

APPENDIX



E

Aboriginal Cultural Heritage and Archaeological Assessment

PART 1 OF 2

Main Report

NORTH STAR TO NSW/QUEENSLAND BORDER ENVIRONMENTAL IMPACT STATEMENT

ARTC

The Australian Government is delivering
Inland Rail through the Australian
Rail Track Corporation (ARTC) in
partnership with the private sector.

Inland Rail North Star to NSW/QLD Border

Appendix E: Aboriginal Cultural
Heritage and Archaeological
Assessment

**Australian Rail Track
Corporation**

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Abbreviations

Abbreviation	Explanation
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHMP	Aboriginal Cultural Heritage Management Plan
ACHRIS	Aboriginal Cultural Heritage Register and Information System
AHC Act	Australian Heritage Council Act 2003
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ALR Act	Aboriginal Land Rights Act 1983
AMS	Accelerator Mass Spectrometry
ARTC	Australian Rail Track Corporation
ASIR	Aboriginal Site Impact Recording
ATSIHP Act	<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)</i>
CHL	Commonwealth Heritage List
cm	centimetre
Cth	Commonwealth
DPIE	Department of Planning, Industry and Environment
EAP	Environmental Assessment Procedure
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESD	Ecologically Sustainable Development
FFJV	Future Freight Joint Venture
GSI	Ground Surface Integrity
GSV	Ground Surface Visibility
ha	hectares
HHMP	Historical Heritage Management Plan
IHO	Interim Heritage Order
km	kilometres
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
m	metres
mm	millimetres
MNES	Matters of National Environmental Significance
NHL	National Heritage List
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
NPW Regulation	National Parks and Wildlife Amendment Regulation 2010
NS2B	North Star to the NSW/QLD Border
NSW	New South Wales
NSWALC	NSW Aboriginal Land Council
NTSCORP Limited	Native Title Services Corporation Limited

Abbreviation	Explanation
OEH	NSW Office of Environment and Heritage (functions now administered by the Department of Premier and Cabinet)
OUV	Outstanding Universal Values
PAD	Potential Archaeological Deposit
QLD	Queensland
RAP	Registered Aboriginal Party
RNE	Register of the National Estate
SEPP SRD	State Environmental Planning Policy (State and Regional Development) 2011
SHI	NSW State Heritage Inventory
SHR	NSW State Heritage Register
SoHI	Statement of Heritage Impact
SSI	State Significant Infrastructure
TSR	Travelling Stock Reserve

Glossary of Terms

Term	Explanation
Alluvium	An unconsolidated accumulation of stream-deposited sediments, including sands, silts, clays or gravels.
Archaeological potential	The likelihood of undetected surface and/or subsurface archaeological materials existing at a location.
Aboriginal archaeological site	The present spatial extent of visible Aboriginal archaeological material(s) at a given location.
Artefact	Any object which has been physically modified by humans.
Angular shatter	Small irregularly shaped fragments of knapped stone interpreted as an undiagnostic 'splinter' fragments.
Assemblage	A collection of artefacts.
Backing/backed	Steep unidirectional or bidirectional retouch that is typically found on one lateral edge of an artefact.
Bedrock	Outcrop of <i>in situ</i> rock material.
Chert/tuff	In this report, the term 'chert/tuff' is used in place of 'chert' and 'tuff'. Despite differing geological origins, archaeologists working in northern and southeastern NSW have tended to use these terms interchangeably (refer, for example, Corkill 1999). The use of the term 'chert/tuff' herein is intended to reduce confusion.
Conglomerate	"A poorly-sorted detrital sedimentary rock composed of rounded gravels, stones or cobbles in a matrix of much finer material" (Milford 1999).
Cortex	An altered, weathered outer surface or 'rind' on a piece of rock.
Complete flake	A complete flake is a flake that has a ventral surface that preserves a complete fracture plane, a platform (or impact point), lateral margins and a termination (Holdaway and Stern 2004: 111).
Core	"A mass of homogenous lithic material that has had flakes removed from its surface" (Andrefsky 2005: 14).
Crest	A landform element that "stands above all, or almost all, points in the adjacent terrain" (Speight 2009: 20).
Effective coverage	A quantifiable estimate of the area in which archaeological materials are "detectable", i.e. exposed ground surface area.
Exposure	An area of land surface where the ground surface is visible, usually as the result of thinner vegetation cover, erosive forces or human-caused disturbance. In archaeological surveys, the percentage of ground surface that is visible is recorded. These percentages of exposure are then used to calculate effective coverage.
Flake	A sharp-edged sliver of stone that has been detached from a core. Flakes have a number of distinctive features or attributes that allow them to be distinguished from other lithic materials. These include a bulb of percussion, a striking platform, a dorsal surface, a ventral surface, a bulbar scar (also known as an <i>errillure</i> scar), bulbar fissures, lateral fissures or hackles and compression waves.
Flake shatter	Any piece of flake debitage with no recognisable striking platform.
Flat	"Planar landform element that is neither a crest nor a depression and is level or very gently inclined" (Speight 2009: 22).
Floodplain	A large flat area, adjacent to a watercourse, characterised by frequent active erosion and aggradation by channelled and overbank stream flow.
Ground Surface Visibility	A term used to describe the area of the ground's surface that is visible during archaeological field surveys.
Hammerstone	A stone that has been used to strike a core to remove a flake, often causing pitting or other wear on the stone's surface.
Hearth	Fireplace often recognised archaeologically through the presence of charcoal or burnt ground. Historical hearths are usually associated with a brick or stone structure.

Term	Explanation
In Situ	In the natural or original position. Applied to a rock, soil, or fossil when occurring in the situation in which it was originally formed or deposited.
Lithic	Of, or pertaining to, stone.
Lower slope	"Slope element not adjacent below a crest or flat but adjacent above a flat or depression" (Speight 2009: 21).
Metamorphic	Rocks whose composition, texture and/or structure have been altered through tectonic pressure and/or heat (Milford 1999).
Mission	Toomelah is variously referred to as a mission, station, reserve or settlement. The word mission has been used in this report to maintain consistency and has been selected as the first historical reference refers to the site as a mission. Toomelah was operated by the NSW Protection Board and therefore had no formal ties with religious institutions and may therefore more accurately be called a settlement or reserve, however, mission has been selected for use in this document for the reasons already stated.
Mudstone	A very fine-grained, hard, cohesive rock which generally has a dull, slightly porous appearance. Mudstone is composed of extremely fine-grained sediments such as rock flour, clay minerals and silt. Mudstone is macroscopically similar to chert but distinguished by its lack of lustre.
Potential Archaeological Deposit	Potential Archaeological Deposit is the hypothesised presence of archaeological deposit where there is uncertainty due to a lack of visibly eroding artefacts, lack of test excavation either locally or in analogous landforms in the region.
Quartz	Quartz is one of the most common minerals on earth. A member of the silica family of minerals, quartz can occur in a variety of forms including free-standing crystals, as veins of milky quartz cutting through other rocks, and as tiny irregularly shaped grains that are components of many rocks.
Silcrete	"A very brittle, intensely indurated rock composed mainly of quartz clasts cemented by a matrix which may well be well-crystallised quartz, cryptocrystalline quartz or opaline silica. The texture of silcrete reflects the host rock and clasts may range in size from very fine grains to boulders" (Langford-Smith 1978: 3).
Stone artefact	Any piece of rock modified by human behaviour.
Striking platform	More-or-less planar surface struck to cause flake removal.
Survey Coverage	The area of a study area surveyed, usually expressed as a percentage. See also Effective Coverage.
Tuff	Rock-type consisting of consolidated volcanic ash ejected from a volcanic.
Ventral surface	The surface of a flake that has broken away from the core. Ventral surfaces are typically smooth and show no evidence of previous flake removals.

1 Introduction

The Australian Government has committed to delivering Inland Rail, an interstate freight rail corridor between Melbourne and Brisbane, via central-west New South Wales (NSW) and Toowoomba in Queensland. Inland Rail is a significant piece of national transport infrastructure which will enhance Australia's existing rail network and serve the interstate freight market.

Inland Rail has been divided into 13 sections, seven of which are located in NSW. The Inland Rail route, which is approximately 1,700 kilometres (km) long, will involve:

- Using the existing interstate rail corridor through Victoria and southern NSW
- Upgrading approximately 400 km of existing corridor, mainly in western NSW
- Providing approximately 600 km of new corridor in northern NSW and southeast Queensland.

Future Freight Joint Venture (FFJV) has been commissioned by the Australian Rail Track Corporation (ARTC) to undertake the Aboriginal Cultural Heritage Assessment Report (ACHAR) (refer section 1.2) for the North Star to the NSW/QLD border section, one of 13 projects that comprise the Inland Rail program.

FFJV aims to undertake this ACHAR to inform the concept design, modelling and preparation of the Environmental Impact Statement (EIS) for the North Star to NSW/QLD border section of Inland Rail (hereafter referred to as the proposal). The area of interest (study area), which is generally 2 km wide, follows the currently disused Boggabilla branch line from just north of North Star, NSW to near the Whalan Creek crossing, before veering north east towards the Macintyre River and the Queensland border (refer Figure 1.1 and Figure 1.2a-e). This corridor links with the Goondiwindi line on the Queensland side near the Kildonan Siding. The study area includes areas of temporary disturbance including:

- Laydown areas
- Access tracks
- Workers camp at North Star
- Borrow pits.

These areas are considered temporary because they are only required during the construction phase of the proposal and are needed for construction purposes.

1.1 Proposal description and key aspects

ARTC is seeking approval to construct and operate the proposal. The proposal consists of approximately 25 km of upgraded track between North Star and a greenfield deviation around Whalan Creek, and 5 km of new track between Whalan Creek and the NSW/QLD border. The proposal is a key component of the wider Inland Rail program between Melbourne and Brisbane.

The proposal consists of the following key features listed in Table 1.1. Those aspects more likely to interact with heritage sensitive areas are discussed in detail below.

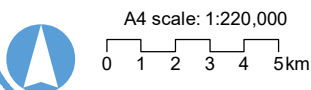
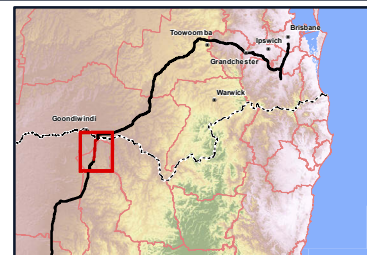
The construction phase of the proposal will also involve laydown areas, temporary access tracks, borrow pits, a mobile concrete batching plant and a construction camp. The design has responded to key environmental features and has been developed in line with engineering constraints for a feasible rail design. The rail design is based on minimising environmental impact, minimising disturbance to existing infrastructure and meeting engineering design criteria.

Map by: MEF\GNZ\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FF\JV_IL_Fig1.1_Study_Area_v3.mxd Date: 13/02/2020 09:17



Legend

- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border
- Construction footprint
- Proposed borrow pit location



Date: 13/02/2020 Version: 3
Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

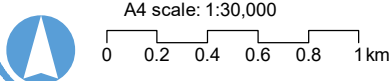
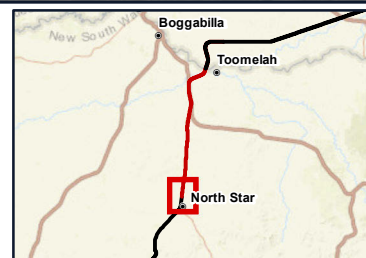
Figure 1.1:
Study area

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Legend

- | | |
|---------------------------------------|------------------------------|
| ● Localities | — Watercourses |
| - - - Existing rail (non-operational) | ■ Proposed construction camp |
| — Adjoining alignments | ■ Proposed laydown area |
| — Major roads | □ Construction footprint |
| — Minor roads | |



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North Star to NSW/QLD border

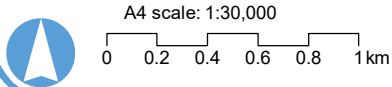
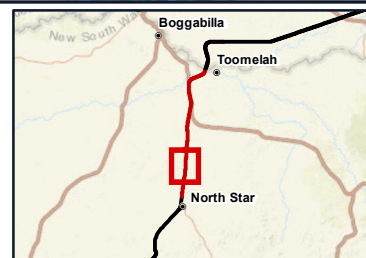
Figure 1.2a:
Project detail

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Legend

- +— Existing rail (operational)
- - - Existing rail (non-operational)
- Major roads
- Minor roads
- Watercourses
- Proposed construction camp
- Proposed laydown area
- Construction footprint



Date: 18/02/2020 Version: 3
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North Star to NSW/QLD border

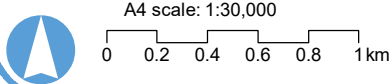
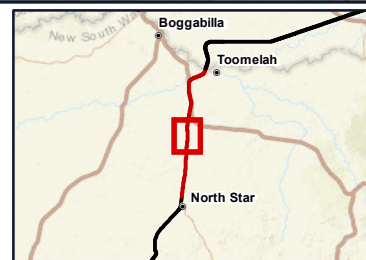
Figure 1.2b:
Project detail

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Legend

- - - Existing rail (non-operational)
- Major roads
- Minor roads
- Watercourses
- Proposed construction camp
- Proposed laydown area
- Construction footprint

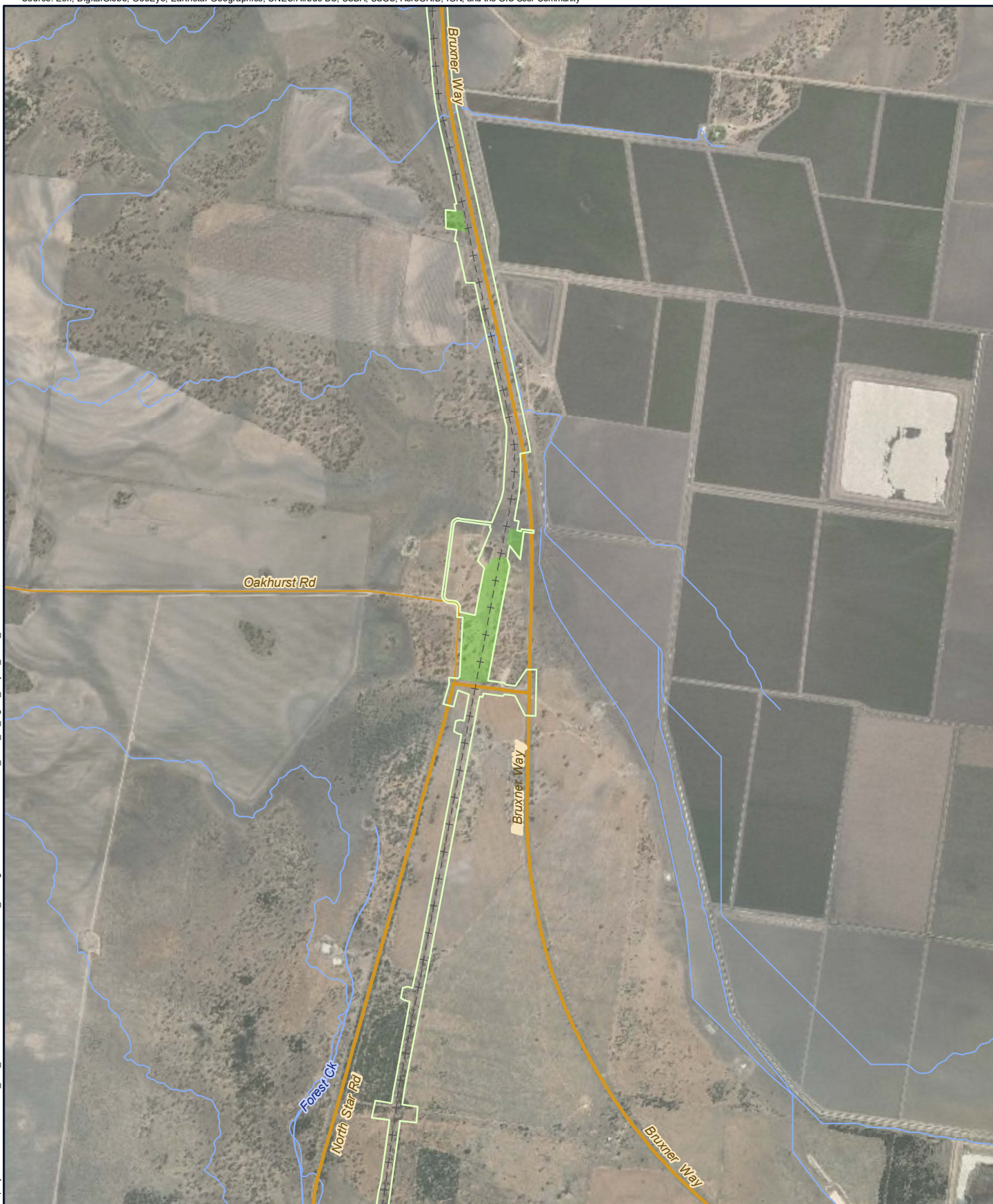


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North Star to NSW/QLD border

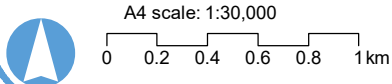
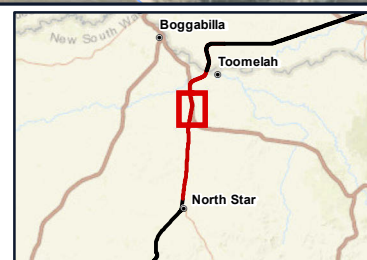
Figure 1.2c:
Project detail

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Legend

- - - Existing rail (non-operational)
- Major roads
- Minor roads
- Watercourses
- Proposed construction camp
- Proposed laydown area
- Construction footprint



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North Star to NSW/QLD border

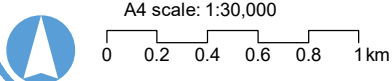
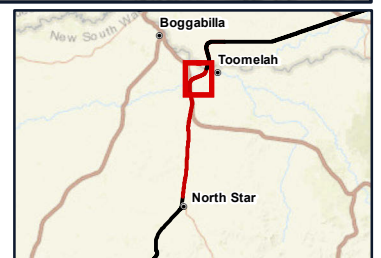
Figure 1.2d:
Project detail

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Legend

- Existing rail (non-operational)
- Major roads
- Minor roads
- Watercourses
- Proposed construction camp
- Proposed laydown area
- Construction footprint
- NSW/QLD border



Date: 18/02/2020 Version: 3
 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 1.2e:
Project detail

Table 1.1 Key features of the proposal

Aspect	Description
New track	<ul style="list-style-type: none"> Approximately 25 km of new track within the existing, non-operational Boggabilla rail corridor Approximately 5 km of new track within a greenfield rail corridor
Crossing loop and turnouts	<ul style="list-style-type: none"> One crossing loop, designed to accommodate trains up to 1,800 m long, with provisions to accommodate trains up to 3,600 m long if required in the future Turnouts will be provided on either end of the crossing loop to allow trains to be guided from one track to another
Bridges	<ul style="list-style-type: none"> Eleven new bridges This includes an approximately 1.8 km long viaduct over the Macintyre River and Whalan Creek, which are major watercourses. The viaduct is located in both NSW and Queensland; therefore, it will be assessed under the <i>NSW Environmental Planning and Assessment Act 1979</i> (EP&A Act) by this EIS, and under the <i>State Development and Public Works Organisation Act 1971</i> by the NSW/QLD border to Gowrie EIS. Approval from both States is required before construction of the viaduct can commence
Drainage	<ul style="list-style-type: none"> Reinforced concrete pipe culverts and reinforced concrete box culverts. Scour protection measures will generally be installed around culverts to avoid erosion Embankment and catch drains adjacent to the proposed alignment to divert surface runoff to the nearest bridge or culvert location
Level crossings	<ul style="list-style-type: none"> Work on new and existing non-operational level crossings (within the existing, non-operational Boggabilla rail corridor) Signalling and communications infrastructure
Ancillary works	<ul style="list-style-type: none"> Ancillary infrastructure including signalling and communications infrastructure, signage, fencing and utilities

1.1.1 Bridges

Bridges are required so that water, vehicles, and in some cases, stock and pedestrians may cross the proposed rail corridor. Two types of bridges are proposed:

- Rail over water
- Rail over road.

The type of bridge proposed depends on a range of factors, including the local topography, road usership, rail and road alignments at the crossing point, and access requirements. Bridges have been provided at all major watercourse crossings along the proposed alignment to minimise impacts to the local riverine system and to avoid having to divert watercourses.

A total of 11 new bridges are proposed. An approximate length for each bridge is included in Table 1.2 and a rail bridge over waterway visualisation provided in Figure 1.3.

Table 1.2 Proposed bridges

Chainage of the southern-most end of the bridge (km)	Bridge	Approximate bridge length
Ch 5.7	Mobbindry Creek Rail Bridge	112 m
Ch 6.1	Mobbindry Floodplain Rail Bridge	182 m
Ch 8.1	Back Creek Rail Bridge	70 m
Ch 16.3	Forest Creek Rail Bridge	154 m
Ch 20.7	UT1 Forest Creek Rail Bridge	136 m
Ch 25.2	Melonenkamm Rail Bridge	160 m
Ch 25.7	Bruxner Way Rail Bridge	114 m
Ch 26.0	Whalan Floodplain #1 Rail	183 m
Ch 27.5	Whalan Floodplain #2 Rail	126 m

Chainage of the southern-most end of the bridge (km)	Bridge	Approximate bridge length
Ch 28.0	Whalan Floodplain #3 Rail	126 m
Ch 29.3	Macintyre River Viaduct	1,750 m



Figure 1.3 Rail bridge over waterway visualisation

Source: Landscape and Visual Impact Technical Report prepared for North Star to NSW/QLD border EIS

1.1.1.1 Macintyre River viaduct

The proposal includes a viaduct of approximately 1.8 km length that crosses Whalan Creek, Tucka Tucka Road and the Macintyre River. Approximately 1.2 km of the viaduct is located in NSW, while the remaining 0.6 km is located in Queensland, where the NSW/QLD border is defined by the centre point of the Macintyre River.

During the feasibility design phase, the design of the Macintyre River Viaduct was informed by geotechnical and flooding studies. Initially, three separate bridge structures were proposed over Whalan Creek, Tucka Tucka Road and the Macintyre River. However, an iterative flood assessment of the design has resulted in a single viaduct structure that minimises upstream flooding impacts.

1.1.2 Earthworks

The proposed alignment traverses the Macintyre River floodplain for approximately 14 km. To achieve flood immunity, the majority of the proposal is elevated on a fill embankment. The embankment height is typically less than 2 m; however, around the realigned Bruxner Way and in the lead up to the Macintyre River viaduct, the embankment height increases to approximately 7.5 m. Photograph 1.1 illustrates an example of embankments and mounding created to accommodate the proposed rail infrastructure.



Photograph 1.1 Example of embankments and mounding

Source: Landscape and Visual Impact Technical Report prepared for North Star to NSW/QLD border EIS

Embankments have been designed and will be constructed to minimise erosion during flood events. The steepness of embankments will be minimised as much as possible to encourage vegetation growth, which will further prevent erosion.

No significant cuttings (> 10 m) are proposed. Therefore, there is a significant deficit of general and structural fill for constructing embankments. Present estimates indicate that the deficit of general and structural fill is approximately 1,100,000 cubic metres (m³), however this is subject to change during the detailed design phase. General and structural fill will be sourced from the borrow pits identified to support the proposals.

The anticipated method of extracting material from the borrow pits and transporting it to site is:

- Standard earthmoving equipment such as trucks and excavators will be used to extract material from the borrow pits. Depending on the size and composition of material from the borrow pits, crushing plants and/or mechanical screens may also be used to process the material.
- Extracted material will be blended, then stockpiled in workable and traceable lots near the extraction site
- Extracted material will undergo quality compliance test to determine whether it is suitable for use as embankment fill
- It will then be transported to construction sites using the public road network and tipped directly onto the formation
- Water carts, graders and compacters will be used to further adjust the moisture content, and spread, compact, trim and profile the material into place
- The reinstatement of borrow pits will be agreed with affected landowners.

Where practicable, materials from excavations and cuttings will be assessed for re-use as embankment fill. If unsuitable for reuse, this material may be formed into permanent spoil mounds within the rail corridor.

Features of the spoil mounds include:

- Located as close as possible to the source of excavated material
- Maximum height of 2 m
- May be located on both sides of the track
- Would be stabilised as required
- Gaps in the spoil mounds would be provided to allow water to drain away from the track.

The exact location, sizing and design of spoil mounds will be determined during the detailed design phase, with consideration given to the results of hydraulic modelling and sight distances. Mounds would not be located in areas where they would impact on flooding or drainage.

1.1.3 Operation of the proposal

Subject to approval of the proposal, construction of the proposal is planned to occur between 2021 and 2025. The proposal will be managed and maintained by the proponent; however, train services will be provided by a variety of operators. Train services are not expected to commence until all 13 sections of Inland Rail are complete, which is planned to be in 2025.

The proposal will be trafficked by an estimated 14 trains per day in 2025, increasing to an estimated 21 trains per day in 2040. Annual freight tonnages will increase in parallel, from approximately 12 million tonnes per year in 2025 to 20 million tonnes per year in 2040. Photograph 1.2 shows an example of the type of freight trains that will use the proposed rail alignment.



Photograph 1.2 Example freight trains

Source: ARTC

1.1.4 Maintenance of the proposal

During the operation phase standard maintenance activities will be undertaken, including:

- Bridge and culvert inspections
- Sleeper replacement
- Rail welding and grinding
- Ballast dropping and cleaning
- Track tamping and reconditioning
- Signalling systems and equipment.

1.2 Purpose and scope of this report

This ACHAR has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs). Table 1.3 outlines the requirements relevant to this assessment. The SEARs can be found in Appendix A.

Table 1.3 Secretary's Environmental Assessment Requirements compliance

Requirements for heritage	Where addressed in this report
Heritage requirements	
<p>12.1 The Proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance of:</p> <ul style="list-style-type: none"> a) Aboriginal places and objects, as defined under the <i>National Parks and Wildlife Act 1974</i> and in accordance with the principles and methods of assessment identified in the current guidelines; b) Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan; c) environmental heritage, as defined under the <i>Heritage Act 1977</i>; and d) items listed on the National and World Heritage lists. 	Sections 7, 8 and 9
12.2 Where archaeological investigations of Aboriginal objects are proposed these must be conducted by a suitably qualified archaeologist, in accordance with section 1.6 of the <i>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW 2010b).	Section 1.3
12.3 Impacts to Aboriginal objects and/or places must be assessed and documented in an Aboriginal Cultural Heritage Assessment Report (ACHAR). Consultation must be undertaken with Aboriginal people in accordance with the <i>Aboriginal Cultural Heritage Consultation requirements for proponents</i> (DECCW 2010a). The ACHAR must document the outcomes of consultation with Aboriginal people and outline measures proposed to mitigate impacts. The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the ACHAR.	Sections 4, 7, 8, 9, 10

The overarching objectives of this ACHAR are as follows:

- To identify the Aboriginal cultural heritage values of the study area through background research, archaeological survey, archaeological test excavation and consultation with Registered Aboriginal Parties (RAP)
- To assess the potential impact of the proposal on the identified Aboriginal cultural heritage values of the study area
- To provide an appropriate management strategy for avoiding or minimising potential harm to the identified Aboriginal cultural heritage values of the study area
- To compile an ACHAR report that will assist the Director-General of the Department of Planning, Industry and Environment (DPIE) in their assessment of the current State Significant Infrastructure (SSI) application.

This assessment has been undertaken in accordance with the NSW Office of Environment and Heritage's *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (NSW Office of Environment & Heritage 2011), *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (NSW Department of Environment Climate Change & Water 2010a) and *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW Department of Environment Climate Change & Water 2010b). As such, its key requirements have been:

- To conduct a search of the Aboriginal Heritage Information Management System (AHIMS)
- To review the landscape context of the study area, with specific consideration to its implications for past Aboriginal land use
- To review relevant archaeological and ethnohistorical information for the study area and environs
- To prepare a predictive model for the Aboriginal archaeological record of the study area
- To undertake an archaeological field investigation
- To identify, notify and register Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the study area

- To provide RAPs with information about the scope of the proposed works and Aboriginal heritage assessment processes
- To facilitate a process whereby RAPs can:
 - Contribute culturally appropriate information to the proposed assessment methodology
 - Provide information that will enable the cultural significance of Aboriginal objects and/or places within the study area to be determined
 - Have input into the development of cultural heritage management options
- To prepare and finalise an ACHAR with input from RAPs.

1.3 Authorship

In accordance with the SEARs requirements, this assessment has been undertaken by the following qualified cultural heritage professionals:

- Luke Kirkwood (Principal Heritage Specialist)
- Dr Kate Quirk (Senior Heritage Specialist)
- Dr Susan Lampard (Principal Heritage Specialist)
- Perri Braithwaite (Professional Heritage Specialist).
- Clair Davey (Senior Heritage Specialist)
- Laura Cross (Professional Heritage Specialist).

Luke Kirkwood (Principal Heritage Specialist, Future Freight Joint Venture (FFJV)) managed all aspects of the Aboriginal heritage assessment detailed herein and was the primary author of this report. Dr Kate Quirk (Senior Heritage Specialist, FFJV) assisted Luke with reporting and fieldwork. Dr Susan Lampard, prepared the historical review for the proposal. Perri Braithwaite undertook GIS mapping for the proposal.

The archaeological survey was undertaken by a combined field team of five FFJV archaeologists (Luke Kirkwood, Dr Kate Quirk, Perri Braithwaite, Clair Davey and Laura Cross) and 18 RAP field representatives.

Luke Kirkwood holds a Bachelor of Science/Arts (Honours) degree in Archaeology and Anthropology from the University of Queensland. Luke has over ten years of cultural heritage management experience.

Dr Kate Quirk holds a PhD from the University of Queensland in Archaeology and has over eight years of cultural heritage management experience.

Dr Susan Lampard holds a PhD from Flinders University in Historical Archaeology and has over 10 years of cultural heritage management experience.

