Country in a safe location (refer Table 2.3). UPC are committed to accommodating the requests for storage and curation of collected objects wherever practicable, noting that the final locations for specific objects will be identified and resolved during consultation with RAPs as part of the development of the AHMP.
3. Continuation of interactive web map	The RAP meeting attendees noted the value of maintaining the web map as an educational tool, possibly to be used at the keeping place in Armidale in conjunction with the collected objects. Subject to project approval, UPC will host the web map for an ongoing period, the duration of which will be determined during consultation with RAPs as part of the development of the AHMP.
4. Options for mitigation for scar trees NE45, NE47, NE49, NE61 and NE67 (Section 9.4.1).	RAPs agreed to the approach described in Section 9.4.1 of the draft ACHA around expert assessment and potential salvage and moving to a keeping place of one or more trees if determined to be of Aboriginal origin. If the trees were not of Aboriginal origin, then no management would apply. However, Colin Ahoy Junior stated that regardless of the outcome for NE49, he would like to have it removed as it is fallen, cut in half and out of context. UPC agreed to follow RAP direction on NE49. The outcomes of this assessment will be detailed in the response to submissions (RTS) report.
5. Additional scar tree survey (Section 9.4.1).	RAPs agreed to the approach set out in Section 9.4.1 of the draft ACHA around additional survey to inspect all mature trees in the development footprint that had not been inspected as part of the archaeological field survey effort to date.
6. Approach for undetermined impacts to sites with PAD (NE15, NE27, NE70, NE83 and NE33 - as per Section 9.4.2 of the draft ACHA).	RAPs supported the approach for potential excavation of NE15, NE27, NE70, NE83 and NE33 as presented in Section 9.4.2 of the draft ACHA. Noting that not all these sites may be impacted.

Table 2.2 Meeting 19 October 2018: key discussion points and outcomes

Topic	Discussion and outcomes
7. Monitoring earthworks during construction for Aboriginal objects.	Some RAPs expressed concern over potential impacts to unidentified sites during ground disturbance works as part of project construction. Steven Ahoy suggested developing a monitoring plan for certain areas (such as near NE70) to address this concern.
	EMM note that monitoring during construction for the purposes of identifying cultural material that may be uncovered during earth disturbance can sometimes be used as a management strategy. However, monitoring is a reactive rather than proactive strategy, and as such, is not an ideal management tool in Aboriginal cultural heritage management. Monitoring for artefacts is not a widely accepted method of management because sites of significance can be destroyed as monitoring is taking place and because it can result in lengthy and costly delays to development works.
	Considering the above, EMM suggests that the archaeological test excavation program proposed in Section 9.4.2 would assist in characterising the subsurface archaeological character of the development footprint in a controlled method rather than monitoring as a first step. The results of the test excavation would then guide any further mitigation measures.
	Overall, UPC has not committed to any monitoring at this stage but will revisit the necessity for any monitoring after test excavation is complete and a better understanding of the subsurface archaeological character is understood. This matter will be resolved further in the RTS report.
8. Salvage of NE10 and NE13 outside the development footprint of the northern array area.	EMM explained that sites NE13 and NE10 are outside of the development footprint but within the project boundary on existing farm tracks. Although they are currently being avoided, they may be at risk of eventual loss if used by landowners. RAPs noted that they would prefer if these artefacts were collected and displayed at the nominated keeping place given that they currently have very low contextual integrity.
	EMM has updated the report to reflect this desired approach (ie site collection of NE10 and NE13) but note it will be subject to endorsement by DPE. Refer to Section 9.2.4.

2.4.3 Additional responses to draft ACHA

EMM reminded RAPs to provide comments on the draft ACHA in the invite to the second consultation meeting on 9 October 2018. Additionally, EMM emailed RAPs on 25 October with a reminder that the closing date for responses was 26 October 2018.

Only two responses to the draft ACHA were received, which were submitted verbally. Cheryl Kitchener (Culturally Aware Aboriginal Heritage Consultancy) called EMM on 26 October 2018 to provide comments on the ACHA verbally. Cheryl stated that she agreed with the draft ACHA generally, but had a small number of comments. The issues raised in the comments to the draft ACHA and their responses are provided in Table 2.3. Rhonda Kitchener (Nyakka Aboriginal Culture Heritage Corporation Archaeological and Cultural Heritage Consultants) also called on 26 October 2018 stating her support of Cheryl's comments.

Table 2.3 Summary of comments and how they are addressed

Comment by Cheryl Kitchener - Culturally Aware Aboriginal Heritage Consultancy	Response to comment
Section 9.4.4 (i) Discovery of new Aboriginal sites Cheryl expressed concern that the procedure for identifying new Aboriginal objects during construction was missing particular steps. Cheryl stated that is it unlikely that people untrained in the identification of Aboriginal objects (eg machine operators during construction) would be able to identify previously unrecorded Aboriginal objects. Cheryl proposed the following to be included as management measures:	
1. UPC staff and contractors be educated about Aboriginal object identification as part of site induction procedures.	UPC is committed to educating staff and contractors of their obligations relating to Aboriginal cultural heritage values through a site induction process (refer Section 9.2.2). The details of operational and training protocols will be developed during consultation with RAPs as part of the development of the AHMP.
2. Disturbance areas should be monitored by an Aboriginal site officer during initial topsoil removal. The site officer would be responsible for recording and collecting any uncovered stone artefacts.	EMM and UPC's response to monitoring during construction is presented in response to Item 7 in Table 2.2.
Section 9.3.1 Aboriginal keeping place Cheryl and Rhonda Kitchener stated that they would prefer it if only an educational sample of collected material was kept at the keeping place. Any excess of material should be reburied on Country in a safe area near the development footprint.	UPC are committed to accommodating the requests for storage and curation of collected objects wherever practical, noting that the final locations for specific objects and details of curation, storage, display and interpretation of recovered objects will be developed and resolved during consultation with RAPs as part of the preparation of the AHMP. As part of this consultation, UPC will also discuss with all RAPs the suitability of reburial for any collected objects.
Acknowledgement of Country Cheryl and Rhonda provided input on how they would like the acknowledgement of Country to be presented in the ACHA. This is based on text emailed to EMM by Cheryl on 8 October 2018.	EMM has updated the ACHA with the recommended text.

3 Environmental context

3.1 Rationale

The environmental characteristics of any area influenced the way Aboriginal people used the landscape. In the past, the availability of resources such as water, flora, fauna, stone material and topography played a substantial role in the choice of camping, transitory movement and ceremonial areas used by Aboriginal people. Therefore understanding environmental factors assists with predicting where Aboriginal sites are likely to occur. Additionally, natural and cultural (human-made) site formation processes that occur after the deposition of archaeological material influence the way archaeological material is distributed and preserved across a landscape.

3.2 Landscape overview

The study area is part of the New England Tablelands Bioregion, which covers an area of more than 3,000,000 ha. Over 95% of the bioregion is within NSW, extending north into Queensland. In NSW, the boundary extends from north of Tenterfield to south of Walcha and includes towns such as Armidale and Guyra. The bioregion is a stepped plateau of hills and plains with elevations between 600 and 1500 m on Permian sedimentary rocks, intrusive granites and extensive Tertiary basalts (OEH 2016b).

Most of the study area is within the Armidale Plateau subregion, which is characterised by an undulating to hilly plateau at an elevation of approximately 1,100 m. It has a stepped landscape across basalt flows with broad valleys which steepen to the east at the head of the Great Escarpment Gorges. Specific landform patterns and landform elements across the study area are described in soil landscapes information presented in Table 3.1.

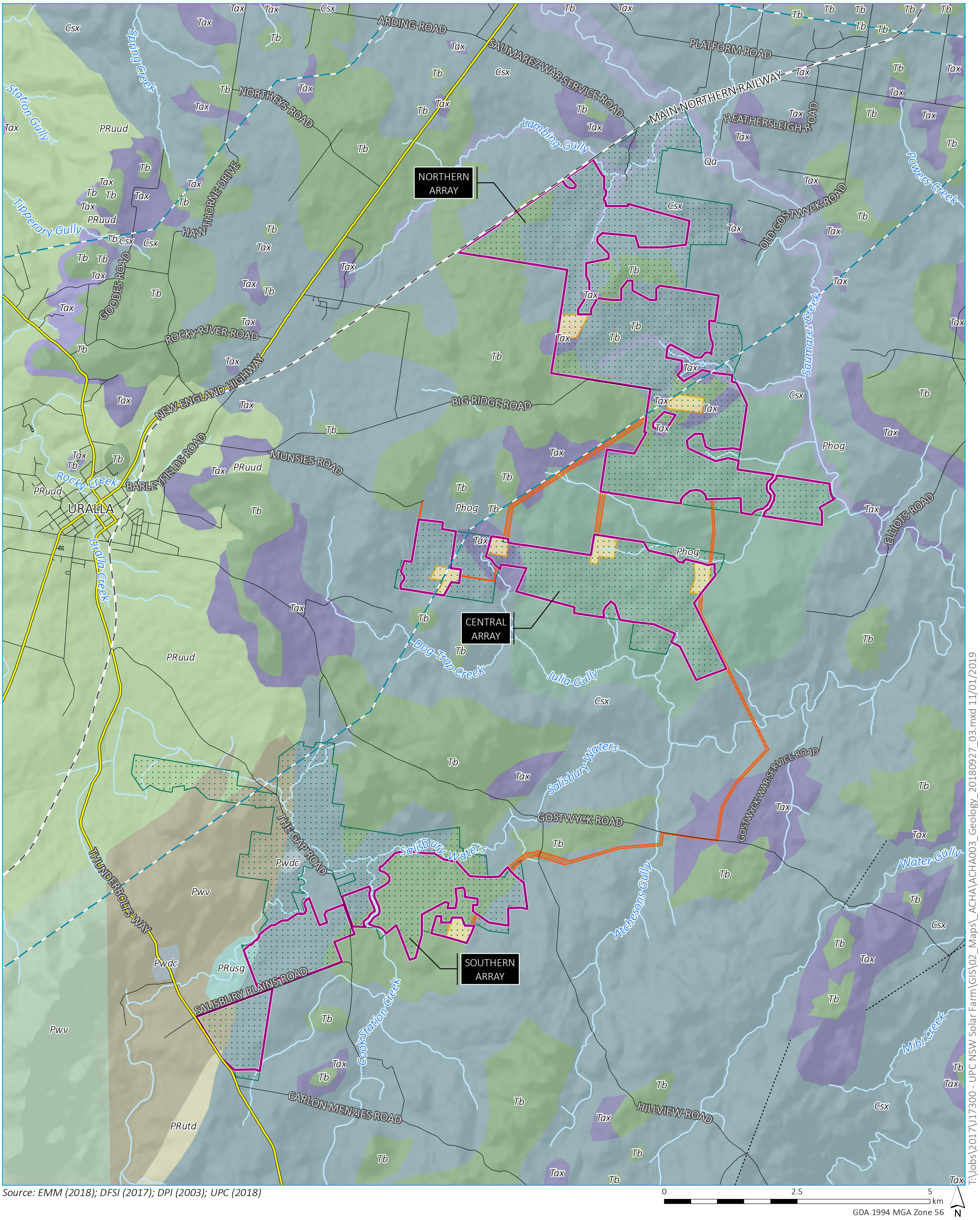
3.3 Geology and geomorphology

The study area is part of the New England fold belt in the north-east of NSW and is composed of sedimentary rocks of Carboniferous and Permian age that were extensively faulted during a period of rapid continental plate movement associated with granite intrusions in the late Carboniferous age (OEH 2016b). Much of the bedrock is now overlain by Tertiary basalt flows rarely exceeding 100 m in thickness that lie on river gravels and sands or on lake sediments. In certain areas, basalt has eroded and exposed the underlying sedimentary layer. The geology of the study area generally contains fine-grained Permo-Carboniferous sedimentary rocks, granites and Tertiary basalt flows.

The geology has a considerable influence on the topography of the landscape. The eastern edge of the New England Tablelands Bioregion is at the Great Escarpment to the east of the study area, where coastal streams have formed deeply incised gorges below the plateau. Granite country across the higher elevations of the study area represents the steepest areas and contains boulder outcrops and rounded tors. Basalt country across the study area is generally more planar, but there are higher peaks around former eruption areas which have formed rocky crests.

Notably, the basalt flows during the Tertiary period filled previously formed drainage patterns, effectively inverting former valley floors into ridge crests and hills. These topographic changes also created swamps and lagoons, such as Dangars Lagoon to the west of the study area.

General information about the geology and outcropping rock material across the study area is described based on the soil landscapes information presented in Table 3.1 and in Figure 3.1.



Source: EMM (2018); DFSI (2017); DPI (2003); UPC (2018)

KEY

- 330 kV transmission line
- Main road
- Local road
- Rail line
- Watercourse/drainage line
- Study area

Development footprint

- Solar array
- Potential site access/ETL easement/electrical cabling
- Potential substation/BESS footprint

- Fault

Geological unit

- Quaternary, unnamed (Qa)
- Tertiary, Armidale beds (Tax)
- Tertiary, unnamed (Tax)
- Tertiary, unnamed (Tb)
- Carboniferous, Sandon beds (Csx)
- Permian, Salisbury Waters Porphyrite (PRusg)
- Permian, Terrible Vale Porphyritic Microtonalite (PRutd)
- Permian, Uralla Granodiorite (PRuud)
- Permian, Gostwyck Adamellite (Phog)
- Permian, Dummy Creek Conglomerate (Pwdc)
- Permian, Wandsworth Volcanic Group (Pwv)
- Permian, undifferentiated (Pwv)

Geology

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 3.1

creating opportunities

3.4 Hydrology

The study area is within the New England Tablelands Bioregion which involves the MacIntyre, Clarence, Gwydir, Macleay, Namoi and Manning River catchments (OEH 2016b). The study area is part of the catchment of the Macleay River which rises to the east of the study area at the confluence of the Gara River, Salisbury Waters and Bakers Creek and flows south-east through a coastal floodplain, where it meets the Pacific Ocean.

The main drainage features of the study area and its surrounds comprise:

- Salisbury Waters and its tributary Cook Station Creek (6th and 5 th order streams in accordance with the Strahler system of stream order, respectively) that intersect the southern array area;
- Julia Gully and its tributary Dog Trap Creek (both 4th order streams) that form in the western part of the central array area and continue to the south of it before flowing into Salisbury Waters; and
- Saumarez Creek (5th order) which flows to the east of the northern array area and its tributaries including Lambing Gully (3rd order) which flows north-east across the top of the northern array area.

In addition to the main streams associated with the study area, there is a network of 1st, 2nd and occasionally 3rd order tributaries that extend across the development footprint. These are more frequent and closely spaced in the southern and central array areas nearby Salisbury Waters and Julia Gully, and become less frequent in the northern array area in undulating areas of lower relief and long undulating rises. The majority of streams within the three array areas have no discernible channel.

There are three primary upland wetlands near Uralla, namely Dangars Lagoon, Racecourse Lagoon and Barleyfields Lagoon. Dangars Lagoon is directly west of the study area, Racecourse Lagoon is approximately 1.6 km west of study area and Barleyfields Lagoon is over 5 km west of the study area next to the New England Highway. Dangars Lagoon (similar to all upland wetlands of the group) is shallow (less than 1.5 m deep), oval-shaped and has rocky margins. The lagoon is fed by springs, streams or overland drainage. The lagoon has been modified by bank construction, excavation and pipe emplacement.

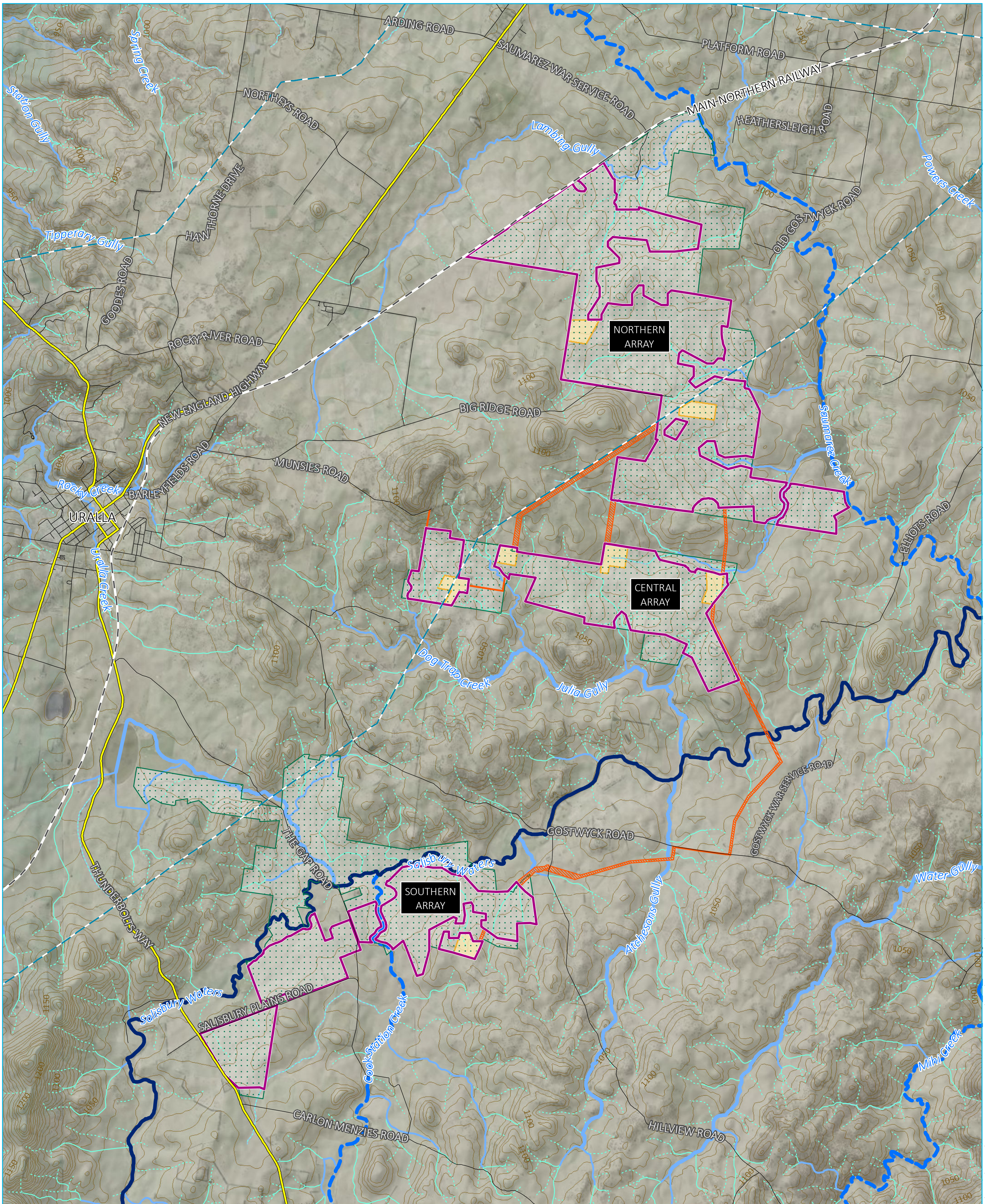
Further information on localised hydrology is described in relation to the soil landscapes information presented in Table 3.1 and in Figure 3.2.

3.5 Soil landscapes information

The study area contains a number of soil landscapes which are defined in the *Soil Landscapes of Armidale* (DECCW 2009). The soil landscapes are presented in Table 3.1.

Soil landscape classifications and their boundaries provide pre-defined areas that are classified by a number of geographic features which are informative for the archaeological investigation. They provide localised information including landform patterns, soils, geology, rock outcrop percentage, land use and vegetation. This information provides another layer to categorise the landscape for the predictive model, additional to what a topographic may provide. For example, topographic contours show that there are numerous crest landforms throughout the study area, whereas soil landscapes information may show that outcropping basalt, granite and silcrete occurs in some areas and not others.

Soil landscape information builds on the underlying geology of the study area and describes what soils overlie the geology and where soils are likely to have been eroded or missing, exposing bedrock or where they have built up.



Source: EMM (2018); DPI (2003); DFSI (2017); UPC (2018)

KEY

- 330 kV transmission line
- Main road
- Local road
- Rail line
- Contour (10 m)
- Study area

Development footprint

- Solar array
- Potential site access/ETL easement/electrical cabling
- Potential substation/BESS footprint

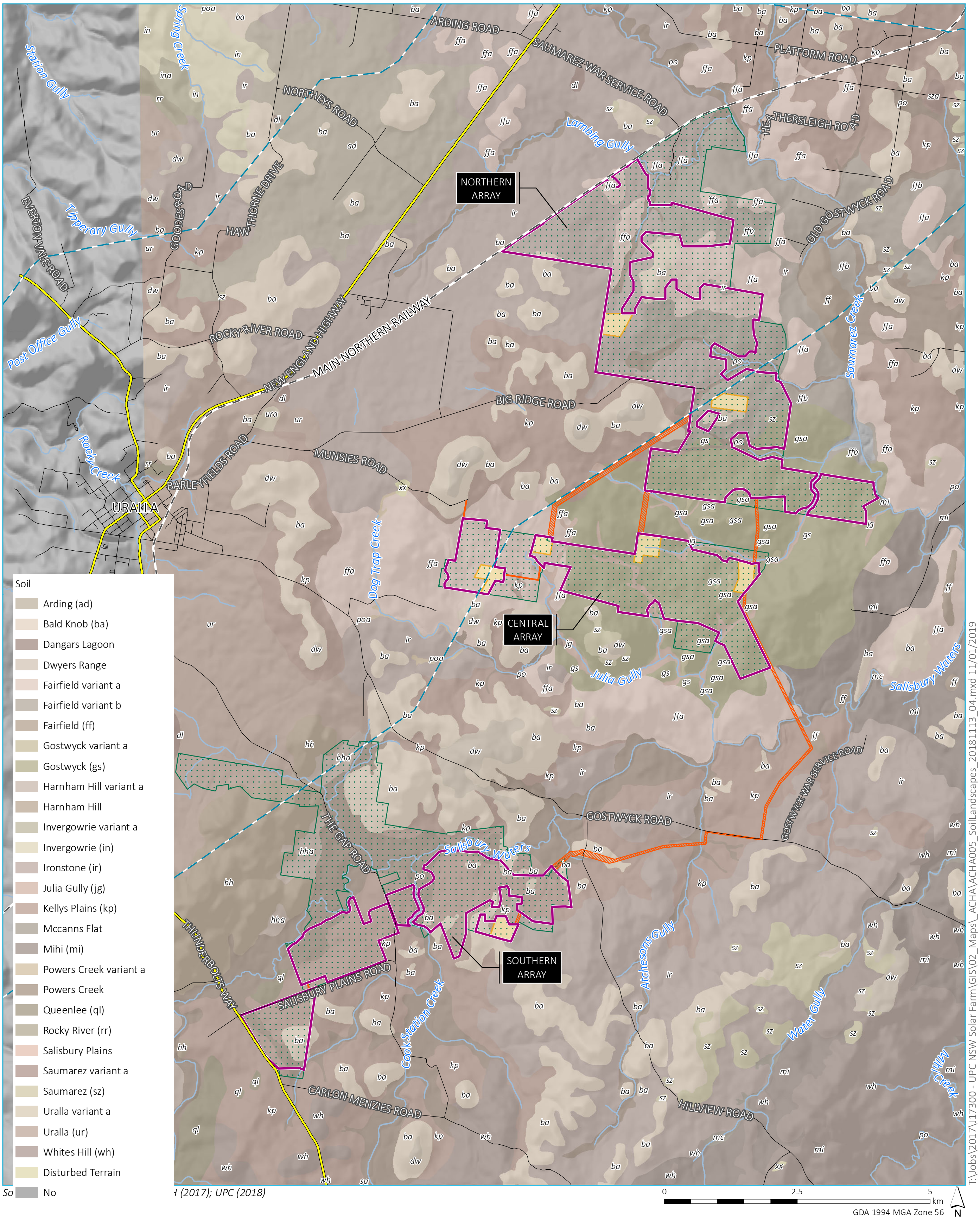
Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order
- 6th order

Hydrology and topography

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 3.2

creating opportunities



Soil landscapes

- - 330 kV transmission line
Main road
Local road
- - Rail line
Watercourse/drainage line
Study area

Development footprint
Solar array
Potential site access/ETL easement/electrical cabling
Potential substation/BESS footprint

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 3.3

EMM
creating opportunities

Table 3.1 presents the soil landscapes relevant to the study area in combination with observations made from topographic maps and Strahler stream order data. It also identifies if particular soil landscapes occur within the development footprint.

3.6 Flora and fauna

The study area has remnants of pre-colonial ecological communities that would have covered the landscape; however, most of it has been cleared leaving only isolated paddock trees or small pockets of trees. A broad scale assessment of vegetation in NSW by Morgan and Terrey (1992) indicates that the following vegetation communities occur within the Armidale Plateau subregion:

- open Ribbon Gum forest and woodland with Snow Gum and Black Sallee on basalt;
- Yellow box, Blakely's Red gum, Rough-barked Apple, Apple box on sedimentary rocks;
- Silver-top Stringybark, New England Stringybark on dry aspects;
- Blakely's Red Gum, Yellow Box and Apple Box on moist, well-drained slopes; and
- New England Peppermint with ribbon gum on flats.

Of the trees listed above, those commonly recorded with Aboriginal scarring and carving in the New England region include Red Gum, Yellow Box and various Stringybark species (DEC 2005, p.59).