Perri Braithwaite holds a Bachelor of Arts (Honours) from the University of Queensland in Archaeology and has over three years of cultural heritage management experience.

Clair Davey holds a Bachelor of Arts (Hons) from the University of Queensland and has over five years of cultural heritage management experience.

Laura Cross holds a Master of Professional Archaeology from La Trobe University. She has two years of experience.

1.4 Report structure

This report contains eleven sections. This section provides background information on the proposal and assessment undertaken. The remainder of the report is structured as follows:

- Section 2 outlines the statutory framework within which this assessment has been undertaken
- Section 3 summarises the methodology undertaken for the assessment
- Section 4 details the Aboriginal community consultation program undertaken for this assessment
- Section 5 describes the existing environment of the study area and its associated archaeological implications
- Section 6 summarises relevant ethnohistoric and archaeological background for the study area
- Section 7 details the archaeological survey and findings
- Section 8 assesses the significance (both cultural and scientific) of Aboriginal cultural heritage sites within the study area
- Section 9 provides an assessment of the potential impacts of the proposal on identified Aboriginal cultural heritage values
- Section 10 details an appropriate management strategy for the identified Aboriginal cultural heritage values of the study area
- Section 11 lists the references cited in-text.

2 Legislative policy standards and guidelines

2.1 Commonwealth legislation

2.1.1 Environment Protection and Biodiversity Act 1999

The primary objective of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth (Cth)) (EPBC Act) is to provide for the protection of the environment, particularly those aspects that are matters of national environmental significance (MNES). Under Part 9 of the EPBC Act, any action that is likely to have a significant impact on a MNES may only progress with approval of the Commonwealth Minister for the Department of the Environment and Energy. An action is defined as a project, development, undertaking, activity, series of activities or alteration. An action will also require approval if:

- It is undertaken on Commonwealth land and will have or is likely to have a significant impact
- It is undertaken outside Commonwealth land and will have or is likely to have a significant impact on the environment on Commonwealth land
- It is undertaken by the Commonwealth and will have or is likely to have a significant impact.

The EPBC Act defines 'environment' as both natural and cultural environments and therefore includes Aboriginal and historical cultural heritage items. Under the Act, protected heritage items are listed on the World Heritage List (WHL), National Heritage List (NHL) (items of significance to the nation) or the Commonwealth Heritage List (CHL) (items belonging to the Commonwealth or its agencies). These two lists replaced the Register of the National Estate (RNE). The RNE has been suspended and is no longer a statutory list; however, it remains as an archive.

Searches of the WHL, NHL, CHL and RNE were originally undertaken in May 2018 and most recently updated in October 2019, with no relevant listings identified for the study area.

2.1.2 Native Title Act 1993

The *Native Title Act 1993* (Cth) provides for the recognition and protection of native title for Aboriginal peoples and Torres Strait Islanders. The *Native Title Act 1993* recognises native title for land over which native title has not been extinguished and where persons able to establish native title are able to prove continuous use, occupation or other classes of behaviour and actions consistent with a traditional cultural possession of those lands. It also makes provision for Indigenous Land Use Agreements to be formed as well as a framework for notification of native title stakeholders for certain future acts on land where native title has not been extinguished.

Searches of the Schedule of Applications (unregistered claimant applications), Register of Native Title Claims, National Native Title Register, Register of Indigenous Land Use Agreements and Notified Indigenous Land Use Agreements were undertaken in May 2018 and more recently updated in October 2019. The Gomeri People (NC2011/006) application was accepted for registration on 20 January 2012 and covers the area of the proposal.

2.1.3 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) (ATSIHP Act) provides for the preservation and protection of places, areas and objects of particular significance to Indigenous Australians. The stated purpose of the ATSIHP Act is the "preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters, being areas and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition" (Part I, Section 4).

Under the Act, 'Aboriginal tradition' is defined as "the body of traditions, observances, customs and beliefs of Aboriginals generally or of a particular community or group of Aboriginals, and includes any such traditions, observances, customs or beliefs relating to particular persons, areas, objects or relationships" (Part I, Section 3). A 'significant Aboriginal area' is an area of land or water in Australia that is of "particular significance to Aboriginals in accordance with Aboriginal tradition" (Part I, Section 3). A 'significant Aboriginal object', on the other hand, refers to an object (including Aboriginal remains) of like significance.

For the purposes of the Act, an area or object is considered to have been injured or desecrated if:

- a) in the case of an area:
 - i) it is used or treated in a manner inconsistent with Aboriginal tradition;
 - ii) the use or significance of the area in accordance with Aboriginal tradition is adversely affected; and
 - iii) passage through, or over, or entry upon, the area by any person occurs in a manner inconsistent with Aboriginal tradition
- b) in the case of an object - it is used or treated in a manner inconsistent with Aboriginal tradition.

The ATSIHP Act can override State and territory laws in situations where a State or territory has approved an activity, but the Commonwealth Minister prevents the activity from occurring by making a declaration to protect an area or object. However, the Minister can only make a decision after receiving a legally valid application under the ATSIHP Act and, in the case of long-term protection, after considering a report on the matter. Before making a declaration to protect an area or object in a State or territory, the Commonwealth Minister must consult with the appropriate minister of that State or territory (Part 2, Section 13).

No declarations relevant to the study area have been made under the ATSIHP Act.

2.2 State legislation

2.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act), administered by the Department of Planning, Industry and Environment, requires that consideration be given to environmental impacts as part of the land use planning process in NSW. In NSW, environmental impacts are interpreted as including impacts to Aboriginal and historical cultural heritage.

Division 5.2, Section 5.12 of the EP&A Act stipulates that a development may be declared SSI if it is declared to be such by a State environmental planning policy such as State Environmental Planning Policy (State and Regional Development) 2011 (SEPP SRD).

Under Clause 14(1) of the SEPP SRD, a development is declared to be SSI if:

- The development on the land concerned is, by the operation of a State environmental planning policy, permissible without development consent under Part 5 of the Act, and
- The development is specified in Schedule 3 of the SEPP SRD.

Pursuant to Division 5.2, Subdivision 4, Section 5.23(1)(d) of the EP&A Act, Aboriginal Heritage Impact Permits (AHIPs) are not required for a SSI authorised by a development consent. Likewise under Section 5.23(1)(c) an approval under Part 4 or an excavation permit under Section 139 of the Heritage Act 1977 are not required. Section 5.23(2) also states that Division 8 of Part 6 of the Heritage Act cannot be invoked to prevent or interfere with an authorised SSI.

Impacts to Aboriginal and historical heritage values associated with approved SSI projects are typically managed under Aboriginal Cultural Heritage Management Plans (ACHMPs) and Historical Heritage Management Plans (HHMPs) respectively. Such management plans are statutorily binding once approved by Department of Planning, Industry and Environment (DPIE).

2.2.2 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act), administered by Department of Premier and Cabinet, is the primary legislation for the protection of Aboriginal cultural heritage in NSW.

It is recognised that as of July 2019 the NSW Department of Premier and Cabinet administers the *National Parks and Wildlife Act 1974*. The former functions of the Office of Environment and Heritage (OEH) are now administered by the Department of Premier and Cabinet and references to OEH have been maintained in instances where they were the author of a guideline or database searches were undertaken prior to the change.

The NPW Act gives the Secretary of Department of Premier and Cabinet responsibility for the proper care, preservation and protection of 'Aboriginal objects' and 'Aboriginal places', defined under the Act as follows:

- An Aboriginal object is any deposit, object or material evidence (that is not a handicraft made for sale) relating to Aboriginal habitation of NSW, before or during the occupation of that area by persons of non-Aboriginal extraction (and includes Aboriginal remains).
- An Aboriginal place is a place declared so by the Minister administering the NPW Act because the place is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects.

Part 6 of the NPW Act provides specific protection for Aboriginal objects and places by making it an offence to harm them and includes a 'strict liability offence' for such harm. A 'strict liability offence' does not require someone to know that it is an Aboriginal object or place they are causing harm to in order to be prosecuted. Defences against the 'strict liability offence' in the NPW Act include the carrying out of certain 'Low Impact Activities', prescribed in Clause 80B of the *National Parks and Wildlife Amendment Regulation 2010* (NPW Regulation), and the demonstration of due diligence.

Section 89A of the NPW Act requires notification of the location of Aboriginal sites within a reasonable time, with penalties for non-notification. Section 89A is binding in all instances, including Division 5.1 projects.

Aboriginal heritage investigations are managed under a series of guidelines including:

- Department of Environment, Climate Change and Water 2010 *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. Department of Environment, Climate Change and Water.
- Office of Environment and Heritage 2011 *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*. Office of Environment and Heritage.
- Department of Environment, Climate Change and Water 2010 *Aboriginal Cultural Heritage Consultation Requirements for Proponents*. Department of Environment, Climate Change and Water.

A search of the AHIMS register was undertaken in October 2019, covering a 50 x 50 km area centred on the study area. A total of 112 Aboriginal archaeological sites were identified with three occurring within the study area:

- A carved tree site consisting of three carved trees that had all since been removed to the Australian Museum (AHIMS #2-4-0003)
- A culturally modified tree within 20 m of the current railway line (AHIMS #2-4-0046)
- An artefact scatter along Back Creek (AHIMS #2-4-0047).

A detailed discussion on the AHIMS search findings are presented in Section 6.2.3.

2.2.3 The Heritage Act 1977

The *Heritage Act 1977* (NSW) (as amended) was enacted to conserve the environmental heritage of NSW. Under Section 32, places, buildings, works, relics, moveable objects or precincts of heritage significance are protected by means of either Interim Heritage Orders (IHO) or by listing on the NSW State Heritage Register (SHR). Sites that are assessed as having State heritage significance can be listed on the SHR by the Minister on the recommendation of the NSW Heritage Council.

Archaeological relics (any relics that are buried) are protected by the provisions of Section 139. Under this section it is illegal to disturb or excavate any land knowing or suspecting that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed. In such cases an excavation permit under Section 140 is required. Note that no formal listing is required for archaeological relics; they are automatically protected if they are of local significance or higher.

Proposals to alter, damage, move or destroy places, buildings, works, relics, moveable objects or precincts protected by an IHO or listed on the SHR require an approval under Section 60. Demolition of whole buildings will not normally be approved except under certain conditions (Section 63). Some of the sites listed on the SHR or on Local Environment Plans (LEP) may either be 'relics' or have relics associated with them. In such cases, a Section 60 approval is also required for any disturbance to relics associated with a listed site.

Under Section 170 of the Heritage Act 1977, NSW Government agencies are required to maintain a register of heritage assets. The Register places obligations on the agencies, but not on non-government proponents, beyond their responsibility to assess the impact on surrounding heritage sites.

Searches of the SHR were undertaken in October 2019, with no relevant listings identified for the study area.

2.2.4 Aboriginal Land Rights Act 1983

The *Aboriginal Land Rights Act 1983* (NSW) (ALR Act) was established to return land in NSW to Aboriginal peoples through a process of lodging claims for certain Crown lands. The Act, administered by the NSW Department of Aboriginal Affairs, is a compensatory regime which recognises that land is of spiritual, social, cultural and economic importance to Aboriginal people. The ALR Act establishes the NSW Aboriginal Land Council (NSWALC) and a network of over 120 autonomous Local Aboriginal Land Councils (LALC) and requires these bodies:

- a) to take action to protect the culture and heritage of Aboriginal persons in the LALC's area, subject to any other law; and
- b) to promote awareness in the community of the culture and heritage of Aboriginal persons in the LALC's area.

LALCs constituted under the ALR Act can make claims. The Registrar of the ALR Act has responsibility for maintaining the Register of Aboriginal Land Claims under section 166 of the Act. All land claims that have been made since the Act came into force in 1983 have been recorded in the Register.

Consultation with the Registrar of the ALR Act in September 2018 has indicated that the study area is wholly within the boundaries of the Toomelah LALC but does not have any Registered Aboriginal Owners pursuant to Division 3 of the ALR Act.

2.3 Local government

2.3.1 Local Environmental Plans

The study area is covered by two Local Environmental Plans, Moree Plains Local Environmental Plan 2011 and Gwydir Local Environmental Plan 2013. Both plans as they related to heritage are identical and are summarised below.

Clause 5.10 of both LEPs provides specific provisions for the protection of heritage items, heritage conservation areas, archaeological relics, Aboriginal objects and Aboriginal places of heritage significance within each Local Government Area.

Under Section 2 of Clause 5.10 of each LEP, development consent is required for any of the following:

- a) demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance):
 - i) a heritage item,
 - ii) an Aboriginal object,
 - iii) a building, work, relic or tree within a heritage conservation area,
- b) altering a heritage item that is a building by making structural changes to its interior or by making changes to anything inside the item that is specified in Schedule 5 in relation to the item,
- c) disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed,
- d) disturbing or excavating an Aboriginal place of heritage significance,
- e) erecting a building on land:
 - i) on which a heritage item is located or that is within a heritage conservation area, or
 - ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance,
- f) subdividing land:
 - i) on which a heritage item is located or that is within a heritage conservation area, or
 - ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance.

In relation to Aboriginal heritage, Clause 5.10, Section 8 of each LEP states the consent authority must, before granting consent under this clause to the carrying out of development in an Aboriginal place of heritage significance:

- a) consider the effect of the proposed development on the heritage significance of the place and any Aboriginal object known or reasonably likely to be located at the place by means of an adequate investigation and assessment (which may involve consideration of a heritage impact statement, and
- b) notify the local Aboriginal communities, in writing or in such other manner as may be appropriate, about the application and take into consideration any response received within 28 days after the notice is sent.

Schedule 5 of each LEP provides a list of heritage items, conservation areas and archaeological sites within each Local Government Area. A review of the list indicates there are no Aboriginal objects or places of heritage significance identified on either of the two schedules within the study area.

Subject to development consent under Division 5.1 of Part 5 of the EP&A Act, the planning controls required by each LEP will not apply to the proposal.

2.4 Non-statutory considerations and guidelines

2.4.1 Register of the National Estate

The RNE is a list of important Indigenous, historical, and natural heritage places throughout Australia, established under the Australian Heritage Commission Act 1975. In 2003, the RNE was superseded by the NHL and CHL under the EPBC Act and the *Australian Heritage Council Act 2003* (Cth) (AHC Act) and, in 2007, the register was frozen. In 2012, all references to the RNE were removed from both the EPBC Act and the *Australian Heritage Council Act 2003*, and the register now exists primarily as an archive.

2.4.2 National Trust of Australia

The National Trust is a community-based, non-government organisation, and has no statutory power. Rather, listing on the Trust's Register provides an indication of the esteem in which the place is held by heritage professionals and the public. No sites within the study area are currently listed on the National Trust Register.

2.4.3 The Burra Charter

The Burra Charter: The Australian ICOMOS charter for places of cultural significance (ICOMOS (Australia) 2013) sets a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance including owners, managers and custodians. The Charter provides specific guidance for physical and procedural actions that should occur in relation to significant places. A copy of the charter can be accessed online at <http://icomos.org/australia>.

3 Methodology

The ACHAR is informed by legislative and proposal SEARs requirements, as well as Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (NSW Office of Environment & Heritage 2011), Aboriginal Cultural Heritage Consultation Requirements for Proponents (NSW Department of Environment Climate Change & Water 2010a) and Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (NSW Department of Environment Climate Change & Water 2010b), which provides a framework for identifying and managing Aboriginal heritage significance under the *National Parks and Wildlife Act 1974* (NSW). In keeping with this framework, the key elements of the assessment are:

- Background research
- Aboriginal heritage survey
- Significance assessment
- Impact assessment
- Management recommendations.

3.1 Background research

The aim of the background research was to:

- Develop an understanding of the known and potential Aboriginal cultural heritage values of the study area
- Identify areas of known or potential Aboriginal cultural heritage value for subsequent inspection
- Provide a context against which the significance of these values was assessed.

A three stage process was used to fulfil these aims, comprising: register searches, analysis of historical mapping and review of previous studies.

3.1.1 Register searches

Searches of all relevant heritage registers were conducted to identify previously recorded heritage places. Registers consulted included:

- Commonwealth statutory and non-statutory heritage registers (WHL, NHL, CHL and RNE)
- NSW State Heritage Register
- NSW Aboriginal Heritage Information Management System
- Gwydir and Moree Plains Shire Council LEP Heritage Schedules
- National Trust of Australia (non-statutory).

3.1.2 Historical mapping

A review of historical maps and other images was undertaken to develop an appreciation of the creation and evolution of the historical landscape of the study area. These included:

- Cadastral mapping (showing property owners, reserves, roads and other infrastructure)
- Topographic mapping (showing the location of structures, types of landforms, the extent of vegetation clearance, the alignment of current and historical transportation corridors as well as other disturbance activities)
- Aerial imagery (showing the location of structures, the extent of vegetation clearance and the alignment of current and historical transportation corridors).

Each of these resources was georeferenced using GIS software, enabling an accurate understanding of the location of the study area relative to elements of the Aboriginal heritage landscape.

3.1.3 Review of previous studies

A review was undertaken of previous heritage studies, as well as general histories of relevance to the study area. This included:

- Balme, Jane. (1986) "*The North-Central Rivers Archaeology Research Project.*" Report prepared for the NSW National Parks and Wildlife Service.
- Bonhomme, Theresa. (1987) "*An Archaeological Survey of the S87 Seismic Program Area in PEL 182, South West of Boggabilla, New South Wales.*" Unpublished report to the Oil Company of Australia.
- Dennison, Albert. (1985) "*Survey on the Boggabilla Common.*" Unpublished report to Toomelah Local Lands Council.
- Dennison, Albert. (1986) "*Survey for Aboriginal Sites at Toomelah.*" Unpublished report to Toomelah Land Council.
- Niche Environment and Heritage (2016a) "*Inland Rail - North Star to Yelarbon: Desktop Aboriginal Cultural Heritage Assessments.*" Unpublished report for Parsons Brinckerhoff.
- NSW National Parks and Wildlife Service (2002a) "*Aboriginal Cultural Heritage Assessment: NSW Western Regional Assessments, Brigalow Belt South Bioregion (Stage 2).*" Report prepared for Resource & Conservation Assessment Council.
- Serrano, Christopher, and Ron Dela Pena. (2016) "*North Star to Yelarbon - Phase 1 Environmental Report.*" Unpublished report to ARTC.
- Umwelt (Australia) (2017) "*Inland Rail - Narrabri to North Star: Aboriginal Cultural Heritage and Archaeological Assessment.*" Unpublished report to ARTC.

The information garnered from these sources was used to identify any additional areas of Aboriginal cultural heritage significance and also to generate an overview of the history of the area, providing a context against which heritage values were assessed.

3.2 Aboriginal cultural heritage survey

A three week survey program was conducted over publicly accessible land consisting of site inspections of identified Aboriginal cultural heritage sites and survey of sensitive landforms that may be impacted (for more information refer Section 7.2). The site survey methodology involved:

- Full survey coverage of the existing rail corridor
- Inspection of previously recorded sites identified during background research noting:
 - Extent and nature of site
 - Potential archaeological deposits.

4 Aboriginal community consultation

Aboriginal community consultation acknowledges the right of Aboriginal people to be involved, through direct participation, on matters that directly affect their heritage. Involving Aboriginal people in all facets of the assessment process ensures that they are given adequate opportunity to share information about cultural values, and to actively participate in the development of appropriate management and/or mitigation measures. The successful identification, assessment and management of Aboriginal cultural heritage values are dependent on an inclusive and transparent consultation process.

Aboriginal community consultation for the current assessment was undertaken in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (NSW Department of Environment Climate Change & Water 2010a). The results of the consultation process undertaken are detailed below.

4.1 Stage 1 – Notification and Registration

The aim of Stage 1 of the Consultation Requirements is to identify, notify and register Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the study area.

4.1.1 Consultation with Regulatory Agencies

Section 4.1.2 of the Consultation Requirements stipulates that proponents are responsible for ascertaining, from reasonable sources of information, the names of Aboriginal people who may hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places. Proponents are required to compile a list of Aboriginal people who may have an interest in the proposed study area and hold knowledge relevant to determining the cultural significance of Aboriginal objects and/or places by requesting contact details of established Aboriginal persons and organisations in writing from:

- a) the relevant regional office of the OEH i.e. Dubbo (since changed to Department of Premier and Cabinet)
- b) the relevant LALCs
- c) the Registrar, Aboriginal Land Rights Act 1983 for a list of Aboriginal owners
- d) the National Native Title Tribunal for a list of registered native title claimants, native title holders and registered Indigenous Land Use Agreements
- e) Native Title Services Corporation Limited (NTSCORP)
- f) The relevant local councils
- g) The relevant Local Land Services (formerly the Catchment Management Authorities).

In accordance with this requirement, the following agencies were contacted via letter or email on 3 August 2018 requesting information on relevant Aboriginal persons and organisations (refer Appendix B):

- OEH
- Toomelah LALC
- Office of the Registrar, Aboriginal Land Rights Act 1983 (NSW)
- Native Title Tribunal
- NTSCORP Limited
- Moree Plains Shire Council
- Gywdir Shire Council
- North West Local Land Services.

Responses were received from four agencies and are attached as Appendix C:

- The OEH responded on 30 August 2018 providing the contact details for 33 groups that may have an interest in the development
- The Office of Registrar responded on 25 September 2018 stating the study area does not have Registered Aboriginal Owners pursuant to Division 3 of the *Aboriginal Land Rights Act 1983* (NSW) and suggesting that contact be made with Toomelah LALC
- NTSCORP responded on 24 September 2018 providing the names for 19 applicants from the Gomeroi People native title claim (NSD 2308/2011) that may have an interest in the development. NTSCORP advised during phone correspondence that they would contact applicants separately about their interest in being involved in this proposal.

4.1.2 Public notification

Section 4.1.3 of the Consultation Requirements requires that, in addition to writing to the Aboriginal people identified by the agencies listed in Section 4.1.1, the proponent must also place a notice in a local newspaper that is circulated in the general location of the proposed proposal. The notification must outline the proposal and identify its location.

In accordance with this requirement, a public notice was placed in the Goondiwindi Argus on 7 November 2018 and the Moree Champion on 8 November 2018. The closing date for registration via this notice was 21 November 2018 for the Goondiwindi Argus and 22 November 2018 for the Moree Champion, which provided the necessary minimum 14 day period for expressions of interest.

No registrations were received in response to the newspaper advertisements. A copy of the newspaper advertisements are available in Appendix D.

4.1.3 Invitations for Expressions of Interest

Section 4.1.3 of the Consultation Requirements requires that proponents must write to the Aboriginal people whose names were obtained through the regulatory agencies and the relevant LALCs to notify them of the proposal and invite them to register an interest in participating in a process of community consultation.

In accordance with this requirement, on 25 October 2018, a letter inviting expressions of interest and containing summary information on the proposal was sent to all Aboriginal persons and organisations identified by the regulatory agencies. A total of 33 Aboriginal stakeholders were invited to register an interest in being consulted. A closing date for expressions of interest of 8 November 2018 and all stakeholders interested in being consulted were included from this date onwards. Registrations of interest were kept open for the duration of the project, acknowledging the size and complexity of the project.

A total of nine organisations confirmed their interest in the assessment with nearly all having been previously registered following the initial call out to Agencies and LALCs. Summary information on all RAPs, including registration dates, is provided in Table 4.1.

Table 4.1 Registered Aboriginal Parties registered for the proposal

Organisation	Date of registration	Method	Contact person
Toomelah Local Aboriginal Land Council	21/8/2018	Email/Phone	Malcolm Peckham/ Rex Weribone
Gomeroi People	6/9/2018	Email/Letter	Dylan Osbourne
Raymond Weatherall	11/9/2018	Email/Phone	Raymond Weatherall
Maria Cutmore	17/9/2018	Email/Phone	Maria Cutmore
Aliera French Trading	17/9/2018	Email	Aliera French
Natasha Long	9/10/2018	Email/Phone	Natasha Long
Yvonne Long	14/10/2018	Email/Phone	Yvonne Long
Natasha Talbott	5/11/2018	Email	Natasha Talbott

Organisation	Date of registration	Method	Contact person
Cindy Foley	3/7/2019	Phone	Cindy Foley

4.1.4 Notification of Registered Aboriginal Party

Section 4.1.6 of the Consultation Requirements requires that the proponent make a record of the names of each Aboriginal person who registered an interest and provide a copy of that record, along with a copy of the expression of interest letter forwarded to the Aboriginal parties, to the relevant Department of Premier and Cabinet regional office and LALC. Section 4.1.5 of the Consultation Requirements provides the opportunity for Aboriginal persons to withhold their details from being forwarded to these parties.

In accordance with these requirements, on 6 December 2018, a list of all RAPs that had not requested their details be withheld was forwarded to the relevant regional office (Dubbo) and the Toomelah LALC. A copy of the Expression of Interest letter sent out on 24 October 2018 and the newspaper advertisement was included in this correspondence.

4.2 Stage 2 – Presentation of Information about proposal

The aim of Stage 2 of the Consultation Requirements is to provide RAPs with information about the scope of the proposal and the proposed cultural heritage assessment process.

For the current assessment, presentation of information about the study area and proposed development was provided to RAPs as part of the registration of interest process detailed in Section 3.1.3. Basic information on the proponent and proposed development was included in the expression of interest letter mailed on 24 October 2018.

4.3 Stage 3 – Gathering Information about Cultural Significance

The aim of Stage 3 of the Consultation Requirements is to facilitate a process whereby RAPs can:

- Contribute to culturally appropriate information gathering and the assessment methodology;
- Provide information that will enable the cultural significance of Aboriginal objects and/or places within the proposed study area to be determined; and
- To have input into the development of any cultural heritage management measures.

For the current assessment, consultation with RAPs regarding the cultural heritage values of the study area included:

- A request with the draft assessment methodology for any initial comments regarding the Aboriginal cultural heritage values of the study area
- Discussion of Aboriginal cultural heritage values during fieldwork
- The provision of a draft report to all RAPs for comment prior to finalisation.

4.3.1 Draft assessment methodology

Sections 4.3.1 and 4.3.2 of the Consultation Requirements require that the proponent present and/or provide the proposed methodology for the Aboriginal cultural heritage assessment to RAPs and that RAPs be given a minimum of 28 days to review and provide feedback on this methodology.

All RAPs for the current assessment were provided with a draft of FFJV's proposed assessment methodology as part of the expression of interest package sent out on 24 October 2019. RAPs were given a minimum of 28 days to review and provide feedback on this methodology.

No responses were received from RAPs relating to the draft methodology.

4.3.2 Archaeological survey

The following RAPs participated in the fieldwork component of this assessment (refer Table 4.2).

Table 4.2 Registered Aboriginal Parties field representatives by organisation

Registered Aboriginal Party	Field representative(s)	Survey 1	Survey 2	Survey 3
Toomelah LALC	Judith Duncan	✓		
	Will McIntosh	✓	✓	✓
	Malcolm Peckham		✓	
	Reg Haines		✓	✓
	Lesley Williams		✓	✓
	Judy Dennison		✓	✓
	Rick McGrady		✓	✓
	Ronald Duncan		✓	✓
	Rhodney McGrady		✓	✓
	Damien McIntosh			✓
	Steve Edwards		✓	✓
	Alec Haines			✓
Gomeri People	Maria Cutmore	✓	✓	✓
	Steven Talbott		✓	✓
Raymond Weatherall	Raymond Weatherall		✓	
	Nathan Leslie	✓		
Natasha Long	Natasha Long	✓		✓
Yvonne Long	Loretta Long	✓		
Aliera French Trading	Wayne French	✓		

Discussions with RAP representatives in the field on the likelihood of archaeological potential across the study area centred on four key areas:

- Flat well drained land (associated with chromosol soils) beside waterbodies are likely areas where archaeology may be found
- Landforms associated with 'black soils' (vertisols) are unlikely to have major camp sites associated with them due to their tendency to retain water
- Large trees are likely to have signs of Aboriginal cultural modification on them particularly box and river red gums
- No local sources of lithic materials are known along the rail alignment, but rocky outcrops are known to exist to the south of North Star including a natural silcrete deposit that exists at the base of a nearby volcano.

RAP field representatives noted an extensive amount of plant resources that would traditionally have been utilised by Aboriginal people as bush foods and medicines, readily growing within the disturbed rail corridor, including warrigal greens (*Tetragonia tetragonoides*) and winter apple (*Eremophila debilis*). Field representatives requested that consideration of plant resources be undertaken when developing interpretative materials and training.

During the course of fieldwork, Aboriginal field representatives highlighted the importance of requiring a keeping place for the storage of artefacts salvaged during construction works suggesting a location either at

Toomelah or Boggabilla. The preference indicated was for the keeping place to be located in town so as to provide education opportunities for local youth.

4.4 Stage 4 – Review of Draft Assessment Report

The aim of Stage 4 of the Consultation Requirements is to prepare and finalise an ACHAR with input from RAPs. Where requested, post-survey meetings have been held with Aboriginal Parties to discuss the findings of the survey and this included a meeting with Toomelah Aboriginal Land Council on 4 November 2019.

Gomeroi People requested a post-survey meeting but due to circumstances beyond ARTC control, a post-survey meeting did not occur. ARTC will continue to liaise with Gomeroi People where possible to inform ongoing cultural heritage management associated with the proposal.

Comments and queries arising from this engagement are summarised in Table 4.3.

Table 4.3 Post-survey meeting feedback

Registered Aboriginal Party	Post-survey meeting	Comments/issues raised	FFJV response
Toomelah LALC	4/11/2019	Cultural Heritage Assessment and Management Recommendations - Overall support with the survey undertaken and management recommendations.	Acknowledged
		Consultation: Concern raised around the Registered Aboriginal Party process and who has right to speak for country. Request that all future work within the Toomelah LALC boundary is undertaken by Toomelah LALC members.	FFJV and ARTC to investigate further and seek advice from OEH on this matter with respect to development of an Aboriginal Heritage Management Plan.
		Flooding concerns	ARTC advised that flooding would be detailed in the EIS and would be open to public comment, noting that numerous non-cultural heritage stakeholder engagement sessions had been had on flooding at Toomelah and Boggabilla
		Recommendation that the Borrow Pits that were not able to be inspected be surveyed pre-construction	Agreed
		Proximity of Massacre Site to Toomelah – Cromptons' Corner and Boonal Homestead	ARTC and FFJV have undertaken review of these massacre locations and determined that they are not within the Project Boundary. Cromptons Corner is west of Goondiwindi and the OEH Brigalow Belt Report identified that a massacre may have occurred near Kildonan Station in Qld. Neither of these locations are near the Project Area. ARTC has been working closely with Bigambal people on the Queensland side of the border to investigate potential areas for burials.

Likewise, in accordance with Section 4.4.2 of the Consultation Requirements, on 4 December 2019 all RAPs were sent a draft of this ACHAR for review and comment. The specified closing date for comments was 15 January 2019, which extended the necessary minimum 28 day review period to 42 days acknowledging the public holiday period over Christmas and New Year's Day. Requests were made by individual Aboriginal Parties to extend this deadline which ARTC granted until the 14 February 2020 (72 days).

Table 4.4 Registered Aboriginal Party Responses to Report

Registered Aboriginal Party	Date received	Comment	FFJV response
Toomelah LALC	23/2/2020	<ul style="list-style-type: none"> Happy with the report. Toomelah LALC are to have active involvement in all stages of mitigation of cultural heritage places which has been identified from recent clearance surveys of the NS2B rail corridor Artefact are to be kept on country, either in storage for education purposes or returned to country Supports TLALC fieldworkers suggestions that AHIMS #2-4-0046 be used as a relocation area that is publicly accessible to local community 	ARTC acknowledges and supports all of these comments
Gomeroi People	22/1/2020	Requested extension to comment period and also a meeting to discuss recommendations	FFJV to meet with Gomeroi People and NTSCorp to discuss the report
Natasha Long	19/12/19	<ul style="list-style-type: none"> Happy with what I have seen in the report regarding the areas that have been looked at. The artefacts scatters should be surface collected and then test pitted. I would recommend wet sieving if possible. With the isolated artefacts some test pit around the area. Just small ones around to just check if previous floods didn't wash away any artefacts. Any and all artefacts as mention in the report about been collected and shown to educate everyone about our people, I agreed. Area where the Bora rings should be fenced off and kept safe, from any impact or dumping of excess dirt. Same goes with any sacred sites that were found. If any bush tucker or medicines are in the impact area are going to be destroyed I would recommend that seeds to be collected or the plants or trees and to be replanted in the safe area if possible. Scared trees that are extremely damaged I would go back to everyone and ask everyone what would they like to do with regarding the scar trees, if possible removal and placed in a safe area. If area is a high possible for impact. Where the construction campsites is going to be I would recommend a test pitting for any other artefacts that could be found in the area Regarding the work with the up and coming area to be done it would be great to get all of the people who work previously. (we worked as a great easy team). I would recommend all of them be placed back on to do the test areas for the test pitting and the areas for the collection as well. 	FFJV acknowledges and supports all of these comments except for the test pitting at the construction camp. This area has been significantly disturbed through land clearance and levelling for playing fields and paddocks. The likelihood of finding appreciable tangible heritage at this location is low.
Yvonne Long	No Response		
Aliera French Trading	No Response		
Raymond Weatherall	No Response		

5 Landscape context

This section reviews the landscape context of the study area as a basis for predicting the character of past Aboriginal occupation within it and its associated archaeological record. Consideration of the landscape context of the study area is predicated on the now well-established proposition that the nature and distribution of Aboriginal archaeological materials are closely connected to the environments in which they occur. Environmental variables such as topography, geology, hydrology and the composition of local floral and faunal communities will have played an important role in influencing how Aboriginal people moved within and utilised their respective Country.

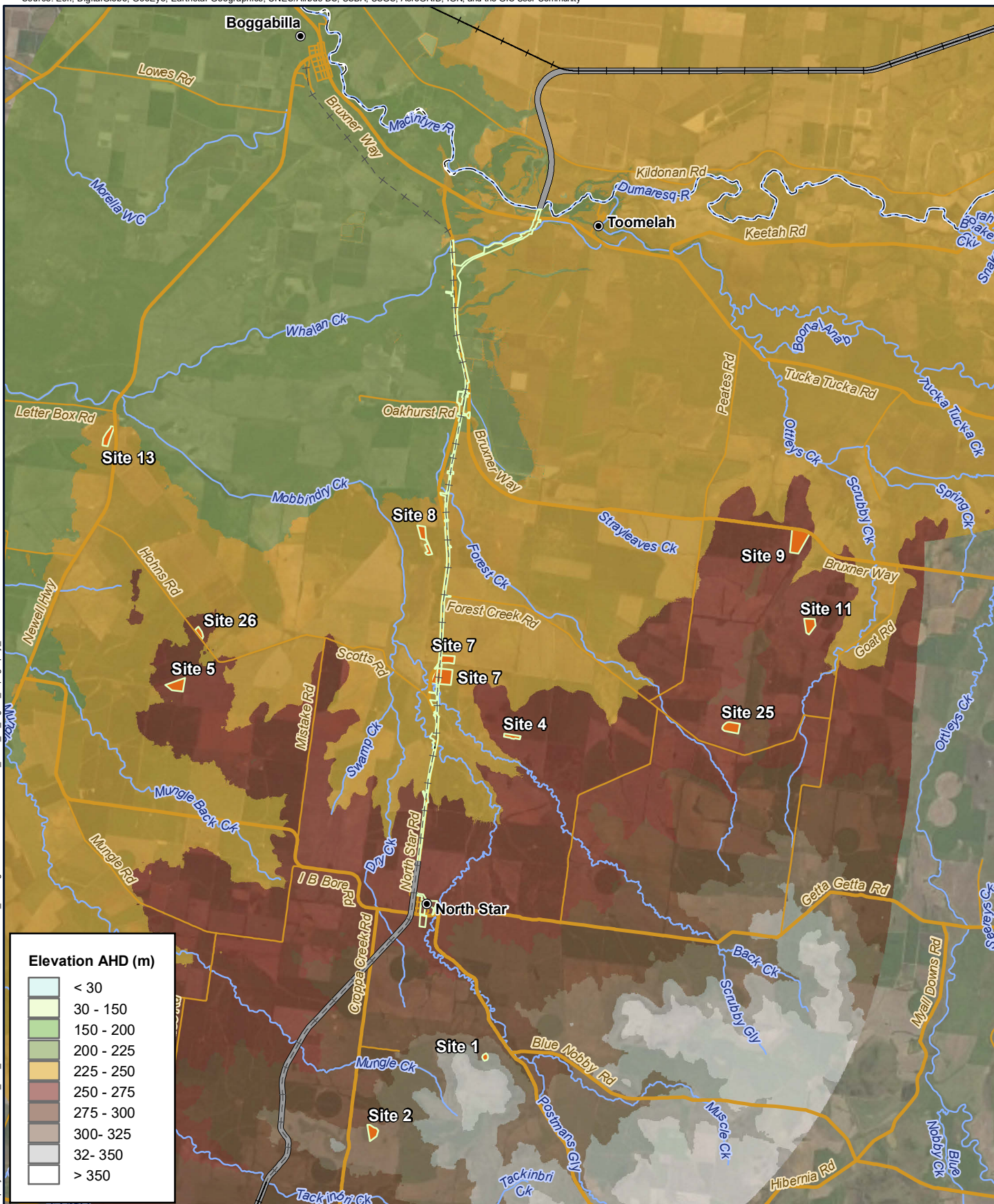
Amongst other things, these variables will have affected the availability of suitable campsites, drinking water, economic plant and animal resources, and raw materials for the production of stone and organic implements. At the same time, an assessment of historical and contemporary land use activities, as well as geomorphic processes such as soil erosion and aggradation, is critical to understanding the formation and integrity of archaeological deposits, as well any assessments of Aboriginal archaeological sensitivity. The environmental factors relevant to the proposal are summarised in Table 5.1.

Table 5.1 Environmental context

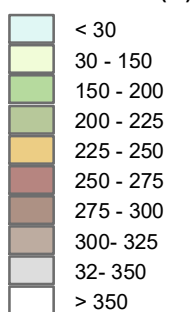
Environmental context	Description
Physiography	<p>The study area lies within two physiographic regions: the Cunningham Slopes (North Star to Mungle) and the Upper Darling Plains (Mungle to the Border).</p> <p>The Cunningham Slopes, part of the New England-Moreton Uplands Province, are characterised by geomorphology typically associated with metamorphic activity. The regolith across this region varies from outcrops composed of highly weathered bedrock (20-50%) to soil on bedrock (20-50%).</p> <p>The Upper Darling Plains are characterised by multi-channel rivers on floodplains (including the Macintyre River) incised into a regolith of predominantly alluvial sediments (>50%) with in situ weathered rock (<20%) (Pain et al. 2011).</p> <p>Further details are in Section 7.6.2.</p>
Topography	<p>The topography of the study area is typified by flat plains interspersed with the occasional very gently undulating hill (refer Figure 5.1). The corridor reaches its highest elevation in the south of the proposal site at North Star, at 260 m, and gradually descends to the banks of the Macintyre River with the point of lowest elevation occurring as the corridor passes over Whalan Creek at 223 m. The Macintyre River is a deeply incised channel with stable river terraces on both sides. The borrow pits to the south of North Star are located on a series of minor cinder cone volcanoes.</p>
Geology	<p>The geology of the study area can be classified into three main precincts. Starting in the south at North Star, the surface geology is characterised by the Keelindi beds, a Cretaceous unit consisting of polymitic gravel, sand, silt and clay overlying quartzose, pebbly sandstone and conglomerate interbedded with minor shale (refer Figure 5.2).</p> <p>Moving north to Mungle, the geology transitions to the similarly aged Dridool beds, which include fine grained sandstone laminated and intermixed with siltstone and mudstone.</p> <p>The geology in the northern extent of the study area is comprised of Quaternary unnamed alluvial fans. Characteristic landforms within this subregion include channels and floodplains in addition to crevasse splays, levees and through flow swamps caused by avulsion of the Macintyre River during the past.</p> <p>South of North Star, a series of basaltic outcrops (minor cinder cone volcanos) are present. The uplift caused by this event also pushed a number of silcrete cobbles to the surface in the surrounding fields.</p> <p>No major rock outcrops of materials are known in the general area of the rail alignment that would have been utilised by Aboriginal people in the past.</p>

Environmental context	Description
Soils	<p>Much like the geology, the soils can be characterised in three major units across the study area. In the south around North Star, the soils are a mix of red and brown chromosols. Chromosols are amongst the most widespread soils used for agriculture in Australia, particularly chromosols with red subsoils (refer Figure 5.3). Chromosols are considered to be well drained soils and it is expected that Aboriginal archaeological sites will be concentrated on the chromosols. Further details are in Section 7.6.2.</p> <p>Areas of alluvial soil, consisting of dermosols, transect layers of vertosols and chromosols along the study area around Mungle. Dermosols are soils with well-structured B2 horizons, containing low levels of free iron, and lacking strong texture contrast between A and B horizons. These two soil types were highly selected by Aboriginal people for extended occupation or temporary camp sites, particularly when found in conjunction with nearby water sources.</p> <p>Vertosols are the dominant soil types within the study area between Mungle and the Macintyre River. Vertosols are clay rich soils with shrink-swell properties that exhibit strong cracking when dry and are commonly associated with the formation of gilgai. They were generally not utilised for extended habitation by Aboriginal people, instead being areas where resources could be gathered before returning to a primary occupation site.</p>
Hydrology and waterways	<p>The study area is sited within the Border River Catchment that contains sections of several large watercourses including the Macintyre River, a perennial watercourse that forms the NSW/QLD border and also the northern limit of the proposal with a well vegetated riparian floodplain on either side of the river (refer Figure 5.4).</p> <p>The study area crosses several anabranch streams of the Macintyre River, including Whalan Creek. In addition, there are several smaller local creeks that cross the proposed alignment including Forest Creek, Back Creek and Mobbindry Creek.</p> <p>The key waterways are:</p> <ul style="list-style-type: none"> Whalan Creek, an ephemeral waterway, larger than other creeks in the area and with a well-defined channel that flows seasonally. It is known to support fish populations Mobbindry Creek and Back Creek, ephemeral waterways with well-defined channels edged by fringing rushes and sedges. They are unlikely to support fish habitat but may support freshwater invertebrates and other food/utilitarian resources Forest Creek, an ephemeral, highly modified waterway with a poorly defined channel and limited or poor riparian vegetation. It is unlikely to be a fish habitat An unnamed drainage tributary of Mobbindry Creek, which is ephemeral. It is unlikely to be a fish habitat. <p>The crossings for Mobbindry Creek, Back Creek, Forest Creek and the unnamed drainage line occur within the previously disturbed Boggabilla railway corridor. New impacts are proposed around Whalan Creek. It should be noted that the proposed rail alignment also avoids impact to Malgarai Lagoon, a nearby billabong to the east of the alignment in the northern part of the study area associated with the Macintyre River system. Malgarai Lagoon was likely a focus area of occupation by local Aboriginal peoples.</p>
Flora and fauna	<p>Key floral species known to occur near the study area (Atlas of Living Australia 2019) that were exploited by Aboriginal people include:</p> <ul style="list-style-type: none"> Timber: Poplar box (<i>Eucalyptus populnae</i>), river red gum (<i>Eucalyptus camaldulensis</i>), brigalow (<i>Acacia harpophylla</i>), belah (<i>Casuarina cristata</i>) and false sandalwood (<i>Eremophila mitchellii</i>). Fruit: Wild orange (<i>Capparis mitchelli</i>), emu apple (<i>Owenia acidula</i>), wild lime (<i>Eremocitirs glauca</i>) and quandong (<i>Santalum acuminatum</i>). Non-Fruits: Native millet (<i>Panicum decompositum</i>), Nardoo, river cooba (<i>Acacia stenophylla</i>), common pigweed (<i>Portulaca oleracea</i>) and yams. <p>Key fauna species known to occur near the study area (Atlas of Living Australia 2019) that were exploited by Aboriginal people for food and other resources (clothing, decoration etc.) include:</p> <ul style="list-style-type: none"> Swamp wallaby (<i>Wallabia bicolor</i>), Australian brushtail possum (<i>Trichosurus vulpecula</i>), eastern grey kangaroo (<i>Macropus giganteus</i>), short-beaked echidna (<i>Tachyglossus aculeatus</i>) Wedge-tailed eagle (<i>Aquila audax</i>), sulphur-crested cockatoo (<i>Cacatua galerita</i>), Pacific black duck (<i>Anas superciliosa</i>), grey teal (<i>Anas gracilis</i>) Snake-necked turtle (<i>Chelodina longicollis</i>), broad-shelled river turtle (<i>Chelodina expansa</i>), carpet python (<i>Morelia spilota</i>), and red-bellied black snake (<i>Pseudechis porphyriacus</i>) Murray cod (<i>Maccullochella peelii</i>), golden perch/yellowbelly (<i>Macquaria ambigua</i>), freshwater catfish (<i>Tandanus tandanus</i>) Balonne freshwater mussel (<i>Velesunio ambiguus</i>) and yabbie (<i>Cherax destructor</i>).

Environmental context	Description
	<p>Native vegetation within the study area has been extensively modified as a result of land use activities. Vegetation today consists predominantly of exotic grassland with scattered paddock trees.</p> <p>Historical clearance activities notwithstanding, it can be confidently asserted that the original vegetation communities of the study area and its environs will have supplied Aboriginal people within or travelling through the area with an extensive array of edible and otherwise useful plant species. Recorded native vegetation communities and locally occurring watercourses would likewise have supported a large and diverse range of economic terrestrial, aquatic and avian fauna.</p>
Past disturbance	<p>The study area is dominated by extensive agriculture including grazing, dryland cropping and irrigation for cotton farming. Other land disturbance includes the construction of roads and the old Boggabilla railway branch line (refer Figure 5.5).</p> <p>Native vegetation within the study area has been extensively modified as a result of agricultural and pastoral land use activities, with the overwhelming majority cleared historically for grazing and/or cropping. Vegetation today consists predominantly of exotic grassland with scattered paddock trees.</p>

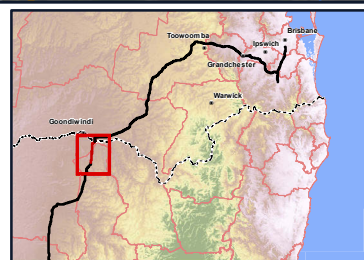
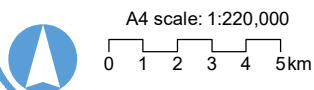


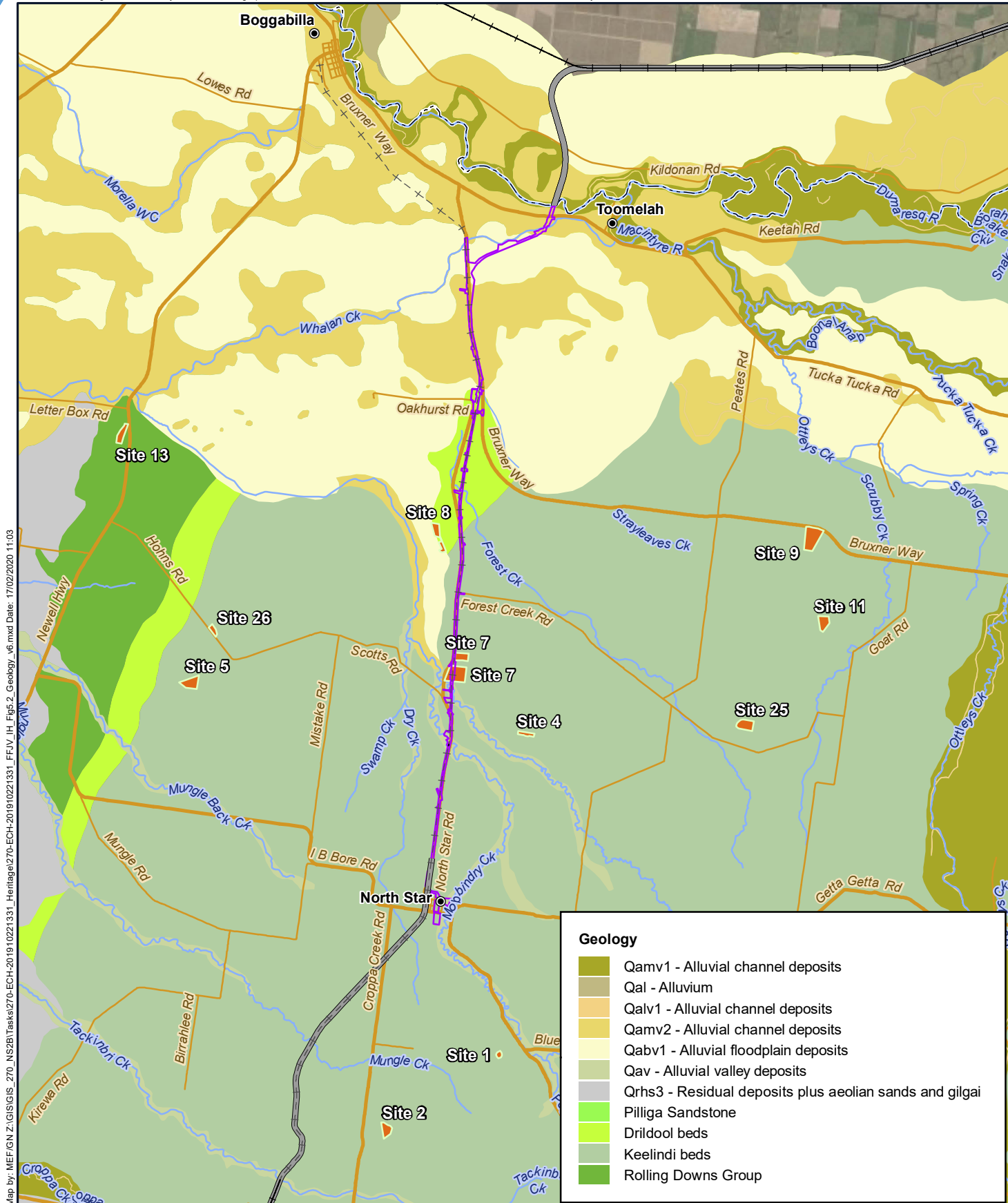
Elevation AHD (m)



Legend

- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- Watercourses
- - - NSW/QLD border
- Construction footprint
- Proposed borrow pit location





Legend

- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- Watercourses
- NSW/QLD border
- Construction footprint
- Proposed borrow pit location

A4 scale: 1:220,000

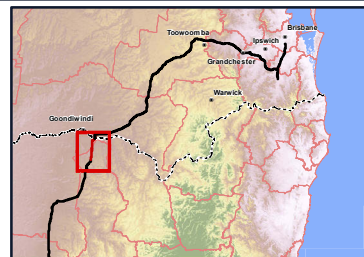
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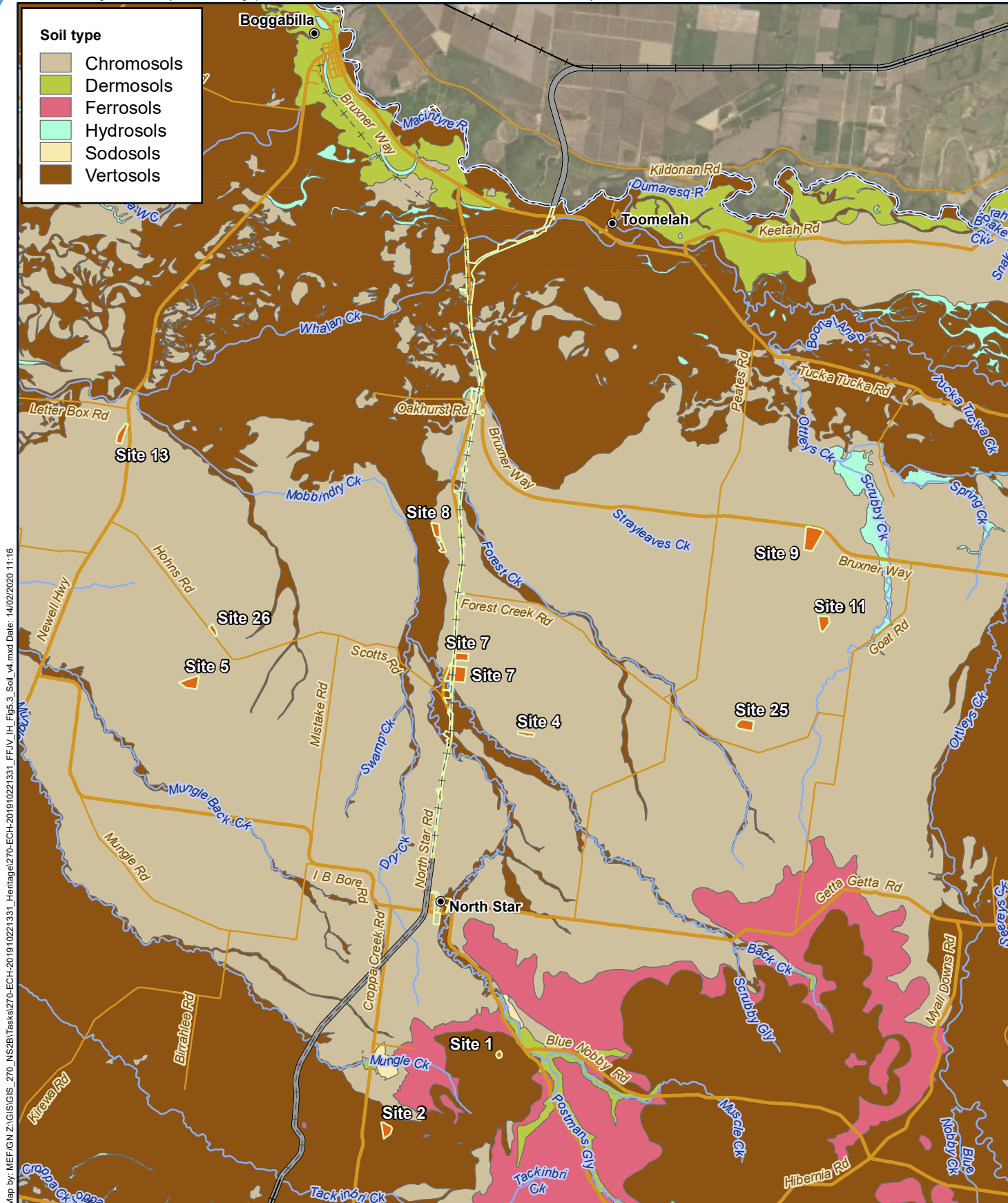


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Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 5.2:
Geology

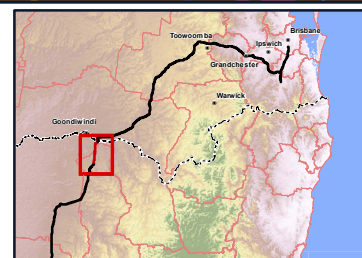
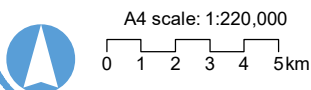




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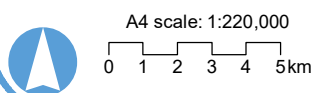
- Localities
- Existing rail (operational)
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- Minor roads
- Watercourses
- - - NSW/QLD border
- ▬ Construction footprint
- Proposed borrow pit location



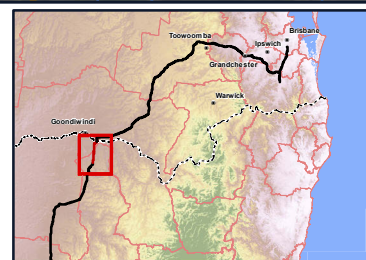


Legend

- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- Watercourses
- - - NSW/QLD border
- Construction footprint
- Proposed borrow pit location

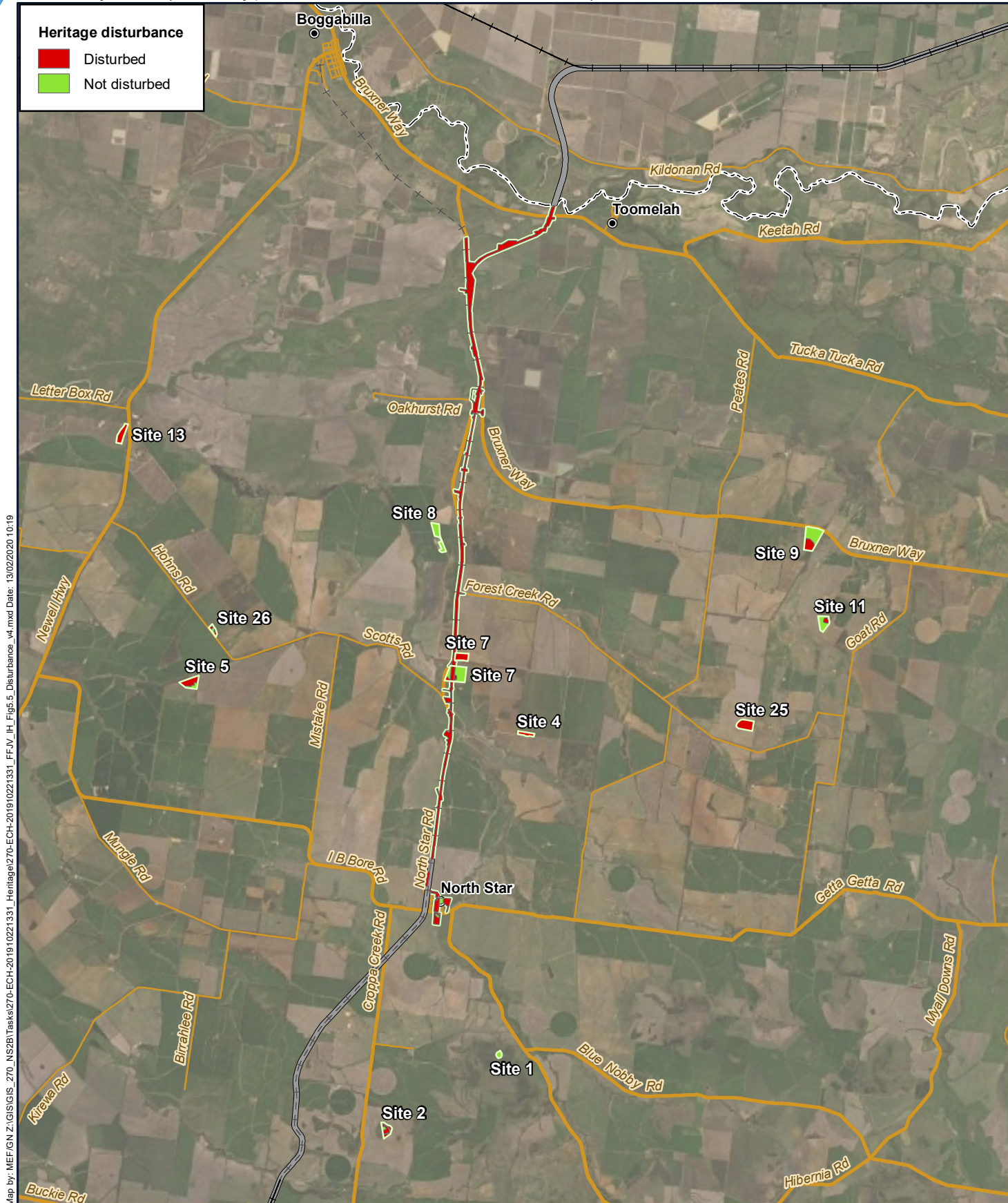


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Coordinate System: GDA 1994 MGA Zone 56



North Star to NSW/QLD border

Figure 5.4:
Watercourses



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Legend

- Localities
- +— Existing rail (operational)
- +- Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border
- Construction footprint

A4 scale: 1:220,000
0 1 2 3 4 5km

Future Freight
Integrating Community, Environment and Engineering

Date: 13/02/2020 Version: 4
Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

**Figure 5.5:
Disturbance**

6 Aboriginal heritage background

6.1 Ethnohistoric context

Aboriginal history, prior to European settlement is poorly understood within the study area with much of what is known dating from the establishment of the current township of Toomelah in the early 20th century (refer Section 6.1.1). Limited archaeological and ethnohistorical studies have been conducted for the region with more emphasis placed on larger towns to the south and west such as Moree and Walgett.