Pre-colonial biodiversity in the study area would have been greater than today and without the impact of widespread vegetation clearance. Native birds, reptiles, mammals, insects and aquatic life would have occupied the landscape providing various resources for consumption by Aboriginal people.

3.7 Land use and disturbance

The majority of the study area been modified by historical land use practices and past disturbances associated with land clearing, manual and machine rock-picking, cropping and intensive livestock grazing. Although the entire study area has been subject to widespread clearing, there are a number of mature trees that have survived since colonial settlement for use as shade for livestock. The properties that make up the study area are currently primarily used for sheep grazing for production of wool and lambs, with some cattle grazing for beef production. These paddocks are still subject to cropping for pasture improvement and can be seen in their various stages of crop rotation.

Areas with significant outcropping bedrock have also been historically cleared of vegetation; however, depending on the nature and extent of bedrock, are likely to have been avoided from repeated cropping due to inaccessibility from farming machinery. Further details of disturbance levels observed in the field are presented in Chapter 6.

Table 3.1 Soil landscapes in the study area

Soil Landscape and type	Landform pattern and hydrology (specific to study area)	Landform elements	Location in study area	Slope and relief	Geology and rock outcrop %	Soil summary	Other comments
Harnham Hill and variant a (hh and hha) Erosional	Rolling low hills interspersed with ephemeral drainage lines (1^{st} and 2^{nd} order) on hills which converge into higher order watercourses and larger open depressions on valley floors (up to 4^{th} order).	Hillcrests, spurs, hillslopes, footslopes, drainage depressions, stream channels.	Outside of development footprint. Northern side of Salisbury Waters.	**Relief:** Low to high (up to 100 m) Slopes are gentle to moderately inclined (5–30%). Lower hill slopes and footslopes very gently inclined (<5%).	Annalee Pyroclastics (mixed volcanics). Rock outcrop 2–10% on mid to upper slopes. Observed as rounded boulders of mix and pebbly volcanics and vitric (glass-like) tuffs. Somewhat resembles granite tors. Noted to feature small, rounded cobble sized outcrops.	**Crests/upper slopes:** A1 Horizon of loam (0-10 cm). B2 Horizon of clay loam (10–20 cm) with bedrock at 20 cm. **Lower slope/footslope** A Horizon of sandy clay loam (0–32 cm). B horizon medium clays can continue past 140 cm.	Soil landscape sheet notes that this contains some significant Aboriginal sites including stone axe quarries and healing ground in the vicinity of Salisbury Court. Mostly light grazing.
Uralla (ur) Erosional	Level to gently inclined undulating plains and rises generally with ephemeral drainage lines (1^{st} and 2^{nd} order) but also a 4^{th} order stream flowing east from Dangars Lagoon.	Hillslopes, footslopes, drainage depressions and occasional gullies or stream channels.	Outside development footprint. West of southern array area.	Slopes are level to gently inclined (0–10%) and local relief is very low (<20 m).	Uralla Granodiorite (medium grained). Conspicuous rock outcrop (large granite tors) on upper slopes (<10%) and sometimes on lower slopes.	A horizons on drainage depressions and open plains can occur up to 55 cm and up to 20 cm on upper slopes. B horizons continue into saprolite and then into granite bedrock.	Mostly light grazing, previously used for gold mining (the Uralla Goldfield).
Powers Creek (po) Alluvial	Alluvial channels, floodplains, terraces and footslopes on basalt alluvium/colluvium. Dominant watercourse is Salisbury Waters (6^{th} order) and numerous tributaries up to 5^{th} order (Cook Station Creek).	Stream channels (Salisbury Waters and its tributaries), plains and terrace scarps.	The central portion of the southern array area surrounding Salisbury Waters. Northern array area on tributaries of Saumarez Creek, including Lambing Gully.	Slopes are generally level to very gently inclined (0–3%) and local relief is extremely low (<9 m).	Alluvium and colluvium derived from Tertiary basalt. Basalt floaters can occur within the topsoil on footslopes. Minor floaters such as fragments of chert/grey wacke also occur. Rock outcrop is absent.	A horizons of medium clay of up to 20 cm on floodplains and footslope/terraces and sandy clays can be up to 45 cm on stream banks. B horizons of heavy clays or can continue deep into alluvium and colluvium.	-

Table 3.1 Soil landscapes in the study area

Soil Landscape and type	Landform pattern and hydrology (specific to study area)	Landform elements	Location in study area	Slope and relief	Geology and rock outcrop %	Soil summary	Other comments
Kellys Plains (kp)	The gently undulating lower slopes and footslopes of low rolling hills on basalt and basalt-related colluvium dissected by 1st and 2nd order streams. Foot slopes leading north towards Salisbury Waters.	Broadly concave hill slopes and foot slopes, drainage depressions.	Mainly southern and south-eastern portion of southern array area surrounding the crests of Bald Knob Soil landscape. Border of the western edge of northern array area.	Footslopes are very gently inclined to gently inclined (1–8%) and with very low to low relief (30 m and occasionally to 50 m).	Tertiary basalt with occasional rock outcrop (<2%) or locally significant outcrop and/or surface-strewn basalt/ironstone floaters.	A horizon is either clay loams on upper footslopes or very dark brown medium heavy clay on footslopes and continues into a B horizon of very heavy clays.	-
Bald Knob (ba) Erosional	Crests of low rolling hills and rises. Springs are noted to occur in association with basalt. Primarily near ephemeral streams 1st and 2nd order streams. But discrete areas is close to within 200 m of Salisbury Waters (6th order).	Hill crests and steeper hill slopes and drainage depressions.	Mainly southern and south-eastern portion of southern array area. Localised crests in the northern array area.	Slopes adjacent to hill crests are typically moderately inclined (10%–30%) with isolated occurrences of steep slopes (>30%). Local relief ranges from very low to high (20–90 m).	Tertiary basalt. Crests are rocky with angular basalt rock outcrop from 20–50%. Some of the unit is also underlain by Armidale Beds which includes silcrete, ferricrete and ferruginous sandstones.	The A soil horizon is either non-existent or very shallow on crests and upper and mid slopes (0–10 cm depth and continue onto bedrock or B horizons. A soil horizon can be up to 30 cm on lower slopes or drainage depressions.	-

Table 3.1 Soil landscapes in the study area

Soil Landscape and type	Landform pattern and hydrology (specific to study area)	Landform elements	Location in study area	Slope and relief	Geology and rock outcrop %	Soil summary	Other comments
Fairfield variant a (Ffa) and variant b (Ffb) Erosional	Chert dominated ridges and small rises (Ffa) and foots slopes (Ffb). Associated with ephemeral streams 1st and 2nd order streams. Includes a small tracts 3rd order streams. Abuts Saumarez Creek (5th order).	Spurs, hillcrests, drainage depressions, rises, gullies and stream channels (Ffa). Foot slopes and drainage depressions (Ffb).	The western portion of the central array area (Variant a) North and north-eastern areas of northern array area (Ffa and Ffb).	Crests and spurs are very gently inclined to moderately inclined (<10%). Hill slopes reach a gradient of up to 30% (moderately inclined). Local relief is very low to low (20–60 m).	Sandon Beds. Common angular to sub-angular rock outcrop (gravels to stones) on crests and hill slopes have common to abundant outcrop. Chert is noted as the main outcrop type but Jasper may also occur. Greywacke also occurs in minor components.	Crests and upper slopes have A horizon of approximately 0-10 cm depth and continue onto shallow B horizon or bedrock. Lower slopes have slightly deeper A Horizon (0-15 cm).	-
Julia Gully (jg) Alluvial/Swamp	Streams and very narrow Floodplains on Gostwyck Adamellite. Primarily 1st and 2nd order streams converging to small tracts of 3rd order streams.	Narrow floodplain, drainage depressions/gullies	Small tracts dissecting the central array area.	Very gently inclined (0-2%) and very low relief (9–30 m).	Gostwyck Adamellite. Some outcrop of metasediments are noted in deeply incised stream beds.	A horizon soils are sandy clay loams up to 35 cm with an underlying B horizon of medium heavy clay.	-
Gostwyck and variant a Erosional	Rolling low hills with abundant granite outcrop (tors). Associated with only 1st order streams, but surrounding Julia Gullyand small tracts of 3rd order streams in central array area.	Crests, spurs, and hill slopes, drainage depressions	The eastern portion of the central array area. Southern portion of northern array area.	Gently inclined to moderately inclined (5–15%) with some flatter crests (<5%). Low local relief (<40 m).	Gostwyck Adamellite comprised of biotite adamellite. This has weathered to form extensive torfield (10–50%) especially on upper slopes. Some quartz veins also occur in the adamellite. Small sections of Gostwyck variant a has 90% rock outcrop.	A horizon is a shallow loamy sand 0–18 cm depth with an underlying B horizon of brown clayey sand up to 45 cm.	-

Table 3.1 Soil landscapes in the study area

Soil Landscape and type	Landform pattern and hydrology (specific to study area)	Landform elements	Location in study area	Slope and relief	Geology and rock outcrop %	Soil summary	Other comments
Ironstone (ir) Erosional/ Transferral	Undulating rises, rare low hills, hill slopes and long >2000 m very gently inclined lower slopes and foot slopes	Crests, spurs, hill slopes, foot slopes, drainage depressions.	Western and north-western portion of the northern array area. Eastern fringe of southern array area.	Very gently inclined to gently inclined (1–10%) slopes. Extremely low to low relief (0–40 m).	Tertiary ferricrete/ironstone which outcrop 10–20% as surface strewn cobble to stone sized nodules. Locally significant silcrete outcropping.	A horizon is generally a shallow clay loam (0–15 cm) onto a medium clay (15–60 cm). Lower slopes and drainage depressions have deeper A horizon of up to 40 cm.	-
Saumarez (sz) Erosional/ Residual	Undulating plains and rises on Tertiary silcrete.	Broad, flat crest in the northern array area.	Very small, approximately 2 ha area on the eastern edge of the northern array area.	Level to very gently inclined slopes (<10%) with low relief.	Unweathered to faintly weathered Tertiary silcrete. Can appear like granite tor fields but also includes smaller cobbles.	Topsoil in missing in outcropping areas but where soil does occur, there are sandy loams.	-

4 Aboriginal cultural heritage context

4.1 Ethno-historical overview

4.1.1 Local population

Information about the socio-cultural structure of Aboriginal society prior to European contact largely comes from ethno-historical accounts made by colonial settlers. These accounts and observations were made after massive social disruption due to disease and displacement. As a result, this information is often contentious, particularly in relation to language group boundaries. Therefore, it is likely that language group boundaries were far more diffuse than the arbitrary demarcations drawn by colonial observers.

The study area falls within the Aboriginal language group boundary of the *Nganyaywana*; also known as the *Anaiwan*. The first historical references of the Anaiwan language were from the Europeans during 1880s (eg William Gardner, Robert Mathews). Norman Tindale (1974) recorded the location of the *Anaiwan* as 'New England tableland from Guyra and Ben Lomond south to Uralla and Moombie Range; northwest to Tingha; at Bendemeer and Armidale' (Plate 4.1). The Encyclopaedia of Aboriginal Australia (AIATSIS) follows Tindale's boundary but classifies the language spoken as *Nganyaywana* (Plate 4.1) which was coined by linguist Terry Crowley (1976). Crowley identified that the *Nganyaywana* had two dialects: *Himberong* spoken to the south in the Walcha district and *Iuwon* spoken in the areas of Armidale, Uralla and Bundarra (Crowley 1976). It is likely that people in the study area spoke the *Inuwon* dialect of the *Nganyaywana*.

Ethnographic and historical accounts of the local Aboriginal population are only provided in fragmented accounts and typically represented what interested new settlers. By the mid-1800s, the Aboriginal population of the New England was already estimated at only five or six hundred people (The Commissioner of Crown Lands for New England 1843, in McBryde 1974, p.8). Although literature is sparse, ethno-historical accounts centre on seasonal movement to gather resources and to avoid the cold in certain areas during winter (McBryde 1974, p.10).

4.1.2 Living arrangements

Shelter at open camp sites would have involved the construction of temporary timber-framed huts, often near the trunks of existing trees. Sir Thomas Mitchell noted when visiting a group of huts near the Gwydir, on the western slopes of the New England Tablelands (also referred to within this report as the Tablelands), that the huts were grouped together, all facing a central hearth. The huts were:

> "...semi-circular, or circular, the roof conical and from one side a flat roof stood forwards like a portice, supported by two sticks. Most of the huts were close to the trunk of a tree and were covered, not as in other parts, by sheets of bark, but with a variety of materials, such as reeds, grass and boughs." (Mitchell 1839, in McBryde 1974, p.9)

The temporary or semi-permanent nature of the huts suggests there was relatively frequent movement throughout the landscape.

Archaeological evidence shows that Aboriginal people also used large stone arrangements and rock overhangs for camping and shelter but there is limited ethno-graphic information about this in the Tablelands.

4.1.3 Burial customs and ceremony

Ethno-historical accounts indicate that Aboriginal people of the Tablelands disposed of their dead by burial. Accounts of burial practices include references to burials being marked by carved trees, stone mounds known as cairns and earth mounds (W Gardener 1854 in McBryde 1974, p.149). Other writers also mention the construction of large earth mounds (approx 4 foot in height) covered by sticks or logs to deter wild dogs (A.W. Howitt 1904, in McBryde 1974, p.149). Further north near Tenterfield there are also accounts of the dead being placed in trees (McBryde 1974, p.149).

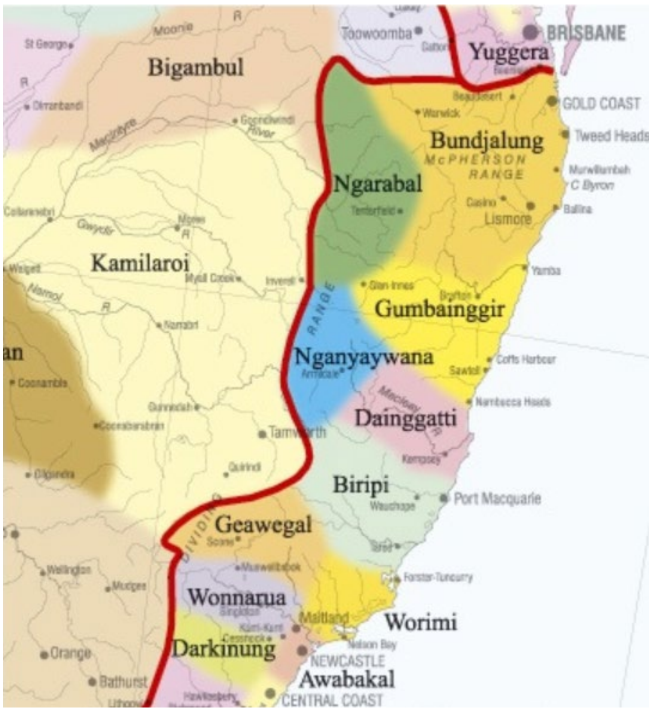


Plate 4.1 Left: Tindale's map (1974) showing the location of the *Anaiwan*.

Right: The Encyclopaedia of Aboriginal Australia (AIATSIS) follows Tindale's boundary but classifies the language spoken as *Nganyaywana.*

4.1.4 Local beliefs and ceremonial practices

The Tablelands have a high number of ceremonial sites including Bora rings, stone pathways, carved trees and rock art. It is commonly known that the area is spiritually linked to Baimai (creator god), Birrahgnooloo (his emu-wife) and Daramulan (son of Baimai) (Flood 2010, p, 238). There are gaps in knowledge regarding information of the use of Bora rings and other ceremonies because Aboriginal people were often unwilling to have white settlers present at the ceremonies, therefore, records of the events tend to be disjointed and mostly speculations.

Male initiation ceremonies were closely linked to Daramulan and Baiami and performed with a Bora ring between August and September due to the celestial phase known as the 'Cosmic Emu' (Fuller et al 2013, p.7). A ceremony at Black Mountain (40 km north of the study area) described by Charles Blomfield, a student of anthropology and ethnographic study, includes emu tracks being used to mark the track toward the Bora ring (Waters 2015, p.36). Within the Tablelands, ceremonies are reported to have continued until the "early eighties" (assuming 1880s) (McBryde 1974, p.41). An 1871 account of the Bora ground mentions a circle of eight to ten yards in diameter surrounded by numerous carved trees (Armidale Express 1871 in McBryde 1974, p.42).

Mt Yarrowyck was at times a meeting place for many of these ceremonies; located approximately 30 km north-west of the study area.

Hudson's (1976) research at an initiation site near Uralla identified site features such as a stone structure (partially collapsed), stone tool grinding grooves and a rock enclosure told to be where the initiation starts. The site looked to be occupied by both men and women; however, further into the initiation; men would walk to the Bora ground 7 km west. The location has not yet been verified during this assessment.

Project RAP, Steven Ahoy, provided accounts of oral history relating to the story of the Anaiwan Brothers possibly relating to the nearby mountains of Arthurs Seat (approximately 8 km north-east of the study area) and Mt Duval (approximately 18 km north of the study area). It is believed that the mountains and related story could mark the boundaries between the north-eastern Anēwan clan's country and the central Rādhūn clan, although there is some uncertainty about the actual location of the two mountains.

> "...there were these two brothers...The story of the Anaiwan brothers, is a story of greed and mistrust in the Anaiwan tribe. There were two brothers who lived in this valley and they were always fighting over food, women and weapons. This went on for many years and they brought other people in to the fight which caused the breakdown of the tribe. The elders tried to talk to the brothers, but they would not listen, so the brothers were banished to the far ends of the tribal boundary and were turned into mountains. Now the two brothers protect the land and the people."
>
> As told by Ethel Archibald to Cheryl Kitchener (1993)

Rather than referring to the entirety of what is now commonly referred to as the 'Anaiwan' tribal group, Ethel Archibald's comment about the brothers being "banished to the far ends of the tribal boundary" may have been referring to the ends of the Anēwan clan's country.

4.1.5 Tools, weapons and clothing

Ethno-historical information lists an array of tools and weapons and also mentions areas of raw material procurement. Many items are unlikely to have survived as artefacts in the archaeological record because they are susceptible to decomposition. Items made of wood are a primary example. Ethnographic accounts of tools in the Tablelands focus on spears, clubs, waddies (a type of hunting stick) and boomerangs among wooden artefacts and on axes and stone implements such as stone tools (McBryde 1974, p.13). Rugs and cloaks were made of kangaroo and possum skins with the aid of bone needles and animal sinews for thread. Wood, bark and animal materials were also used to make items like bags, fishing nets and wooden vessels (McBryde 1974, p.13).

4.1.6 Post-contact period overview

Surveyor-General John Oxley explored the region in 1818. Development of land for grazing followed, primarily for cattle, although by the end of the 19th century this had largely changed to sheep grazing. Aboriginal people often worked as stockmen on the stations. By 1851, the town of Armidale had a population of over 500 which expanded to over 4,000 during the next decade (OEH 2016a). At around the same time, the number of Aboriginal people in the Tablelands New England was estimated by Commissioner George McDonald to be around 600 (McDonald 1845 in Hudson 2006). He also noted the impact of disease and land clearance for sheep grazing (in diminishing macropod numbers) on the Aboriginal population.

Tensions between Aboriginal people and settlers mounted throughout the early to mid-19th century. During the 1830s, Tablelands formed one corner of the government's Mounted Police who were often responsible for the escalation of armed conflict and violence in rural districts. However, violence extended outside the law which is exemplified by the atrocities carried out by a dozen or so stockmen in what is known as the Myall Creek massacre in 1838. Twenty eight Aboriginal men, women and children who were camped peacefully were slaughtered and after two trials, seven of the eleven perpetrators were hanged (Roberts 2006, p.104).

The contact period on pastoral runs in the Tablelands featured many interactions with Aboriginal people, which ranged from atrocities relating to the murder of Aboriginal people during early settlement to working arrangements between settlers and local Aboriginal people.

During the 1830s, a period of intense hostility characterised the spread of pastoral concerns within the colony. There were frequent conflicts between shepherds and Aborigines. Aboriginal people stole sheep and attacked shepherds, probably to defend territory but also triggered by the taking of women. Shepherds raped Aboriginal women and killed Aboriginal people in retaliation for real or imagined offences (Pickard 2008, p.78). Some squatters employed Aboriginal people as shepherds (such as Edward Ogilvie in northern NSW) and it was often women who did much of the shepherding. Yet, if they were paid wages at all, they were much lower than white employees and more often they were given rations and cast-off clothes (Pickard 2008, p.71).

There are many historical accounts of Terrible Vale station (approximately 7 km south of the study area) owned by Edward Gostwyck Cory. Accounts of cruelties included:

> "From the years when Cory occupied the run, the head stockman at Terrible Valley was a man named Billy, who was a ruthless bully of the local Aborigines...Another legend passed down through some people who worked on the station, was that a large number of Aborigines were killed near the creek on Terrible Vale in the early days of settlement."
>
> (Elizabeth Gardiner, Terrible Vale: No Time Like the Past, 1998, p17)

Some insights into Aboriginal employment and daily life on pastoral runs are provided in the following excerpts from accounts at Terrible Vale:

> "The buildings [at the homestead] were all near to one another as a protection against the Aborigines whom new inhabitants at Terrible Vale did not trust. They were camped in bark gunyahs on the station, sometimes quite close to the homestead, so at night the Taylors always closed the wooden shutters of their primitive home."
>
> (Elizabeth Gardiner, Terrible Vale: No Time Like the Past, 1998, p24)

> "At Terrible Vale William Tydd Taylor employed an Aborigine referred to by the names Black Micky or Flash Mick, and on more formal occasions he was recorded as Michael Blackfellow. Micky was employed there during the 1850s and 1860s and he was remembered as a smart young fellow who was a great rider, delighting in riding as a buckjumper. On Sundays during the summer he used to come out in a clean white duck suit, cabbage tree hat and white puggaree, with tail hanging down behind. In his later years, Frederick George Taylor recalled how the Aborigines around Terrible Vale during his childhood were sometimes very useful.
>
> Many were content, however, to live on a couple of meals a day, peace and quietness and as little work as possible. They lived principally on possums and bandicoots, making cloaks for themselves out of possum skins. Later on some of them used to have a little flour, tea and sugar, given to them by William Tydd Taylor. Several Aborigines were known to be employed on Terrible Vale by the early 1860s."
>
> (Elizabeth Gardiner, Terrible Vale: No Time Like the Past, 1998, p32)
>
> "An overview of life on Terrible Vale towards the end of last century was provided in the reminiscences of Carl Taylor...Although he saw very few Aborigines, he remembered seeing where they had had corroborees on the station, as the grass had been worn down in a circular area."
>
> (Elizabeth Gardiner, Terrible Vale: No Time Like the Past, 1998, p129)

The upheaval and violence of colonial occupation was also accompanied in many areas by the renaming of the landscape evident in the new runs set up at Gostwyck, Saumarez and Salisbury. If not immediately resulting in the physical removal of Aboriginal people and their right to tenure, the appropriation of land was cemented by the new settlers' names which were often more enduring than the early settlers, Cory amongst them (refer to Ferry 1999, p.16). By the early 1850s, this expansion and the often hostile interactions between the Aboriginal population and the colonial squatters had devastating effects. The local Anaiwan people were effectively displaced from their land and other traces of former custodianship of the land were eroded by the renaming of much of the topography and local watercourses (Ferry 1999, p.3, 15-16). The Anaiwan continued to inhabit the region maintaining traditional practices, where possible, with reports of encampments and corroborees into the 1860s (Ferry 1999, p.47).

By the mid-19th century, it was clear that European settlement had removed much of the land and resources necessary for traditional Aboriginal life. One response by Europeans was an attempt to 'settle' the Aboriginal people in a similar way to Europeans. In 1851, Commissioner Massie reported that:

> "...a reserve for use by Aborigines of 350 acres had been put aside, which contained good cultivation ground, good water and every essential requisites for the permanent location of the Aborigines, should they feel disposed to forget their migratory habits."
>
> (Massie 1851)

Aboriginal segregation became more institutionalised by the late 19th century and between 1883 and 1908, 16 Aboriginal reserves were established in the Macleay, Nambucca and Bellinger valleys. By 1910, there were said to be only 262 Aboriginal people in the Tablelands (including what were then called 'half castes') (Jordan 2006, p.123). However, by the 1950s there were nearly 1,000. Today, over 5% of the regional population is of Aboriginal descent (Jordan 2006, p.123). Aboriginal people have made considerable headway in regaining their lost voice from centuries of adversity. The Aboriginal people of the Tablelands today are a testament that traditional authority, structures and legitimacies of Aboriginal law and culture have survived and continue to grow into the 21st century (Jordan 2006, p.123).

4.2 Previously recorded sites

4.2.1 AHIMS search

i Overview

EMM conducted a search of the Aboriginal Heritage Information Management System (AHIMS) register on 9 November 2017. The search covered an area of approximately 25 km x 25 km centred on the study area; but also extended beyond the study area boundary. The aim of the search was to identify if any Aboriginal sites or places are registered within the study area; and to aid predictions for the study area from the frequency and distribution of Aboriginal site types in the broader landscape. A copy of the AHIMS search is provided in Appendix B.

The AHIMS search identified 36 Aboriginal sites which are categorised in Figure 4.1 and their locations presented in Figure 4.2. Only one site is registered within the study area, namely a scarred tree (AHIMS ID #21-4-0046). As part of a preliminary site inspection, archaeologist Graham Knuckey searched for this site (refer Section 4.3.2). The site was not located as the AHIMS data is incorrect – it is actually 1.4 km north-east of the central array area and outside of the study area and development footprint (refer to Section 4.2.1.iii below).

The AHIMS search also identified two sites registered with restricted information, meaning that the location and site type was not provided in the search results. EMM contacted the AHIMS registrar on 24 April 2018 to verify if the restricted sites are in the study area. An OEH representative from the Heritage Division confirmed that the restricted sites are outside the study area and development footprint and will not be impacted.

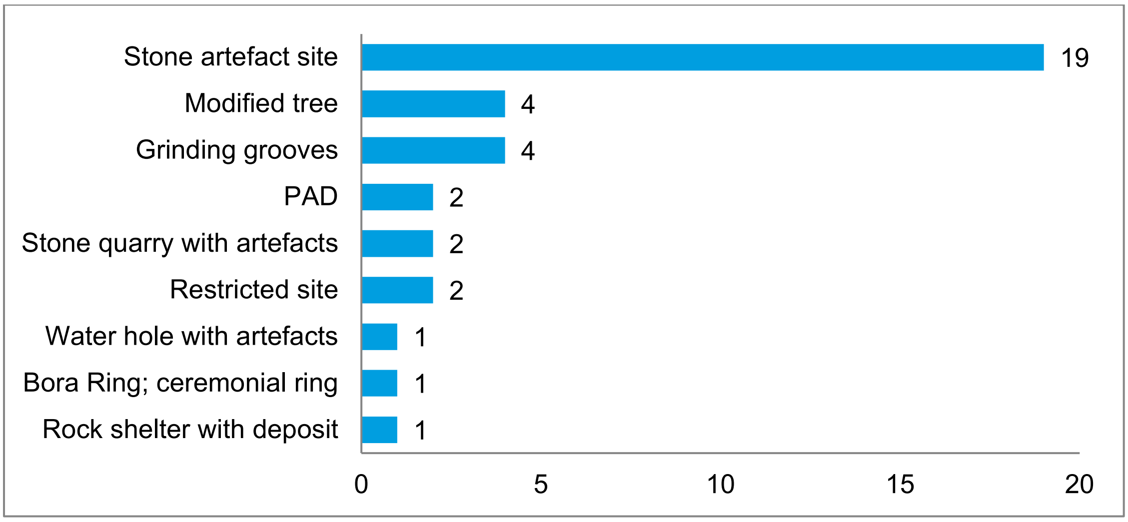
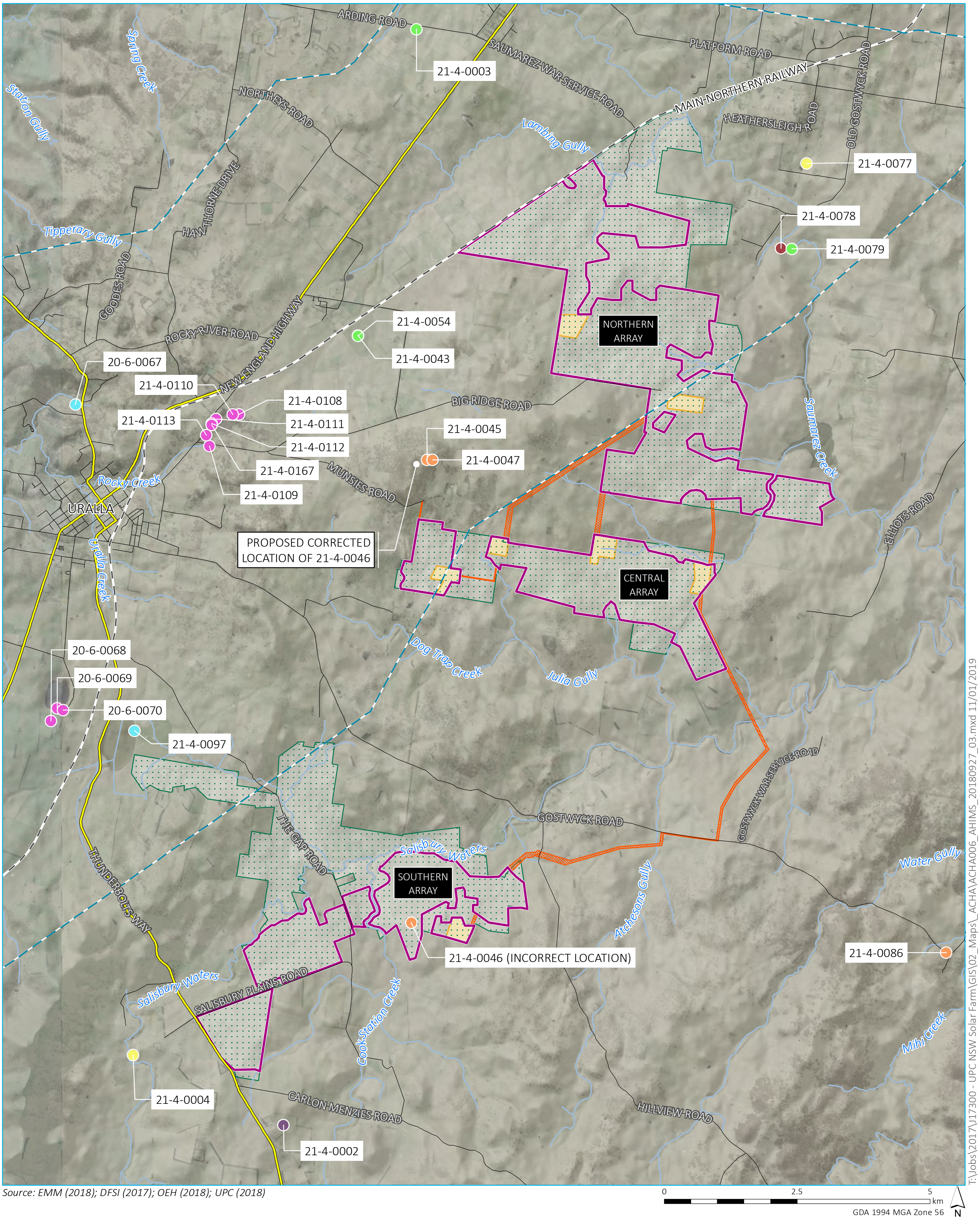


Figure 4.1 AHIMS search site frequency results



Source: EMM (2018); DFSI (2017); OEH (2018); UPC (2018)

KEY

- 330 kV transmission line
- Main road
- Local road
- Rail line
- Watercourse/drainage line
- Study area

Development footprint

- Solar array
- Potential site access/ETL easement/electrical cabling
- Potential substation/BESS footprint

AHIMS site type

- Bora Ring; ceremonial ring
- Grinding grooves
- Modified tree
- PAD
- Stone artefact site
- Stone quarry with artefacts
- Water hole with artefacts

AHIMS sites

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 4.2

EMM
creating opportunities

ii Site distribution

The most common site types are stone artefact sites (n=19), which includes isolated artefacts and artefact scatters. A further four sites are also associated with stone artefacts and include two stone quarries, a water hole and a rock shelter with deposit. These sites are generally distributed adjacent to watercourses including the headwaters of Rocky Creek (5 km north-west of the central array area) and Salisbury Waters and its ephemeral tributaries (4 km east of the study area).

Additionally, there are concentrations of stone artefact sites around local lagoons. Three isolated artefacts are registered (AHIMS ID #20-6-0069 to 20-6-0070) within 250 m of Racecourse Lagoon (approximately 1.5 km west of the study area). A cluster of sites are adjacent to Barleyfields Lagoon, which is noted to occur nearby a source of outcropping silcrete mapped under a variant of the Uralla soil landscape.

The remaining sites occur in lower frequencies and include stone quarries, modified trees, grinding grooves, a rock shelter and a Bora Ring.

Four grinding grooves are registered adjacent to and up to 450 m from watercourses in the broader landscape. Two of the grinding groove site cards were reviewed (AHIMS#21-4-0079 and #21-4-0053) which revealed that grindings grooves occur on outcropping granite or granite/grey bille nearby watercourses.

Two stone quarries are registered on AHIMS. Salisbury Court (AHIMS#21-4-0004) is 1.5 km west of the southern array area, approximately 100 m from Salisbury Waters on the Harnham Hill soil landscape. The site card notes it is on a low ridge and features outcropping “siltstone” but which is actually vitric tuffs characteristic of the Harham Hill soil landscape (Hudson 1996). Site #21-4-007 is 1.6 km east of the northern array area on the Fairfield soil landscape next to a tributary of Saumarez Creek. EMM reviewed the site card, which mentioned the presence of a “variety of material” with cores and flakes, but does not note specific material types. Photos appear to show silcrete cobbles and a basalt or greywacke axe head.

Four modified trees have previously been recorded outside the study area. Site SC8 (AHIMS ID #21-4-0046) is incorrectly registered within the study area. This site is actually 1.4 km north-east of the central array area (refer Section 4.2.1.iii below).

A Bora Ring site (AHIMS #21-4-0002) is registered 1.4 km south-east of the southern array area; however no surface evidence of the site was identified subject to a site inspection (refer Section 4.2.1.iii below). The site card provides only a cursory description stating that the location is the site of two Bora rings. Further consultation with RAPs as part of this ACHA did not result in further information being shared about this site.

The rock shelter known as ‘Church Gully Uralla’ is more than 4 km west of the southern array area (AHIMS#20-6-0018). The report associated with this site is discussed in Section 4.3.4.

iii Site verification

As part of identifying preliminary heritage constraints for the project, archaeologists from EMM and Remnant Archaeology conducted a site inspection on 7 February 2018 to ground-truth and verify the location of two Aboriginal sites recorded on AHIMS: scarred tree (AHIMS ID #21-4-0046) registered in the southern array area presented as part of the PEA; and a Bora Ring site (AHIMS #21-4-0002), registered approximately 1.4 km to the south-east of the southern array area presented as part of the PEA. Neither site was re-located during the fieldwork.

The registered location of the Bora Ring was inspected by Dr Graham Knuckey along with an area approximately 200–300 m south-west of the recorded location to account for the possibility of a data error in the AHIMS register. However, although many rocks were identified amongst grasses, no definable pattern resembling a ceremonial ring was observed. As such, it could not be determined if the site had been disturbed from farming activities or if it had been recorded incorrectly. The AHIMS site card only contains cursory information, mentioning the remains of two Bora rings, but no further detail or a map was provided.

The location of the scar tree (AHIMS ID #21-4-0046) was also inspected, but there were no trees at all; dead or alive. A brief inspection of dead trees 300 m to the north, and another group of dead trees on the access track to the paddock further east, revealed no scarring, cultural or otherwise. Further analysis of the map provided on the AHIMS site card revealed that the site was recorded incorrectly on AHIMS and is actually 1.4 km north-east of the central array area close to Big Ridge Road (refer Figure 4.2).

4.3 Regional archaeological context

4.3.1 Archaeological occupation models

Archaeological studies of the Tablelands have been ongoing since the 1960s and comprise academic studies closely associated with the University of New England (UNE) along with archaeological consultancy investigations in response to proposed developments across the region. The academic studies in particular have led to the development of regional Aboriginal occupation models that have been established, debated and refined – particularly from the mid-Holocene onwards.

Initial archaeological research by UNE indicated that Aboriginal occupation of the Tablelands was seasonal and transitory. This was argued to be because of the cold climate during winter and the associated lack of resources for subsistence (Bowdler 1981). In the 1970s, McBryde emphasised the harshness of the Tablelands, suggesting that it would have been a major obstacle to year-round occupation, resulting in a sparse distribution of sites in this zone compared with other more temperate climates (Binns & McBryde 1972). Some argued that instead, the Tablelands were mainly used for ceremonial purposes which was supported by the rich archaeological record of Bora rings, art sites, stone arrangements and carved trees along with Aboriginal knowledge of intangible sites (Flood 2010, pp.238–239).

In 1979, rock shelters were excavated by Carol Williams nearby and including the Mt Yarrowyck Art Site (approximately 30 km north-east of the study area). At least seven (and possibly as many as 13) habitation sites were identified. The results indicated that the art site was occupied up to 4,000 years ago and that the area was used primarily as a ceremonial area along with maintenance areas, but not long-term habitation areas (Williams 1980, pp.83–85).

These initial hypotheses were challenged as a result of further research at UNE. In a major study, Godwin (1990) argued that the Tablelands were not abandoned in winter at all, but occupied all year round by small mobile groups. His evidence based on ethno-history, climate and surface archaeology suggests that the cold winter climate of the Tablelands was not a barrier to year-round settlement (Godwin 1990). Goodwin identified that the Tablelands had varying resources zones of woodland, grassland and wetlands.

A recent study by Beck, Haworth and Appleton (2015) built upon the theory of year-round settlement, with a specific focus on the resources of lagoons in the upland wetlands (Appleton et al 2015). They found that during the later Holocene, Aboriginal occupation in this area became more visible, including a high number of ceremonial sites in association with areas of greatest lagoon concentration. They hypothesise that the drier, more uncertain climate of the late Holocene would have concentrated game around larger lagoons which became the focus of consumption and exchange for Aboriginal people. They argue that the concentration of resources would have supported larger numbers of people often associated with ceremonial activity. The increase in social connectivity through ceremonial activity at this time may have been both a cause and effect of the spread of new technologies in stone implement manufacture and exchange. The study highlights that ceremonial places occur more frequently than in other regions and in clusters (Beck 2006).

The upland wetlands study also identified that there is very little information about the chronology of sites in the Tablelands, including lagoon sites. The study involved surveys of a sample of 14 lagoons ranging from 2 ha to 400 ha in size and identified stone artefacts adjacent to eight of the lagoons. The stone artefacts include backed microliths, ground edge axes and a grindstone. Scarred trees, axe grinding grooves and a quarry were also found within 200 m of lagoons.

The upland wetlands study involved archaeological excavations at a number of lagoons including the nearby Dangars Lagoon, Racecourse Lagoon and Barleyfields Lagoon. Although the results are yet to be published, EMM contacted John Appleton for a summary of the results. Appleton noted the paucity of results at Dangars Lagoon where only two to three artefacts where identified. Appleton identified that the historical modification of the lagoon and not knowing the true prehistoric water level may have affected the results (Appleton pers comm., July 2018). The most informative results were gathered from Barleyfields Lagoon, where optically stimulated luminescence (OSL) dating has identified dates of possibly early Holocene occupation, which are currently the earliest dates on the Tablelands (Appleton pers comm., July2018). The excavation also extended to the south of Barleyfields Lagoon into a quarry of silcrete where a number of subsurface silcrete artefacts were identified (Appleton pers comm., July 2018).

4.3.2 Archaeological sites overview

Archaeological and linguistic evidence suggests that the Tablelands were most intensively occupied from around 4000 years ago (Beck 2006). This is based on the finds of surface or near-surface artefacts (Beck 2006), with very little found at greater depth. The oldest known Aboriginal site (c4300 years old) is near Bendemeer on the southern edge of the Tablelands (although this may change based on recent findings at Barleyfields Lagoon, refer Section 4.3.1).

Carved trees, ceremonial Bora grounds and art sites have all been identified within the Tablelands and indicate the original inhabitants' important spiritual and physical connection to the landscape. Other surviving material remains include seed grinding and axe grinding grooves in rock slabs, cooking areas and stone artefact scatters representing open camp sites. Appleton et al (2015) identifies that Aboriginal occupation was patterned, not random. Activities in the landscape were focused at places where people lived and worked (quarries, camp sites and ceremonial sites), with a preference for areas with clustered resources, such as lagoons, and also along tracks and pathways which were followed for ritual and secular purposes (Appleton et al 2015). Transitory areas feature fewer archaeological traces, sometimes only marked by isolated or low density stone artefact scatters.

Stone quarry and grinding groove sites are site types that represent more utilitarian, even industrial practices. Stone quarries are relatively common in the Tablelands and range from significant quarries such as that at Moore Creek, to smaller but significant working areas on isolated outcrops such as the Salisbury Court axe quarry site (AHIMS#21-4-0004 1.5 km west of the southern array area). The Moore Creek quarry site is in the Tamworth LGA approximately 80 km south-west of the study area on a ridge approximately 300 m above a valley and features a large outcrop of andesitic greywacke.

Hudson's thesis on the Salisbury Court quarry identified that the local materials were transferred locally but also up to 50 km to the west (Hudson 1996). It also identified imported or 'exotic' material and axes provenanced to the Moore Creek quarry. These findings raised interesting implications for the movement of people and trade to the west rather than to the east towards the coast where there is the absence of traded material (Hudson 1996). The site features tools made from outcropping vitric tuffs, the product of volcanic ash flows, which are included in the Harnham Hill soil landscape to the west of the study area.

Appleton advised that there is a geological band of silcrete that occurs at approximately the 1,030 m Australian Height Datum (AHD) contour line. As such, silcrete boulders and pavements of varying qualities are exposed around this contour line and may feature sites such as grinding grooves or stone quarries (Appleton, pers comm., July 2018).

McBryde noted in her 1974 publication that suitable rock for grinding grooves is rare across the Tablelands, and therefore grinding groove sites often comprise small portable sandstone blocks (McBryde 1974, p.159). She noted that the closest grooves were to the south near Walcha at the time. However, since then, a number of grinding groove sites have been identified in the local area (refer Section 4.2.1). A number of these sites are noted to be on outcropping granite bedrock, but there is some ambiguity in the geological terminology. Discussions with OEH and John Appleton identified that areas of suitably coarse outcropping silcrete have been used for grinding grooves which may sometimes be mistaken for granite (Roger Mehr and John Appleton pers comm., June–July 2018).

In the later Holocene, Aboriginal occupation in upland areas became more visible in the archaeological record, including a number of ceremonial sites in conjunction with lagoons (Appleton et al. 2015). Stone arrangements in various groupings such as cairns, circles, lines and corridors have also been identified although not a lot is known about them.

Archaeological evidence of burials has been identified in rock shelters but also as open sites marked by earth mounds, piles of stones and nearby carved trees (McBryde 1974, pp. 136-153). Stone tools changed over time whereby stone artefacts from 5,000-10,000 years ago became smaller than previously made and included backed artefacts and points.

4.3.3 Ceremonial site characteristics

The Tablelands have a high frequency of ceremonial sites that are visible in the archaeological record, some of which have characteristics unique to the region. McBryde identified and described the characteristics of ceremonial sites in the Tablelands which included "earth-rimmed circles or 'Bora rings', and sites of stone arrangements" (McBryde 1974, p.29); although it is also noted that certain stone arrangements could have fulfilled the same function as the earth-rimmed Bora ring circles. Some ceremonial sites have also been recorded as being marked by carved trees (McBryde 1974, p.29 & p.41).

Stone arrangements in the Tablelands include stone cairns or heaps of stones, standing stones, small circles and alignments of stones. McBryde identified stone cairn sites at a number of locations across north-eastern NSW, which were often grouped along crests, ridges and knolls (McBryde 1974, pp.31-33). The study noted that stone arrangements on the Tablelands did not reveal any significant landscape patterning "apart perhaps from the preference for elevated sites with a good outlook". One site at Black Mountain (approximately 50 km north of the study area) was known as part of a Bora ground and featured 17 large heaps of stones on a "slight hollow on the top of a peak, one of the highest points in the area" (McBryde 1974, p.41).

Bora rings in the Tablelands have been identified as circular cleared areas (typically 10-15 m in diameter) edged with a low bank of earth up to 1 m in height and nearly 2 m wide (McBryde 1974, p. 52). Literary accounts suggest that Bora grounds often comprised two circles joined by a pathway, often flanked by ground drawings of human and animal figures, and carvings of geometric designs in nearby trees. McBryde listed 26 Bora sites known at the time in the Tablelands (McBryde 1974, pp.59-62).

4.3.4 Local reports

i Excavations at Church Gully Archaeological Excavation (Bowdler 1980)

In 1979, Sandra Bowdler carried out excavations at Church Gully near Uralla as part of a training exercise for students at UNE, approximately 4.5 km west of the study area (Bowdler 1980). The site is adjacent to Church Gully (3rd order), which is approximately 100 m south-west. Bowdler found limited surface artefacts and therefore chose excavation locations based on what was perceived to be a favourable place to inhabit on the south side of a large "jumble" of granite boulders, overlooking Church Gully. A sparse assemblage of stone artefacts was retrieved (fewer than 200), including backed blades and a couple of flakes off ground edge axes. Raw material consisted of quartz, crystal quartz, silcrete, quartzite and chert. Test pits across four locations (Locality 1 to 4), totalling 9.75 square metres (m^2) were dug to varying depths between 0.7–1.6 m. At Locality 4, artefacts were present throughout the deposit which was dug to a depth of 1.6 m and may have continued further. No dating of the site was retrieved and no occupation theories were presented in the preliminary report.

ii An Archaeological Survey of 92 Uralla Road, Armidale (Hudson 1998)

In April 1998, Suzanne Hudson Consulting (Hudson) conducted an archaeological field survey for subdivision of 92 Uralla Road, consisting of Lot B DP 399846, Lot A DP 400397, and lots 661, 662, and 633 DP 755808, approximately 7 km north of the study area.

The survey area featured on a lower slope and creek banks and included Martins Gully (2nd order stream) which flows through the survey area. The geology of the survey area features the Sandon Beds, which comprises greywackes, cherts, volcanics and sandstones. The landscape had been affected by European farming practices of dairying and cropping, evident through the extensive land clearing and the development of environmental control features (such as dams and imported topsoils, etc).

As the survey area was only 17 ha, a full coverage approach was adopted. Poor ground visibility and the boggy nature of the soil proved to be an impediment on the survey. No Aboriginal sites were identified during the survey. Although some silcrete raw material was observed, it was not identified as Aboriginal artefact material.

iii Draft report For Telstra on Fibre Optic Cable Line Balala – Bendemeer Road, Uralla (Hudson Consulting 1999)

In January 1999, Hudson conducted an archaeological field survey of Balala Station at Uralla over 18 km west of the study area. The survey was in response to the proposed development of a Telstra fibre optic cable.

The geology of Hudson's survey area included quartz, jasper, silcrete, quartzite, chert, greywacke, as well as fine grained igneous material. Roumalla Creek, a significant tributary of the Gwydir River, was the dominant landscape feature of the survey area and featured weathering granite shelves in the main channel and producing angular to rounded pebbles of the materials listed above.

Prior to the survey, Hudson predicted that a number of site types had potential to occur, including stone artefact scatters, scarred trees, carved trees, burials, sites of rituals and significance, quarries and grinding sites, and stone arrangements. Particularly, stone artefacts were predicted to occur adjacent to river banks, ridges or spurs overlooking watercourses and in the vicinity of raw material outcrops such as basalt, silcrete, chert or other fine grained rocks.

Although the measurement of the survey area is not provided in Hudson's report, the survey team focused on bare, eroded surfaces such as creek banks and vehicle tracks because the landscape was mostly covered in grass (98%). No Aboriginal sites were identified, which Hudson attributed to poor ground surface visibility as a result of historical pasture use and dense ground cover. Hudson mentioned that stone axes and flaked tools had been identified on similar landscapes during past surveys in nearby areas.

iv An Archaeological Survey of Part of Brushgrove, Uralla (Suzanne R Hudson Consulting 1999)

In April 1999, Hudson conducted an archaeological field survey approximately 30 km west of the study area at Brushgrove Uralla in response to the proposed construction of a shed on a property. The survey area was within a historically cleared landscape of Roumalla Creek and its lesser tributaries; although Hudson did not identify particular surveyed landforms. Furthermore, it was on the boundary of the greywacke or the western slopes and the Uralla granodiorite suites. Hudson predicted that the survey area could feature sites including isolated artefacts or low density scatters, grinding grooves on outcropping granite.

Similar to her findings at Balala Station (refer to summary above), no Aboriginal sites were identified, despite the area having good ground surface visibility from recent stock grazing. A number of granite boulders were inspected, but no evidence of grinding grooves or shelters were identified.

v New England Regional Landfill (Appleton 2009)

In 2009, John Appleton (Archaeological Survey & Reports Pty Ltd) completed an assessment for the New England regional landfill at Waterfall Way, approximately 16.5 km north-east of the study area. The survey covered two small hills bridged by a saddle formation and two ephemeral creeks. The area was heavily cleared but still had some eucalypts standing, predominately regrowth under 150 years old.

The geology of the area was noted as Armidale Beds which produce basalt outcropping between 960–1030 m AHD. Appleton also noted that sandstone and chert may be present in his survey area.

Only two isolated artefacts were identified both of which were discovered within 200 m of a creek bed. One was found 250 m downstream from a registered campsite and the second was found in an erosion feature on the central drainage depression. This was in line with their predictive model which was based on the lack of resources in the area including lack of permanent water, mature trees, caves and the lack of useful knapping material. It predicted a low yield and predicted that most finds would be in the erosion features.

vi Metz Solar Farm (Remnant Archaeology 2017)

In 2017, Graham Knuckey (Remnant Archaeology) prepared an ACHA for the Metz Solar Farm on Bayley Park, approximately 25 km north-east from the study area. The report assessed a large study area covering 750 ha. The area was divided into three main landforms which included, gentle slopes at the north-west and south-east of the survey area, creeklands which followed Limerick Creek through the centre of the survey area, and undulating plains which sat to the west of the creek and both the northern and southern ends of the survey area.

The geology of the area is noted as of Carboniferous overlaid with Permian, subsequently disrupted during the Tertiary period.