An early attempt to summarise the few early reports of this area was undertaken by Austin et al. (1980). This study identified that the project was predominately located within the boundaries of a sub-dialect of the Gomeroi people known as Wiriyaaray (Kamilaroi: Weraerai (Horton 1994)). Austin describes this dialect as belonging to the people who lived between the Dumaresq and Gwydir Rivers west of the Great Dividing Range. They considered this dialect to now be extinct, having been replaced by Gamilaraay and Northern Gamilaraay dialects (Austin et al. 1980).

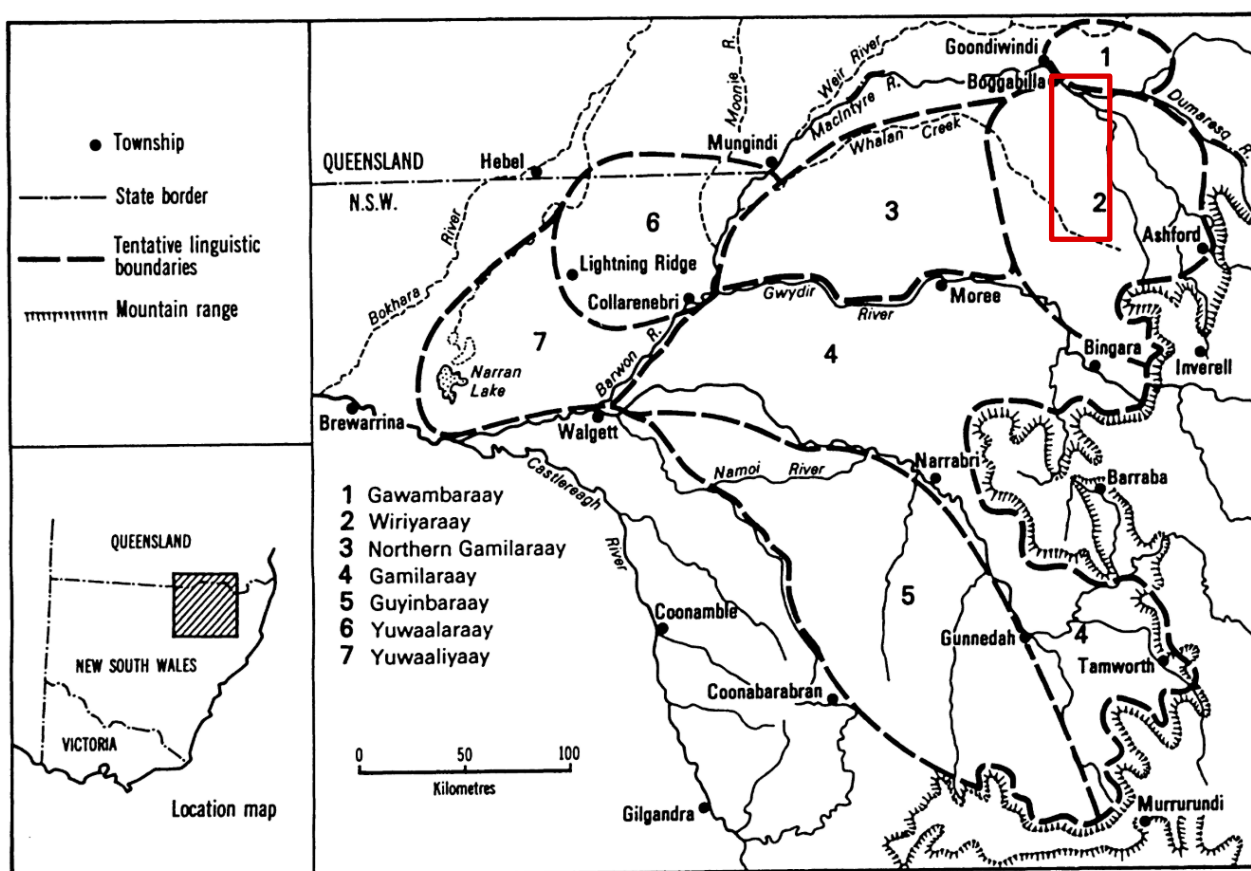


Figure 6.1 Linguistic boundaries in north central NSW with approximate study area outlined in red

Source: Adapted from Austin et al. 1980

This is contrasted with O'Rourke (1997), who favoured the name Kawambarai, a term derived from Mathews (1903) who argued it was the term for the dialect of the Kamilaroi on the southern bank of the Macintyre at Boggabilla. This different term may reflect an emergent language associated more with Gamilaraay as the language syntax evolved.

Limited information is available on the material culture of the groups in this area, but a possible analogue would be those identified by Balme (1986) summarising the journals of explorers. In her regional review, Balme documented: bark containers for holding water and gathering food; kangaroo skin cloaks; wooden clubs and hafted stone axes; nets for catching fish and birds; spears and spear throwers; and fish traps constructed in major creeks and rivers.

Isabel recollects the settlement was highly controlled. She enjoyed Sunday School, but everyone was tense and fearful on Monday and Wednesday mornings when the manager's wife would come to inspect the houses to make sure they were clean. The children were also inspected to make sure they didn't have sores or head lice (Flick and Goodall 2004:27). There was very little interaction with the town of Boggabilla – permission had to be sought from the manager to leave the mission (Flick & Goodall 2004:29). Rations were scant and consisted of flour, sugar, tea, jam and condensed milk, so the families supplemented this by hunting rabbit, goanna and emu, however, fish from the river were the main source of protein (Flick & Goodall 2004:30). In 1940, 139 of the 240 residents were on rations (Long 1970:66).

During Isabel's time at the mission (1938-1942), infrequent corroborees were held in the early years (1938-39), prior to the closure of Tingha and the relocation of the people from that mission. They would wait for the manager to go to town and would then hold the corroboree "on the side of the mission where old Granny Whiteman had her place" (Flick & Goodall 2004:36). A lookout would be posted up a tree to watch for the approaching truck, which was the earliest warning sign heralding the manager's return.

In 1970, Long published a summary of his observations of Aboriginal Settlements across Australia where he observed that the population at Toomelah (which he referred to as Boggabilla), had fluctuated significantly during its history. In 1939, when the mission formerly opened, there were just over 200 people. By 1947, it was quantified at 199, increasing to 288 in 1963. When Long visited in November 1965 the population of 216 people was made up of 87 adults and 129 children, however, there were also a number of men who worked away from the mission and visited on the weekends or between jobs. The population was largely made up of children under 15 years (57.4 %) and only 11.5% were over 40 years in age. Long reported that the majority of the people living on the mission came from a limited number of families: the descendants of two brothers accounted for 65 people (31%), while the descendants of another man numbered 44 people (20.3%). These two groups had not intermarried. The descendants of a woman made up a further 24% of the population (53 people). Therefore, 75.3% of the population came from three families. Furthermore, Long indicated that other than one woman from Melbourne, the residents were overwhelmingly from the local area (Long 1970:65).

Accommodation consisted of 26 houses at that time, which resulted in "gross overcrowding" in some of the houses (Long 1970:65). Either 23 or 24 of these were the original houses built in 1938-39 and were in poor condition. The houses were connected to water, pumped from the river, but although the electrical work had been done, the electricity had not been connected. Long reported that bathroom-laundries had been added, but were not in use as yet. Instead "the houses had pit latrines and garbage disposal was carried out by the station handyman" (Long 1970:66).

Services to the community consisted of the school, with a new school building having been finished in 1965 with about 80 students enrolled and operated by three teachers. The number of residents on rations had been reduced and these were collected from Boggabilla, with all residents going to either Boggabilla or Goondiwindi to shop. Unless they were injured or otherwise on a pension, the men of the mission were employed, mainly clearing land, shearing, or as shed or permanent hands on local stations. Two were recorded as working on the railway. Other than two women employed on the mission, none of the women or girls worked – probably a factor of the young average age of the population, which would indicate these women were engaged with small children (Long 1970:65).

The mission consisted of approximately 457 acres with Long reporting that 300 of these were unimproved pasture. This land was leased, although it is unclear if this lease arrangement directly benefited the local residents. Long suggested that the lease payments should be redirected to the residents to assist in renovations or improvements "or, with more risk, by encouraging the residents to organise to use it to fatten young cattle" (Long 1970:68).

Long indicated that money would not be made available in 1966 to improve conditions or build new houses (Long 1970:67). It would appear that the neglect of the mission was already evident. By 1988, when Human Rights Australia prepared their report on the mission, conditions had deteriorated considerably (Human Rights Australia 1988). Since that time, Toomelah has received grants and support from State and Federal governments and in 2017, the Australian Army undertook development works at Toomelah as part of the Army Aboriginal Community Assistance Program resulting in the construction of a new multipurpose hall (Ingall 2017a 2017b).

6.2 Archaeological context

This section describes the archaeological context of the study area on a regional and local scale. Archaeological data of relevance to this area, including the results of previous archaeological investigations within and surrounding the study area, are reviewed in order to contextualise the results of the current assessment.

6.2.1 Regional archaeological context

Table 6.1 Previous regional Aboriginal heritage assessments

Author	Year	Project/ location	Assessment type	Summary of results
J. Balme	1986	North-Central Rivers district, west of the proposal to Bourke	Survey	Major and comprehensive survey of then known Aboriginal heritage values and resources in the North-Central Rivers area of NSW.
P. Purcell	2002	Brigalow Belt (Toomelah)	Survey	<p>Major regional assessment of Brigalow Belt South bioregion with includes part of the study area near Toomelah. Report found that Aboriginal archaeological sites on floodplains and alluvium landforms are strongly associated with an average distance to water of 119 m.</p> <p>Site density is higher on the alluvial floodplains than on hillslopes. It was noted that this may be the result of erosional processes with higher soil movement occurring on floodplains and alluvial fans.</p> <p>Estimates of site density were affected by limited survey and mapping coverage in the region, with the assessment mainly limited to travelling stock routes and reserves.</p> <p>The report recommended more sampling and landform mapping to be undertaken for the region.</p>

6.2.2 Local archaeological context

Apart from broad regional syntheses and due diligence reports prepared for Inland Rail, there is only one heritage assessment that has been conducted within the study area. Table 6.2 provides a summary of the previous heritage assessments that have been carried out on lands adjacent to Toomelah Mission.

Table 6.2 Previous local Aboriginal heritage assessments

Author	Year	Location	Assessment type	Summary of results
A. Dennison	1985	Boggabilla Common	Survey	Survey of the Boggabilla Common immediately south of South Street and west of Bruxner Highway where Boggabilla Central School is now located. 26 Aboriginal archaeological sites were identified, comprising 25 culturally modified trees and one hammerstone. The report notes that some occupation sites were also found but not documented.
A. Dennison	1986	Immediately adjacent to Toomelah Mission	Survey	Toomelah community survey of an area immediately south and west of the Toomelah Mission that included an old stock route. 37 culturally modified trees of various sizes were identified. These findings suggest stock routes are areas where culturally modified trees are likely to remain extant.

Author	Year	Location	Assessment type	Summary of results
T. Bonhomme	1986	Euraba, west of the proposal	Survey	Reconnaissance survey of proposed gridded seismic lines between Boomi and Boggabilla. Eight artefact scatters, five isolated artefacts and one culturally modified tree were identified. Raw material included silcrete, basalt, quartzite and quartz. This report concluded that areas in close association with creek lines and watercourses were the most likely locations to contain extant surface and subsurface archaeology.
T. Bonhomme	1987	46km south east of Boomi	Survey	Survey on areas surrounding Whalan Creek identified two significant artefact scatters up to 400 m in length. Four culturally modified trees were also noted. The assessment found that there was a high potential for sites to be found along the entire length of Whalan Creek. The predictive model noted that watercourses and billabongs were the main focal points for past activities and theorised that creek lines were the main lines of connection across otherwise waterless plains. Travel across these plains is hypothesised to have been limited to short forays to procure particular resources when available.
P. Purcell, L. McAdam & Toomelah Local Aboriginal Land Council	2002	Brigalow Belt (near Toomelah)	Survey	Major regional assessment of Brigalow Belt South bioregion included part of the study area near Toomelah. Survey in this area identified 59 sites in the general vicinity of the study area (mostly culturally modified trees) with two sites recorded within or immediately adjacent to the study area (AHIMS sites #2-4-0046 and #2-4-0047).
Niche	2016	Study area	Options Assessment	Desktop assessment noted that there were three registered AHIMS sites within 500 m of the originally proposed options for North Star to NSW/QLD Border. Report noted numerous landform features (watercourses and lagoons) as having moderate to high potential for Aboriginal archaeology to be present. All options were ranked with the same potential level of impact to Aboriginal cultural heritage.
Umwelt	2017	Inland Rail: Narrabri to North Star	Survey	Assessment for the Narrabri to North Star component of Inland Rail. Assessment identified a number of heritage sites including seven artefact scatters, 13 isolated artefacts, one contact site and one culturally modified tree. The assessment found that isolated artefacts can be found almost anywhere across the proposed alignment, reflecting what is known as 'background scatter'. Artefact scatters were more typically associated with major watercourses, with the assessment identifying the terraces adjacent to the Gwydir River, Mehi River and Croppa Creek as being of moderate to high archaeological potential.
Ozark	2018	Newell Highway: Boggabilla to Moree	Survey	Assessment for the road upgrades to the Newell Highway between Boggabilla and Moree. Assessment identified two culturally modified trees outside of the project disturbance footprint.

6.2.3 Aboriginal Heritage Information Management System database

A search of the AHIMS database (AHIMS Search# 341962) was undertaken in October 2019 for a 50 x 50 km area centred on the study area (refer Appendix E). A total of 112 sites were identified within the search area, with nearly two thirds being culturally modified trees and almost a third being artefact scatters Table 6.3. This skewed count of site types merits consideration of two facts:

- The wider regional area has not been extensively surveyed for tangible and intangible Aboriginal cultural heritage values
- The majority of survey that have occurred have targeted Travelling Stock Reserves (TSR) which typically have higher numbers of culturally modified trees represented due to reduced rates of vegetation clearance in these corridors.

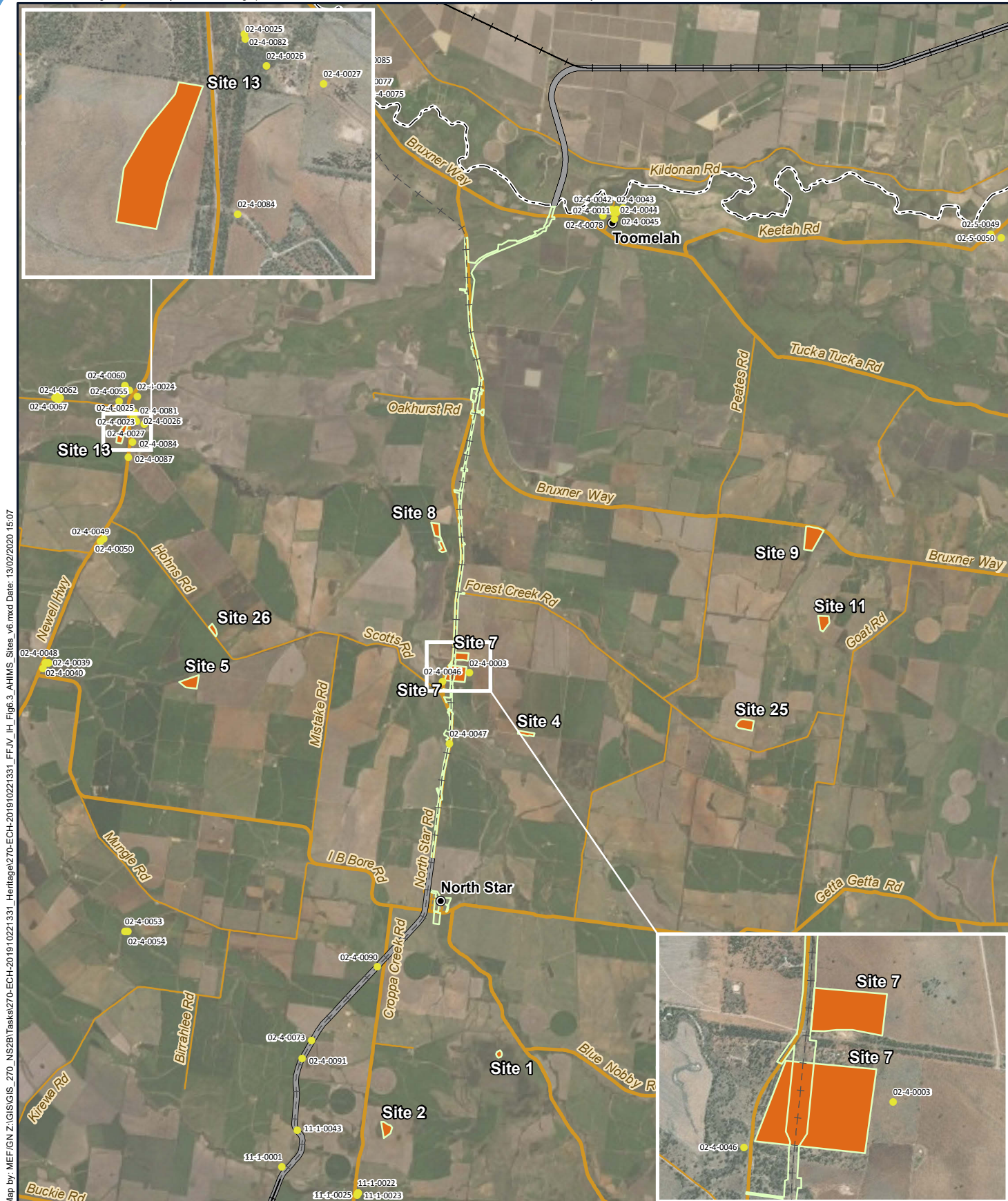
Table 6.3 Regional count of previously registered Aboriginal Heritage Information Management System sites

Site type	Site type count	Site type percentage
Culturally modified tree	68	60.71%
Artefact scatter	36	32.14%
Burial	2	1.79%
Carved tree	2	1.79%
Potential Archaeological Deposit	1	0.89%
Sacred site	1	0.89%
Historic site	1	0.89%
Isolated artefact	1	0.89%
Total	112	100%

Only three Aboriginal archaeological sites were identified within the study area, comprising one artefact scatter, one culturally modified tree and a complex of three carved trees that have since been relocated to the Australian Museum in Sydney (refer Table 6.4). Site details are provided in the table below with their locations shown on Figure 6.3.

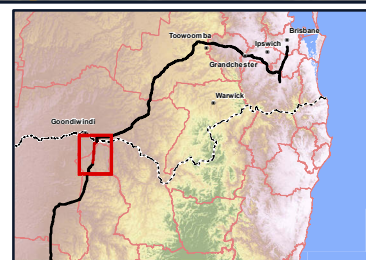
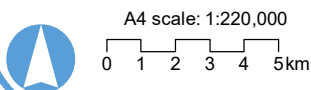
Table 6.4 Aboriginal Heritage Information Management System sites within the study area

AHIMS Site ID	Site name	Site type	Current AHIMS status	Recorder
2-4-0003	Boggabilla Mungle	Carved Tree Complex	Valid (salvaged and stored at Australian Museum)	David Bell, Annie Nicholson
2-4-0046	BBS Toomelah LALC Mobbindry Ck1	Artefact Scatter	Valid	Leila McAdam, Toomelah LALC
2-4-0047	BBS Toomelah LALC Mobbindry Ck ST2	Culturally Modified Tree	Valid	Leila McAdam, Toomelah LALC



Legend

- AHIMS sites
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- - - NSW/QLD border
- Construction footprint
- Proposed borrow pit location



7 Archaeological survey

7.1 Aim and objectives

The aim of the archaeological survey was to identify, record and map Aboriginal cultural heritage values within the study area. These values include both the tangible remains of past Aboriginal activity (i.e. archaeological evidence) as well as intangible cultural values. To achieve these aims, the following specific survey objectives were developed:

- To comprehensively survey, by pedestrian transects, land within the study area
- To identify and record aboriginal archaeological sites within the study area
- To inspect, where appropriate, areas of known or potential Aboriginal cultural heritage value, including AHIMS sites, and areas identified by RAP representatives
- To obtain sufficient data to facilitate the development of appropriate management and mitigation measures for identified Aboriginal sites, areas of Aboriginal cultural heritage value and areas of archaeological sensitivity.

7.2 Methodology

The field survey team consisted of five FFJV archaeologists (Luke Kirkwood, Dr Kate Quirk, Perri Braithwaite, Clair Davey and Laura Cross) and eighteen RAP representatives. They completed the archaeological survey of the study area over:

- Survey 1 - five days from 10 December to 14 December 2018
- Survey 2 - six days from 3 June to 8 June 2019
- Survey 3 - seven days from 12 August to 18 August 2019.

A list of representatives who participated in the archaeological survey has been provided in Section 4.

All surveys were conducted on foot. The location of each transect completed during the survey, including start and end points, was recorded using one of two handheld Global Positioning System (GPS) units, with associated transect data (e.g., Ground Surface Visibility (GSV) and Ground Surface Integrity (GSI) ratings) entered directly into the same unit upon the completion of each transect. All data was recorded using iPad based recording forms.

7.3 Site definition

The definition, in spatial terms, of Aboriginal archaeological sites is a topic of considerable importance to modern cultural heritage management and one that has generated significant discussion in Australian archaeology (e.g. Doleman 2008; Holdaway 1993a; Holdaway, Fanning, & Witter 2000a; Holdaway, Witter, & Fanning 1998; MacDonald & Davidson 1998b; McNiven 1992; Robins 1997; Shiner 2008). Aboriginal archaeological sites can be broadly defined as places in the landscape that retain physical evidence of past Aboriginal activity. Such evidence, of course, can assume a range of forms, depending on the nature of the activity or activities that produced it, and can vary dramatically in quantity and extent. Some Aboriginal archaeological sites are, by their very nature, easy to define in spatial terms, with culturally modified trees and rock shelters, for example, readily distinguishable from their surrounding landscapes. Difficulties arise, however, for sites whose present-day physical extent is, more often than not, a product of geomorphic processes, as opposed to the actions of Aboriginal people in the past.

Although relevant to a variety of site types, geomorphic processes such as soil erosion and aggradation, are of particular relevance to the identification and definition of surface scatters of stone artefacts, commonly referred to as 'open camp sites' or 'artefact scatters'. It is, for example, now widely accepted that the archaeological visibility of such sites is, in most instances at least, entirely dependent on the operation of such processes, which will have acted variously to expose, conceal or remove completely associated archaeological materials (Dean-Jones and Mitchell 1993; Fanning et al. 2008, 2009; Shiner 2008). As demonstrated by countless large-scale excavation projects in south-eastern Australia, surface artefacts invariably represent only a fraction of the total number of artefacts present within these sites, with the majority occurring in subsurface contexts. Artefact exposure, unsurprisingly, is highest on erosional surfaces and lowest on depositional ones. At the same time, in many areas, surface artefacts have been shown to form part of more-or-less continuous subsurface distributions of artefacts, albeit with highly variable artefact densities linked to environmental variables such as stream order and landform.

Such evidence poses a significant analytical and interpretive dilemma. Defining sites on the basis of surface artefacts alone is clearly problematic, with modern site boundaries invariably reflecting the size and distribution of surface exposures as opposed to the actions of Aboriginal people in the past. Nonetheless, for pragmatic reasons, this is the most commonly used approach, with 'distance' and 'density-based' definitions dominating. In NSW, two of the most commonly employed distance-definitions are 'two artefacts within 50 m of each other' and 'two artefacts within 100 m of each other'. Neither definition is derived from a particular theoretical approach or body of empirical research - they are simply pragmatic devices for site definition. Definitions based on artefact density also vary in their particulars. However, one of most commonly used definitions is that which isolates, within an arbitrarily defined 'background scatter' of one artefact/100 m², higher density clusters that are subsequently defined as 'sites'.

Non-site or distributional archaeology offers an alternative approach to distance and density-based site definitions (Ebert 1992; Foley 1981), with individual artefacts, not sites, treated as the basic units of analysis (for published Australian examples refer Doelman 2008; Holdaway et al. 2000; McNiven 1992; Robins 1997; Shiner 2008). While recognising the interpretive potential of non-site approaches with respect to data analysis and discussion, their implementation in the context of cultural heritage management studies is difficult. Here, the identification of 'sites' is required for reasons of recording (i.e., their entry into the AHIMS site database) as well as ease of relocation, protection and ongoing management. The identification of spatially-discrete 'sites', therefore, offers the most pragmatic approach to Aboriginal heritage management in impact assessment contexts (refer to McDonald 1996 for a different approach).

For this assessment, the 'two artefacts within 100 m of each other' definition has been adopted.

7.4 Limitations

While all of the proposed alignment was able to be surveyed, the following issues limited the survey at some of the borrow pits:

- Lack of access: Borrow Pits (Site 1, Site 11, Site 25) and additional paddock for laydown south of North Star
- Safety: Borrow Pits (Site 5 (Part), Site 9 (Part))

7.5 Survey results

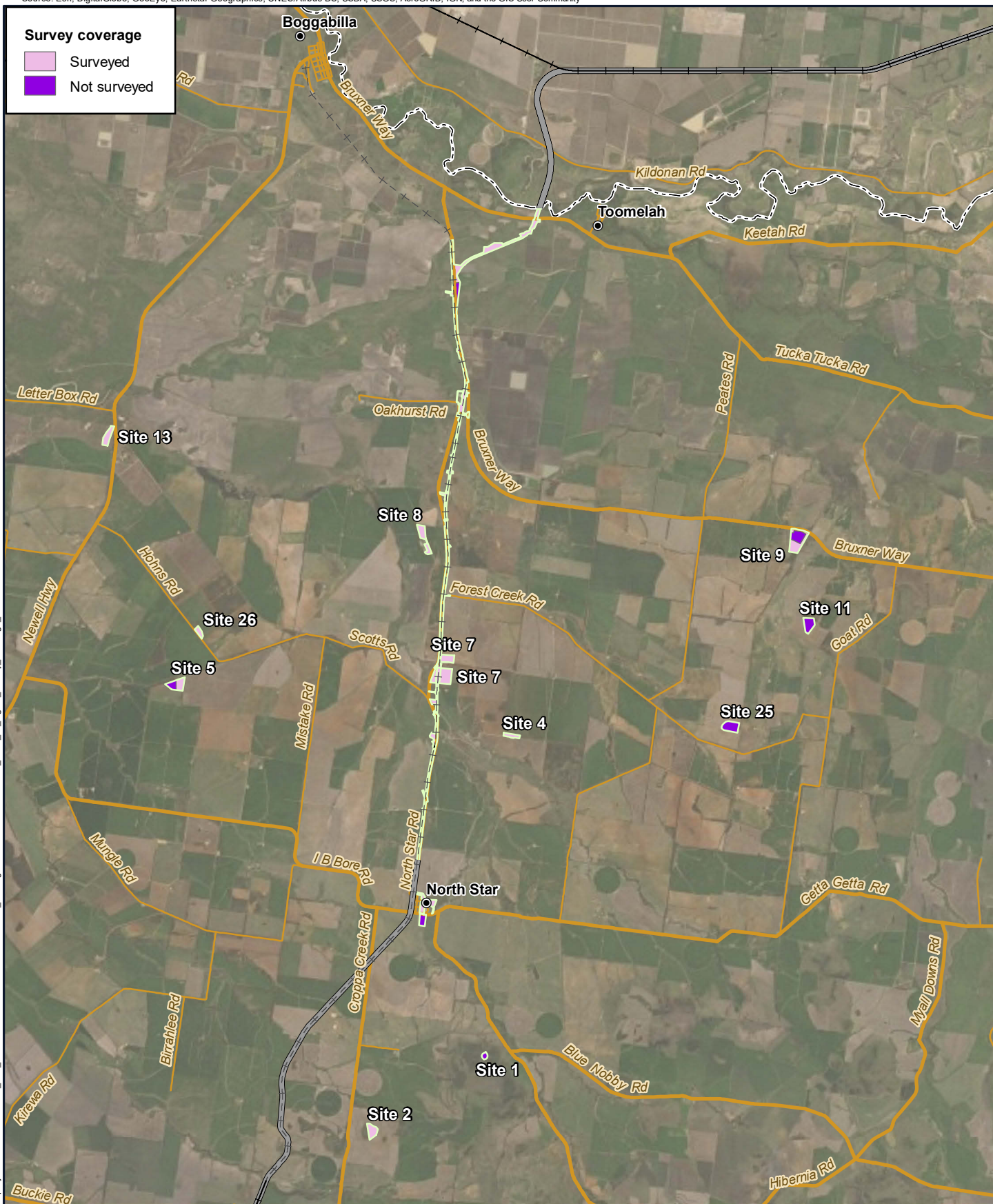
7.5.1 Survey coverage and effective coverage

A total of 25 survey units were assessed by pedestrian survey, which covered a total survey area of 656 hectares (ha) or ~75% of the total study area. Effective coverage estimates for each transect completed during survey are shown in Table 7.1. GSV across the study area was mixed, ranging from 40 to 100% with some areas in floodplains having high weed growth. Areas of enhanced GSV were primarily due to historic disturbance through grading of easements adjacent to the existing railway track or ploughing. Calculation of the total effective coverage achieved for the current survey indicates that around 31% (c.204.58 ha) of the survey area was effectively surveyed for surface Aboriginal archaeological materials. Figure 7.1 shows the survey coverage associated with the study area. Areas not surveyed were as a result of land access restrictions and other constraints.