The survey identified three low-density artefact concentrations which were on the undulating plains. As discussed in the predictive model as part of the ACHA report prepared by Knuckey (2017), low-density scatters were discovered up and away from the main creek. Isolated artefacts were identified over all three landforms and a potential Aboriginal stone arrangement was identified on the gentle slope landform near a dried ephemeral creek bed.

Knuckey (2017) noted that high levels of disturbance had occurred within the survey area over many years due to agricultural practices. This is likely to have altered the position and location of many artefacts; therefore making it problematic for any predictive model to be too specific. In the assessment of significance, Knuckey (2017) noted that the scar trees and stone arrangement were considered to be of medium-high significance while the artefact concentration and isolated artefacts were considered to be of low-medium significance.

5 Predictive model

5.1 Discussion of background information

This section aims to summarise the background information presented in Chapter 3 and Chapter 4 and discuss its implications for the study area based on landscape analysis. This section of the report provides a preamble to the predictive model that follows. The predictive model provides more succinct predictive statements for site types identified within the study area.

Academic-based archaeological investigations in the Tablelands dating back to the 1960s have provided a wealth of high-level information that has attempted to link large datasets of sites together and create meaningful Aboriginal occupational models. As such, information about the regional archaeological character of the Tablelands has an advantage over other parts of NSW in areas where there are numerous consultancy reports but no overarching studies tying the data together.

As noted previously, earlier studies have emphasised that the Tablelands have a high number of ceremonial sites including Bora grounds, stone arrangements, carved trees and rock art sites (McBryde 1974; Bowdler 1981). The distribution of stone arrangements and Bora grounds across the landscape is somewhat unpredictable as the choice of their location appears to be based on spiritual reasons rather than simply landscape features and resources. Notwithstanding, sites such as stone arrangements have been noted to be commonly on hill crests, spurs and ridges (McBryde 1974). As such, these landforms in the study area with outcropping stone of suitably small boulders would have highest potential to feature such sites. Many of the soil landscapes mapped across the study area are noted to feature outcropping stone material, but only physical survey would determine if:

a) the outcropping material is of suitable size to have been used for stone arrangements;

b) such sites physically occur; and

c) the extent of disturbance potentially affecting such sites.

Care would also need to be taken to distinguish natural stone clusters or piles created by farming practices, such as rock-picking and stockpiling, from actual Aboriginal sites.

Many ceremonial site features are unlikely to have survived in the archaeological record and therefore are unlikely to occur in the study area. Although earth-mounded Bora rings have been recorded throughout the Tablelands (largely through historical accounts), if they were created in the study area they are unlikely to have survived in the archaeological record because of historical clearing and agricultural practices. Furthermore, earth-mounded or stone-mounded burials would have been susceptible to extensive disturbance and degradation over time. Similarly, for these reasons, scar or carved trees are likely to be rare; nevertheless, any mature trees should not be discounted until inspected.

Rock art sites (paintings and engravings) are unlikely to occur in the study area as they typically occur in rock shelters or expanses of suitable outcropping bedrock. The AHIMS search identified a 'shelter' known as 'Church Gully Uralla' (AHIMS # 20-6-0018); however, it was not described as a rock shelter in the actual report, as there was no mention of an overhang, but a "jumble" of granite boulders (Bowdler 1979, p.1). Soil landscapes information for the study area indicate that the Gostwyck and Uralla soil landscapes feature large granite tors, but further inspection in the study area would be required to determine their size and suitability as shelters. Notably, it would be important to identify if overhangs occur on the granite tors as they have been known to feature ochre art (McBryde 1974, p.67).

Later studies performed since the 1980s (Godwin 1990; Beck 2006; Appleton *et al* 2015) challenged the original theories suggesting the Tablelands was primarily seasonally occupied by family groups as well as used for ceremonial purposes. The notion of year-round occupation sets a frame of reference that the Tablelands were occupied more intensively than once thought and in more utilitarian ways and this may extend to the study area.

Open camp sites of stone artefact scatters, stone quarries and grinding groove sites have some potential to occur in the study area. Notably, land surrounding lagoons (such as Dangars Lagoon immediately west of the study area) has been identified to feature multiple site types including artefact scatters of microliths, ground edge axes, grinding stones, scarred trees and a quarry. This area may have supported intensive occupation, and may feature subsurface archaeological deposits.

Notably, the quarry site Salisbury Court is on the Harnham Hill soil landscape which can feature rounded boulders of mixed and pebbly volcanics and vitric (glass-like) tuffs. A portion of the study area shares a similar soil landscape. Furthermore, there are various other types of outcropping rock in the study area that may have been suitable for quarrying, including basalt, chert, jasper, silcrete and grey wacke. However, this is dependent on the quality of material and how it presents itself in the landscape.

There is potential for grinding groove sites including portable grinding grooves and also outcropping bedrock. AHIMS details indicate that some outcropping granite may be suitably fine-grained to have been used as grinding grooves. Additionally, there is outcropping silcrete which may have been used for both quarrying and grinding creating grooves.

The predictions for the distribution of scatters of stone artefacts or isolated artefacts in the study area are generally consistent with established models in eastern NSW that are based on proximity to water and the reliability of the water source. Larger sites with higher artefact densities are likely to occur near reliable streams, whereas smaller, low-density sites may occur near ephemeral streams. Elevated landforms with good outlook near streams are areas most likely to have been chosen for camp sites. The AHIMS search results provide a cursory image of the distribution of stone artefact sites and support that they are commonly found in association with both ephemeral and reliable streams and lagoons. Any stone artefact sites in the study area are likely to be a reflection of mid-Holocene occupation and later and may include backed microliths and ground edge axes made from local and imported material (Beck 2006).

The studies by Hudson available on AHIMS (1998; 1999a; 1999b) represent some examples of nearby archaeological surveys; however, no Aboriginal sites were identified from these investigations. This does not disqualify the potential for sites in the study area, but highlights that past agricultural land use may have disturbed or removed sites and the grazing paddocks that characterise the landscape may be covering surface archaeological material dependent on the extent of grasses and intensity of livestock grazing.

5.2 Predictive model

A predictive model of Aboriginal site location has been devised based on the data presented in the preceding sections. In summary, the model has been formed by an analysis of:

- landscape features in the study area and surrounds;
- pre-colonial period ecological conditions;
- advice from Aboriginal knowledge holders including RAPs;

- ethno-historical information about Aboriginal life and material culture; and
- the type and distribution of Aboriginal sites described in previous reports and AHIMS data (refer to Chapter 4).

The model enabled predictions to be made about the location of Aboriginal sites within the study area and this information guided the archaeological survey effort performed as part of this ACHA.

5.2.1 Predictive model results

The results from the predictive model are summarised in Table 5.1.

Table 5.1 Predictive model of site location

Site type	Predictions for study area
Open artefact sites and isolated finds	Open stone artefact scatters and isolated finds are the site types most likely to occur in the study area. These may occur anywhere as background scatter, but are most likely to occur close to reliable sources of water (generally within 200 m). Although stone artefact sites may be present in these areas, their detection is dependent on favourable ground surface visibility conditions. Further, more recent ground disturbance, for instance through farming or flooding, will have an effect on the accuracy of the predictive model. High sensitivity for open stone artefact sites includes level to gently inclined, elevated landforms near high order streams including crests, spurs, terraces and lower slopes/foot slopes that were above regular inundation and provided good outlook. Smaller and lower density artefact scatters and isolated artefacts may occur near the ephemeral tributaries (3rd order and below). Isolated artefacts or small artefact scatters may occur anywhere away from watercourses. These are most likely to be identified on level to gently inclined terrain but not moderately inclined areas that would have been too steep for occupation or on low-lying floodplains where regular inundation would have prevented focussed activities.
Scarred trees	Scar trees may occur where native vegetation has been preserved. This has largely been cleared across all three areas that make up the study area; however, a review of aerial imagery indicates that clusters of trees and individual trees are distributed across the landscape. Closer inspection would clarify if there are native mature trees with potential or younger regrowth or exotic trees that have no potential.
Carved trees	Carved trees may occur in association with burials, ceremonial sites or as indicators of 'dreaming' tracks and pathways. As such, they may occur only where native vegetation has been preserved, but their location within the landscape is difficult to predict without the aid of cultural knowledge.
Grinding grooves and grind stones	There are outcroppings of silcrete on the Ironstone and Saumarez soil landscape in the northern array area that may feature grinding grooves. Elsewhere grinding grooves on bedrock are unlikely to occur as other types of outcropping geology is probably unsuitable for grinding. However, outcropping of suitably fine-grained granite may have been used for grinding grooves. Furthermore, portable grinding grooves may occur in the landscape, most likely adjacent to watercourses and possibly part of larger open camp site assemblages.
Hearths	The extent of historical land use (primarily vegetation clearance) has led to widespread disturbance, which is likely to have removed or destroyed archaeological traces of this site type. Soil landscapes information indicates that topsoils generally comprise shallow duplex soil profiles and therefore deeper stratified deposits suitable for the preservation of hearths are unlikely to exist.
Burials	Burials can occur anywhere in the landscape but their identification is rare. Generally they would be identified by mounds of earth, carved trees or stone markers. Theoretically they are more likely to occur in areas with cobble and small boulder rock outcrops such as crests and upper slopes of the Harnham Hill and Uralla soil landscapes (outside of the development footprint), the Bald Knob soil landscape (found in parts of the southern and northern array areas) and Gostwyck soil landscape (found in parts of the central and northern array areas). Equally, these soils may have been too shallow and rocky for interment.

Table 5.1 Predictive model of site location

Site type	Predictions for study area
Stone arrangements	Stone arrangements are most likely to occur on elevated and relatively flat landforms (eg crests, terraces, ridges) nearby sources of outcropping cobbles or small boulders capable of being moved manually. However, it is very likely that they have been disturbed and/or destroyed by historical land use practices. The areas most likely to feature suitable stones are the Harnham Hill and Uralla soil landscapes (outside of the development footprint but within study area), the Bald Knob soil landscape (found in parts of the southern and northern array areas) and Gostwyck soil landscape (found in parts of the central and northern array areas).
Quarries (stone or ochre)	Quarries of volcanic material and vitric tuffs have a moderate to high likelihood of occurring on the crests and upper slopes of the Harnham hill soil landscape; however, this is outside the development footprint but within the study area. Resources of basalt, chert and greywacke in the Powers Creek soil landscape may occur but only if rock floaters are exposed, possibly in stream channels. The crests and upper slopes of the Bald Knob and Fairfield soil landscape may feature quarries of basalts or metabasalts but only if the material is of a suitable quality. The occasional outcrop or locally significant outcrops of surface basalt on the Kellys Plains soil landscape may feature basalt resources. Quarries of chert, jasper and greywacke may occur on crests, spurs and hill slopes on areas of Fairfield soil landscape. Any outcropping metasediments (metamorphic sedimentary rocks) in areas of the Julia Gully soil landscape have some potential to have been used as a quarry. Field inspection would clarify what types of metasediments occur, if any. Silcrete quarries may occur in the areas mapped as the Ironstone and Saumarez soil landscapes. Quarries of chert, jasper and greywacke may occur on crests, spurs and hill slopes on areas of Fairfield soil landscape. Resources of basalt, chert and greywacke in the Powers Creek soil landscape may occur but only if rock floaters are exposed, possible in stream channels.
Rock art, shelters and engravings	Rock shelters and/or rock art and engravings may occur in areas with large granite tors, comprising the Gostwyck soil landscape (parts of the central and northern array areas) and Uralla soil landscape (outside the development footprint but within the study area). Tor fields are visible from aerial imagery which indicates they occur most obviously in the discrete pockets of the Gostwyck variant a soil landscape in the east of the central array area and south of the northern array area. Tor fields are not obvious on aerial imagery in the Uralla soil landscape (outside the development footprint but within the study area), but ground verification is warranted.
Middens	Middens of bone, charcoal, stone and freshwater shells may occur along extensive and reliable river systems. However, they are rare in the local landscape and are likely to have been disturbed or removed by historical land use. If present, they are most likely to occur in association with open camp sites.

6 Archaeological survey

6.1 Overview

EMM conducted an archaeological field survey of the survey area with the assistance of RAP site officers in two stages (Stage 1 and Stage 2) between 21 May and 28 August 2018. The survey was completed over a total of 19 days. Stage 1 was between 21 May and 1 June (10 days) and Stage 2 was between 31 July and 8 August (8 days), followed by an extra day on 28 August. An overview of the survey tracks completed for the survey is shown on Figure 6.2.

The primary aims of the survey were to:

- identify Aboriginal archaeological sites and/or Aboriginal places with the assistance of Aboriginal knowledge holders;
- characterise the landscape to aid predictions of archaeological potential;
- identify sites or areas that would require further investigation if planned for development as part of the project;
- identify sites or areas to be avoided by development, where possible; and
- identify areas with minor or negligible Aboriginal cultural heritage values that are most suitable for development.

6.2 Sampling strategy

6.2.1 Overview

The survey area considered for sampling was directly based on an indicative development footprint, including various ETL alignments, site access corridors and substation and battery and energy storage system (BESS) options (referred to collectively as 'infrastructure options'). Overall, the survey area was a refinement and reduced portion of the study area, which was the focus of the background research and predictive model presented earlier in this report.

The survey strategy was developed on the basis of the predictive model for Aboriginal site location (refer Chapter 5). The overarching aims of the survey strategy were to focus on the landforms most likely to feature Aboriginal sites (areas of high archaeological sensitivity) while also gathering a representative sample of landforms less likely to feature Aboriginal sites to confirm predictions of low archaeological sensitivity.

The survey area was categorised into classes of landforms for sampling during the survey (refer Figure 6.1). The extent of sampling within each landform class was proportionate to its level of archaeological sensitivity as presented in the predictive model.

i Landform division for sampling

Prior to the survey, the study area was divided into broad landform morphological classes, guided by the definitions presented in the *Australian Soil and Land Survey Field Book* (National Committee on Soil and Terrain 2009). This approach allowed for a broad landscape division to assist survey planning and was flexible enough to allow specific landform elements to be defined during the field survey. The landform classes are shown on Figure 6.1, noting that the figure represents the landform classes across the study area, which is broader than the survey area. Furthermore, the landform classes shown in Figure 6.1 were further refined in the field based on observations on the ground and may not strictly correlate to the figure. The landform classes and their corresponding landform elements are described in Table 6.1.

The landform classes guided the boundaries of the survey transects which were further categorised into more specific landform elements.

Table 6.1 Landform classes and their corresponding landform elements

Landform class	Landform element
Crest	This includes hill crest, spur crest and ridge landform elements.
Hill slope	Hill slope was divided into two categories: • Hill slope 1 – very gentle to gently inclined slopes (representing areas suitable for Aboriginal camping activities); and • Hill slope 2 – slopes of moderate inclination and above (representing steeper terrain not typically suitable for open camp sites).
Flat	This includes flat terrain including undulating plains, floodplains and terraces.
Watercourse	This includes stream channels and a 50 m corridor of land adjacent to watercourses. Watercourse landform units are further divided into three categories: 1st and 2nd order streams; 3rd order streams; and 4th order and above.

6.2.2 Sampling approach for array areas

The survey effort within the three array areas was weighted towards areas of higher archaeological sensitivity with the aims to verify the accuracy of the predictive model and identify where sites occur. A lower intensity of survey effort was designated to areas of low archaeological sensitivity to support predictions of low archaeological potential. These predictions were continually refined during fieldwork based on observations about site distribution made in the field.

A key objective of the survey was to sample the geographic extent of the array areas. In practical terms, this meant designing the survey so that the three array areas could be observed from a distance so that identified areas of interest could be targeted; for example, areas of outcropping bedrock or micro-topographic features such as knolls with potential as open camp sites.

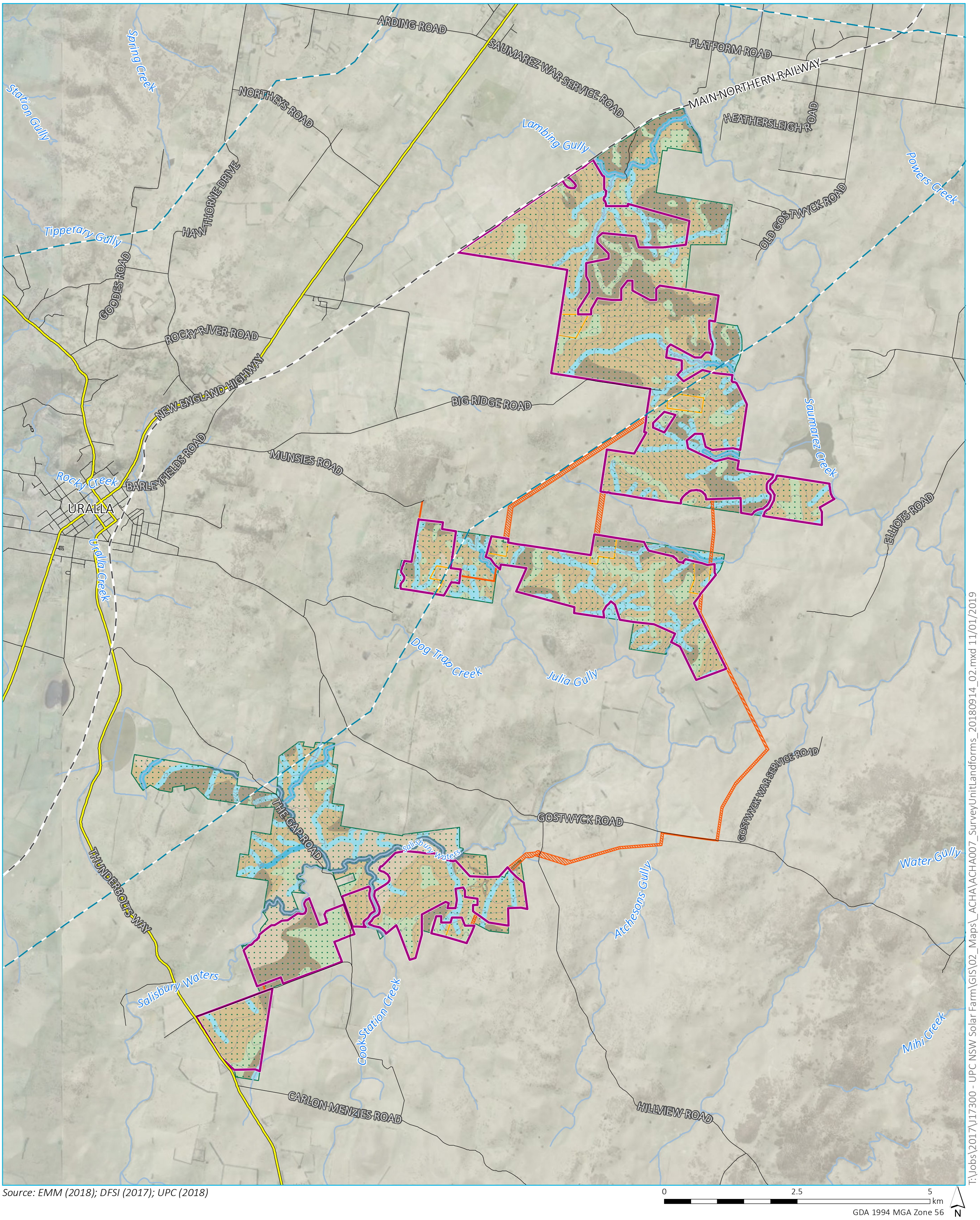
The areas targeted for high archaeological sensitivity were:

- all crest landforms, with particular emphasis on spurs overlooking watercourses and at the confluence of multiple watercourses;
- areas of outcropping raw stone material which mostly coincided with crest and upper hill slope landforms and occasionally within or adjacent to highly eroded watercourses;
- particular emphasis was placed on inspecting outcropping silcrete material and therefore landforms along the 1030 m contour line (known to feature outcropping silcrete) were targeted; and

- watercourses and level to gently inclined landforms within 200 m of streams for open camp sites, with higher order streams (3rd and 4th) receiving particular emphasis.

Although many of the areas with outcropping bedrock will be unsuitable for PV solar array infrastructure, they were included in the survey on the assumption that the entire development footprint had the potential to be developed. This approach also had the advantage of identifying the variation in archaeological sensitivity across crests; as not all crests were found to contain sites or archaeological potential. This approach allowed for sites associated with outcropping rock to be identified and given appropriate management measures, while also identifying crests with no sites and low archaeological potential that are more suitable for development.

Areas designated for less intensive sampling included expansive hill slopes and plains on improved pastures. Sampling across these landscapes also included a focus on minor watercourses (1st and 2nd order streams), which presented as grassed drainage depressions. These areas were identified to have low sensitivity for Aboriginal sites in the predictive model.



Source: EMM (2018); DFSI (2017); UPC (2018)

KEY

- 330 kV transmission line
- Main road
- Local road
- Rail line
- Watercourse/drainage line
- Contour (5 m)
- Study area

Development footprint

- Solar array
- Potential site access/ETL easement/electrical cabling
- Potential substation/BESS footprint

Survey unit

- Crest
- Flat
- Hillslope 1 (slope <10%)
- Hillslope 2 (slope >10%)
- Watercourse (1st and 2nd order)
- Watercourse (3rd order)
- Watercourse (4th+ order)

Survey unit landforms

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 6.1

EMM
creating opportunities

6.2.3 Sampling approach for substations and BESS location

The substation and BESS options within the three array areas were targeted for survey on the rationale that they are areas where more extensive ground disturbance will occur when compared to solar array installation within the three array areas. Accordingly, these areas were surveyed more intensively than the general array areas despite mostly being outside of archaeologically sensitive areas.

6.2.4 Sampling approach for linear infrastructure

Linear infrastructure options within the development footprint, ie connection infrastructure and site access options, were also subject to archaeological survey. It was considered important to survey all of these options as they had the potential to intersect with archaeologically sensitive landforms.

6.2.5 Survey limitations

Archaeological surveys are inherently limited by ground surface visibility conditions and therefore any survey, despite the intensity of survey effort and spacing of survey transects, is considered to only sample the archaeological landscape. The archaeological survey did not aim to cover the entire ground surface within the development footprint, but rather to characterise the archaeological landscape through an extensive survey effort.

Not every mature native tree was inspected during the archaeological survey. Mature native trees encountered along survey transects were inspected; however, EMM acknowledges that there is some potential for Aboriginal modified trees to occur outside of the survey transects within the development footprint. The implications and management measures relating to this issue are presented in Section 9.4.1.

6.3 Survey method, site identification and site recording

6.3.1 Overview

The Aboriginal sites identified and recorded during the survey comprised open stone artefact sites, grinding grooves, scarred trees and stone quarries. The survey field method along with the rationale, definitions and issues surrounding the identification and recording of these sites are outlined below.

6.3.2 General survey field method

The archaeological survey and data collection methods followed Section 2.2 of the Code (DECCW 2010a). The survey involved pedestrian field transects within defined landform units. The survey team comprised five people per day during Stage 1 and four people per day during Stage 2. Each survey participant was spaced approximately 10 m apart within an approximate 50 m corridor. This method was considered to be suitable for a landscape characterised by grassed paddocks, whereby suitable ground exposures were easy to identify and targeted at this spacing. Although the survey team was spread across a 50 m corridor, the assessment calculations assume that each participant could only observe approximately 5 m of the ground surface in front of them (eg five field members covered 25 m of ground within the 50 m corridor). Notwithstanding, this calculation does not account for more obtrusive site types such as grinding grooves and scar trees which are observable from a much greater distance.

The survey team targeted ground exposures along transects such as outcropping bedrock, ploughed fields, vehicle and animal tracks, scalds and sheetwash erosion and stream banks, all of which provided good ground surface visibility for identifying Aboriginal objects.

The survey team paid particular attention to outcropping stone material such as silcrete, basalt and granite that dominated parts of the survey area.

6.3.3 General site and transect recording methods

Site recording was completed in accordance with the Code (DECCW 2010a). Site locations and their details were recorded with digital tablets using site recording forms created by EMM on the Survey123 application for ArcGIS (Esri© software). The digital tablets had a location accuracy of up to ±3 m which is similar to hand-held non-differential GPS units. The Survey123 forms allowed for a site's location, details and representative photographs to be linked together, which avoided potential post-fieldwork issues around data integrity.

All artefact locations were marked with high visibility stake flags and/or flagging tape (eg scar trees). Site locations and details were checked and finalised using ArcGIS software Collector and ArcMap post-fieldwork. Hand-held non-differential GPS units were also used to mark individual artefact locations when recording sites with multiple artefacts. These locations were linked to the Survey123 site locations and assisted in defining site boundaries during the post-fieldwork phase of this ACHA.

Survey transects were recorded on a separate Survey123 form created by EMM. The Survey123 form allowed for survey transects starting points, details and representative photographs to be recorded. The course of survey transects were recorded as tracks on hand-held non-differential GPS units which were linked to the Survey123 forms.

6.3.4 Site definitions and recording methods

i Open stone artefact sites

Open stone artefact sites were defined by the presence of one (isolated find) or more (artefact scatter) stone artefacts visible on the ground surface. The boundaries of a site are limited to the spatial extent of the visible stone artefacts. The mapped site points and/or 'site areas' do not represent the areas of potential archaeological deposit (PAD) that also apply to some sites (refer to the term 'PAD' below).

Open stone artefact sites were recorded by marking each artefact location or each cluster of artefacts within a 5 m radius as a separate waypoint in the GPS. Site boundaries were allocated by drawing a line around the cluster waypoints for each site using ArcGIS software. Stone artefacts more than 50 m apart were recorded as separate sites. EMM acknowledges that the 50 m rule applied here is an arbitrary distinction for site boundaries and is used mainly for efficiencies in site management and to establish consistency in site recording methods.

ii Stone quarries

Stone quarries represent where Aboriginal people gathered raw stone materials for stone tools and/or manufactured stone tools from the adjacent source material. Quarry sites are found at rock outcrops where the material was of suitable quality to have been used to manufacture stone tools. Stone quarries were defined by the presence of outcropping stone material with nearby evidence of the same material type used in the stone tool manufacture process. This was most commonly indicated by large stone cores or stone flakes distributed amongst the same naturally outcropping material.

EMM acknowledges that the 'open stone artefact' site type shares some of the same characteristics as 'stone quarries', such as the presence of stone artefacts. However, they have been distinguished from each other because quarries can not only represent open camping activities, but also a fixed location where Aboriginal people needed to visit to extract a resource. In contrast, the location of typical open camp sites were not fixed, but chosen by Aboriginal people for their favourable conditions.

iii Potential archaeological deposits

EMM has defined PADs as the predicted extent of concentrated subsurface Aboriginal objects in a particular area. PADs are not technically Aboriginal sites until, and if, subsurface Aboriginal objects are identified, which is typically established through archaeological test excavation. PAD areas have been assigned to landforms that are distinguishable from the surrounding landscape (eg elevated areas with good outlook overlooking watercourses) as being likely to retain higher artefact densities than the assumed 'background scatter' of archaeological material in the broader landscape.

The identification of PADs associated with Aboriginal open camp sites was partly based on observations in the field and discussions with RAPs, but also related to the predictive model. Although PAD was attributed to areas for a variety of reasons, the main qualifiers were:

- The presence of surface artefacts or other Aboriginal objects. Ground surface visibility as part of the archaeological survey effort was typically considered high enough in each PAD area to identify at least one or more surface artefacts thereby indicating likelihood of subsurface potential. Notwithstanding, finding no visible surface artefacts in an area would not disqualify an area from being attributed with PAD.
- Level to gently inclined ground (<10%) indicating suitable camping or activity areas.
- Contours that distinguish the landforms with PAD from the surrounding landscape (eg spur crest, hill crest or knoll). Landform boundaries were also interpreted through observations in the field. Notably, rocky crest landforms that were protected from intensive cultivation were often attributed with PAD.
- Proximity to water: typically up to 100 m from 1st and 2nd order streams and up to 200 m from 3rd order streams and above. Elevated landforms at the confluence of higher order streams were also more likely to be attributed with PAD.

EMM acknowledges that all PAD areas have been historically cleared of native vegetation and some have been subject to pasture improvements such as ploughing. As such, the term PAD does not assume high subsurface integrity; instead it is a prediction of potential subsurface artefact concentrations.

All stone quarry sites are predicted to have PAD. The assumption is that in most cases the visible surface material at quarries is represented by larger artefacts (such as cores) and that smaller material (eg flakes) is likely to be buried.

iv Modified trees

Modified trees (either carved or scarred) can be difficult to identify. Scars commonly occur on trees through natural processes such a branch tears, insect damage, storm and fire damage and faunal damage. Scars can also occur from mechanical damage from vehicles or farming equipment.

The attributes of potential scarred trees were discussed during the survey amongst archaeologists and RAPs before it was decided if a scar would be recorded or not. A precautionary approach was adopted, whereby some of the more ambiguous examples were recorded anyway. The assessment of scar trees was made from the experience of the survey team and the guideline *Aboriginal scarred trees in New South Wales: a field manual* (DEC 2005). In some of the more ambiguous examples, it cannot be verified whether some scars recorded during the survey are of natural or Aboriginal origin. In such instances, an expert evaluation by a scar tree expert (aborist or other) would be required to determine the status of certain trees.

v Grinding grooves

Grinding grooves were defined as an area of outcropping bedrock containing evidence of one or more grinding grooves where ground-stone hatchets or other grinding practices (ie seed grinding) were implemented.

6.4 Survey coverage data

6.4.1 Rationale

The aim of recording and analysing survey coverage data is to determine the effectiveness of the survey. It is evaluated for its effectiveness in identifying the distribution of Aboriginal objects across the landscape, taking into account the potential for archaeological deposits. The percentage of the ground surface exposed in each landform and the visible ground surface within exposures (as ground exposures are often obscured by vegetation, gravels, etc) influences the survey results. For example, an archaeologically sensitive landform surface that is highly exposed by erosion is likely to reveal Aboriginal artefacts, whereas a similar landform that is thickly grassed will obscure surface artefacts if they are present.

Overall, calculation of effective survey coverage is used to estimate not only how much area was physically surveyed, but also how favourable the survey conditions were for the identification of Aboriginal sites.

6.4.2 Pedestrian survey coverage results

i Overview

The survey comprised 155 walking transects across the survey area, completed over 19 days. GPS track log data indicates that each survey participant walked approximately 247 km, which represents the total length of the survey transects. Figure 6.2 and Figures 6.2A to 6.2H presents the survey transects logged by GPS, but represents only where the archaeologist walked during survey (one person's movements). It does not accurately represent the transect width covered by the survey team, which sometimes involved people separating beyond the 50 m corridor to inspect key landscape features such as rock outcrops and trees along the general transect alignment.

Landform coverage data is summarised in Table 6.2 and data for individual transects are provided in Appendix C. Examples of different landforms, ground surface visibility conditions and disturbance levels are shown in Plate 6.1 to Plate 6.20.

Table 6.2 Survey effective coverage summary

Landform class	Length (m)	Proportion of survey (%)	Area (m^2)	Effective coverage area (m^2)	Effective coverage%
Crest	92,413	37.4	2,007,125	307,211	15
Hill slope 1	89,921	36.5	2,169,813	246,245	11
Hill slope 2	4,958	2.0	99,152	6,246	6
Flat	36,131	14.6	768,108	88,695	12
Watercourse (1st and 2nd order)	20,475	8.3	473,012	48,214	10
Watercourse 3rd order	1,828	0.7	41,889	17,975	43
Watercourse 4th order +	1,307	0.5	32,676	3,889	12

Table 6.2 Survey effective coverage summary

Landform class	Length (m)	Proportion of survey (%)	Area (m^2)	Effective coverage area (m^2)	Effective coverage%
Total	**247,033 m**	**-**	**5,591,775 m^2**	**718,475 m^2**	**-**

ii Outcropping geology and crests

Crests (hill crests, ridges and spurs) were the most surveyed landform class, with a total of 92 km of crest landform walked by the survey team (approximately 37% of the survey effort). Over half of the surveyed crests were spurs. This landform element was differentiated from hill crests and ridges to further define the lateral crests of land that descend from the summit of hills or ridges. Spurs typically extend, with decreasing elevation, closer to streams and valley floors than hill crests or ridges. These features make spurs have a higher likelihood of being suitable open camp sites and were targeted for this reason.

Effective coverage on crests was approximately 15%, which had the second highest results for all landform classes considered as part of the archaeological survey. This was mainly because crests featured higher levels of erosion and outcropping bedrock. Crests with outcropping bedrock were typically less disturbed than other landforms because they have been protected against continual ploughing associated with pasture improvement. Notwithstanding, the extent of outcropping bedrock varied significantly across crests and not all crests had outcropping stone material (approximately 3.2 km of transects).

Crests on the Bald Knob soil landscape typically had high percentages of outcropping basalt (5–70%) boulders (Plate 6.1). All instances of the Bald Knob soil landscape were inspected for the presence of Aboriginal objects such as stone artefacts and/or stone arrangements; however, out of the approximate 10 km walked only one isolated artefact was identified (NE34). Notwithstanding, two historical dry stone walls with some ambiguous circular features were identified within the southern array area (NE57 – refer Section 6.5.8). Overall, the absence of Aboriginal sites indicates that the type of basalt within the Bald Knob soil landscape was generally not utilised by Aboriginal people for stone tool manufacture. Outcropping basalt was also commonly identified in lower outcrop percentages on crests within the Fairfield soil landscape (Plate 6.2) and only very sporadically on the Ironstone and Kellys Plains soil landscapes.

Outcropping silcrete was commonly identified close to the 1,030 m contour line across the survey area. Silcrete was mostly identified on crests but also occurred on upper hill slopes and occasionally on lower slopes where significant erosion had occurred. Outcropping silcrete was more frequent in the central and northern array areas because of generally higher elevation, and only occurred at the far eastern boundary of the southern array area. Silcrete mostly occurred as rounded bedrock pavements, sometimes resembling tors or large boulders (Plate 6.3 to Plate 6.7). Outcropping silcrete in surface-strewn boulder and cobble form was much rarer within the survey area and occurred in isolated, locally significant forms on the Ironstone, Fairfield and Gostwyck soil landscapes (Plate 6.4). Notwithstanding, the widespread evidence of field rock-picking and stockpiling is likely to have had a significant impact on the pre-historic distribution of smaller boulders and cobbles across the landscape (Plate 6.9).

The coarseness and grain size of silcrete varied significantly throughout the survey area. Generally, the silcrete outcropping as bedrock pavements and larger tor-like boulders more aptly resembles quartzite or sandstone in terms of coarseness. This is likely to represent silcrete where the full chemical conversion has not quite converted the sediments into silcrete and therefore the matrix remains 'granular' (John Appleton pers comm., 2018). Although silcrete is also present in coarse small boulders or cobbles, finer examples featured smooth matrices with high silica content.

Outcropping granite on crests is very common across the southern portion of the northern array area and the eastern half of the central array area on the Gostwyck soil landscape. Granite was often observed as large boulders or tors protruding from eroded crest landforms (Plate 6.10 and Plate 6.5). There was some level of ambiguity initially in outcropping distinguishing granite from silcrete in the southern-most parts of the northern array area (refer to the Gostwyck soil landscape boundary for an indication –Figure 3.3). Superficially, both often feature coarse weathered cortex and share the same position in the landscape. Although each material intertwines throughout the landscape, silcrete (sedimentary) and granite (igneous) are from entirely different geological processes and their association is coincidental.

Rarer examples of outcropping material included chert, greywacke (Plate 6.6) and jasper. Greywacke outcrops were difficult to distinguish from basalt where only cortex was visible. The outcropping chert was of poor quality and featured frequent fracture planes and was therefore very brittle. Jasper was only identified on two occasions (T31 and T75) and also had similarly poor characteristics; however, there was evidence of Aboriginal use at site NE14 (refer Section 6.5.7).

Finally, small ironstone boulders were commonly identified in the Ironstone and Kellys Plains soil landscapes. Ironstone often had the appearance of ferrous slag deposits and was commonly observed to have been subject to rock-picking and stockpiling across the landscape (Plate 6.9).

Plate 6.1 Crest with outcropping basalt on the Bald Knob soil landscape: T76, southern array, view west.

Plate 6.2 Crest with outcropping basalt on the Fairfield soil landscape: T100, northern array, view west.

Plate 6.3 **Crest with outcropping silcrete on the Gostwyck soil landscape: T138, northern array, view east.**

Plate 6.4 **Example of silcrete outcropping in smaller boulder and cobble forms on the Saumarez soil landscape: T23, northern array, view east.**

Plate 6.5 **Crest with outcropping granite tors on the Gostwyck soil landscape: T50, central array, view north.**

Plate 6.6 **Crest with outcropping greywacke: T96, northern array, view north.**

Plate 6.7 Rarer occurrence of significant silcrete expanse the: T31, northern array, view south.

Plate 6.8 Crest with significant outcropping silcrete on the Gostwyck soil landscape: T85, northern array, view south-west from drone.

Plate 6.9 Example of silcrete and ironstone boulder stockpile as a result of rock-picking: T95, northern array, view east.

Plate 6.10 Crest with outcropping granite tor: T41, central array, view south-east.

iii Hill slopes

Very gentle to gently inclined slopes (landform class hill slope 1) was the next most surveyed landform class and received approximately 36% of the survey effort. Effective coverage of this landform class was slightly below that of crests at 11%. This was largely attributed to the higher levels of grass coverage present along the vast grazing paddocks that characterise this landform type. Moderately inclined hill slopes (hill slopes) were much rarer in the survey area and therefore only made up 2% of the survey effort (Plate 6.14).

Although outcropping bedrock did occur along these survey transects, their occurrence was much more sporadic than on crests and easily targeted from a distance. Disturbance levels were also much higher on this landform class, as they represent where extensive clearing, followed by repeated ploughing for pasture improvement has occurred (Plate 6.11). Although not all paddocks were freshly cultivated, furrow depressions representing past plough events and soil mounding from rock-picking machinery was evident across the survey area.

iv Flats

Undulating flat terrain including elevated plains, terraces and flood plains made up 14.6% of the survey effort and commonly showed evidence of recent pasture improvement (Plate 6.15). Notably, almost all of the land adjacent to Salisbury Waters (6th order) in the southern array area was part of an extensive, low-lying flood plain. Effective coverage results for flats (12%) was almost identical to that for hill slopes, which was anticipated considering that both landforms represent the primary grazing paddocks in the survey area. Ground cover was generally short grass with exposures from plough lines, scalds, sheet wash, animal tracks and localised disturbance from dams. Outcropping stone was almost non-existent on flats, but very sporadically featured small traces of surface strewn cobbles such as ironstone, basalt and silcrete.

v Watercourses

Watercourse transects were divided into three categories: 1st and 2nd order streams; 3rd order streams; and 4th and above order streams. Watercourses in the 1st and 2nd order category were sampled the most within the survey area as they were the mostly frequently occurring watercourses (8.3% of the survey effort). Effective coverage of this landform class was relatively low at 10%, which is attributed to the general absence of defined stream banks and associated exposures (Plate 6.17).

The development footprint has been set back away from higher order streams as part of the project refinement process. Subsequently, there were limited opportunities to sample higher order watercourses. There was only one 3rd order stream within the survey area which was sampled at two occasions (T61 and T151). This stream was deeply incised and eroded (Plate 6.18) and had high effective coverage results (43%).

The survey focused on landforms near 4th order and above streams including Salisbury Waters (southern array area - Plate 6.20), Cook Station Creek (southern array area) and a small section of Saumarez Creek (northern array area – Plate 6.19); however, because of the 50 m + set-backs employed as part of the project refinement process, there was rarely the opportunity to inspect the actual stream banks of these watercourses. As such, despite only 1.3 km of 4th order and above streams being surveyed, the survey actually covered much more land close to this landform class (eg T63 and T72 in the southern array area).

Plate 6.11 Gentle hill slope showing evidence of ploughing for pasture improvement: T136, northern array, view east.

Plate 6.12 Gentle hill with surface-strewn ironstone: T124, southern, view north.

Plate 6.13 Hill slope within typical grazing paddock: T123, central array, view south.

Plate 6.14 Moderately inclined hill slope within typical grazing paddock: T123, northern array, view west.

Plate 6.15 **Ploughed flood plain adjacent to Salisbury Waters typical grazing paddock: T71, southern array, view north-east.**

Plate 6.16 **Elevated plain adjacent to typical grazing paddock: T116, central array, view north.**

Plate 6.17 **Typical 1st and 2nd order stream with low ground surface visibility and no defined stream channel: T96, northern array, view north-east.**

Plate 6.18 **Unnamed 3rd order watercourse showing deeply incised and eroded banks: T61, northern array, view north.**

Plate 6.19 Saumarez Creek: T86, northern array area, view north.

Plate 6.20 Salisbury Waters: view west from T62, southern array area, view north.

vi Coverage of soil landscapes

Table 6.3 provides a summary of survey coverage in relation to the soil landscapes. It shows that ground surface visibility was generally consistent across soil landscapes except for areas with significant outcropping bedrock (ie Gostwyck variant a and Bald Knob) or eroded stream banks which provided higher levels of exposure.

Table 6.3 Coverage of soil landscapes

Soil landscape	Length (m)	Area (m^2)	Effective coverage area (m^2)	Effective coverage%
Saumarez	471	9,429	1,320	14
Gostwyck variant a	3,119	67,864	15,123	22
Julia Gully	2,923	67,962	14,264	21
Bald knob	11,091	235,261	47,564	20
Powers Creek	20,940	439,372	61,334	14
Fairfield variant a	30,483	725,997	76,266	11
Kellys Plains	34,302	807,170	91,439	11
Ironstone	36,375	840,100	120,170	14
Fairfield variant b	41,256	897,375	113,599	13
Gostwyck	66,072	1,501,246	177,396	12
Total	**247,033**	**5,591,775**	**718,475**	

vii Evaluation of survey coverage

The effective coverage results indicate that the ground surface visibility conditions during the survey were generally effective to characterise the distribution of archaeological sites across the survey area. Despite continuous grass coverage, the amount of exposed ground surface allowed the survey team to identify numerous open stone artefact sites which are described in Section 6.5.

The extent of survey across the three array areas was very useful in characterising the level of disturbance caused by vegetation clearance and pasture improvement, often including rock-picking and stockpiling. The only relatively protected areas were those with outcropping bedrock expanses and boulders that have been cleared of vegetation but avoided by continual machinery damage.

The coverage results are considered comprehensive for grinding groove sites and stone quarries because outcropping stone was specifically targeted and visible from a distance in the field and also guided by landforms (crests and upper slope) and soil landscapes mapping. This does not account for potentially buried outcrop features which would be unpredictable and difficult to target.

Coverage for mature native trees was informative for the presence of Aboriginal scarred trees but not considered comprehensive for all mature native trees. The survey identified that despite most of the survey area being cleared, there are tracts of mature native trees dispersed across the survey area, particularly within the southern portion of the northern array area. Many trees are dead and the product of dieback, which raises further issues about estimating the age of many of the dead trees. A strategy to address this survey limitation is presented in Section 9.4.1.

6.5 Aboriginal site results

6.5.1 Overview

The survey team identified 96 sites during the 19 days of archaeological field survey. Sites were labelled sequentially with an NE prefix standing for New England. The 96 sites comprise 95 Aboriginal sites and a historical dry wall site that was originally thought to have potential to be an Aboriginal stone arrangement (NE57). The site types and their frequencies are listed in Table 6.4 and shown on Figures 6.2A to 6.2H. A summary of each site is provided in Table 9.2 and details of each site are provided in Appendix E.

Table 6.4 Sites results summary

Site type	Site frequency	Percentage of total sites
Artefact scatter	16	17%
Artefact scatter, PAD	9	9%
Grinding groove	1	1%
Grinding groove, artefact scatter, PAD	4	4%
Grinding groove, PAD	1	1%
Historical site – dry stone wall	1	1%
Isolated find	43	45%
Isolated find, PAD	3	3%
Quarry, artefact scatter, PAD	5	5%
Scarred tree	13	14%
Total	**96**	**100%**

The most frequent and widely distributed Aboriginal objects are stone artefacts which are present in 80 out of the 96 sites (83%) including artefact scatters (n=25 including those with PAD), isolated finds (n=46 including those with PAD), quarries (n=5) and grinding groove sites (n=4).

Twenty-two sites were considered to have areas of PAD and featured surface evidence in quarries (n=5), artefact scatters (n=9), isolated finds (n=3) and grinding grooves with artefact scatters (n=4). Less common site types identified were scarred trees (n=13), grinding grooves (n=6) and quarries (n=5).

6.5.2 Landscape associations

Aboriginal sites were identified in each of the landform classes defined for the survey. The highest frequency of sites were identified on crests (57%), followed by hill slopes (30%), flats (6%) and watercourses (6%) (refer Table 6.5). Notably, all site type features are represented on crest landforms and contain the most archaeologically significant sites, including all of the stone quarry sites, all open stone artefact sites attributed with PAD and the most significant grinding groove site (NE09).

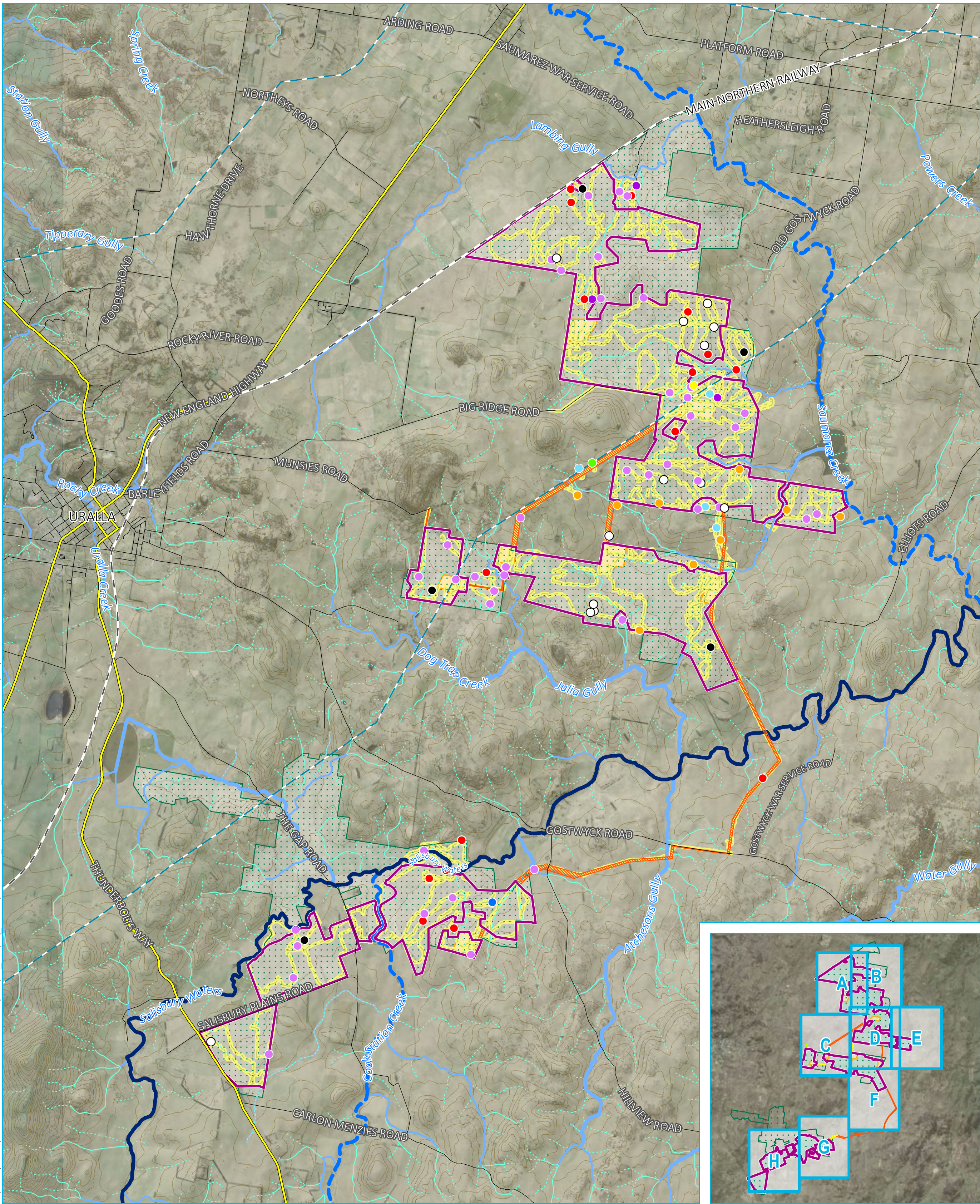
Sites were identified an average of approximately 218 m from 1st or 2nd order streams, 960 m from 3rd order streams and 1,750 m from 4th order and above streams, with the minimum distance being 3 m and the maximum distance being 764 m. The median distance from mapped watercourses was 166 m. The considerable average distance from higher order streams indicates that lower order streams (particularly 2nd order) were capable of supporting low intensity camping and resource gathering activities.

Approximately half of the sites identified on hill slope landforms were isolated artefacts which are largely attributed to 'background scatter' caused by isolated events or accidental discard. Over half of the scarred trees identified were on hill slope landforms.

Three of the six grinding groove sites identified were on hill slope landforms in areas with outcropping silcrete bedrock. Most of the sites identified on flats and watercourses were isolated artefacts but also included isolated incidences of scarred trees and artefact scatters.