Table 7.1 Effective coverage data for the current survey

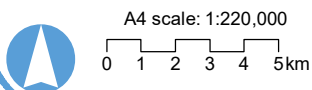
Survey unit	Landform units	Survey unit area (m ²)	GSV %	Exposure %	Effective coverage (m ²)	Effective coverage %
1	River Terrace	59,302	70	70	29,058	49
2	Flats - Vertosols	87,824	50	50	21,956	25
3	Flats - Vertosols	419,622	40	40	67,140	16
4	Flats - Vertosols	286,030	100	50	143,015	50
5	Flats - Vertosols	817,368	50	50	204,342	25
6	Flats - Chromosols	191,569	70	60	80,459	42
7	Flats - Chromosols	270,896	70	50	94,814	35
8	Flats - Chromosols	108,354	80	50	43,342	40
9	Flats - Chromosols	187,012	80	50	74,805	40
10	Flats - Chromosols	417,902	80	50	167,161	40
11	Flats - Chromosols	278,431	80	50	111,372	40
12	Flats - Chromosols	211,291	50	40	42,258	20
13	Flats - Chromosols	535,656	50	50	133,914	25
14	Flats - Vertosols	279,433	50	10	13,972	5
15	Flats - Vertosols	125,417	50	10	6,271	5
16	Upper Slope	188,066	100	50	94,033	50
17	Upper Slope	82,849	80	70	46,395	56
18	Upper Slope	277,900	50	10	13,895	5
19	Upper Slope	548,130	70	50	191,846	35
20	Flats - Chromosols	171,440	100	70	120,008	70
21	Flats - Chromosols	495,935	80	50	198,374	40
22	Flats - Chromosols	99,866	100	50	49,933	50
23	Flats - Chromosols	239,044	50	30	35,857	15
24	Crest	89,018	50	50	22,255	25
25	Lower Slope	98,301	80	50	39,320	40
Total		6,566,656			2,045,795	31

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FF\JV_IH_Fig7.1_Survey_Coverage_v5.mxd Date: 14/02/2020 11:21

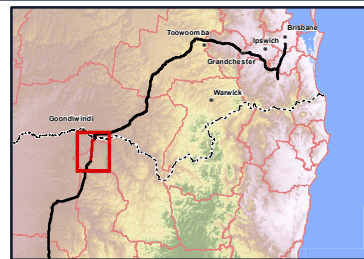


Legend

- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border
- Construction footprint



Date: 14/02/2020 Version: 5
Coordinate System: GDA 1994 MGA Zone 56



North Star to NSW/QLD border

Figure 7.1:
Survey Coverage

7.5.2 Tangible Heritage – Archaeological sites

A total of 54 Aboriginal archaeological sites, comprising 36 artefact scatters/isolated artefacts and 18 culturally modified trees were identified within or adjacent to the proposal area. These included:

- Three previously recorded AHIMS sites (AHIMS#: 2-4-0046, 2-4-0047 and 2-4-0003)
- 51 new sites recorded by FFJV.

The 51 new Aboriginal archaeological sites recorded comprised 35 open artefact sites (i.e. 22 artefact scatters and 13 isolated artefact sites) and 16 culturally modified trees. A total of 1,573 artefacts were identified. A summary of site details are provided in Table 7.2 and their locations shown on Figure 7.2, Figure 7.3a-l and Figure 7.4a-l. Detailed site summaries are provided in Appendix F.

Table 7.2 Aboriginal archaeological sites within the study area recorded by field survey team

AHIMS ID	Site name	Site type
2-4-0046	BBS Toomelah LALC Mobbindry Ck1	Artefact Scatter
2-4-0047	BBS Toomelah LALC Mobbindry Ck ST2	Culturally Modified Tree
2-4-0103	NS2B-19-AS1	Artefact Scatter
2-4-0120	NS2B-19-AS2	Artefact Scatter
2-4-0119	NS2B-19-AS3	Artefact Scatter
2-4-0118	NS2B-19-AS4	Artefact Scatter
2-4-0117	NS2B-19-AS5	Artefact Scatter
2-4-0116	NS2B-19-AS6	Artefact Scatter
2-5-0088	NS2B-19-AS7	Artefact Scatter
2-4-0115	NS2B-19-AS8	Artefact Scatter
2-4-0139	NS2B-19-AS9	Artefact Scatter
2-4-0102	NS2B-19-AS10	Artefact Scatter
2-4-0101	NS2B-19-AS11	Artefact Scatter
2-4-0100	NS2B-19-AS12	Artefact Scatter
2-4-0099	NS2B-19-AS13	Artefact Scatter
2-4-0098	NS2B-19-AS14	Artefact Scatter
2-4-0097	NS2B-19-AS15	Artefact Scatter
2-4-0096	NS2B-19-AS16	Artefact Scatter
2-4-0095	NS2B-19-AS17	Artefact Scatter
2-4-0122	NS2B-19-AS18	Artefact Scatter
2-4-0121	NS2B-19-AS19	Artefact Scatter
11-1-0056	NS2B-19-AS20	Artefact Scatter
11-1-0055	NS2B-19-AS21	Artefact Scatter
2-5-0089	NS2B-19-AS22	Artefact Scatter
2-4-0114	NS2B-19-IA1	Isolated Artefact
2-4-0109	NS2B-19-IA2	Isolated Artefact
2-4-0108	NS2B-19-IA3	Isolated Artefact
2-4-0107	NS2B-19-IA4	Isolated Artefact
2-4-0141	NS2B-19-IA5	Isolated Artefact
2-4-0140	NS2B-19-IA6	Isolated Artefact
2-4-0138	NS2B-19-IA7	Isolated Artefact
2-4-0137	NS2B-19-IA8	Isolated Artefact

AHIMS ID	Site name	Site type
2-4-0136	NS2B-19-IA9	Isolated Artefact
2-4-0113	NS2B-19-IA10	Isolated Artefact
2-4-0112	NS2B-19-IA11	Isolated Artefact
2-4-0111	NS2B-19-IA12	Isolated Artefact
2-4-0110	NS2B-19-IA13	Isolated Artefact
2-4-0104	NS2B-19-ST1	Culturally Modified Tree
2-4-0105	NS2B-19-ST2	Culturally Modified Tree
2-4-0106	NS2B-19-ST3	Culturally Modified Tree
2-4-0129	NS2B-19-ST4	Culturally Modified Tree
2-4-0128	NS2B-19-ST5	Culturally Modified Tree
2-4-0127	NS2B-19-ST6	Culturally Modified Tree
2-4-0126	NS2B-19-ST7	Culturally Modified Tree
2-4-0125	NS2B-19-ST8	Culturally Modified Tree
2-4-0124	NS2B-19-ST9	Culturally Modified Tree
2-4-0135	NS2B-19-ST10	Culturally Modified Tree
2-4-0134	NS2B-19-ST11	Culturally Modified Tree
2-4-0131	NS2B-19-ST12	Culturally Modified Tree
2-4-0132	NS2B-19-ST13	Culturally Modified Tree
2-4-0133	NS2B-19-ST14	Culturally Modified Tree
2-4-0130	NS2B-19-ST15	Culturally Modified Tree
2-4-0123	NS2B-19-ST16	Culturally Modified Tree

7.5.2.1 Lithics

A total of 1,534 individual stone artefacts were recorded during the archaeological surveys. A simplified typological breakdown of the recorded assemblage (refer Table 7.3 and Table 7.4) shows that the assemblage is dominated by flakes (n=1,324, 86%) comprising complete flakes (n=818, 53%), distal flakes (n=126, 8%), proximal flakes (n=159, 10%) and flake shatter (n=84, 5%).

Formed objects (i.e, tools, cores) make up the remainder of the assemblage with retouched flakes (n=56, 4%), complete and broken cores (n=40, 7.3%), axes (n=9, 1.6%) and choppers (n=2, 0.4%).

The most common raw material recorded was silcrete (n=1,308, 85%), followed by chert (n=102, 7%). Other raw materials were represented but at significantly smaller counts.

Identified cores include 28 unidirectional, 10 multidirectional and 1 bidirectional cores manufactured on varying blanks (i.e., cobbles, flakes etc.).

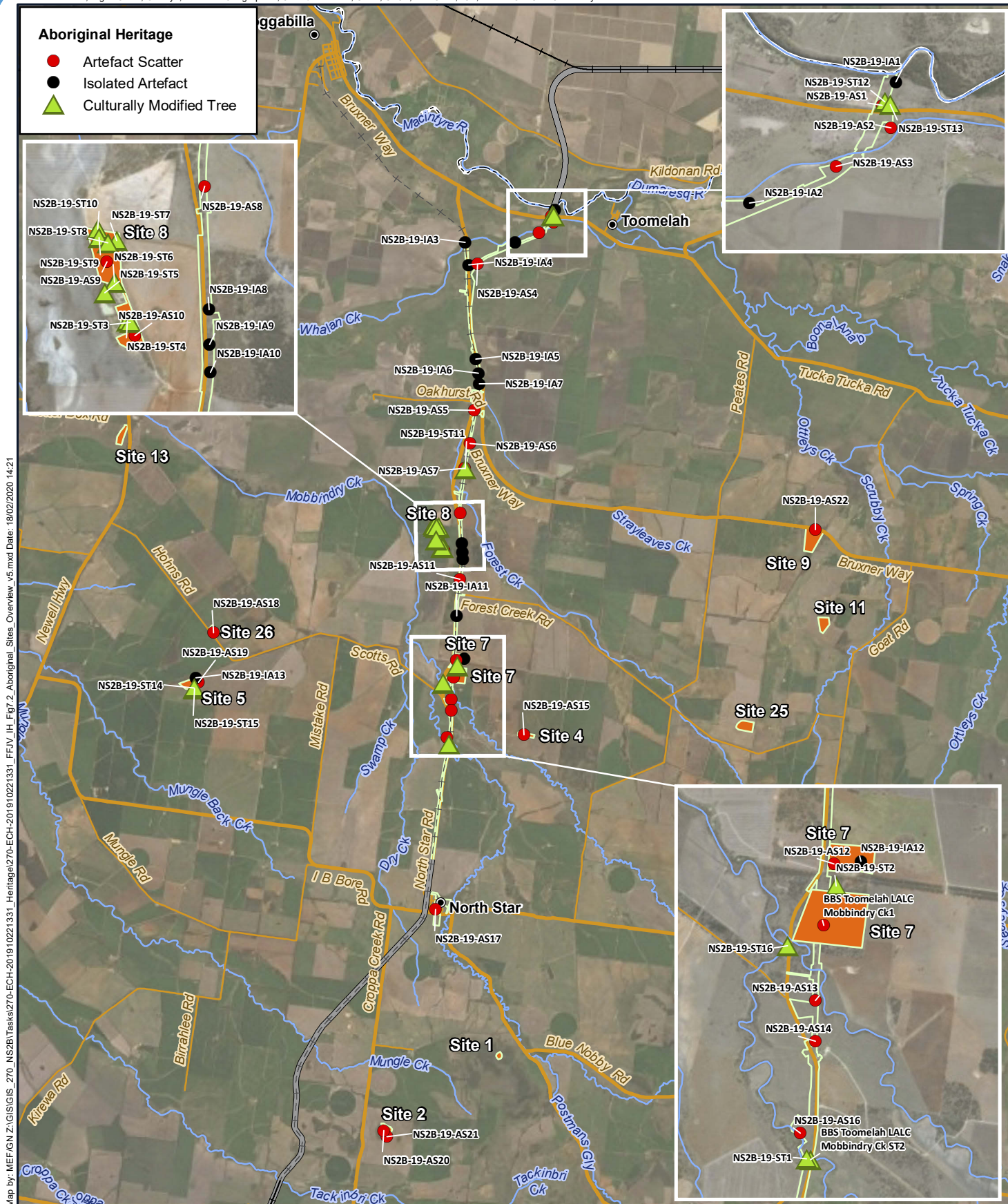
Cortex is moderately well represented in the survey assemblage, with 42 artefacts retaining cortex at discard.

Table 7.3 Simplified typological breakdown of artefacts

Raw material	Artefact type					
	Core	Flake	Grindstone	Hatchet head	Total (n)	% Total
Chalcedony	1	7			8	0.52%
Chert	21	81			102	6.65%
Fine Grained Siliceous	1	29			30	1.96%
Petrified Wood	2	8			10	0.65%
Quartz	6	30			36	2.35%
Quartz (Crystal)		2			2	0.13%
Quartzite		27			27	1.76%
Sandstone			1		1	0.07%
Silcrete	177	1131			1308	85.27%
Tuff		1			1	0.07%
Volcanic		8		1	9	0.59%
Total (n)	208	1324	1	1	1534	
% Total	13.56%	86.31%	0.07%	0.07%	100%	

Table 7.4 Detailed typological breakdown of artefacts

Raw material	Artefact type													
	Flake - Complete	Flake - Proximal	Flake - Medial	Flake - Distal	Flake - Longitudinal Split	Flake - Shatter	Flake - Tool	Core - Bidirectional	Core - Multidirectional	Core - Unidirectional	Axe - Ground	Grindstone - Muller	Total	% Total
Chalcedony	2					4	1		1				8	0.52%
Chert	50	8	4	8	2	7	2		12	9			102	6.65%
Fine Grained Siliceous	19	5	2	1			2			1			30	1.96%
Petrified Wood	6		1				1		2				10	0.65%
Quartz	17	6	1	3		3		4		2			36	2.35%
Quartz (Crystal)	2												2	0.13%
Quartzite	15	4	3	1	2	1	1						27	1.76%
Sandstone												1	1	0.07%
Silcrete	701	135	46	111	20	69	49	9	100	68			1308	85.27%
Tuff				1									1	0.07%
Volcanic	6	1		1							1		9	0.59%
Total	818	159	57	126	24	84	56	13	115	80	1	1	1534	100%
% Total	53.32%	10.37%	3.72%	8.21%	1.56%	5.48%	3.65%	0.85%	7.50%	5.22%	0.07%	0.07%	100%	



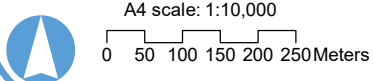
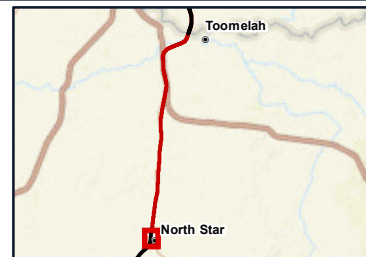
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Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FF JV_IH_Fig7.3_Aboriginal_Sites_MB_v5.mxd Date: 18/02/2020 14:25



Legend

- Localities
- + - Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- Watercourses
- Construction footprint
- Proposed construction camp
- Proposed laydown area

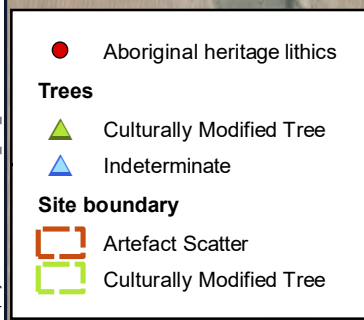
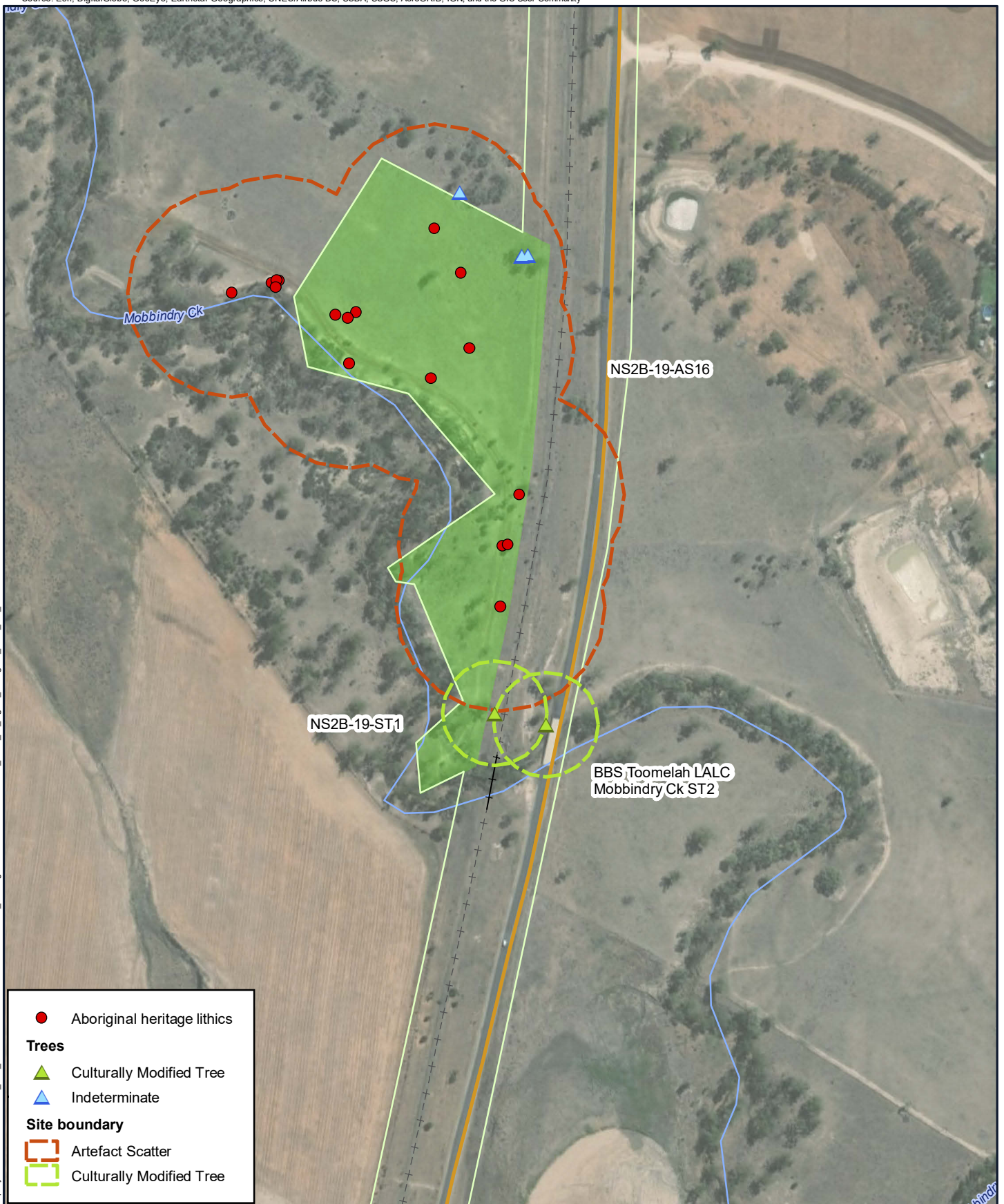


Date: 18/02/2020 Version: 5
 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

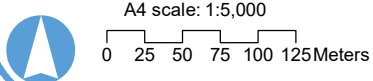
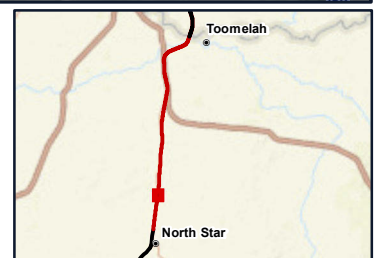
Figure 7.3a:
 Aboriginal archaeological sites - alignment

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FF JV_IH_Fig7.3_Aboriginal_Sites_MB_v5.mxd Date: 18/02/2020 14:25

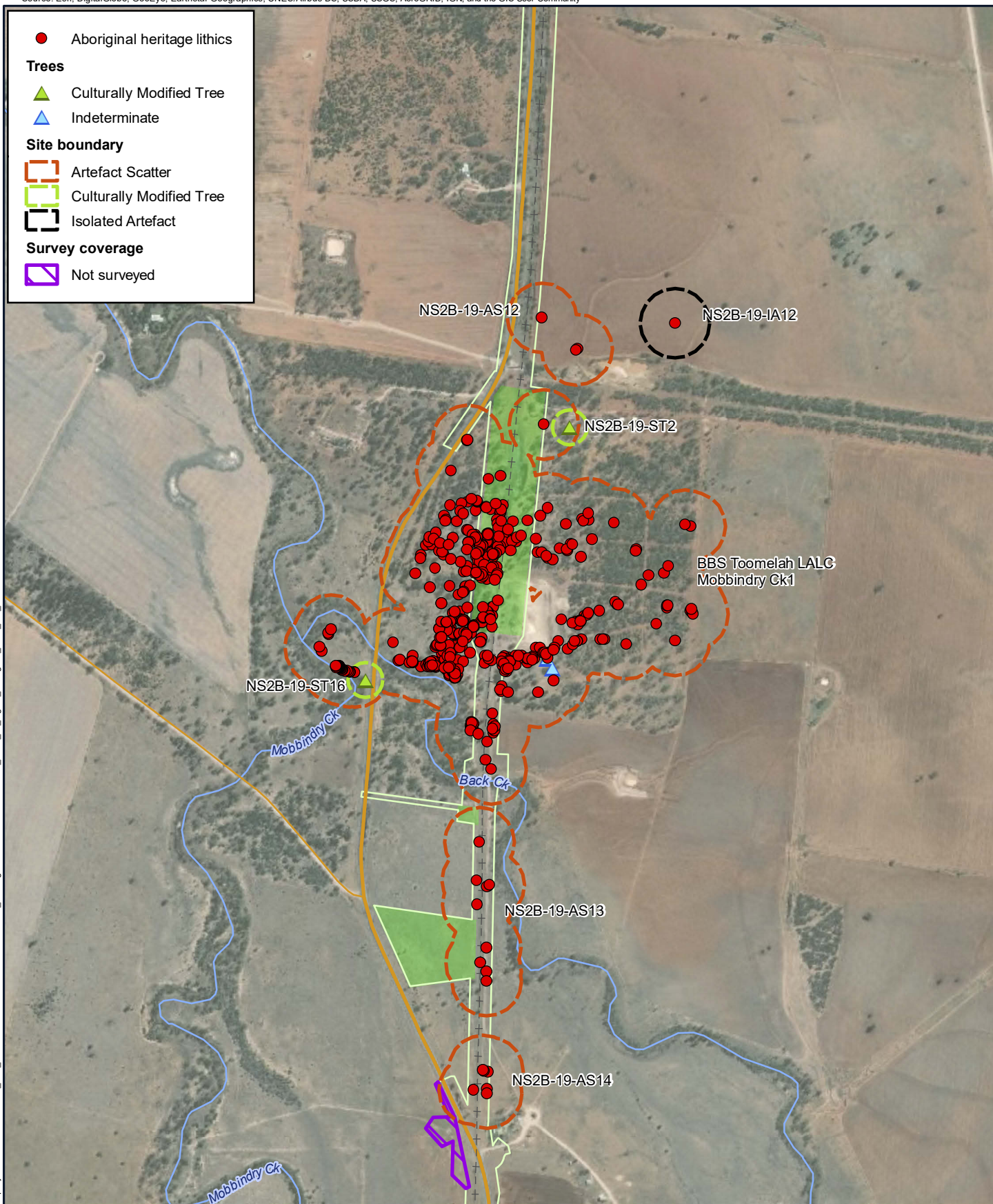


Legend

- +— Existing rail (operational)
- - - Existing rail (non-operational)
- Major roads
- Watercourses
- Construction footprint
- Proposed laydown area

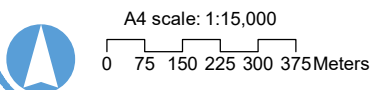
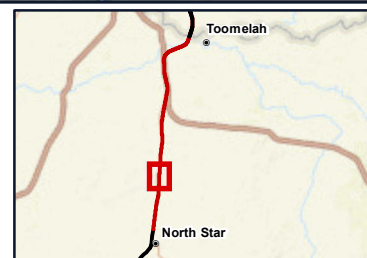


Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FF JV_IH_Fig7.3_Aboriginal_Sites_MB_v5.mxd Date: 18/02/2020 14:25



Legend

- + - Existing rail (non-operational)
- Major roads
- Minor roads
- Watercourses
- Construction footprint
- Proposed laydown area

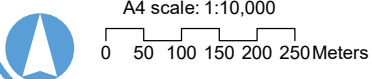
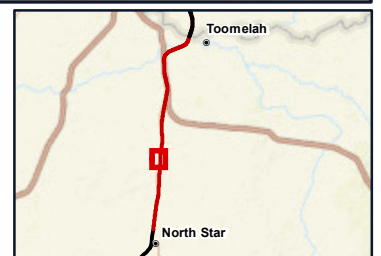


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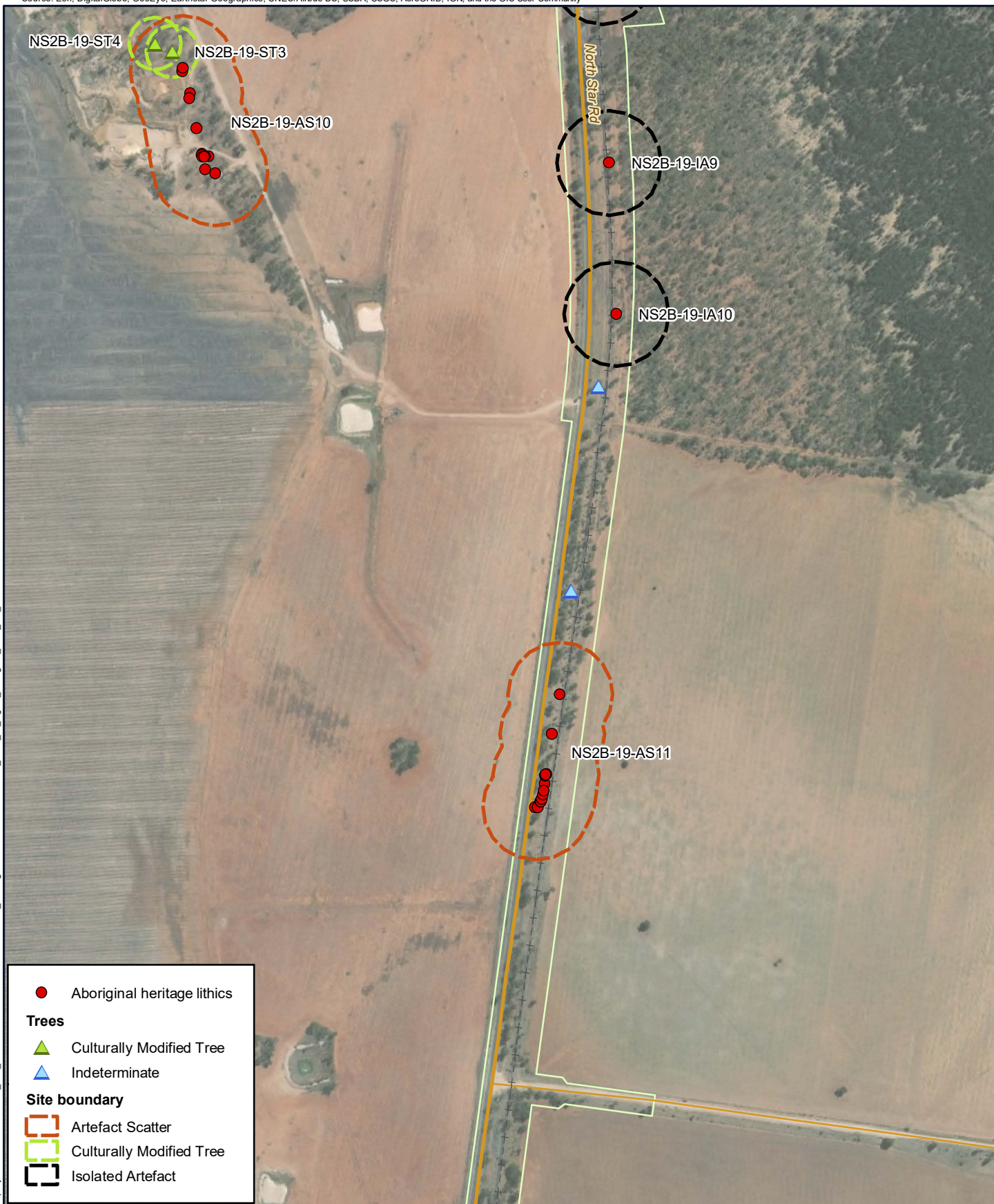


Legend

- + - Existing rail (non-operational)
- Major roads
- Minor roads
- Construction footprint