Table 6.5 Site types and their associated landforms

Row Labels	Crest	Hill slope	Flat	Watercourse	Total
Artefact scatter	10	5		1	**16**
Artefact scatter, PAD	9				**9**
Grinding groove		1			**1**
Grinding groove, artefact scatter, PAD	2	2			**4**
Grinding groove, PAD	1				**1**
Historical site - unverified	1				**1**
Isolated find	20	14	5	4	**43**
Isolated find, PAD	3				**3**
Quarry, artefact scatter, PAD	5				**5**
Scarred tree	4	7	1	1	**13**
Total	**55**	**29**	**6**	**6**	**96**



Source: EMM (2018); DFSI (2017); UPC (2018)

0 2.5 5 km

GDA 1994 MGA Zone 56

N

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KEY

- 330 kV transmission line
- Main road
- Local road
- Rail line
- Contour (10 m)
- Survey transect
- Study area

Strahler stream order
- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order
- 6th order

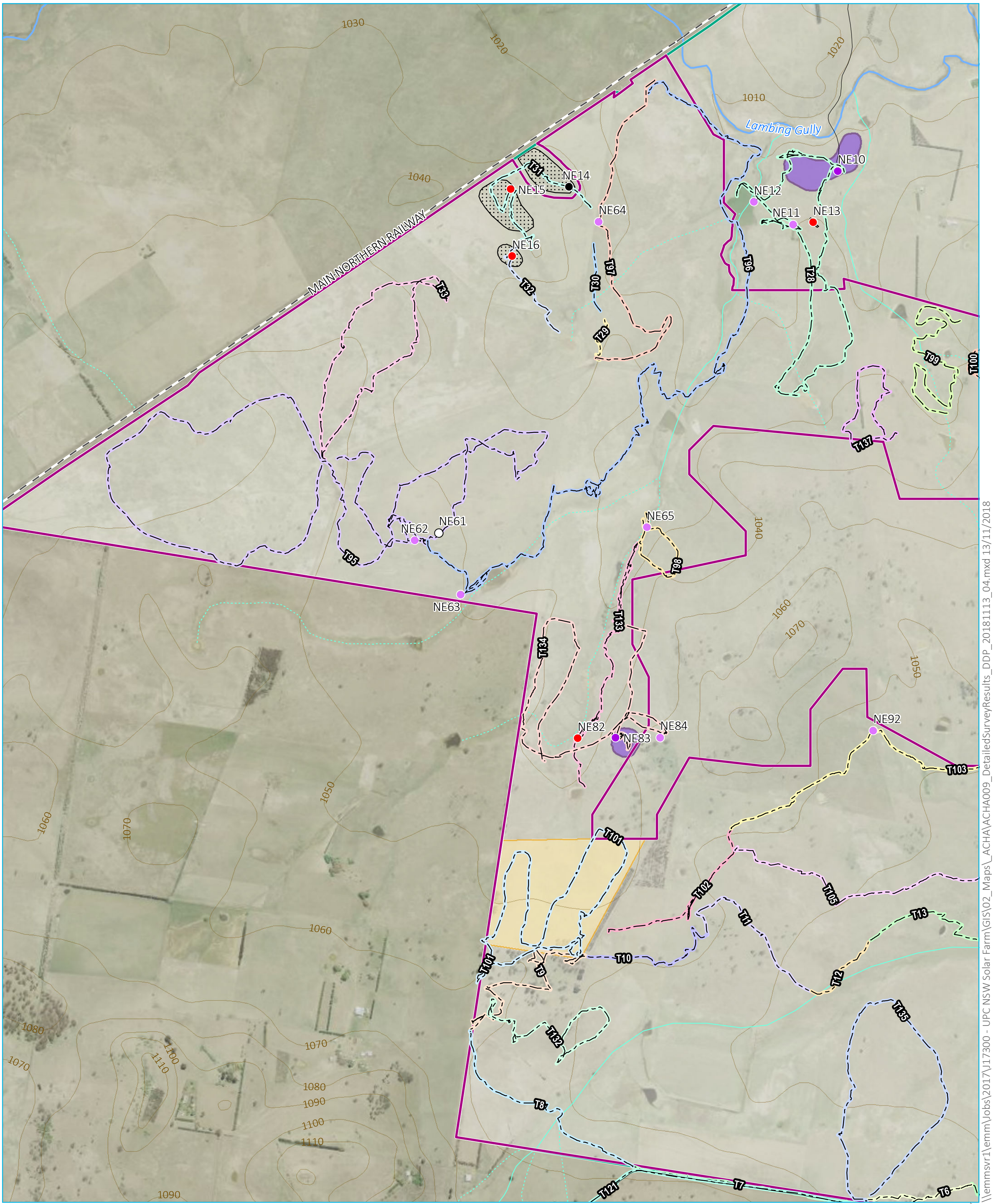
Development footprint
- Solar array
- Potential site access/ETL easement/electrical cabling
- Potential substation/BESS footprint

Site type
- Artefact scatter
- Artefact scatter, PAD
- Grinding groove
- Grinding groove, PAD
- Grinding groove, artefact scatter, PAD
- Historical site - unverified
- Isolated find
- Isolated find, PAD
- Quarry, artefact scatter, PAD
- Scarred tree

Field survey results - overview

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 6.2

EMM
creating opportunities



Source: EMM (2018); DFSI (2017); UPC (2018)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

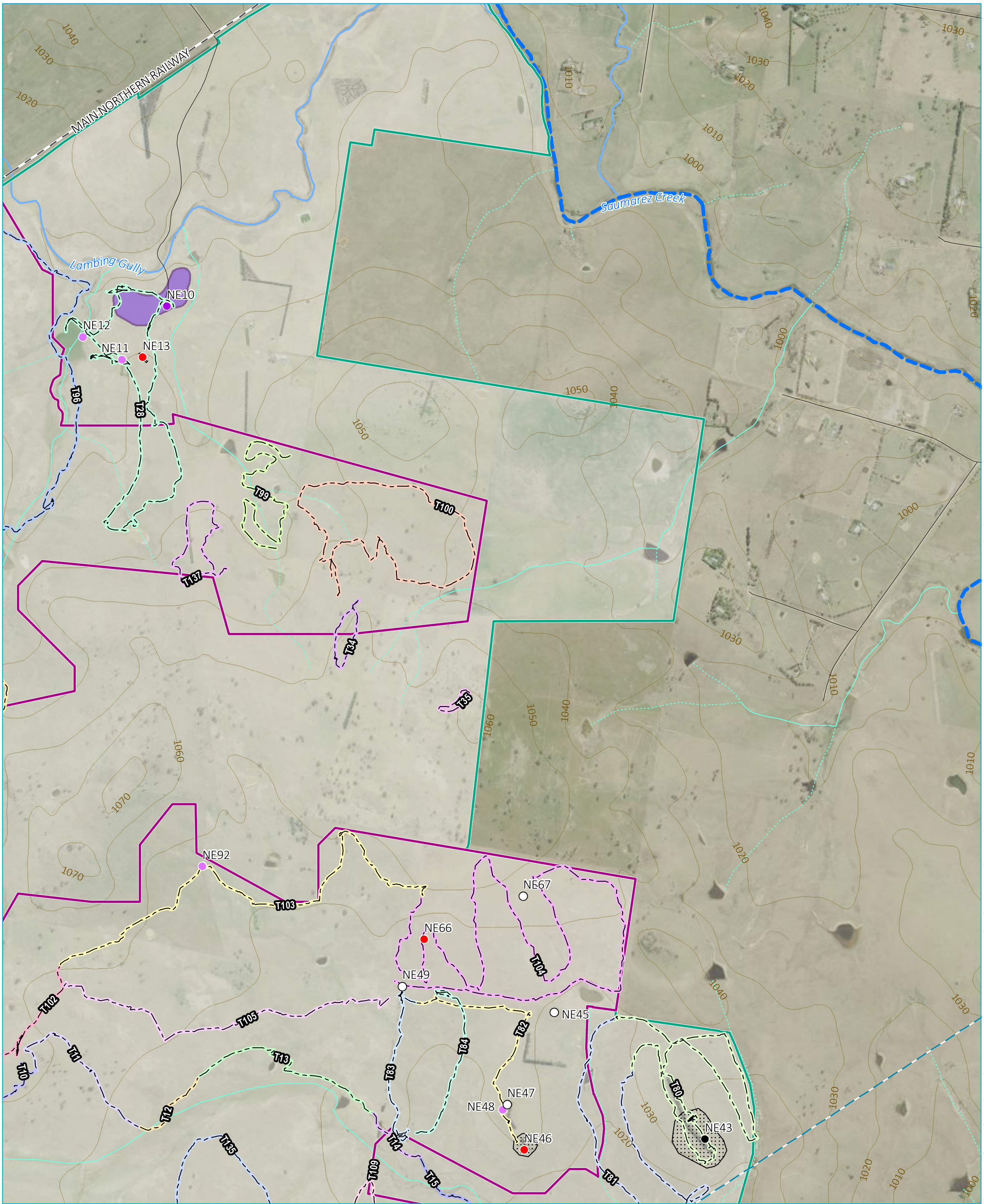
KEY

Local road
Rail line
Contour (10 m)
Study area
Development footprint
Solar array
Potential substation/BESS footprint
Survey transect
PAD
Site
Strahler stream order
1st order
2nd order
3rd order
Site type
Artefact scatter
Isolated find
Isolated find, PAD
Quarry, artefact scatter, PAD
Scarred tree

Field survey results - overview

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 6.2A

EMM
creating opportunities



Source: EMM (2018); DFSI (2017); UPC (2018)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

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KEY

- 330 kV transmission line
- Local road
- Rail line
- Contour (10 m)
- Study area

Development footprint

- Solar array

- Survey transect
- PAD
- Site

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 5th order

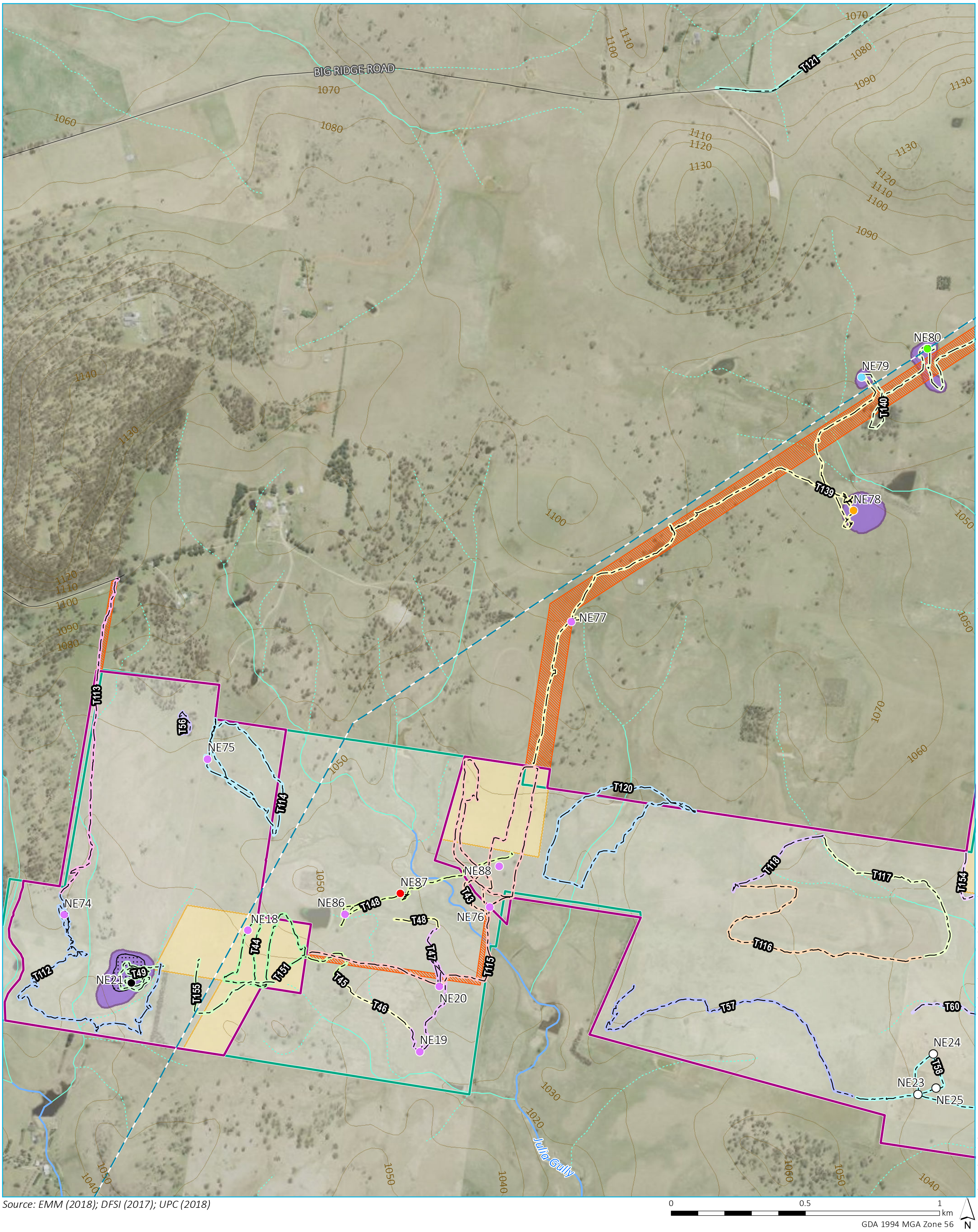
Site type

- Artefact scatter
- Isolated find
- Isolated find, PAD
- Quarry, artefact scatter, PAD
- Scarred tree

Field survey results - overview

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 6.2B

creating opportunities



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Source: EMM (2018); DFSI (2017); UPC (2018)

KEY

- 330 kV transmission line
- Local road
- Contour (10 m)
- Study area

Development footprint

- Solar array
- Potential site access/ETL easement/ electrical cabling
- Potential substation/BESS footprint

- Survey transect
- PAD
- Site

Strahler stream order

- 1st order
- 2nd order
- 3rd order

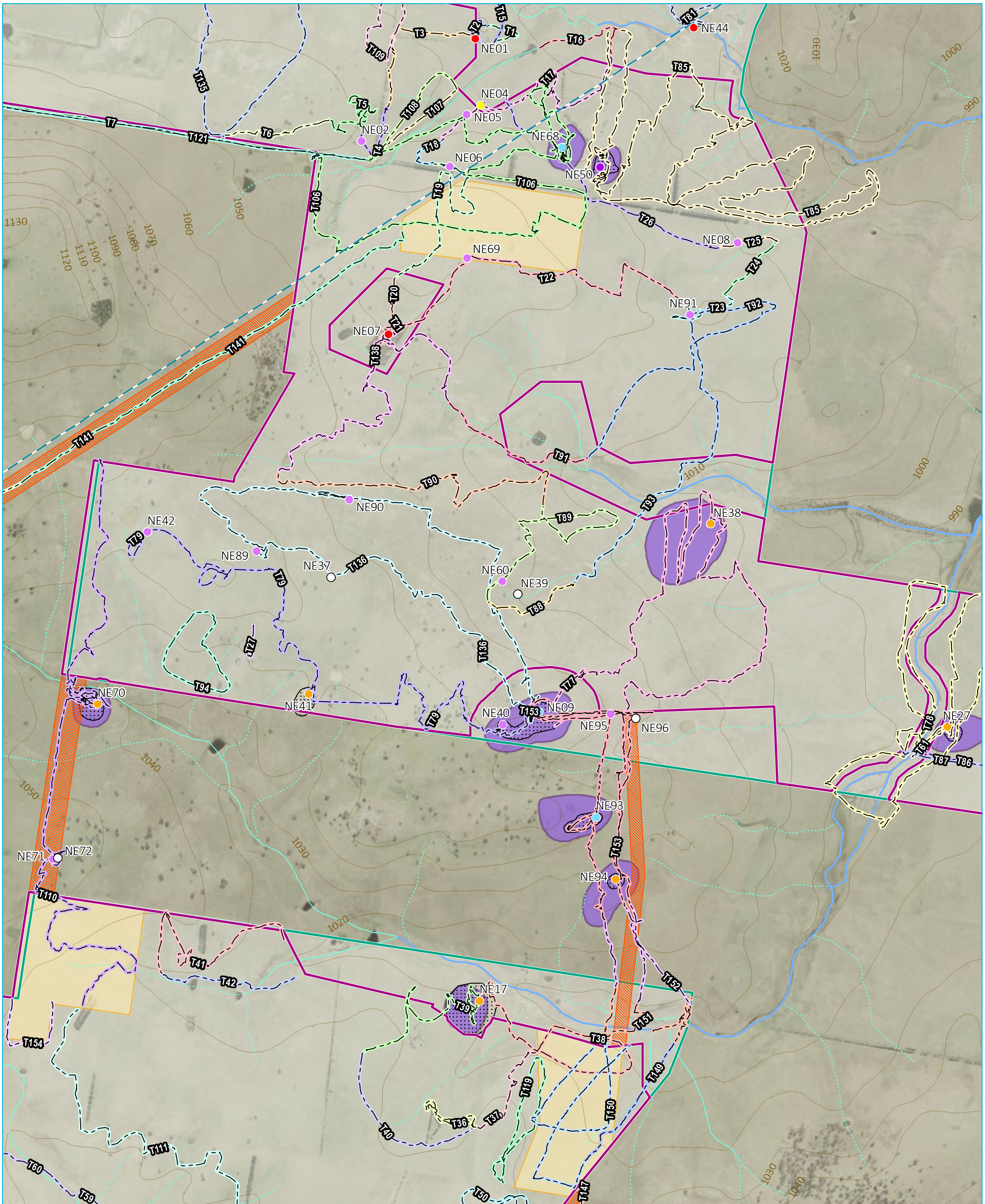
Site type

- Artefact scatter
- Artefact scatter, PAD
- Grinding groove, PAD
- Grinding groove, artefact scatter, PAD
- Isolated find
- Quarry, artefact scatter, PAD
- Scarred tree

Field survey results - overview

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 6.2C

EMM
creating opportunities



Source: EMM (2018); DFSI (2017); UPC (2018)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

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KEY

- 330 kV transmission line
- Local road
- Contour (10 m)
- Study area

Development footprint

- Solar array
- Potential site access/ETL easement/ electrical cabling
- Potential substation/BESS footprint
- Survey transect
- PAD
- Site

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order

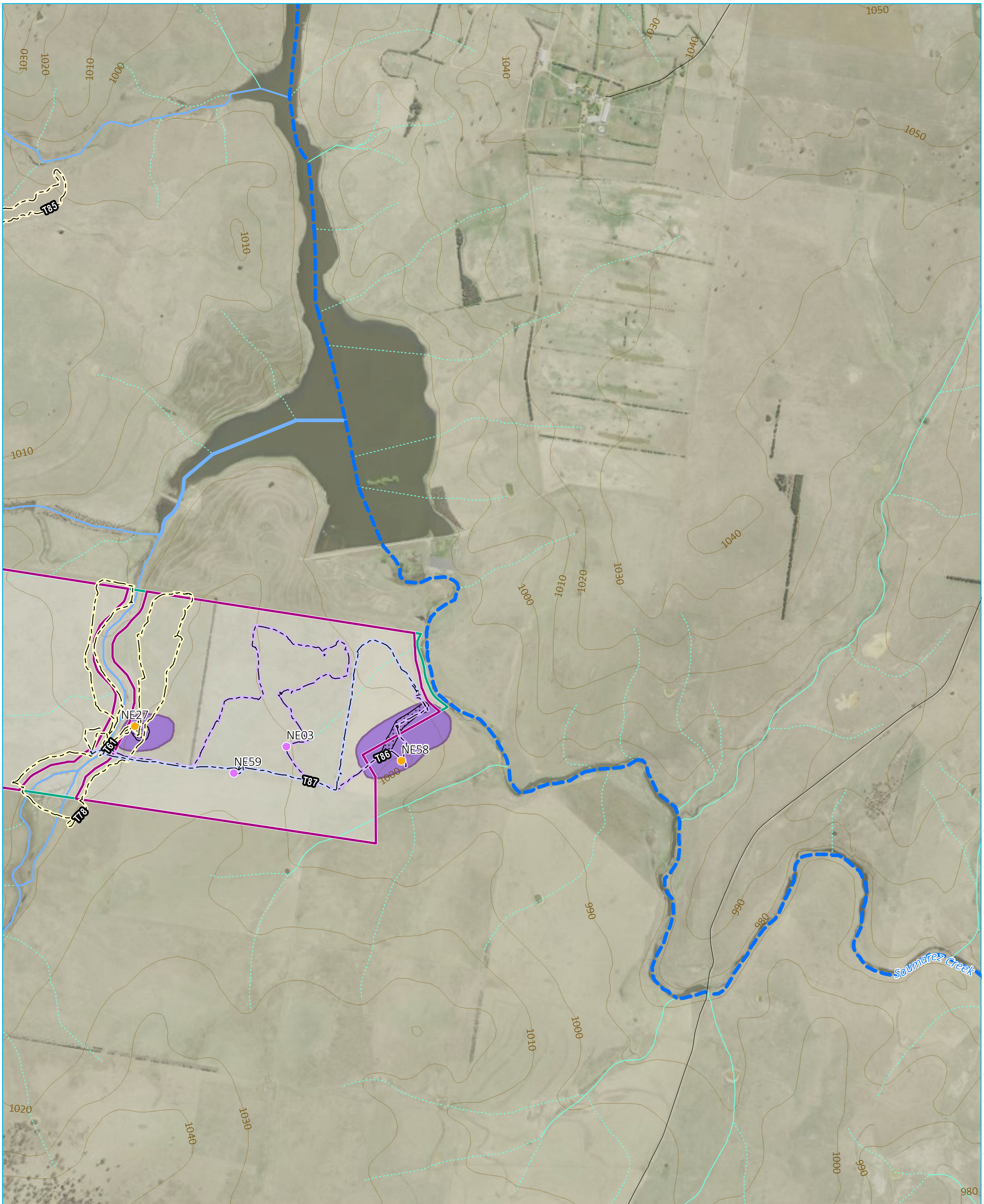
Site type

- Artefact scatter
- Artefact scatter, PAD
- Grinding groove
- Grinding groove, artefact scatter, PAD
- Isolated find
- Isolated find, PAD
- Scarred tree

Field survey results - overview

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 6.2D

EMM creating opportunities



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Source: EMM (2018); DFSI (2017); UPC (2018)

0 0.5 1 km
GDA 1994 MGA Zone 56
N

KEY

- Local road
- Contour (10 m)
- Study area

Development footprint

- Solar array

- Survey transect
- PAD
- Site

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order

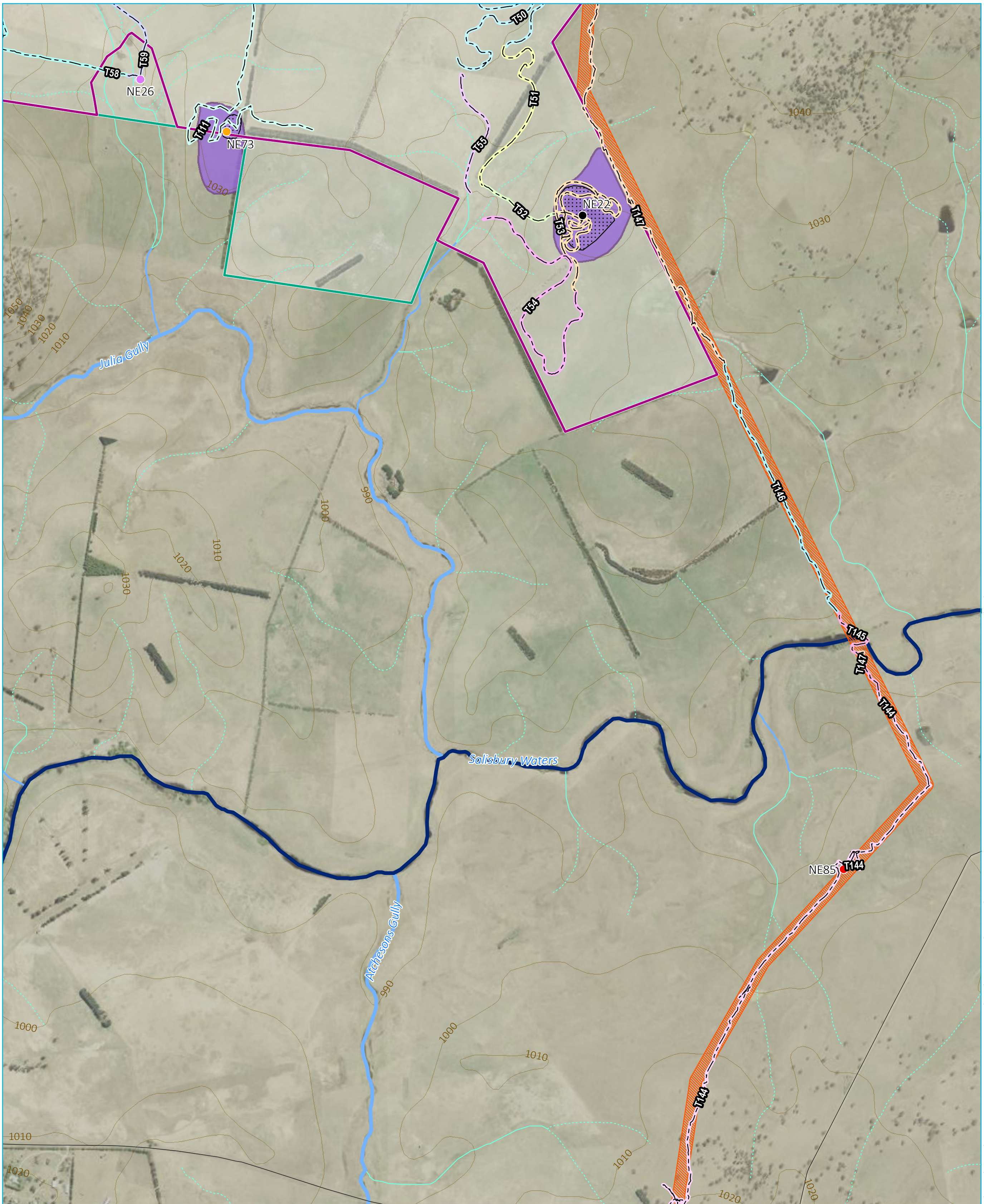
Site type

- Artefact scatter, PAD
- Isolated find

Field survey results - overview

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 6.2E

EMM
creating opportunities



Source: EMM (2018); DFSI (2017); UPC (2018)

0 0.5 1 km
GDA 1994 MGA Zone 56
N

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KEY

- Local road
- Contour (10 m)
- Study area

Development footprint
- Solar array
- Potential site access/ETL easement/ electrical cabling

- Survey transect
- PAD
- Site

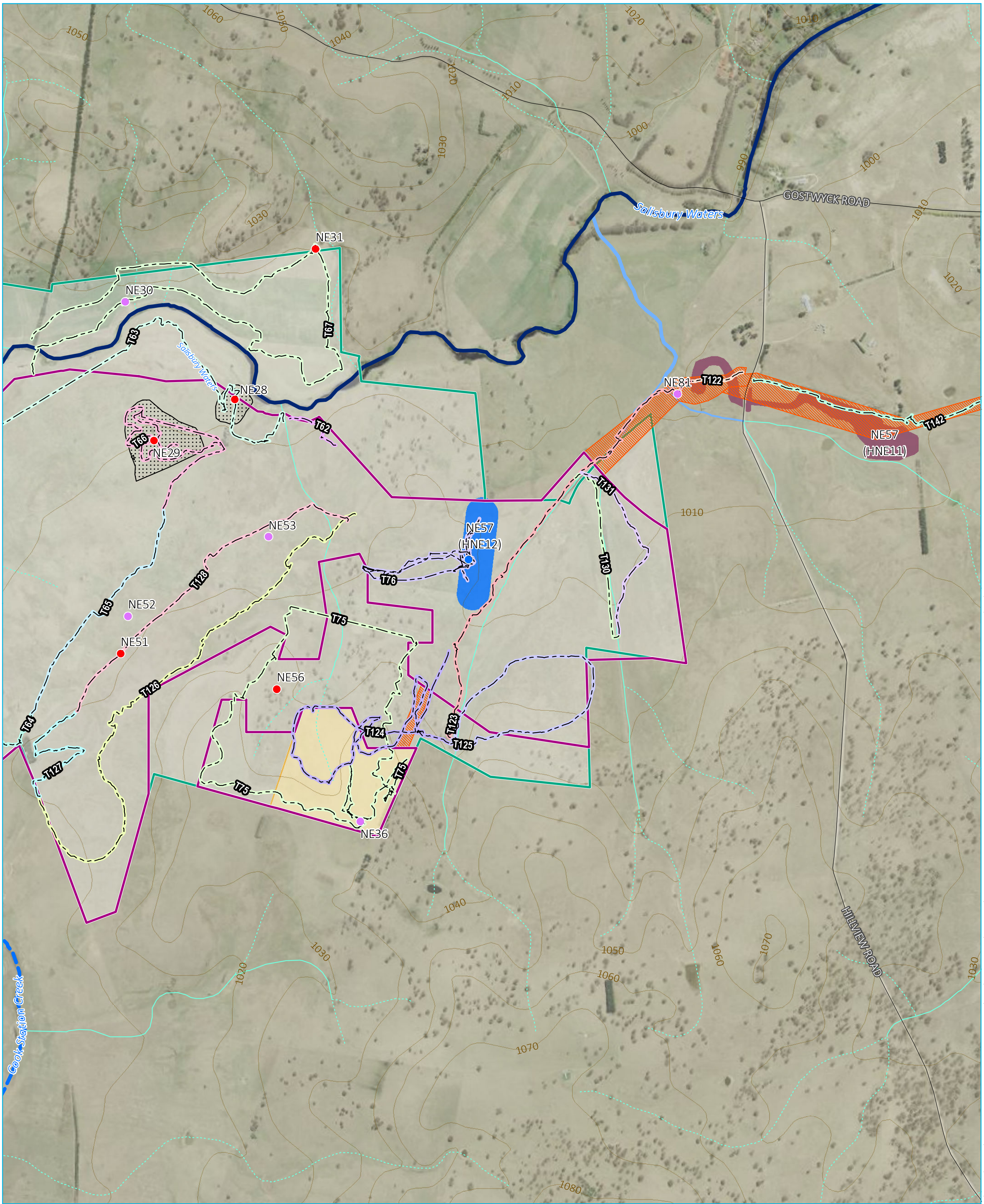
Strahler stream order
- 1st order
- 2nd order
- 3rd order
- 4th order
- 6th order

Site type
- Artefact scatter
- Artefact scatter, PAD
- Isolated find
- Quarry, artefact scatter, PAD
- Scarred tree

Field survey results - overview

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 6.2F

creating opportunities



Source: EMM (2018); DFSI (2017); UPC (2018)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

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KEY

Local road

Contour (10 m)

Study area

Development footprint

Solar array

Potential site access/ETL easement/ electrical cabling

Potential substation/BESS footprint

Survey transect

Site

Strahler stream order

1st order

2nd order

3rd order

4th order

5th order

6th order

Site type

Artefact scatter

Historical site - unverified

Isolated find

Identified in historic heritage assessment

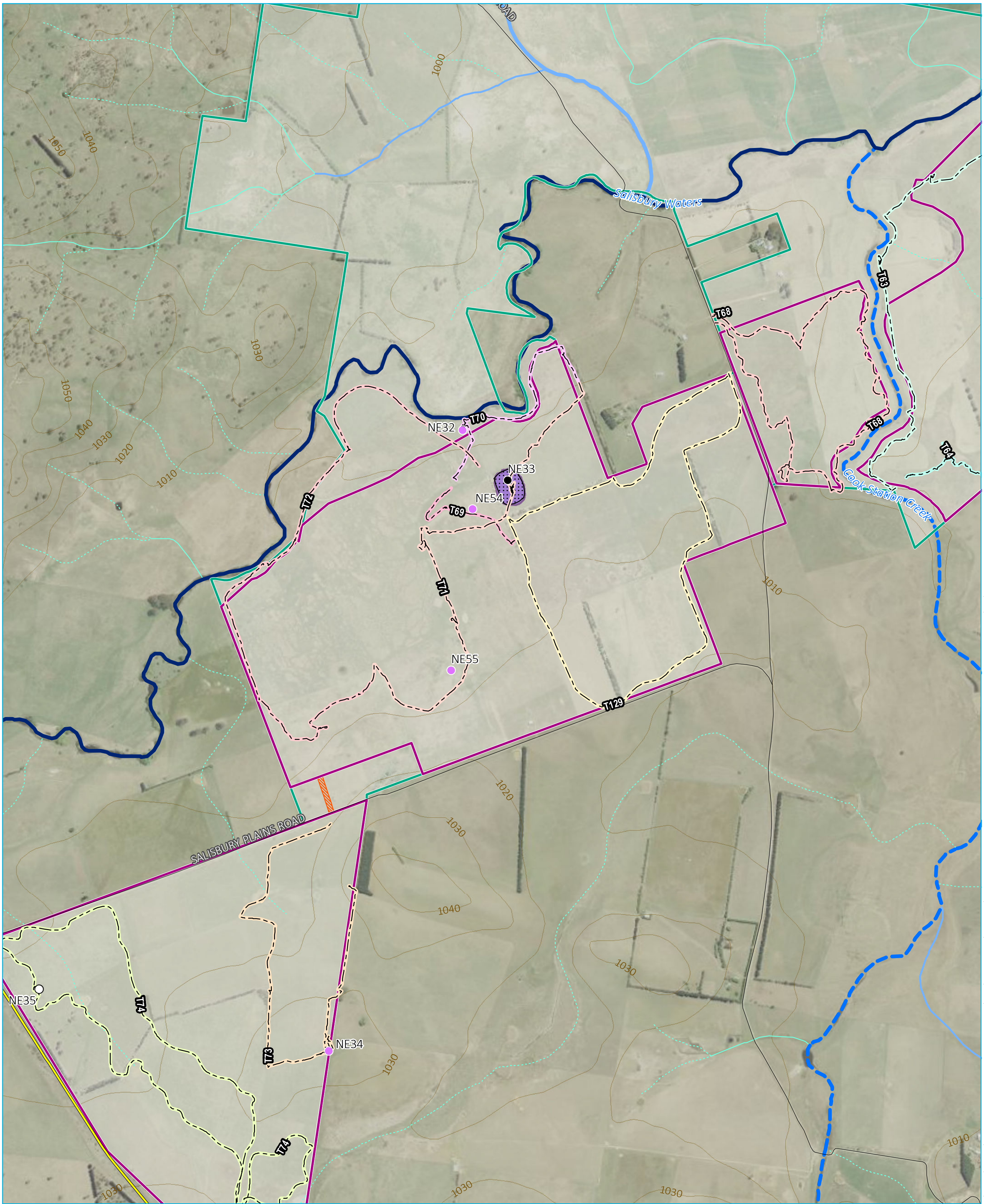
NE57 (HNE11)

NE57 (HNE12)

Field survey results - overview

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 6.2G

creating opportunities



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Source: EMM (2018); DFSI (2017); UPC (2018)

0 0.5 1 km
GDA 1994 MGA Zone 56
N

KEY

- Main road
- Local road
- Contour (10 m)
- Study area

Development footprint

- Solar array
- Potential site access/ETL easement/ electrical cabling
- Survey transect
- PAD
- Site

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order
- 6th order

Site type

- Isolated find
- Quarry, artefact scatter, PAD
- Scarred tree

Field survey results - overview

New England Solar Farm
Aboriginal cultural heritage assessment
Figure 6.2H

EMM
creating opportunities

6.5.3 Disturbance to sites

The existing ground disturbance level was recorded for each site in an attempt to gauge the significance of the sites and the potential for subsurface archaeological material. Each site was assigned to the categories of low, moderate or high disturbance (refer Table 6.6).

Low disturbance was attributed to approximately 25% of the total sites. These were sites that have been historically cleared and subject to livestock movement, but are amongst stone outcrops that have protected them from continuous pasture improvement. Accordingly, 18 of the 21 sites attributed with PAD were also those recorded with low levels of disturbance.

Over half of the sites (52%) were attributed with moderate levels of disturbance. Evidence of current or historical clearing followed by ploughing associated with pasture improvement was the most widespread form of moderate disturbance noted throughout the survey area. Similarly, one silcrete quarry site was attributed with moderate disturbance as it was clear that rock-picking had occurred and stockpiled parts of the quarry area. The additional level of disturbance from rock-picking across the survey area is difficult to quantify and can only be gauged by the remnant rock piles scattered in paddocks throughout the landscape.

High levels of disturbance were assigned to approximately 10% of the total sites. These sites had little to no contextual integrity, such as dam bund walls, rock-picking stock piles, graded vehicle track cuttings and other excavated mounds from farming practices.

Table 6.6 Disturbance levels across sites identified during survey

Site type	High	Moderate	Low	N/A (scarred trees)	Total
Artefact scatter	2	13	2		**16**
Artefact scatter, PAD		2	7		**9**
Grinding groove			1		**1**
Grinding groove, artefact scatter, PAD			4		**4**
Grinding groove, PAD			1		**1**
Historical site - unverified			1		**1**
Isolated find	8	32	3		**43**
Isolated find, PAD		1	2		**3**
Quarry, artefact scatter, PAD		1	4		**5**
Scarred tree				13	**13**
Total	**10**	**49**	**24**	**13**	**96**

6.5.4 Stone artefact site characteristics

i Contexts

Stone artefact scatters (including those with PAD) were mostly identified on crest landforms (n=19, or 76%). The remaining artefact scatters were rare and occurred on hill slopes (n=5) and on a watercourse in one instance (NE44). Isolated finds were more widely distributed throughout the landscape, whereby only half occurred on crests (n=23), followed by hill slopes (n=14), flats (n=5) and watercourses (n=4). The wider representation of isolated finds suggests they are generally a product of more transitory occupation, except where on a crest considered to have PAD.

The artefact scatters (n=9) and isolated artefacts (n=3) associated with PAD are mainly on crests defined by outcropping granite and/or silcrete boulders which has acted to protect these sites from considerable disturbance (eg Plate 6.21 and Plate 6.28). Artefacts were commonly identified amongst the outcropping boulders and noticeably discontinued outside of the crest areas, even if ground surface visibility levels remained favourable.

Only two open artefact scatters (NE27 and NE58) and one isolated find (NE10) was attributed with PAD outside crests defined by outcropping boulders due to their unique positions in the survey area: being on crests adjacent to reliable watercourses (3rd order and above). It is acknowledged that these sites are unlikely to have high subsurface archaeological integrity, but may benefit from testing (if under threat of impact) to understand the effects of pasture improvement on open stone artefact sites.

ii Lithic assemblage

A total of 238 surface artefacts were recorded during the survey. Artefact frequencies ranged from 1 to 19 across the sites that featured stone artefacts. The average artefact frequency per site was low at only 2.6, which is not surprising considering that 46 of the 80 sites that featured stone artefacts were isolated finds.

The 238 artefacts were divided into 10 artefact types which are displayed in Figure 6.3. The largest percentage of artefacts is classed as complete flakes (42%). Fragments of broken flakes including proximal, medial and distal portions, as well as flaked pieces and longitudinally split flakes make up a further 14% of the assemblage. Notably, a total of 75 cores were identified, making up 31% of the assemblage. This is a very high proportion when compared to typical artefact assemblages and is a strong indicator that much of the raw material for stone tool manufacture was sourced locally.

A total of 12 retouched flakes were identified (8%), eight of which were classed as retouched axe blanks. Five of the axe blanks were identified as basalt and three were identified as metamorphosed greywacke. Notably, none of the axes showed evidence of grinding and all were bifacially flaked. The remaining four retouched flakes were all of silcrete and included two scrapers and two flakes with retouch along their lateral margins.

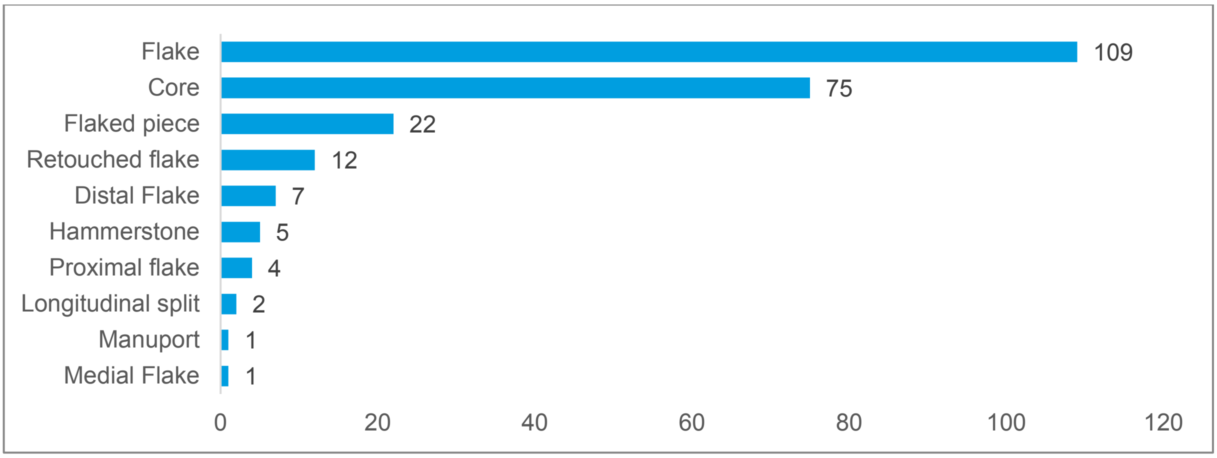

Figure 6.3 Artefact types and their frequencies

A summary of the raw materials is shown on Figure 6.4. Silcrete, a silica rich sedimentary rock, was the predominant artefact raw material (n=112). Over half of the cores identified in the field (n=43) were made from silcrete. A total of 52 chert artefacts were identified, and over half of these were flakes (n=31). Material labelled as 'volcanic' included basalts and metabasalts. Metamorphic artefacts featured metamorphosed greywacke. Quartzite made up only 5% of the assemblage but comprised four of the five recorded hammerstones. Material labelled as 'other' included jasper artefacts and other coarse material that may be a very coarse and granular silcrete.

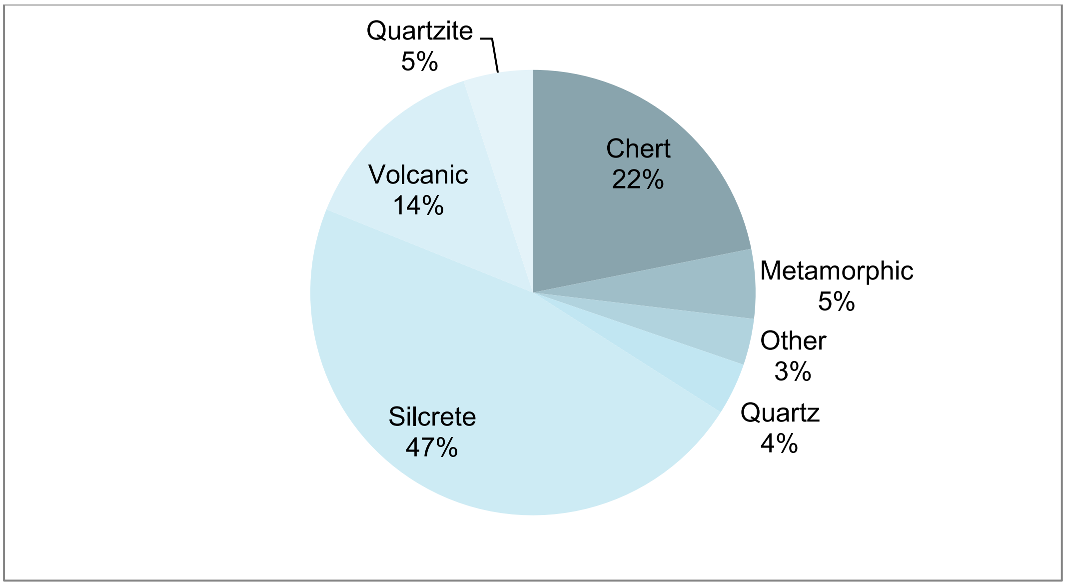

Figure 6.4 Raw material types and their percentages

Plate 6.21 NE17: Example of stone artefact site with PAD amongst outcropping granite boulders and tors, central array area, view north.

Plate 6.22 NE17: basalt axe.

Plate 6.23 **NE87: Example of open site subject to repeated ploughing, view east, central array area.**

Plate 6.24 **NE87: metamorphosed greywacke axe.**

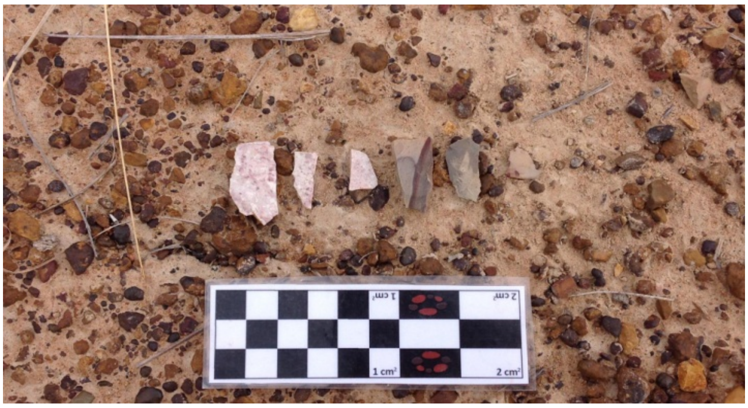

Plate 6.25 **NE44: scatter of chert flakes and flake fragments.**

Plate 6.26 **NE50: basalt axe.**

Plate 6.27 **NE74: Quartzite hammerstone with evidence of ‘pecking’ from percussion. Central array area.**

Plate 6.28 **NE70: another example of an open stone artefact site with PAD amongst granite outcrop, view north-west. Potential site access corridor between central and northern array areas.**

Plate 6.29 NE29: Artefact scatter site showing highly degraded and eroded landscape, view north-west, southern array area.

Plate 6.30 NE29: Silcrete core.

Plate 6.31 NE91: silcrete core.

Plate 6.32 NE83: showing protected rocky outcrop in foreground and heavily ploughed field beyond, northern array area, view west.

Plate 6.33 NE74: rare example of black chert flake.

Plate 6.34 NE27: Quartz flake and basalt axe.

6.5.5 Grinding groove sites

Six grinding groove sites were identified during the survey. Three of the grinding groove sites were identified during survey of the northern array area (NE04, NE09 and NE68) and the remaining three were identified during the survey of the ETL options between the central and northern array areas (NE79, NE80 and NE93). All of the grinding groove sites were identified in areas of outcropping coarse silcrete bedrock resembling granular quartzite.

Grinding groove sites were identified within an elevation range between 1,030-1,080 m AHD. This closely correlates with Appleton's observation of silcrete outcropping at 1030 m AHD throughout the Tablelands (John Appleton pers comm. 2018). Grinding groove sites were identified within the Gostwyck, Powers Creek, Kellys Plains and Fairfield variant b soil landscapes. The variance in soil landscapes indicates that elevation is a more reliable indicator for the presence of grinding grooves than relying on soil landscapes information alone.

The most significant and extensive grinding groove site was identified on a prominent hill crest along the southern boundary of the northern array area (NE09) (Plate 6.35 and Plate 6.36). The survey team counted approximately 100 grooves made up of concentrations across the width of the crest on outcropping silcrete bedrock (Plate 6.37 and Plate 6.38). Further grinding grooves are likely to occur on the site where soil and vegetation debris are obscuring the bedrock surface.

NE09 is relatively far from overflowing water, being over 220 m from a 1st order stream and over 850 m from the nearest 3rd order stream. Grinding activities typically require the aid of water to assist stone abrasion. One explanation is that the bedrock pavements at NE09 easily captures water in rock pools and also channels water along bedrock fracture planes. This would have provided areas for grinding at the base of channels and also adjacent to rock pools. The grooves observed were elongated and oval in shape typical of the axe grinding process. Additionally, stone artefacts including basalt, silcrete and chert flakes and a basalt hammerstone were identified within 20 m of the outcropping silcrete at the periphery of the site. Despite concentrated survey effort further from the site, surface artefacts did not appear to extend past this distance.

Plate 6.35 Grinding groove site NE09, photo taken from aerial drone, view north-east with Saumarez Creek in the far distance (top left corner).

Plate 6.36 Top-down view of NE09 showing extent of significant outcropping silcrete.

Plate 6.37 (NE09) Example of large groove concentration extending into the ground surface.

Plate 6.38 NE09: arrows indicate a number of groove concentrations within proximity to each other.

Plate 6.39 Context of grinding grooves NE68 showing nature of outcropping silcrete, view down-slope, north-west, northern array area.

Plate 6.40 Example of groove locale at NE68 featuring four narrow (left) and one broad (right) groove.

Plate 6.41 **Context of grinding grooves NE79 showing nature of outcropping silcrete and view south towards an ephemeral stream.**

Plate 6.42 **Groove locale at NE79 showing narrow and broad grooves.**

Plate 6.43 **Context of grinding grooves NE80 on a broad hill crest with locally significant outcrop.**

Plate 6.44 **Large ground edge volcanic stone identified at NE68 (left) and nearby irregular and deeply grooved bedrock.**

The character of the remaining grinding grooves differed from NE09 in that they all occur on smaller, isolated silcrete bedrock expanses identified on hill slopes or crests. For example, NE68, NE79 and NE80 featured multiple locales of grooves distributed amongst pockets of locally significant outcropping silcrete (Plate 6.39 to Plate 6.43) while NE04 and NE93 are on small isolated outcrops. Grooves ranged from typical elongated ovals associated with axe edge grinding or shaping wood to much broader and irregularly shaped grooves. The function of the broader grooves is unknown but may have been associated with axe-body polishing or even seed grinding. Notably, a large irregular ground edge implement was identified at NE68 (approximately 200 mm x 200 mm in size), where its size may indicate the function of a two handed axe (Plate 6.44).

6.5.6 Scarred trees

A total of 13 scarred trees were recorded across all three array areas. Aboriginal tree scarring can be difficult to distinguish from natural scarring. This is particularly true in instances where the subject trees are dead and have decayed, often leaving scars and scar dry-faces cracked, splintered and decomposed (eg Plate 6.50). All of the examples were on dead trees so it would be difficult to determine their true age, considering that they have been dead for an unknown amount of time. Furthermore, as no characteristic attributes were visible (eg leaves and smaller branches), the species of the trees were not determined in the field but were considered to belong to the *Eucalyptus* genus.

Typically scars where small and round to oval in shape, starting from around 350–400 mm but up to 100 mm from the base of the tree (eg NE23 (Plate 6.45) and NE61 (Plate 6.47)). Such scars may have been used for containers (such as coolamons) or shields, but the ambiguity of bark regrowth makes it difficult to determine their original forms. Larger, more elongated scars were rarer, with one scar (N39) extending over 2 m which could possibly represent a single-person canoe (Plate 6.46). NE61 is the only tree with evidence of cut marks visible on the scar dry face where overgrowth has receded. However, it is unclear whether the cut was made by a stone or metal (historical) implement.

Two of the 13 trees are no longer standing: NE25 is completely uprooted and partially decomposed and NE49 features only the top half of a scar and the base of the tree is missing (Plate 6.51 and Plate 6.52). Additionally, NE47 is partially felled, meaning that the tree has been cut down above the remnant scar.

Overall, there are three recorded trees (NE45, NE67 and NE72) that are in such poor condition that expert advice would be required to make a more accurate determination of whether or not the scars are of Aboriginal origin. Furthermore, any of the 13 scars would warrant further expert assessment to verify if they are of Aboriginal origin prior to any management outside that of avoidance.