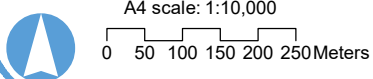


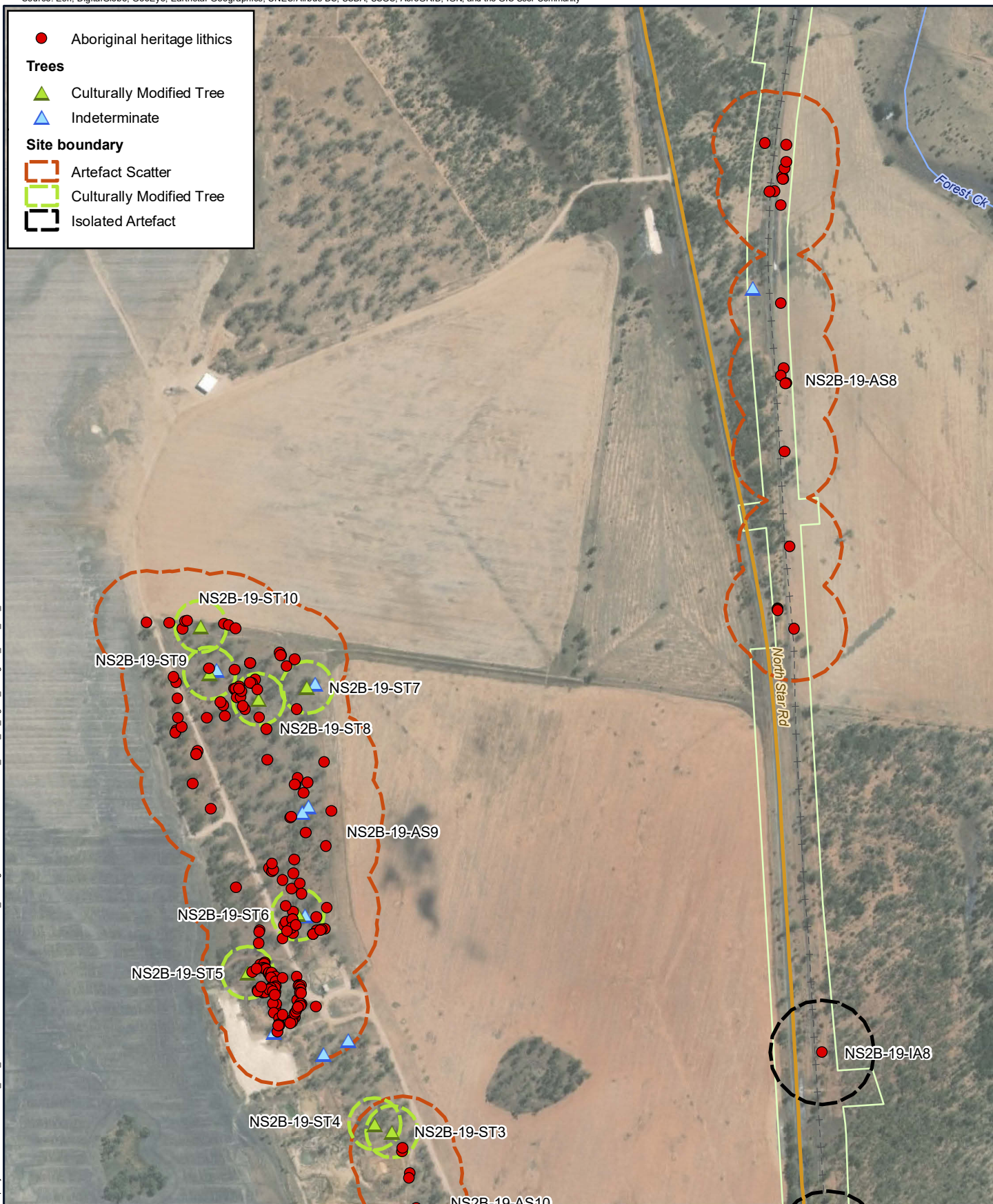
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Legend

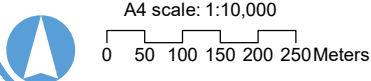
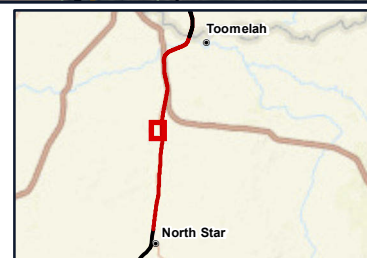
- + - Existing rail (non-operational)
- Major roads
- Minor roads
- Construction footprint

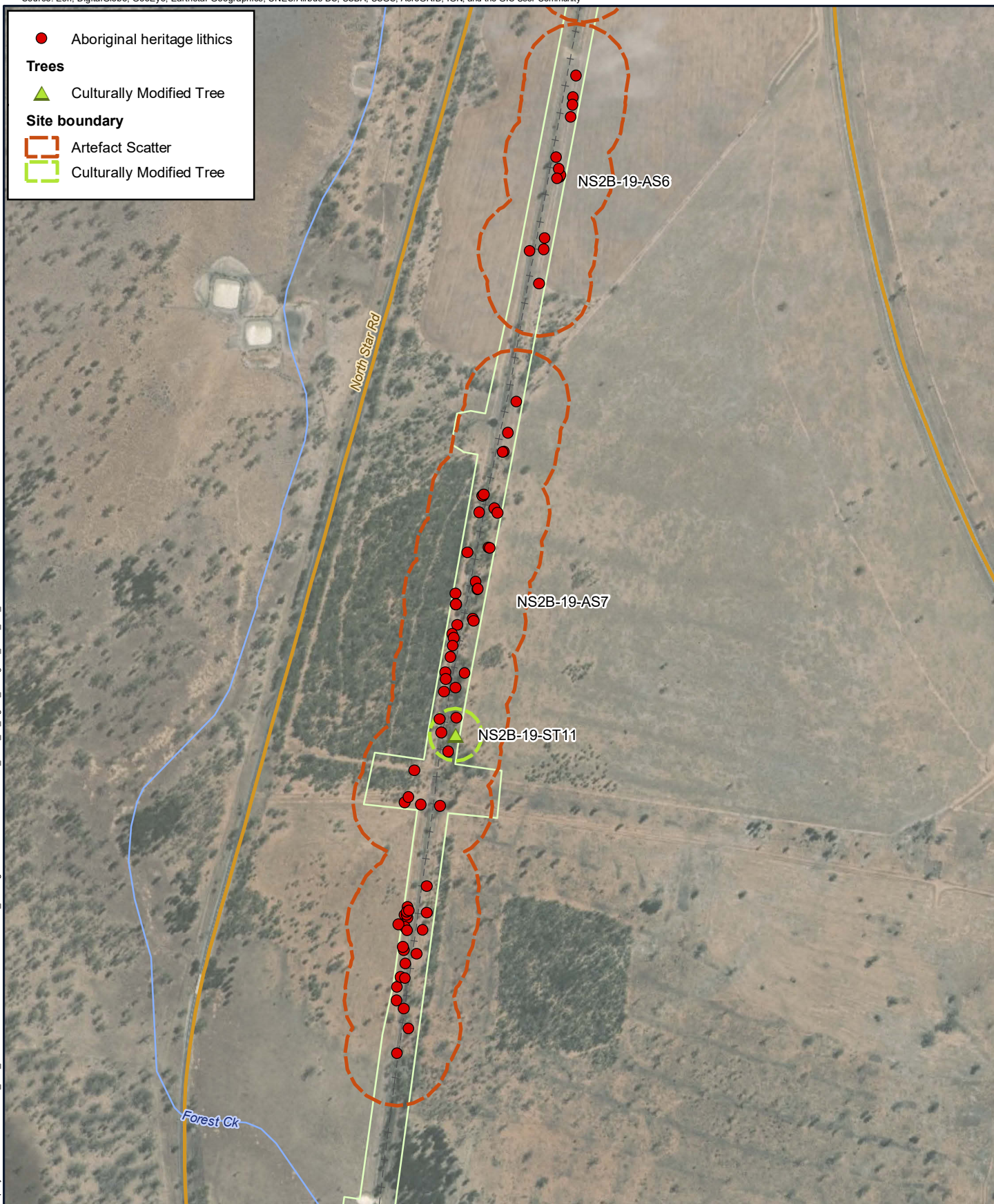




Legend

- - - Existing rail (non-operational)
- Major roads
- Watercourses
- Construction footprint





Legend

- + - Existing rail (non-operational)
- Major roads
- Watercourses
- Construction footprint



A4 scale: 1:10,000
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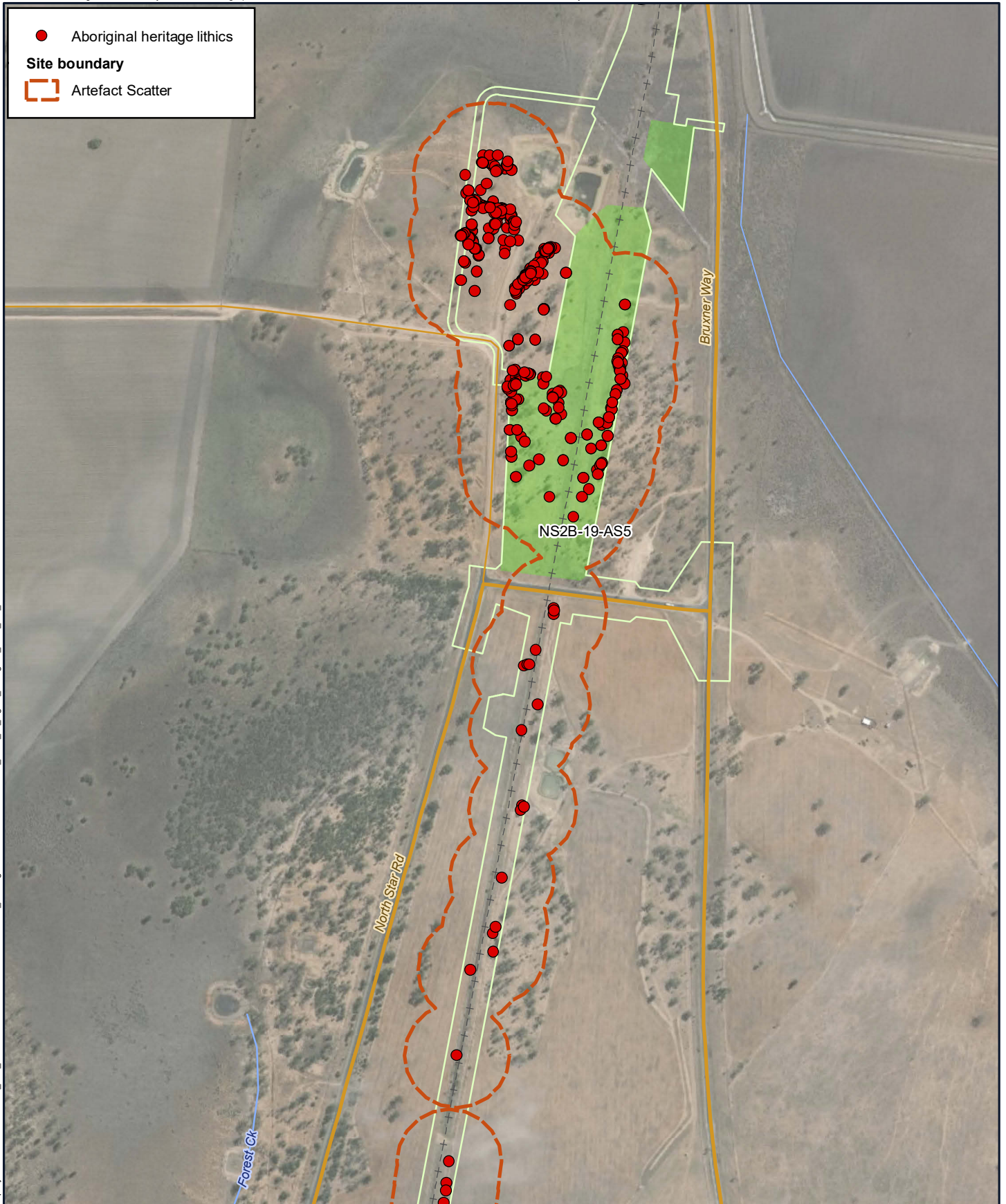


Date: 18/02/2020 Version: 5
 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

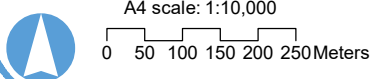
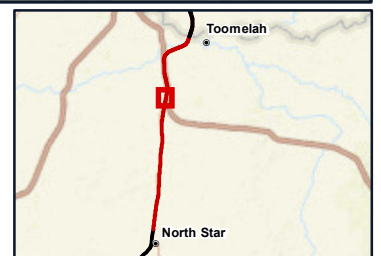
Figure 7.3g:
 Aboriginal archaeological sites - alignment

Map by: MEF\IGN Z:\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FF JV_IH_Fig7.3_Aboriginal_Sites_MB_v5.mxd Date: 18/02/2020 14:25



Legend

- + - Existing rail (non-operational)
- Major roads
- Minor roads
- Watercourses
- Construction footprint
- Proposed laydown area

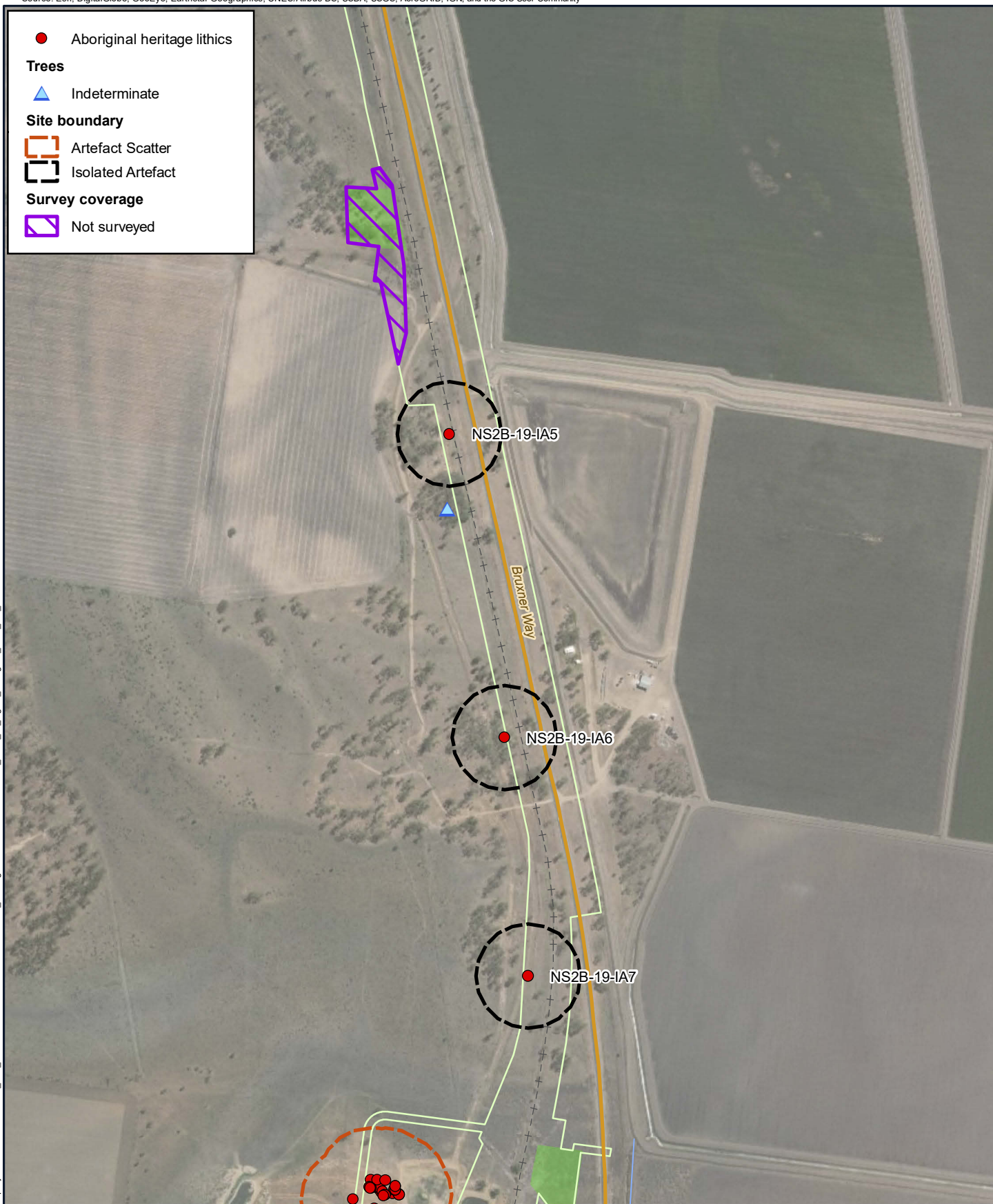


Date: 18/02/2020 Version: 5
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North Star to NSW/QLD border

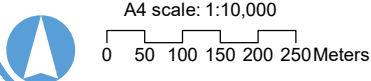
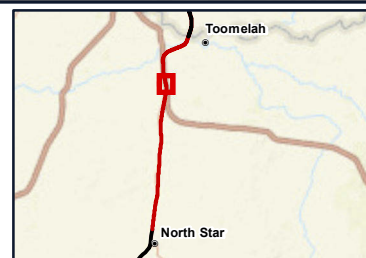
Figure 7.3h:
 Aboriginal archaeological sites - alignment

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Legend

- + - Existing rail (non-operational)
- Major roads
- Construction footprint
- Proposed laydown area

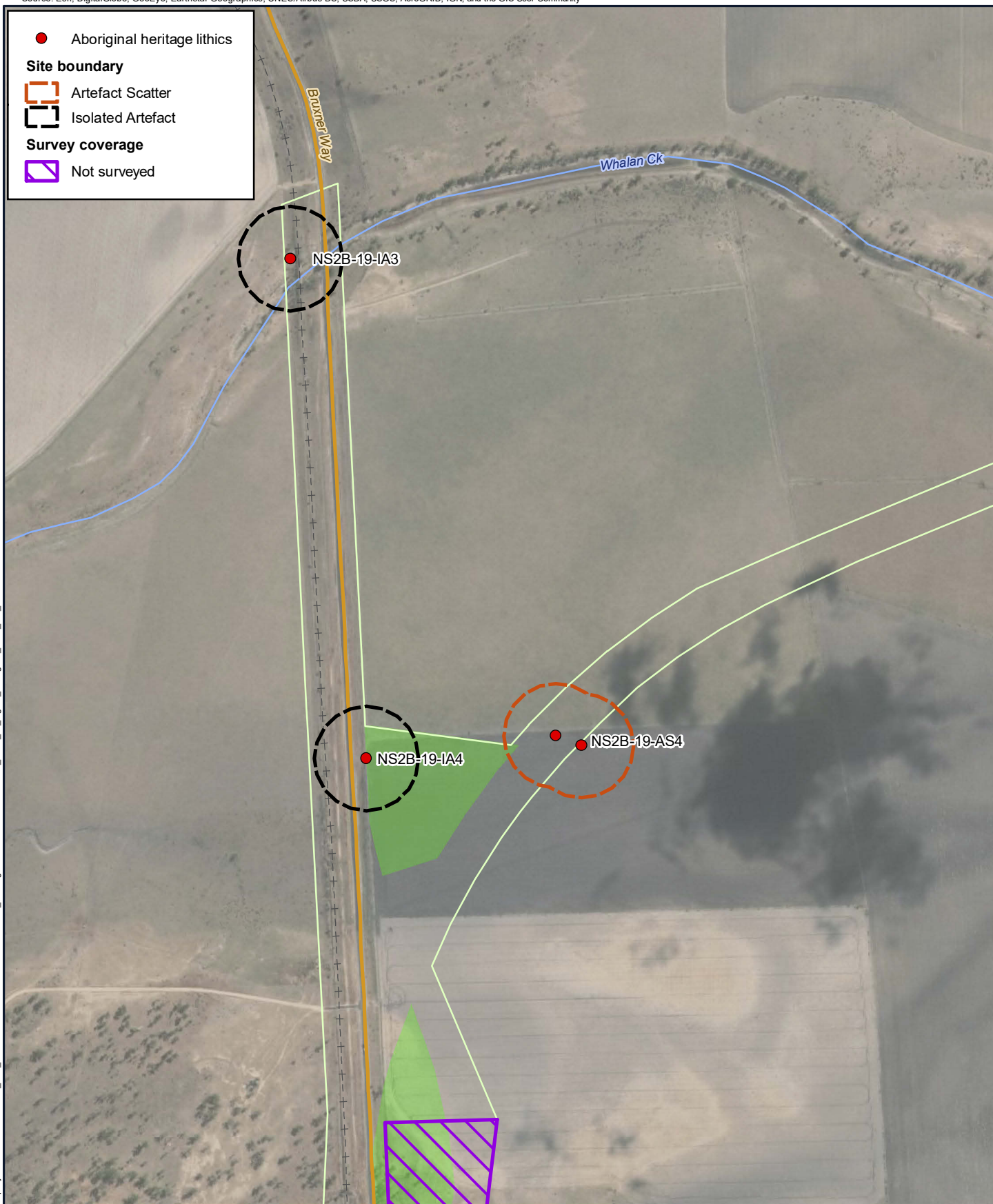


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North Star to NSW/QLD border

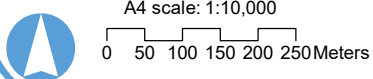
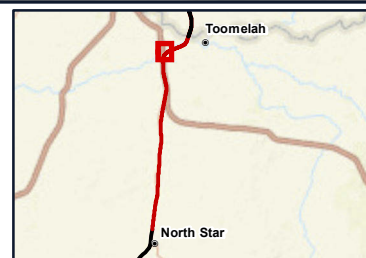
Figure 7.3i:
Aboriginal archaeological sites - alignment

Map by: MEF\IGN Z:\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FF JV_IH_Fig7.3_Aboriginal_Sites_MB_v5.mxd Date: 18/02/2020 14:25



Legend

- + - Existing rail (non-operational)
- Major roads
- Watercourses
- Construction footprint
- Proposed laydown area

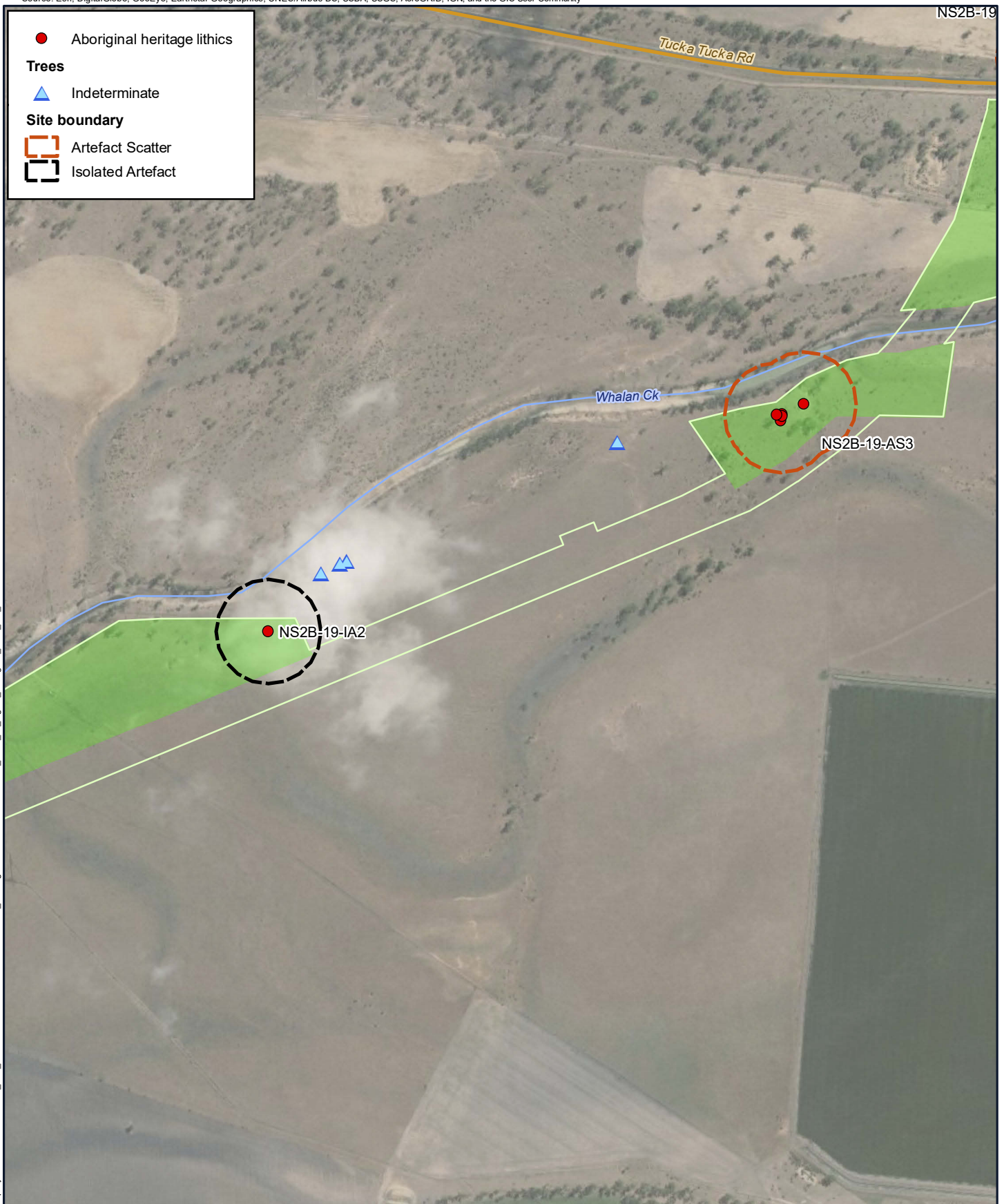


Date: 18/02/2020 Version: 5
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North Star to NSW/QLD border

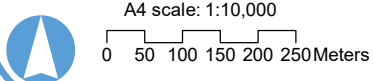
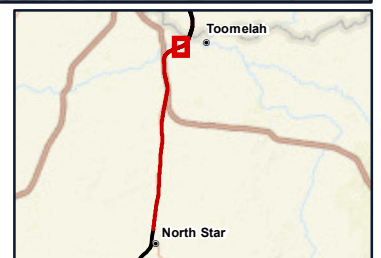
Figure 7.3j:
 Aboriginal archaeological sites - alignment

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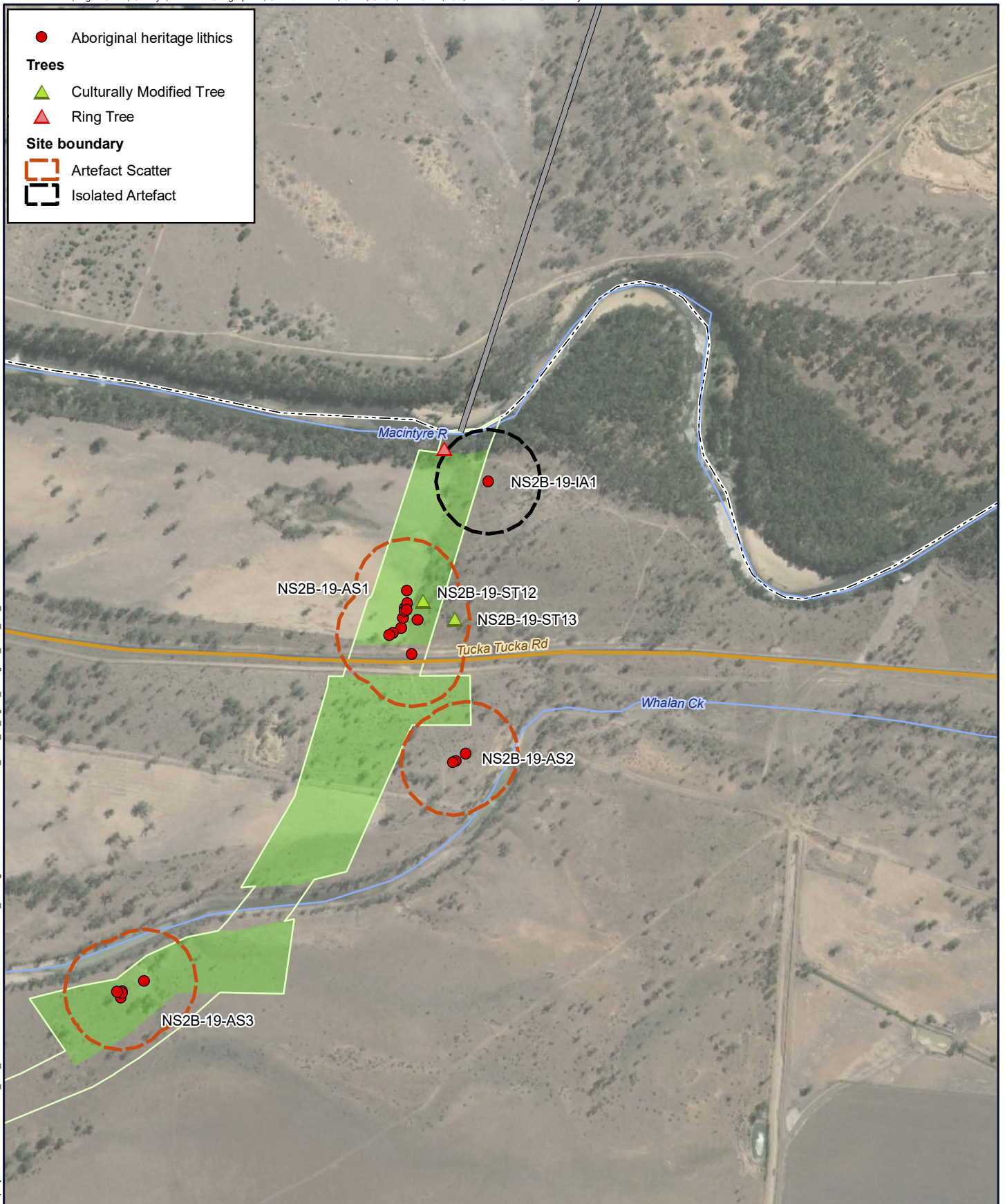


Legend

- Major roads
- Watercourses
- Construction footprint
- Proposed laydown area

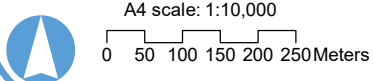
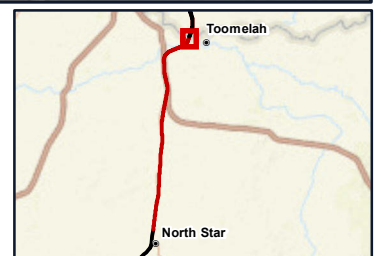


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Legend

- Major roads
- Watercourses
- NSW/QLD border
- Construction footprint
- Proposed laydown area



Date: 18/02/2020 Version: 5
Coordinate System: GDA 1994 MGA Zone 56


North Star to NSW/QLD border

Figure 7.3I:
Aboriginal archaeological sites - alignment


Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FFJV_IH_Fig7.4_Borrow_Pits_MB_v4.mxd Date: 17/02/2020 09:11