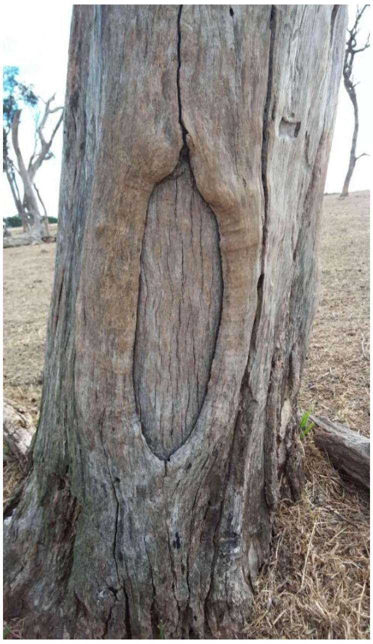

Plate 6.45 NE23 showing scar overgrowth and dry face in good condition, central array area.

Plate 6.46 NE39 showing where scar dry face has decomposed and is largely missing, northern array area.

Plate 6.47 NE61 showing evidence of damage at the upper edge of the scar where overgrowth has receded, northern array area.

Plate 6.48 NE67 showing an irregular shape and split, northern array area. Scar is possibly natural.

Plate 6.49 NE96 showing a scar where considerable scar overgrowth has occurred, northern array area.

Plate 6.50 NE37 showing decay and damage to the lower portion of a scar, northern array area.

Plate 6.51 NE25: showing the location of a scar on a fallen tree, central array area.

Plate 6.52 NE49: showing a felled tree with a scar cut in half, northern array area.

6.5.7 Stone quarries

The survey team identified five open stone artefact sites which are considered to be Aboriginal stone quarries. As detailed in Section 6.3.4, stone quarries were defined by the presence of outcropping stone material with adjacent evidence of the same material type used in stone tool manufacture process. Based on field observations alone, the outcropping material at a site cannot be provably linked to the adjacent stone artefacts. Notwithstanding, links between outcrops and stone artefacts were based on field observations, notably the high representation of stone cores of the same material type.

Stone quarries of a variety of material were identified in the survey area, comprising silcrete (NE14 and NE22), basalt (NE21 and NE33) and greywacke. However, quarry sites were rarely identified considering the high amount of outcropping material, including basalt, silcrete, greywacke, chert and jasper, observed on crests and slopes during the survey (refer Section 6.4.2).

Silcrete quarries NE14 and NE22 were identified on crest landforms in the northern array area where outcropping silcrete included surface cobbles and small boulders. This type of outcropping was an infrequent occurrence when compared to the typical bedrock expanses of silcrete observed in certain transects in the northern array area and ETL options. The distribution of surface cobbles and boulders are likely to have been further reduced by farming practices such as rock-picking. Both quarries occur at 1030 m AHD.

The silcrete quarries featured cores commonly above 100 mm maximum length and up to 200 mm. Adjacent natural silcrete cobbles and boulders ranged greatly in size but typically ranged from palm-sized examples (approximately 50–70 mm maximum length) to boulders of around 400 mm maximum length. This indicates that the cores identified at these sites represent material that was only in initial stages of core reduction. Notably, NE14 was identified amongst outcropping red jasper material. The jasper was generally of poor quality for stone tool knapping and featured multiple fracture plains. Notwithstanding, the survey team identified a few examples of cores and flakes which indicates that Aboriginal people attempted to use this material.

Basalt quarry NE21 was identified on a small hill crest (or knoll) near the southern edge of the central array area and basalt quarry NE33 was identified on the spurred crest of a terrace in the southern array area. Both sites were centred on small outcrops of bedrock in fragmented boulder form where cores and flakes were scattered amongst the outcropping material.

One quarry (NE43) was identified to be a potential metamorphosed greywacke outcrop with surrounding greywacke flakes, cores and tools.

Plate 6.53 Quarry NE14 showing crest with outcropping jasper and silcrete, northern array area, view north-east.

Plate 6.54 N14 showing examples of jasper core (left), flake (centre) and natural example (right)

Plate 6.55 Quarry NE21 showing section of outcropping silcrete boulders, possibly stockpiled from rock-picking, central array area, view north-west.

Plate 6.56 An example of silcrete cores from NE21.

Plate 6.57 Quarry NE21 showing nature of outcropping basalt, central array area, view south.

Plate 6.58 NE21: an example of basalt cores.

Plate 6.59 Quarry NE33 basalt outcrop with orange flags indicating stone artefact locations, southern array area, view south.

Plate 6.60 NE33: a selection of basalt artefacts and a quartzite hammerstone (second from right).

Plate 6.61 Quarry NE43 on hill crest, showing dispersed outcrop identified as metamorphosed greywacke, northern array area, view south-east.

Plate 6.62 An example of artefacts from NE43 of potential greywacke material.

6.5.8 NE57: dry stone walls (HNE11 and HNE12)

During Stage 1 of the field survey, the survey team came across an irregular feature of basalt boulders across a broad hill crest in the southern array area, appearing to form a straight line. Further inspection of this area also identified a number of cleared circular features next to the wall. After further historical research, this feature was identified as the remnants of a dry stone wall, probably built during the mid-1800s. Notably, the wall occurs in an area with a high percentage of outcropping basalt boulders and was probably built by utilising the boulders available at the location. This site is detailed in the historical heritage assessment (Appendix E of the EIS) but has been summarised here due to its initial ambiguity and interest to the RAPs.

Site NE57 comprises two dry stone wall features and associated cleared circles which are at the eastern extent of the southern array area (Figure 6.2G). The walls have been labelled as HNE11 (Plate 6.64 and Plate 6.66) and HNE12 (Plate 6.63 and Plate 6.65) in the historical heritage assessment (Appendix E of the EIS).

HNE11 is a remnant wall or fence-base comprised of basalt boulders. The boulders do not show obvious signs of dressing. The boulders along the majority of the wall (approximately 850 m) have been scattered and do not demonstrate any vertical structure resulting in single-course basalt blocks forming an alignment approximately 6 m across. The western end of this feature is defined by an arc and the western-most extent shows form that defines it as a wall or fence-base, including a wooden post. This may be interpreted as a 'fold' for holding livestock. The eastern extent of the wall features cleared circular areas that may have been associated with rock clearing and collecting to build the wall.

HNE12 is very similar to HNE11 and is south-west, approximately 1000 m away. This feature is approximately 300 m in length. There is no vertical form visible at HNE12 but its similarity to HNE11 indicates that this too was a wall or fence-base. Circular features were also recorded adjacent to this feature.

Overall, the poor condition of the walls may be because they were dismantled. The historical heritage assessment notes that the *Rabbit Nuisance Act of 1883* compelled private landholders to do all 'such acts, deeds, matters and things as are necessary to destroy the rabbits on such land' (*Rabbit Nuisance Act of 1883* - Clause 39) or incur financial penalties. A number of remnant rabbit fences enclosing granite boulders are evidence of the rabbit problem that historically beset the area.

The circular features adjacent to both walls were initially flagged as potential Aboriginal stone circles or stone arrangements during the survey. Although this theory cannot be totally discounted, the circles' close relationship with the dry stone walls and notable absence in other areas of outcropping basalt suggest that they were created during the historical period and in relation to the wall.

Plate 6.63 **Aerial drone photography of HNE12, view north-west, southern array area. Image shows wall extending over crest. Cleared circular areas can be seen to the right and left of the wall. Continuation of naturally outcropping basalt can be seen extending to the left of the image.**

Plate 6.64 **Aerial drone photography of HNE11, view west, southern array area. Image shows arched section of wall considered to be a livestock 'fold'.**

Plate 6.65 **HNE12: showing dismantled section of wall from the ground with cleared circular areas on either side of the wall, view south, southern array area.**

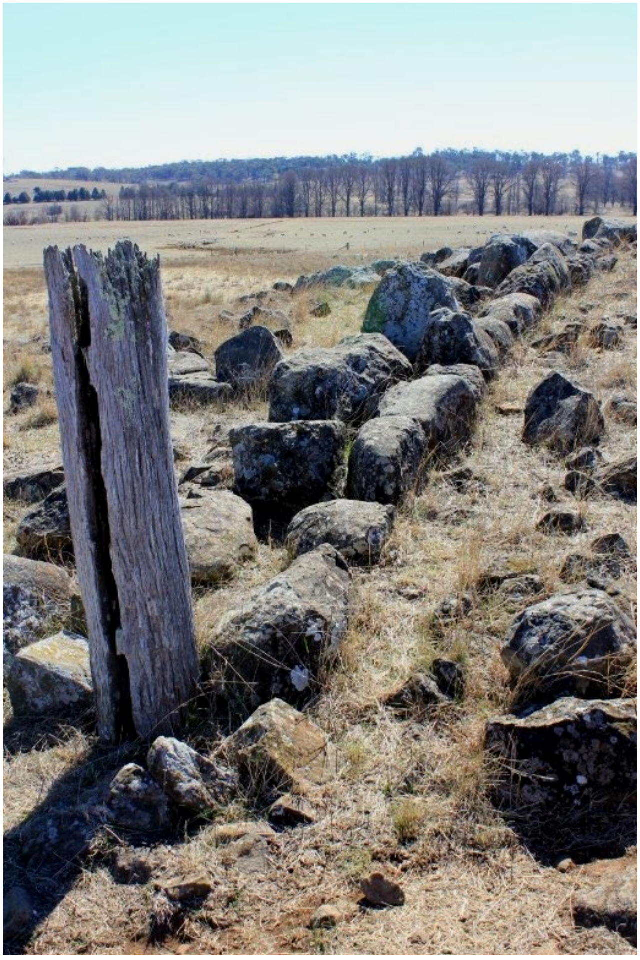

Plate 6.66 **HNE11: showing timber post at the end of the 'fold' and more substantial remnants of the wall feature.**

6.6 Discussion

6.6.1 General interpretation

The archaeological investigation has provided an informative and representative example of the widespread occupation of Aboriginal people in the survey area. The site types identified support the notion of the landscape being used by Aboriginal people more intensively and in more utilitarian ways when compared to earlier theories that suggested mainly ceremonial use (McBryde 1974, refer Section 4.3.1). The frequent distribution of open camp sites on elevated crests near watercourses, along with grinding groove sites, quarries and scarred trees show that the survey area was part of the landscape utilised by Aboriginal people for its natural resources. The high frequency and variation in local raw material types (namely silcrete, basalt, greywacke and chert) would have allowed Aboriginal people to be relatively selective in what raw materials they used for stone tool manufacture, and this may be why stone quarries were relatively rare when compared to the extent of outcropping raw material. Notwithstanding, widespread historical disturbance (eg clearing, ploughing and rock-picking) may have affected their current representation in the landscape.

Aboriginal grinding grooves were only found on outcropping silcrete boulders and pavements. The extensive site at NE09 represents a location distant to flowing water, but may have attracted use after rain when rock pools filled on the outcropping pavement. The stone artefacts identified amongst the outcropping bedrock at this site also indicates that the site experienced multiple activities including axe grinding and smaller implement manufacture. The distance from water may have deterred more long-term camping, but again, pooled water may also have been available for consumption for extended periods after any one rain event.

The remaining grinding groove sites are in locations more typical for grinding groove sites, being as close to water as the location of the outcropping material permitted. These sites featured both broad and narrow grooves and therefore may have supported more than axe grinding and possibly seed grinding or axe polishing. Interestingly, none of the stone axes identified in the survey area had evidence of grinding. This may have been because such implements were a tool type of their own (no grinding required) or that they were shaped prior to further grinding.

No ceremonial sites, Aboriginal stone arrangements, rock art or burials were identified. The identification of such sites are rare generally, primarily because they represent rarer activities, but also because widespread historical disturbance is likely to have destroyed or highly disturbed their archaeological indicators in the landscape.

There is a clear indicator that Aboriginal people were targeting crests with outcropping material, not only for raw materials (eg quarries on silcrete and basalt), but for camping amongst areas of granite and/or silcrete boulders and granite tors. These locations represent relatively flat land in elevated areas with good outlook over the surrounding landscape. This would have provided safety and visibility over the landscape and rocks for sitting or standing. As such, it is likely that these sites exist today not only because they have been less disturbed from historical practices, but also because they were specifically targeted for occupation and used more intensively than the broader landscape. It is probably only by coincidence that these are also the best preserved areas as they are unsuitable for intensive cultivation and livestock grazing.

Although the survey area features some significant finds, it would be erroneous to view it in isolation. The AHIMS search results along with background research show that the survey area is only a small snapshot of a much broader and more dynamic cultural landscape. The presence of Bora rings, quarries (including a unique and significant axe quarry – Salisbury Court), scarred trees, grinding grooves and open stone artefact sites and lagoons within the AHIMS search area indicates that the finds within the survey area are representative of a continuous archaeological character, and that many more sites are likely to be found in similar landscape contexts throughout pastoral properties in the Tablelands.

7 Significance assessment

7.1 Defining heritage significance

Heritage sites, objects and places hold value for communities in many different ways. The nature of those heritage values is an important consideration when deciding on how to manage a heritage site, object or place, and balance competing land-use options.

The main heritage values assessed are summarised in an assessment of 'Cultural Significance'.

The primary guide to the management of heritage places is the Australia International Council on Monuments and Sites (ICOMOS) *Burra Charter* (ICOMOS 2013). The *Burra Charter* defines cultural significance as follows:

> Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects. Places may have a range of values for different individuals or groups.
>
> (ICOMOS 2013)

The purpose of this assessment is to examine various aspects of the identified Aboriginal cultural heritage values for the purpose of assessing possible development impacts associated with the project. This assessment focuses on two main types of significance values: socio-cultural and historic values (significance for the Aboriginal community) and scientific values.

7.2 Socio-cultural and historic value: significance for the Aboriginal community

'Non-archaeological Aboriginal heritage values' refer to places which have meaning in accordance with memory or tradition, but are not necessarily associated with cultural objects. These sorts of places are described as 'intangible sites' and include any socio-cultural or historic values related to historically important persons, events, phases or activities in the Aboriginal community. Aboriginal cultural knowledge is defined as:

> ...accumulated knowledge which encompasses spiritual relationships, relationships with the natural environment, and the sustainable use of resources, and relationships between people, which are reflected in language, narratives, social organisations, values, beliefs, and cultural laws and customs...
>
> (DECCW 2010)

The project RAPs were consulted to determine whether any socio-cultural or historic heritage value relates specifically to the study area more broadly regardless of archaeological evidence. Throughout the consultation process and during fieldwork, RAPs communicated that their Elders had spoken about Aboriginal occupation of the broader landscape including the localities of Uralla, Kellys Plains, Gostwyck and Salisbury Plains and mentioned that it was pleasing to see the archaeological evidence related to such occupation. The general consensus was that, prior to the survey, RAPs did not know of the location of specific sites within the broader study area, but were told by their Elders that such site types may exist within the landscape. RAPs acknowledged that this was partly due to the physical and cultural dislocation from the landscape faced by local Aboriginal people after colonial settlement.

During Stage 2 of the survey, Nganyawanna Elder, Les Ahoy (project RAP), advised that the study area may be part of what is known as Oorala, which is a local Anaiwan word meaning “a camp”, “meeting place” or “a place where people come together”. The township of Uralla was named by Europeans based on the word Oorala. Les stated that his Elders told in their stories that: “the Niangala Mob (our most southerly Nganyawanna Clan) along with the Biripi nation of the Taree region utilised this area (ie Oorala) as a camping/trading area with the local Nganyawanna Clan (Armidale mob)” (Les Ahoy, pers comm., 3 August 2018). After further clarification, Les informed EMM that the boundaries of the study area alone do not represent all of Oorala, but a component of a broader cultural landscape which would not have clearly definable boundaries. EMM have not identified or been provided with written sources that specify the development footprint being part of a specific Aboriginal inter-clan meeting or trading place. As such, EMM assume that this information is provided through oral sources only.

It would be difficult to verify Les’s information with archaeological evidence without further detailed research into aspects such as traded stone materials and implements. However, the known archaeological sites demonstrate Aboriginal occupation through multiple camping areas, featuring utilitarian activities such as stone tool manufacture, stone grinding, stone resource extraction and tree scarring.

Overall, the Aboriginal community has identified that heritage values in the study area are directly linked with the Aboriginal sites identified during the survey. No specific historical connection has been linked to the identified sites apart from a broader notion that the study area may have formed part of what was known as Oorala. As such, each site in this report has not been attributed with a socio-cultural or historic significance rating.

Aboriginal sites with archaeological evidence are all of value to the Aboriginal community through the tangible connection that they represent with pre-colonial Aboriginal land use. Although all Aboriginal sites have significance to the Aboriginal community, RAPs repeatedly emphasised the importance of grinding groove and open camp site NE09 primarily for its high aesthetic and educational values and also the prominent tangible link it provides the Aboriginal community with their ancestors.

7.3 Scientific value

7.3.1 Overview

The following scientific values are identified as ‘low’, ‘moderate’ or ‘high’ for each identified Aboriginal site with an overall rating identified based on the results of each individual assessment. The significance criteria are outlined below:

Research potential: the potential of a site to contribute to the present understanding of society and the human past. This is commonly linked to rarity, representativeness, site integrity, research themes and the potential extent of data retrievable for further analysis and interpretation. The research potential of archaeological sites is often only realised through archaeological investigation methods. A site with high research potential would be able to provide information about the past that is not obtainable from any other source, or supplements written and oral sources.

Rarity and representativeness: the frequency of a site type and how the sites relate to the wider archaeological record. The significance may be due to sites being uncommon because of the related activity that created them, or preservation, or they are uncommon now because of ongoing site destruction through development and change. Sites with high representative value would typically need to be a pivotal example of its type that demonstrates the principle characteristics of a site.

Integrity: the level of disturbance or intactness of a site and how this may affect research potential. For example, artefacts identified in heavily cultivated areas would be unsuited to addressing research questions of site structure, but it may still be useful to characterise the artefact types and raw materials used in the region.

Educational value: the potential of a site to be used as an educational tool. This usually includes sites with easily identifiable and accessible characteristics that are good representative examples. Sites with high educational value can have aesthetically distinctive or iconic qualities.

7.3.2 Sites and significance

i Overview

The frequency of sites falling within each significance category is summarised in Table 7.1. The significance values listed in the following tables are based on assessed scientific and education values. The scientific values are listed for each site in Table 9.2 and detailed in Appendix D.

Table 7.1 Scientific significance frequency by type

	Significance level				
Site type	**High**	**Moderate**	**Low**	**Not applicable**	**Total**
Artefact scatter		4	13		17
Artefact scatter, PAD		8			8
Grinding groove		1			1
Grinding groove, artefact scatter, PAD	3	1			4
Grinding groove, PAD	1				1
Historical site - unverified				1	1
Isolated find		1	42		43
Isolated find, PAD		3			3
Quarry, artefact scatter, PAD		5			5
Scarred tree		8	5		13
Total	**4**	**31**	**60**	**1**	**96**

ii Sites of high significance

The four sites assessed to be of high significance are summarised in Table 7.2. All sites of high significance are grinding groove sites located in the northern array area and within proximity of the ETL options connecting the central and northern array areas.

Table 7.2 Sites of high significance by landform

Site type	**Crest**	**Hill slope-1**	**Total**
Grinding groove, artefact scatter, PAD (NE09, NE79 and NE68)	1	2	3
Grinding groove, PAD (NE80)	1		1
Total	**2**	**2**	**4**

NE09 is grinding groove site with surface artefacts and PAD and is assessed as having high significance as a rare site complex on a uniquely prominent landscape feature, with many representative examples of grinding grooves unmatched in size and extent by other known grinding grooves in the local area. NE09 also has high educational potential by its easily distinguishable characteristics and aesthetic qualities. The grooves and associated PAD for stone artefacts also have high research potential for the study of a unique site complex and potential identification of specific activity areas and small-scale site structures. There is also research potential for a case study on the locally significant occurrence of grinding grooves created on outcropping silcrete bedrock centred on the 1030 m AHD contour line. The presence of silcrete grinding grooves is far less common elsewhere in NSW.

The remaining three grinding groove sites (NE79, NE68 and NE80) of high significance represent locales of grinding grooves on outcropping bedrock, distributed in concentrations across a distance of up to 50 m. Although not as extensive and aesthetically prominent as NE09, they represent a different class of grinding groove site more closely tied to camping within the vicinity of watercourses (within 300–400 m); despite such distances still being quite far from conventional assumptions that grinding grooves need to be directly within or adjacent to creek lines for water access. These grooves have research potential related to the type of grooves created, ranging from typical narrow axe grooves to broader grooves possibly from seed grinding, axe polishing and very narrow grooves from wooden implement grinding. Such sites also have some research potential if subsurface archaeological material amongst the site occurs. Notably, NE68 contains a large ground edge implement (Plate 6.44) that is likely to have been ground on-site on one of the nearby grooves. This artefact is atypical; however, archaeologist John Appleton suggested that it may be a two-handed axe (John Appleton pers comm., August 2018).

iii Sites of moderate significance

The 31 sites (32%) assessed to be of moderate significance are summarised in Table 7.3. Moderate significance was frequently attributed to sites with some research potential for their predicted subsurface archaeological material. PAD was typically assigned to artefact scatters and isolated finds identified amongst areas of outcropping granite and/or silcrete on crest landforms. The rationale was that these landforms were both targeted by Aboriginal people for camping but also have been the best preserved from cultivation damage. The actual scientific significance of artefact scatters and isolated artefacts with PAD is currently unknown and could only be established through archaeological test excavation.

Similarly, the stone quarry sites have been attributed with moderate scientific significance, primarily linked to research potential associated with PAD. The main limiting factors of these sites relate to the predicted integrity of these sites. Although they have been avoided by cultivation more than paddock artefact sites, they are less protected than sites with significant boulders and tors. Moreover, sites such as the silcrete quarries showed evidence of rock-picking and stockpiling either within the site (NE22) or within nearby paddocks (N14). Notwithstanding, if higher site integrity was established through archaeological test excavation and considerable material was identified, these sites would need to be revaluated with potential for higher research and significance values to be assigned. For example, given favourable conditions, quarries can be used for identifying raw material selection and procurement techniques, as well as trade and travel routes on local and regional levels.

Table 7.3 Sites of moderate significance by landform

Row Labels	Crest	Flat	Hill slope-1	Watercourse	Total
Artefact scatter	2			1	**3**
Artefact scatter, PAD	9				**9**
Grinding groove			1		**1**
Grinding groove, artefact scatter, PAD	1				**1**
Isolated find	1				**1**
Isolated find, PAD	3				**3**
Quarry, artefact scatter, PAD	4	1			**5**
Scarred tree		1	6	1	**8**
Total	**20**	**2**	**7**	**2**	**31**

Two grinding groove sites (NE04, NE93) were attributed with moderate scientific significance, primarily because they were isolated examples with only one (NE04) or few (NE93) grooves. Accordingly, their aesthetic and educational values are lessened. This also may reflect more sporadic and isolated occupation events when compared to the more extensive groove sites of high significance.

Eight of the 13 scarred trees were assessed to be of moderate significance. The main limiting factors for the scarred trees to be considered high significance was the general level of decay, damage and ambiguity present across the identified examples. For example, NE39 has an impressive scar size and form; however the dry face is almost completely decayed, leaving clear diagnosis and interpretation problematic.

Three artefact sites unrelated to PAD were attributed with moderate significance. Two of these sites (NE15 and NE40) were given this rating primarily based on their association with more significant sites. NE15 was adjacent to quarry NE14 and may represent a continuation of the activity area despite the over 50 m break in site boundaries. NE40 was attributed with moderate significance primarily because it occurs amongst the same silcrete outcrop complex as the highly significant grinding groove site NE09. It may represent the western boundary of PAD associated with the NE09. The artefact scatter representing NE07 was assessed to be of moderate significance as it occurred amongst an extensive silcrete pavement expanse, second only to the grinding groove site NE09. This site context is unique; however, no grinding grooves were identified and the pavement nature of the silcrete means PAD is unlikely to apply to this site.

iv Sites of low significance

The 60 sites (62%) assessed to be of low scientific significance are summarised in Table 7.4. These are sites that do not have the same capacity to inform about past Aboriginal life. While such sites symbolise Aboriginal presence in the landscape through their very existence, they can tell us little else, or little further than what is already known and established in archaeology. Notwithstanding the limited information potential, each site is of cultural significance to the Aboriginal community.

Table 7.4 Sites of low significance by landform

Site type	Crest	Flat	Hill slope-1	Watercourse	Total
Artefact scatter	8		5		13
Isolated find	19	5	14	4	42
Scarred tree	4		1		5
Total	**31**	**5**	**20**	**4**	**60**

Low significance was typically attributed to open artefact scatters and isolated finds in moderately to highly disturbed contexts, such as highly exposed contexts within pasture improved paddocks, graded vehicle tracks or excavated mounds (eg dam walls). The majority of low significance sites (70%) are isolated artefact finds commonly distributed throughout the landscape in a relatively unpredictable fashion. Although most isolated finds were identified on crests and hill slopes when compared to flats and watercourses, this trend is probably more the product of those landforms making up most of the survey area and therefore being sampled the most during survey. Overall, these sites hold little value beyond their physical contents (ie stone artefacts) as their contexts have been compromised.

Five scarred trees were assessed to be of low significance. These are either highly decayed or ambiguous examples (NE67 and NE72), or trees that have been cut down or fallen naturally (NE25, NE47 and NE49). Neither of the standing examples have dry faces and their ambiguity means they may have occurred from natural damage.