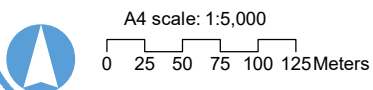


Legend

 Borrow pits

Survey coverage

 Not surveyed



Date: 14/02/2020 Version: 4
 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 7.4a:
Aboriginal archaeological sites – borrow pits

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-2019\10221331_Heritage\270-ECH-2019\10221331_FFJV_IH_Fig7.4_Borrow_Pits_MB_v4.mxd Date: 17/02/2020 09:11



Legend

Borrow pits

● Aboriginal heritage lithics

Site boundary

Artefact Scatter



A4 scale: 1:5,000
 0 25 50 75 100 125 Meters



Date: 14/02/2020 Version: 4
 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 7.4b:
Aboriginal archaeological sites – borrow pits

Map by: MEF\GN Z:\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FFJV_IH_Fig7.4_Borrow_Pits_MB_v4.mxd Date: 17/02/2020 09:11



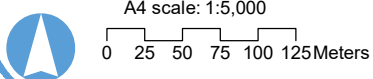
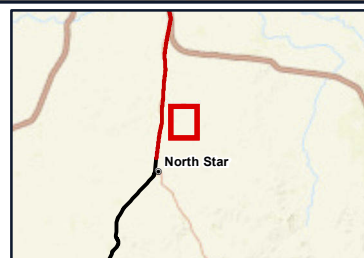
Legend

Borrow pits

● Aboriginal heritage lithics

Site boundary

Artefact Scatter

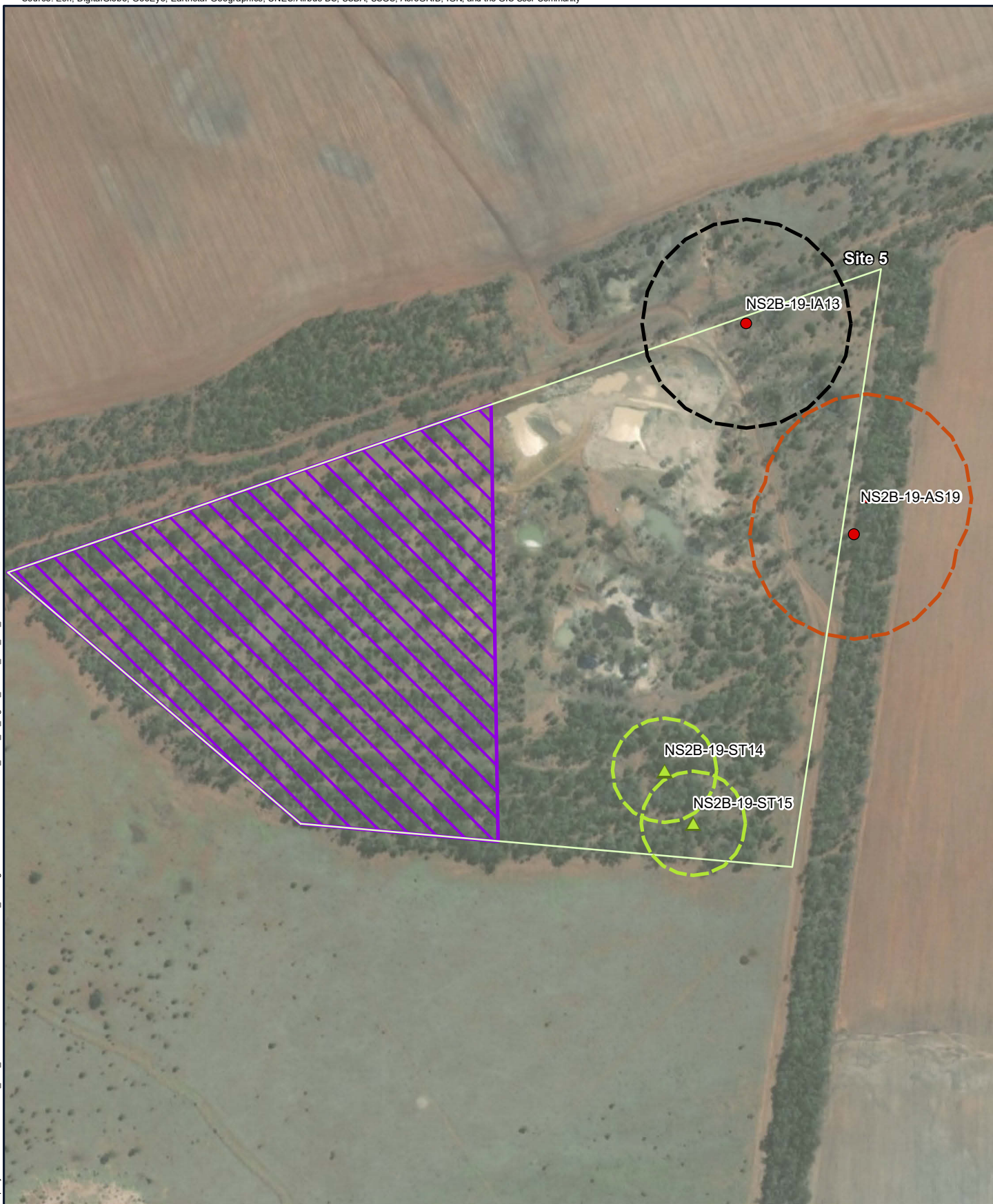


Date: 14/02/2020 Version: 4
 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 7.4c:
Aboriginal archaeological sites – borrow pits

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FFJV_IH_Fig7.4_Borrow_Pits_MB_v4.mxd Date: 17/02/2020 09:11



Legend

Borrow pits

● Aboriginal heritage lithics

Trees

▲ Culturally Modified Tree

Site boundary

Artefact Scatter

Culturally Modified Tree

Isolated Artefact

Survey coverage

Not surveyed



A4 scale: 1:5,000
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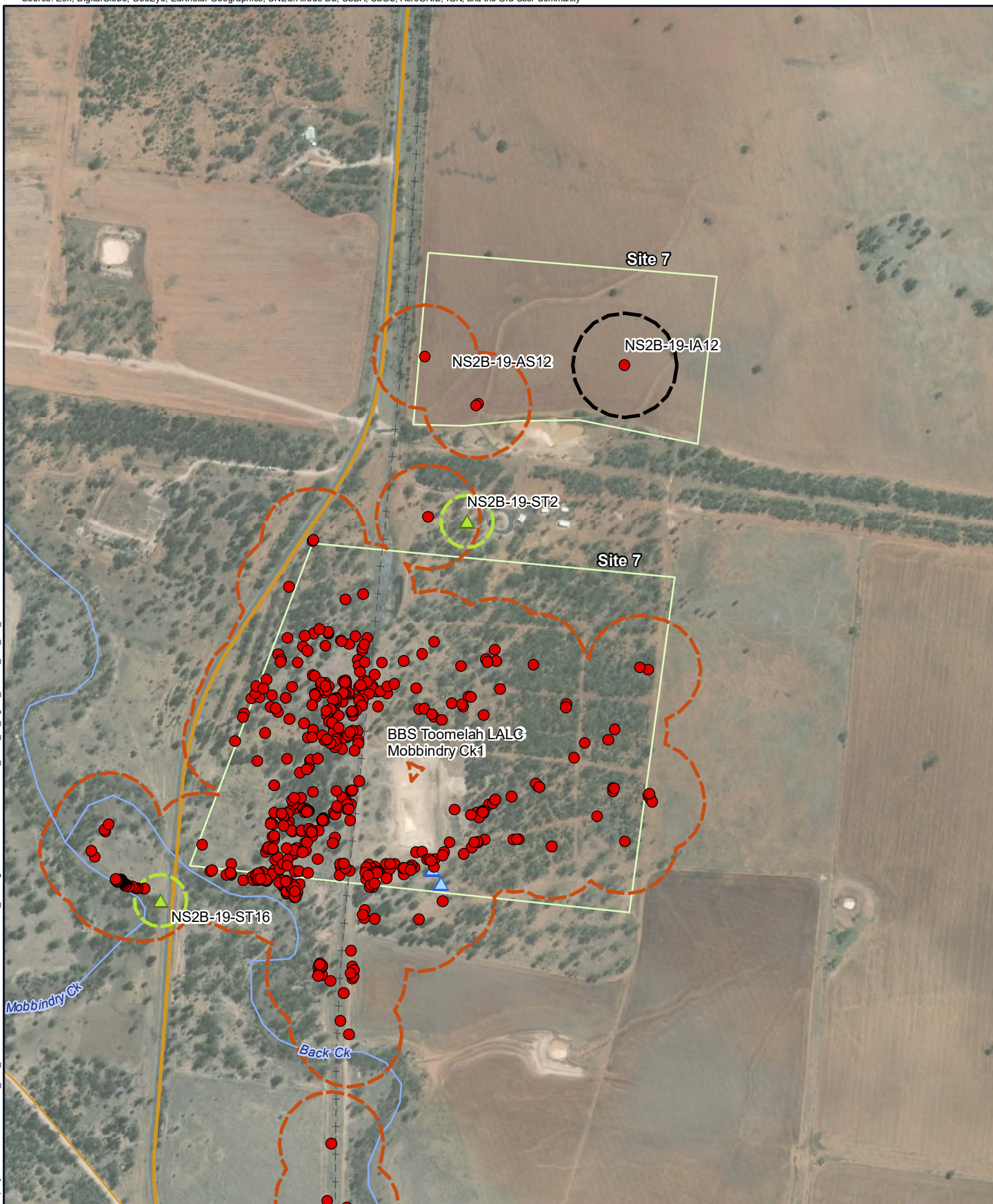


Date: 14/02/2020 Version: 4
Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 7.4d:
Aboriginal archaeological sites – borrow pits

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-2019\10221331_Heritage\270-ECH-2019\10221331_FFJV_IH_Fig7.4_Borrow_Pits_MB_v4.mxd Date: 17/02/2020 09:11



Legend

- - - Existing rail (non-operational)
- Major roads
- Minor roads
- Watercourses
- Borrow pits

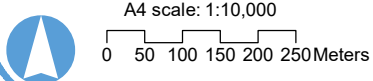
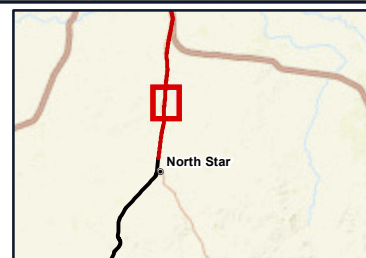
● Aboriginal heritage lithics

Trees

- ▲ Culturally Modified Tree
- ▲ Indeterminate

Site boundary

- Artefact Scatter
- Culturally Modified Tree
- Isolated Artefact

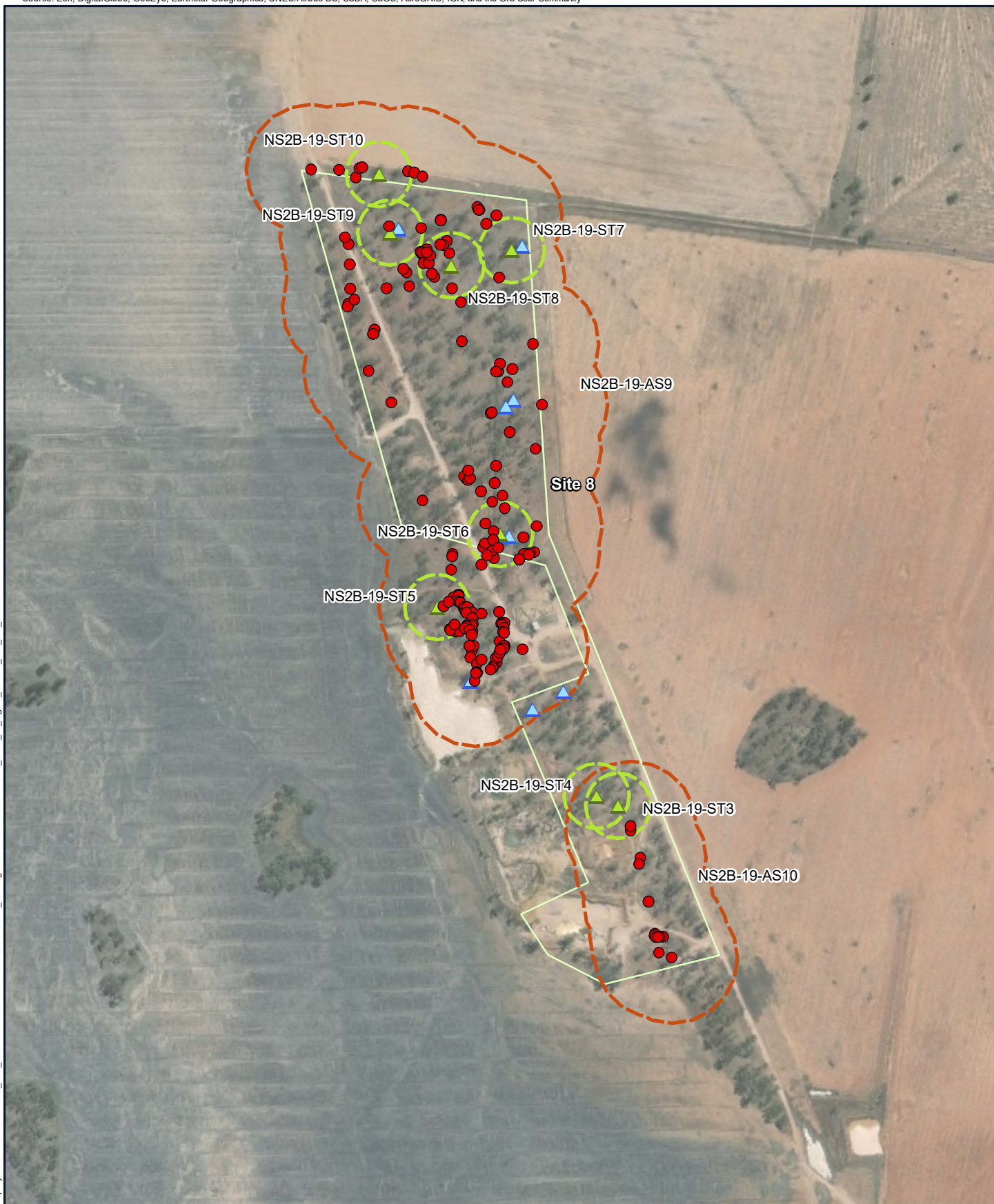


Date: 14/02/2020 Version: 4
Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 7.4e:
Aboriginal archaeological sites – borrow pits

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FFJV_IH_Fig7.4_Borrow_Pits_MB_v4.mxd Date: 17/02/2020 09:11



Legend

Borrow pits

Aboriginal heritage lithics

Trees

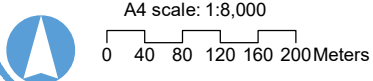
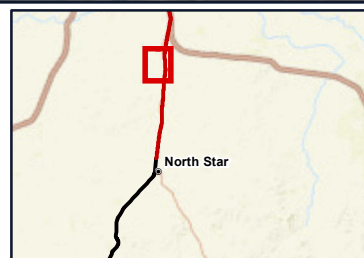
Culturally Modified Tree

Indeterminate

Site boundary

Artefact Scatter

Culturally Modified Tree

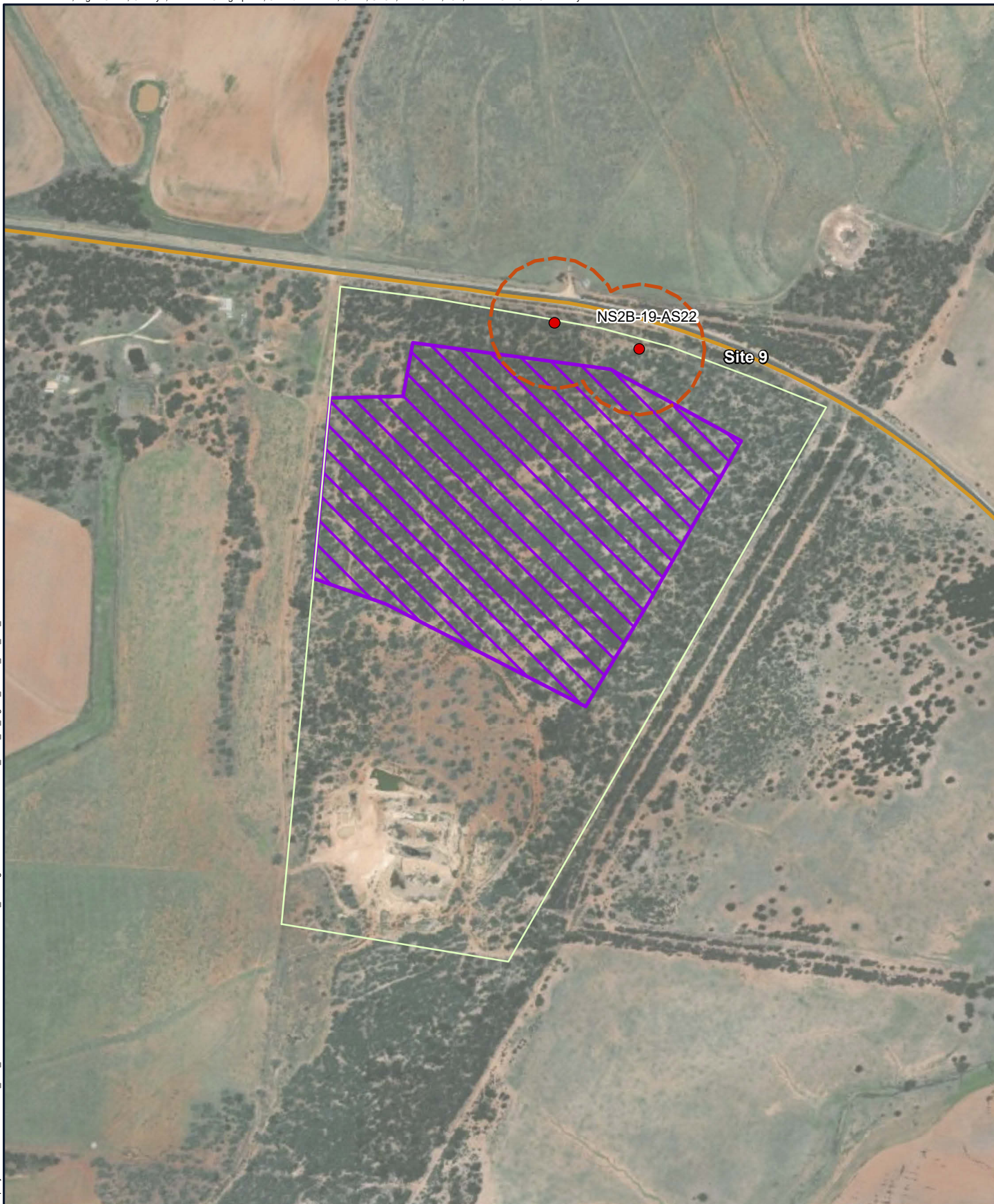


Date: 14/02/2020 Version: 4
 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 7.4f:
 Aboriginal archaeological sites – borrow pits

Map by: MEF\GN Z:\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FFJV_IH_Fig7.4_Borrow_Pits_MB_v4.mxd Date: 17/02/2020 09:11



Legend

- Major roads
- Borrow pits

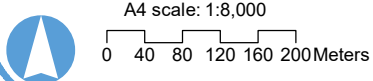
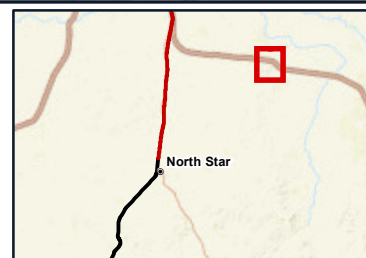
- Aboriginal heritage lithics

Site boundary

- Artefact Scatter

Survey coverage

- Not surveyed

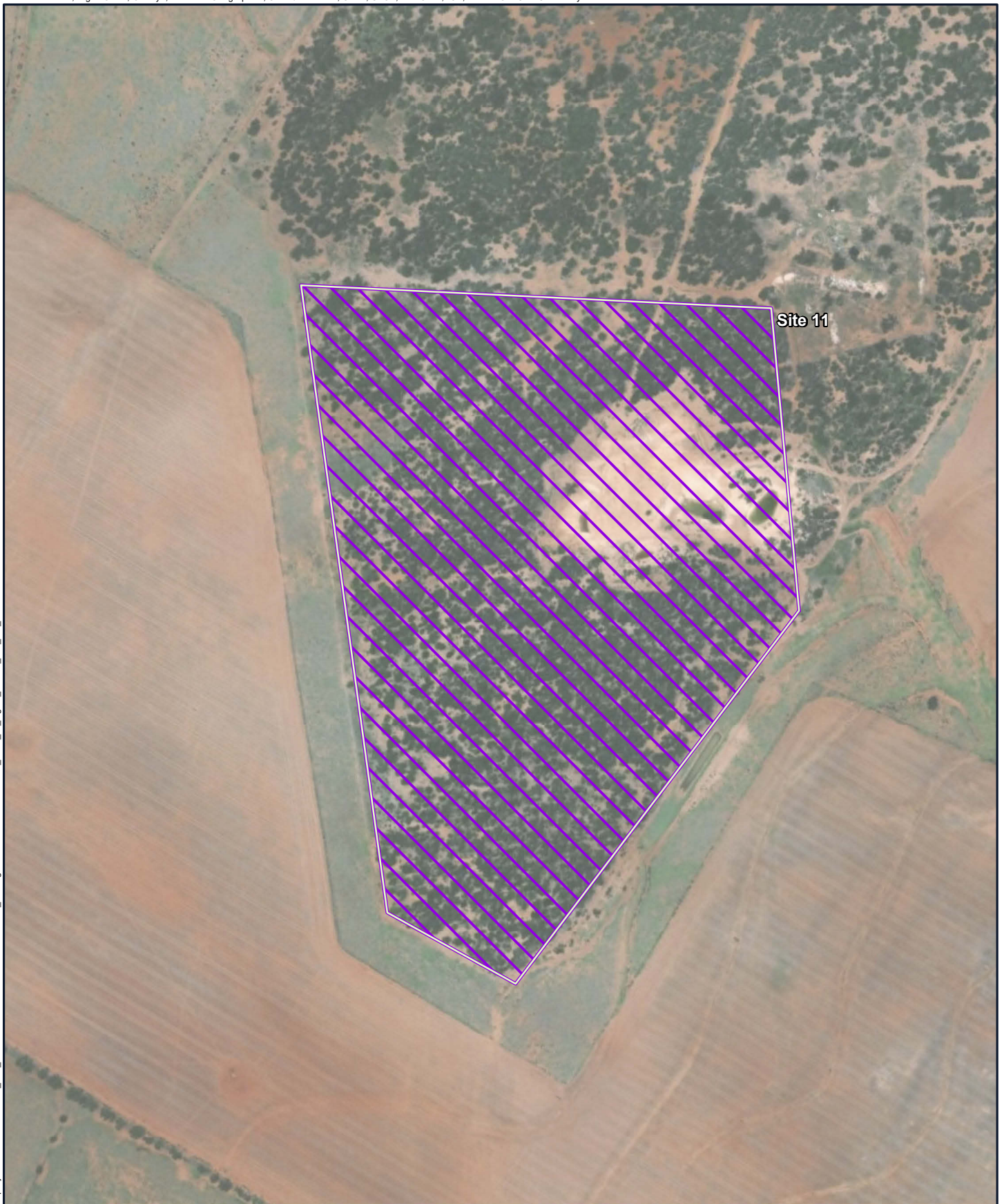


Date: 14/02/2020 Version: 4
 Coordinate System: GDA 1994 MGA Zone 56


North Star to NSW/QLD border

Figure 7.4g:
Aboriginal archaeological sites – borrow pits


Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-20191022\1331_Heritage\270-ECH-20191022\1331_FFJV_IH_Fig7.4_Borrow_Pits_MB_v4.mxd Date: 17/02/2020 09:11



Legend

 Borrow pits

Survey coverage

 Not surveyed



A4 scale: 1:5,000
 0 25 50 75 100 125 Meters



Date: 14/02/2020 Version: 4
 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 7.4h:
 Aboriginal archaeological sites – borrow pits

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-20191022\331_Heritage\270-ECH-20191022\331_FFJV_IH_Fig7.4_Borrow_Pits_MB_v4.mxd Date: 17/02/2020 09:11



Legend

- Major roads
- Borrow pits



A4 scale: 1:5,000
 0 25 50 75 100 125 Meters



Date: 14/02/2020 Version: 4
 Coordinate System: GDA 1994 MGA Zone 56


North Star to NSW/QLD border

Figure 7.4i:
Aboriginal archaeological sites – borrow pits


Map by: MEF\GN Z:\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FFJV_IH_Fig7.4_Borrow_Pits_MB_v4.mxd Date: 17/02/2020 09:11



Legend

 Borrow pits

Survey coverage

 Not surveyed



A4 scale: 1:5,000
 0 25 50 75 100 125Meters



Date: 14/02/2020 Version: 4
 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 7.4j:
Aboriginal archaeological sites – borrow pits

Map by: MEF\IGN Z:\GIS\GIS_270_NS2B\Tasks\270-ECH-2019\10221331_Heritage\270-ECH-2019\10221331_FFJV_IH_Fig7.4_Borrow_Pits_MB_v4.mxd Date: 17/02/2020 09:11



Legend

- Minor roads
- Borrow pits

- Aboriginal heritage lithics

Site boundary

- Artefact Scatter



A4 scale: 1:5,000
 0 25 50 75 100 125Meters



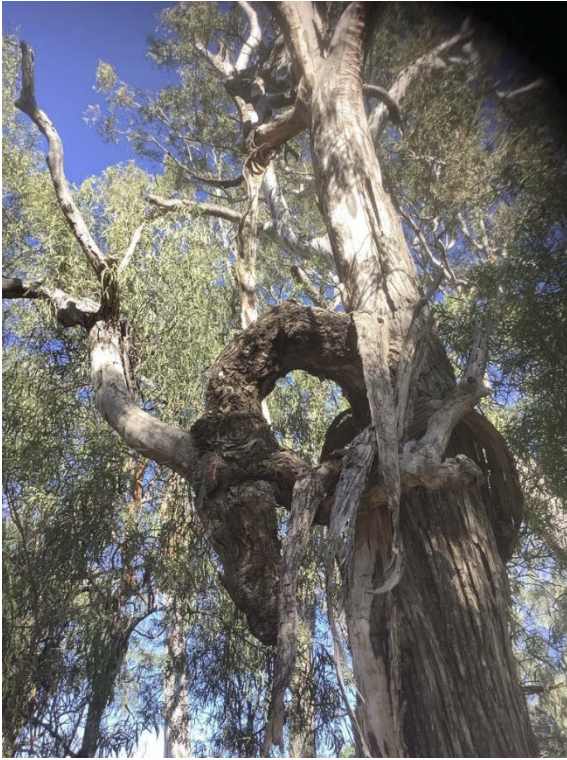
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 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 7.4k:
 Aboriginal archaeological sites – borrow pits

7.5.3 Tangible Heritage – Ring Tree (NS2B-19-RT1)

A “ring tree” was located on the southern banks of the Macintyre River approximately where the proposed viaduct crosses the river. Ring trees (sometimes called hoop trees) are trees where branches have grown together, fusing and forming a ring. Ring trees can occur through both natural (inosculation) and cultural (grafting) means. Ring trees are considered controversial in Australian archaeology and Aboriginal communities, as there has been limited study into their origins or purpose (Hope 2015; Lawrence 2009). Field representatives on the survey, identified this tree is being a marker tree either symbolising a border or point of interest (camp site). Despite this tree’s proximity to Toomelah, it was not previously known to the local field representatives.



Photograph 7.1 The “ring” of the ring tree shown bent over and growing around the branch below



Photograph 7.2 Context shot of ring tree on vehicle track leading down to Macintyre River. Note that a separate tree is growing in front

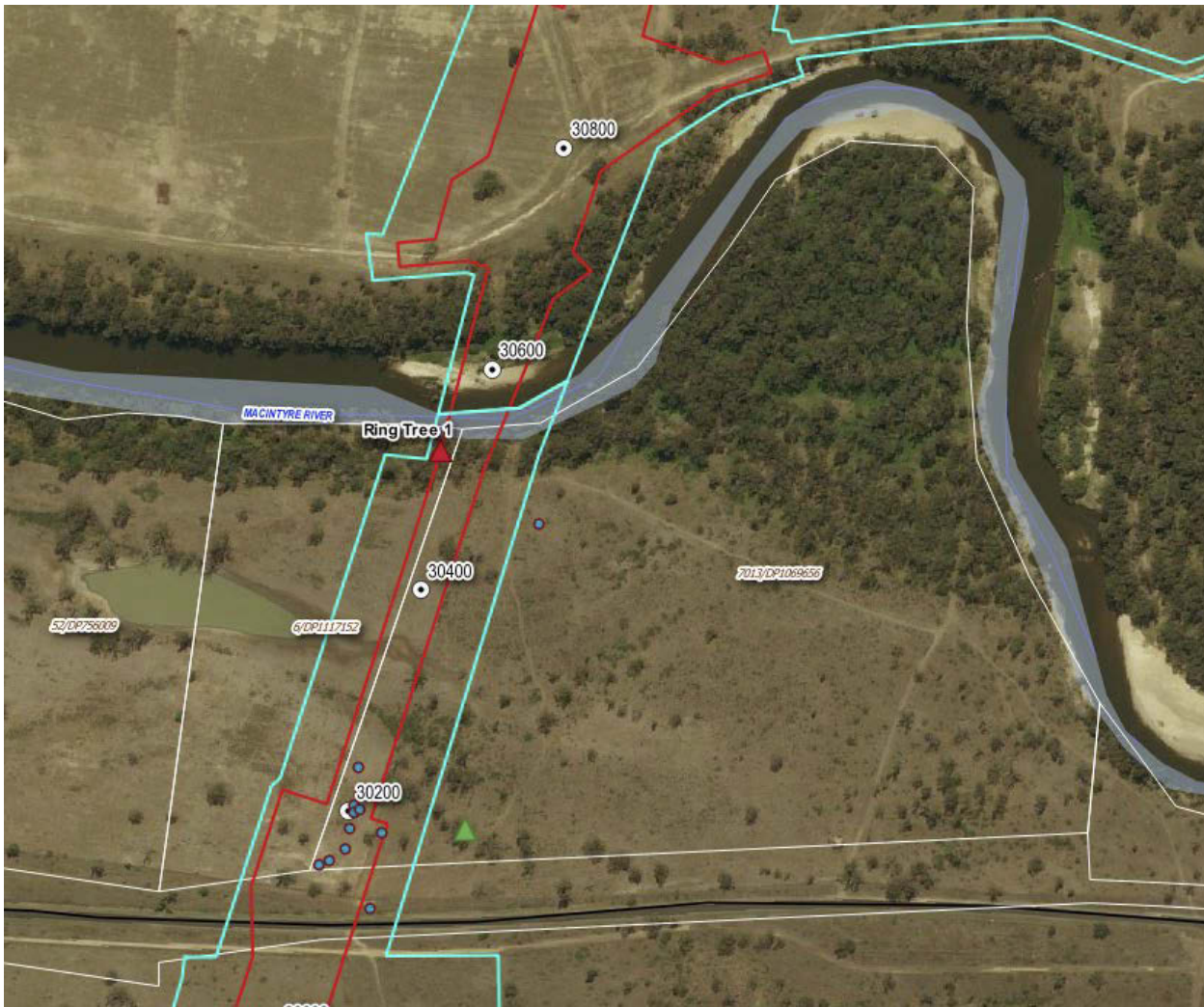


Figure 7.5 Location of ring tree on the southern banks of the Macintyre River and on the boundary with the permanent disturbance footprint (red line)

7.5.4 Intangible Heritage – Plant resources (NS2B-19-IH1)

In addition to archaeological resources, RAP field representatives identified at least 16 commonly found plant resources that are traditionally used by past and current Aboriginal people as bush foods and medicines. The plant resources of the Border Rivers and Gywdir Catchments areas have also been extensively documented in a book published by the Catchment Management Authority (McKemey and White 2011). The 16 plant species were identified within the disturbed railway easement corridor, and in some cases were growing in the remaining rail line itself, suggesting that these plants are tolerant of significant impact. Field representatives expressed a strong desire that their traditional knowledge be documented as part of this report and that management recommendations consider incorporating this knowledge into an interpretation strategy for the Inland Rail program.

These plant resources are listed in Appendix G and Figure 7.7 shows intangible Aboriginal cultural heritage sites.

7.5.5 Intangible Heritage – Watercourses (NS2B-19-IH2)

The rail alignment crosses a number of watercourses (refer Table 7.5). All watercourses were highlighted as being important cultural features to the local Aboriginal community. No specific information relating to oral tradition was provided for each crossing.

Table 7.5 Water crossings within the rail alignment

Water crossing	Location/Chainage
Mobbindry Creek	5,800
Back Creek	8,400
Forest Creek	16,500
Whalan Creek	29,600
Macintyre River	30,600

7.5.6 Other considerations

7.5.6.1 Indeterminate trees

In addition to the sixteen culturally modified trees which were identified and confirmed during the survey, an additional twenty-six modified trees were identified by survey participants that could not be convincingly demonstrated to be cultural or natural scars (refer Table 7.6). The scars on these trees were typically either diseased or damaged or the tree in question was assessed as being young and therefore not likely to have been culturally scarred. Rather than dismiss these trees immediately recommendations (refer Section 10.2.4) are made regarding their reappraisal by an arborist prior to determination as to whether or not they should be salvaged.



Photograph 7.3 Example of indeterminate scar



Photograph 7.4 Example of indeterminate scar

Table 7.6 Indeterminate culturally modified trees

Tree ID	Status	Tree type	Tree condition
Tree 1	Indeterminate	Box Gum	Diseased
Tree 2	Indeterminate	Box Gum	Alive
Tree 3	Indeterminate	Box Gum	Dead
Tree 4	Indeterminate	Box Gum	Alive

Tree ID	Status	Tree type	Tree condition
Tree 5	Indeterminate	Box Gum	Alive
Tree 6	Indeterminate	Box Gum	Alive
Tree 7	Indeterminate	Box Gum	Alive
Tree 8	Indeterminate	Box Gum	Alive
Tree 9	Indeterminate	Box Gum	Alive
Tree 10	Indeterminate	Box Gum	Alive
Tree 11	Indeterminate	Box Gum	Dead
Tree 12	Indeterminate	Box Gum	Good
Tree 13	Indeterminate	Box Gum	Good
Tree 14	Indeterminate	Box Gum	Good
Tree 15	Indeterminate	Box Gum	Good
Tree 16	Indeterminate	Box Gum	Good
Tree 17	Indeterminate	Box Gum	Good
Tree 18	Indeterminate	Box Gum	Good
Tree 19	Indeterminate	Box Gum	Good
Tree 20	Indeterminate	Box Gum	Good
Tree 21	Indeterminate	Box Gum	Diseased
Tree 22	Indeterminate	Box Gum	Alive
Tree 23	Indeterminate	Box Gum	Alive
Tree 24	Indeterminate	Box Gum	Alive
Tree 25	Indeterminate	Box Gum	Diseased
Tree 26	Indeterminate	Box Gum	Alive

7.5.6.2 Circular feature

During the survey, a circular feature was identified in the southern half of Site 8, a proposed borrow pit for the proposal. The feature is an almost circular patch of barren ground with nearly no grass measuring approximately 8m across. A linear cleared line connects the circle and extends north east to a nearby access track.

A number of hypotheses were put forward to explain this feature including:

- The small ring and path of a ceremonial complex known as a bora ring – Bora rings (also known in Queensland as kipper rings) are earthen structures constructed for the dual purposes of holding corroborees and also for the initiation of young men. Typically, these complexes consisted of a larger ring (corroboree) connected to a smaller ring (initiation) by a path (Petrie 1904, p. 51) (refer Figure 7.6). Bowdler (1999) described the size of the larger ring as 25-30m across with the smaller ring being on average 10 to 12 m with a path running south west from the larger ring to the smaller ring. Satterthwait and Heather (1987) concurred with this finding in their extensive review of bora rings around Brisbane, confirming that the smallest recorded size for a ring was 10m while pathways tended to depart from the main circle between 135° SE and 224° SW. Bowdler also noted that earth was typically mounded up 25 to 50 cm in height for most bora rings, however in this case there doesn't appear to be any mounding.
- A deflated ant/termite nest (particularly that of the meat ant (*Iridomyrmex purpureus*) – During usage of a nest, some species of ants and termites will either passively (through construction of the nest) or actively (removal of vegetation/gravel) clear an area around their nest which may be circular in shape. After the nest is abandoned, the mound will slowly deflate over time leaving a cleared area. However, ant and termite nests in this area of NSW are rarely more than 1-2m in size.

- Storage of farm equipment – It was postulated that a piece of circular infrastructure such as a water tank may have been stored in this location over a long period of time, leading to compacted soil and little to no vegetation growth. While this is a possibility, it does not explain the cleared line extending away from the circular feature. Nor does it seem likely as a nearby tree branch has grown across the circular feature and shows no sign of damage from the placement and relocation of such infrastructure.

The nature of this feature remains unresolved. To clarify the status of this feature, further investigations are recommended in Section 10.2.5.

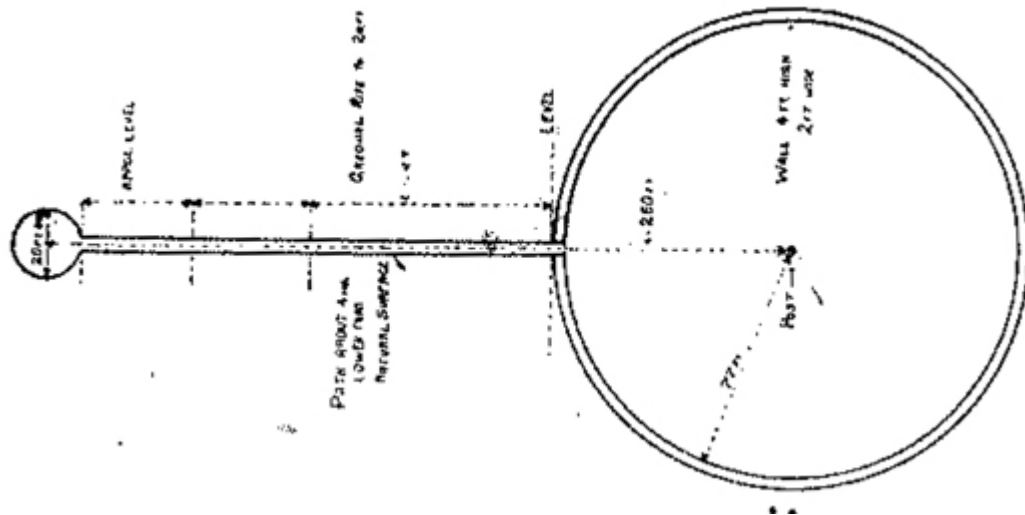


Figure 7.6 Schematic of a bora ground showing a larger ‘public’ ring connected to a smaller ring by a path

Source: Bowdler, 2001



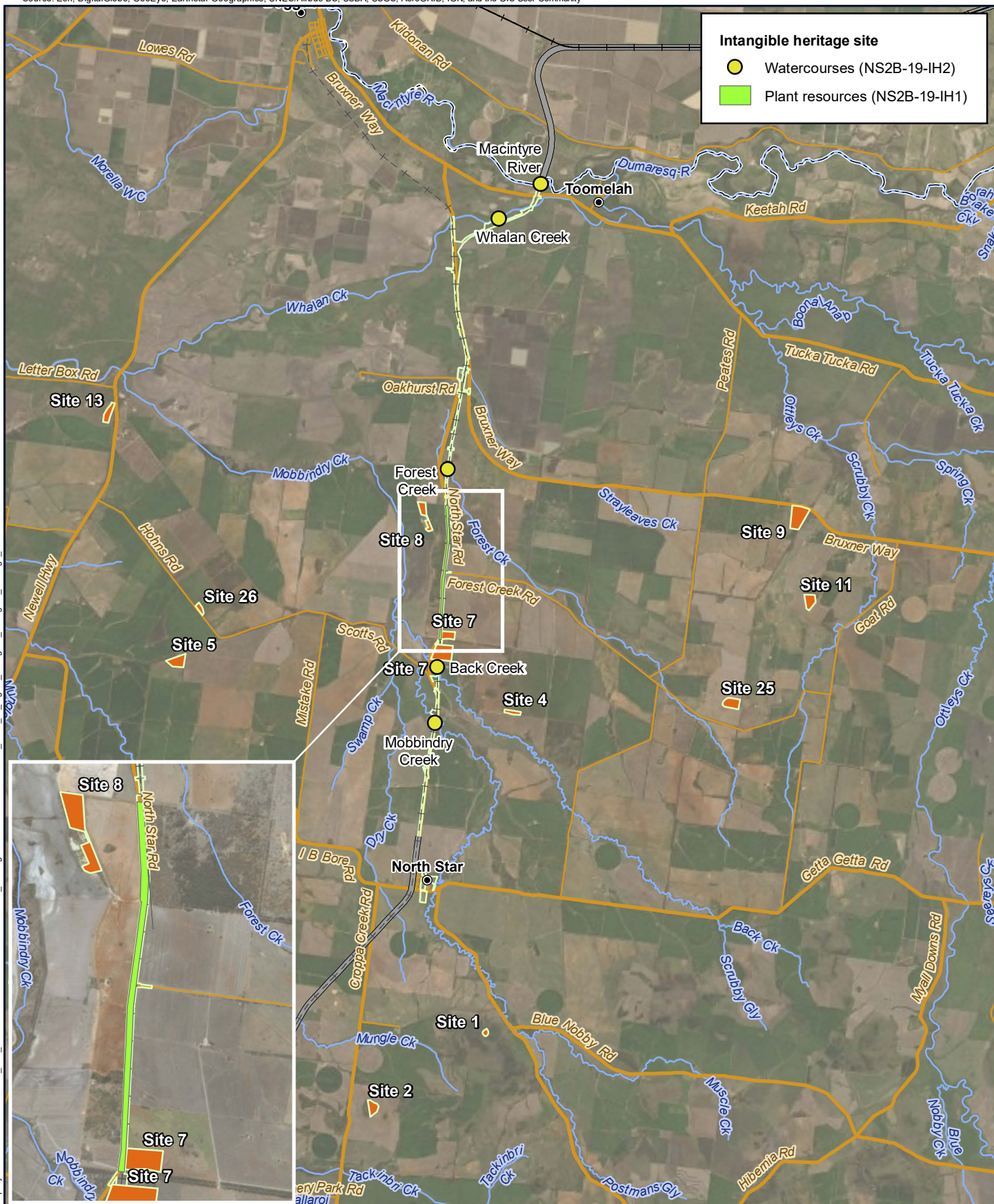
Photograph 7.5 Circular feature looking west



Photograph 7.6 Circular feature looking east



Photograph 7.7 Circular feature looking west

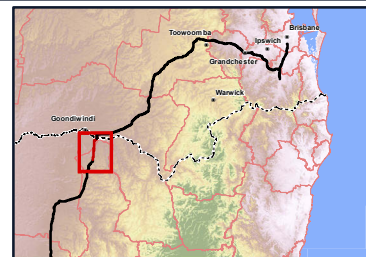
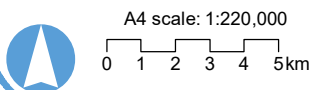


Intangible heritage site

- Watercourses (NS2B-19-IH2)
- Plant resources (NS2B-19-IH1)

Legend

- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- Watercourses
- - - NSW/QLD border
- Construction footprint
- Borrow pits



7.6 Spatial distribution

The distribution of Aboriginal archaeological materials within any given landscape can be assessed from two analytical positions. The first, known as a site-based approach, utilises the 'site' as the basic unit of analysis whilst the second, referred to as a non-site approach, utilises the individual artefact as the unit of analysis.

The non-site approach is employed here as a means of assessing the relationship of recorded artefacts to the environmental variables of distance to water and landform.

7.6.1 Distance to watercourse

The proximity and permanency of potable water sources are routinely cited as key determinants of Aboriginal settlement patterns (White and McDonald 2010). Accordingly, Table 7.7 tabulates the relationship of these variables to recorded artefact locations within the proposal site. Low artefact counts are likely to skew the analysis somewhat and caution must be taken with this analysis on that basis. However preliminary indicators suggest that those watercourses with permanent water (higher Strahler order) are more likely to be associated with Aboriginal heritage.

Over 80% of the identified lithic resource was found in proximity to large established creek lines (4th order and higher). First and second order stream lines within the Proposal area are unlikely to have been a source of permanent potable water, unlike 3rd and 4th order streams including Whalan Creek, Mobbindry Creek, Back Creek and Forest Creek. This matches the observations of Balme (1986) and Bonhomme (1987) who identified major sites on established creek lines and waterholes with permanent water. See the Biodiversity technical report prepared for the North Star to NSW/QLD border EIS for further information on stream order mapping.

Table 7.7 Relationship between watercourses distance/stream order and artefact

Distance to water source (m)	Strahler order				Total artefact	% of total artefact
	1	2	3	4+		
0 – 100		8		227	227	15%
101 – 200	28			200	200	14%
201 – 300	27	6		316	316	22%
301 – 400	2	15	48	92	92	10%
401 – 500+	86	14	84	420	604	38%
Total	143	43	132	1255	1573	
% of Total vs. Stream Order	9%	3%	8%	80%		

7.6.2 Landform analysis

As with the stream order analysis (refer Section 7.6.1), the low number of stone artefacts in most of the recorded sites identified limits the true statistical value of landform analysis. Flats, particularly those associated with water, are the dominant landform in this analysis (refer Table 7.8). There are obviously some other considerations that must be noted when comparing different landforms:

- **Drainage** – while flats are noted as being high in artefact density, some parts of the study area are flats without suitable contributory factors (permanent water, etc.). Archaeology is not expected in these locations.
- **Soils** – Closely linked to drainage is the type of soils. Chromosols (referred to in the general area as 'red soils') are considered to be well drained soils as opposed to vertosols or 'black soils'. It is expected that Aboriginal archaeological sites will be concentrated on the chromosols, where the free draining sediments offer attractive living areas. Alternatively, very few, if any, sites will be located on the poorly draining black soils, which are given to inundation and are unsuitable for occupation (refer Figure 7.8).

- Past disturbance – Past disturbance can have an influence on the numbers of artefacts one may find on a survey. This factor can be discarded when artefact counts are higher, normalising the statistical analysis.
- GSV – The level of GSV can play a significant role in the identification of artefacts within different landforms. In the case of the flats in the below example, these artefacts would not have been identified were it not for the fact that localised erosion was occurring on the creek banks.

This analysis of lithics within the temporary proposal disturbance footprint confirms that the majority of lithic based archaeological sites are found on flats dominated by chromosol soils (refer Table 7.8).

Table 7.8 Artefact distribution in relation to landform

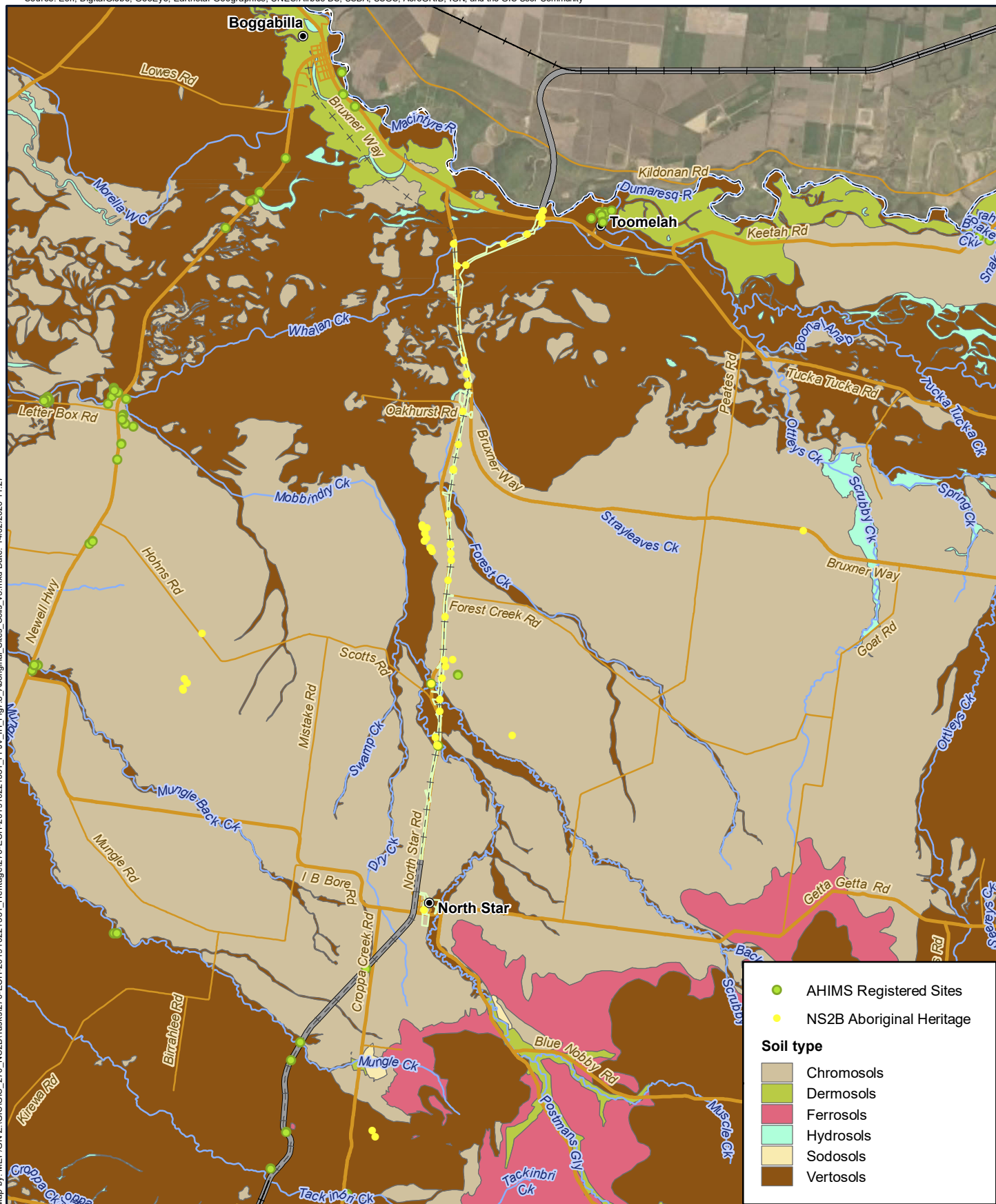
Landform	Landform area (m ²)	Area effectively surveyed (m ²)	% of landform effectively surveyed	Number of sites	Number of artefacts
Crest	89,018	22,255	25%	1	10
Flats - Chromosols	3,207,396	1,152,297	36%	28	989
Flats - Vertosols	2,015,694	456,696	23%	8	13
Lower Slope	98,301	39,320	40%	1	21
River Terrace	59,302	29,058	49%	2	11
Upper Slope	1,096,945	346,169	32%	5	11

If we combine these lithics with lithics recorded immediately outside of the temporary proposal disturbance footprint (publicly accessible land adjacent to the temporary proposal disturbance footprint at Wearne and Mungle Siding), this trend increases (refer Table 7.9). Normalising and representing the data as artefact/hectare, it suggests that lithics are almost 50% more likely to be found on flats with chromosol soils. Combined with the proximity to water analysis, it can be confidentially predicted that major sites will be located on chromosol flats within close proximity to 4th order watercourses.

Table 7.9 Combined artefact distribution in relation in relation to landform

Landform	Number of sites	Number of artefacts	Number of artefacts/ha	Total percentage of artefacts
Crest	1	10	4.49	17%
Flats - Chromosols	28	1,468	12.73	47%
Flats - Vertosols	8	13	0.28	1%
Lower Slope	1	21	5.34	20%
River Terrace	2	11	3.78	14%
Upper Slope	5	11	0.31	1%

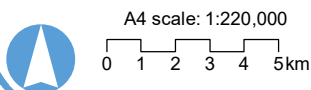
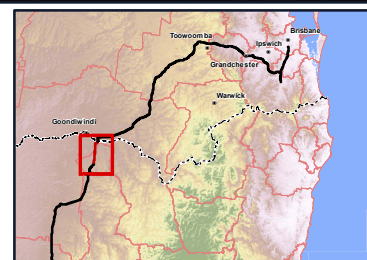
Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-2019\10221331_Heritage\270-ECH-2019\10221331_FF\JV_IH_Fig7.8_Aboriginal_Sites_Soils_v5.mxd Date: 14/02/2020 11:27



Legend

- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- Watercourses
- - - NSW/QLD border
- Construction footprint

- AHIMS Registered Sites
 - NS2B Aboriginal Heritage
- Soil type**
- Chromosols
 - Dermosols
 - Ferrosols
 - Hydrosols
 - Sodosols
 - Vertosols



7.7 Archaeological Sensitivity: Subsurface Archaeological Potential

Subsurface archaeological potential is addressed in the context of this assessment by the concept of 'archaeological sensitivity'. As a concept it relies on four key factors, comprising the nature and extent of visible surface artefacts across the study area, a review of the findings of previous archaeological investigations in analogous landforms in the surrounding area, on-site observations of post-depositional processes and historic ground surface disturbances. Using these variables, the level of archaeological sensitivity has been graded into three categories: nil, low and high. These ratings have then been applied to the study area to assess levels of potential subsurface deposit.

Much of the study area, particularly the northern and southern sections have been assessed as being of low archaeological sensitivity. These areas of low sensitivity are associated with vertosol soils or are over 500m from a main watercourse. Areas of high archaeological sensitivity have been characterised by areas where surface artefacts have been identified in densities considered greater than 'background scatter'. These areas are significantly associated with areas of well drained land (chromosol soils) fringing flood prone area (vertosol soils). Areas of nil archaeological sensitivity are associated with areas of gross disturbance.

Relative to areas of low sensitivity, it is predicted that subsurface archaeological deposits located within areas of high sensitivity (chromosol soils fringing vertosol soils) will exhibit higher mean artefact counts, densities and assemblage richness values (i.e., with respect to the representation of technological types and raw materials). Archaeological features such as knapping floors and hearths are also more likely to occur in these areas.

Areas of 'nil' archaeological sensitivity within the study area comprise those associated with vertosols (also known as 'black soils') and areas where significant vegetation clearance has occurred. Aboriginal archaeological materials are unlikely to be present in these areas.

Regarding the validity or accuracy of the sensitivity ratings, it should be noted that sensitivity mapping has been undertaken on a broad-scale and significant variation in artefact densities/complexity within areas of identified archaeological sensitivity is considered likely. Sensitivity mapping is provided to guide management of the study area's archaeological resource and would be managed as part of the ACHMP.

8 Scientific values and significance assessment

8.1 Principles of assessment

Heritage sites hold value for different communities in a variety of different ways. All sites are not equally significant and thus not equally worthy of conservation and management (Pearson and Sullivan 1995, p. 17). One of the primary responsibilities of cultural heritage practitioners, therefore, is to determine which sites are worthy of preservation and management (and why) and, conversely, which are not (and why) (Smith and Burke, 2007, p. 227). This process is known as the assessment of cultural significance and, as highlighted by Pearson and Sullivan (1995, p. 127), incorporates two interrelated and interdependent components. The first involves identifying, through documentary, physical or oral evidence, the elements that make a heritage site significant, as well as the type(s) of significance it manifests. The second involves determining the degree of value that the site holds for society (i.e., its cultural significance) (Pearson and Sullivan 1995, p. 126).

In Australia, the primary guide to the assessment of cultural significance is the Australian ICOMOS Charter for Places of Cultural Significance (ICOMOS (Australia) 2013), informally known as The Burra Charter, which defines cultural significance as the “aesthetic, historic, scientific, social or spiritual value for past, present or future generations” of a site or place (ICOMOS (Australia) 2013). Under the Burra Charter model, the cultural significance of a heritage site or place is assessed in terms of its aesthetic, historic, scientific and social values, none of which are mutually exclusive (refer Table 8.1). Establishing cultural significance under the Burra Charter model involves assessing all information relevant to an understanding of the site and its fabric (i.e., its physical make-up) (ICOMOS (Australia) 2013, p. 12). The assessment of cultural significance and the preparation of a statement of cultural significance are critical prerequisites to making decisions about the management of any heritage site or place (ICOMOS (Australia) 2013, p. 11).

Table 8.1 Values relevant to determining cultural significance, as defined by Guidelines to The Burra Charter : Cultural Significance

Value	Definition
Aesthetic	Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria may include consideration of the form, scale, colour, texture and material of the fabric; the smells and sounds associated with the place and its use.
Historic	Historic value encompasses the history of aesthetics, science and society...[a] place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may have historic value as the site of an important event.
Scientific	The scientific or research value of a place will depend on the importance of the data involved, on its rarity, quality or representativeness, and on the degree to which the place may contribute further substantial information.
Social	“Social value embraces the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a majority or minority group”.

8.2 Historic value

Historic value refers to the associations that a place has with a historically important person, event, phase or activity in an Aboriginal community (NSW Office of Environment & Heritage 2011, p. 9). Historic values can but will not necessarily be represented by physical evidence.

Three key historical values were identified within or immediately adjacent to the study area:

- Toomelah Mission and Boggabilla –the historical heart of this area for the local Aboriginal community. Established in the early 1930s, Toomelah acted as a sister village to Boggabilla providing employment to residents of Toomelah and acting as a gateway to the larger settlement of Goondiwindi. The proposal is sited 2 km to the west of the current Toomelah settlement.

- The Shearing Shed - NS2B-18-H3 – Anecdotal evidence provided by representatives from Toomelah identified that the Shearing Shed (NS2B-18-H3) was used sometimes by the wider community as a dance hall. The shed was burnt down accidentally and now only foundations and debris remain. The Shearing Shed is discussed in the Historical Heritage Technical Report of the North Star to NSW/QLD Border Inland Rail EIS.
- The Boggabilla Railway Line – Many of the senior Aboriginal Party representatives identified that their relatives had worked on the NSW rail network including some who apparently had links to the Boggabilla Branch Railway Line. Rail has also historically played an important role in the local Aboriginal community, offering relatively cheap tickets for travel across the State.

No specific historical heritage value was identified for the sites identified during the survey. Further analysis (which may include dating) may result in revision of the assessment of the significance value.

8.3 Social (cultural) value

Social or cultural value refers to the spiritual, traditional, historic and contemporary associations and attachments a place or area has for Aboriginal people and can only be identified through consultation with Aboriginal people (NSW Office of Environment & Heritage 2011, p. 8).

Throughout the survey, all RAP representatives identified Aboriginal cultural heritage as being of high social/cultural value and stated that where possible, impacts to such heritage should be avoided.

8.3.1 Cultural landscape

RAPs indicated that the study area sits within a broader cultural landscape that has cultural significance for Aboriginal people. Forming part of this cultural landscape are important landscape features, such as, the Macintyre and Dumaresq Rivers, Boobera Lagoon and all minor watercourses/lagoons which surround and in some cases are found within the study area (Pearson 1973). In addition to landforms, all Aboriginal objects (i.e., stone artefacts) identified during the archaeological survey for the proposal represent links to the cultural landscape that local Aboriginal people would have inhabited in the past.

8.3.2 Aboriginal dispossession and resistance

RAPs indicated that conflict, including massacres of Aboriginal people, between Aboriginal people, local settlers and Mounted Police occurred in the region surrounding the study area. In particular, Crampton's Corner (25 kilometres to the north west of the Proposal) was noted as a massacre location (Copland 1990; Wallace 2014). The Centre for the History of Violence (CHR) research team at Newcastle University has undertaken a review of all documented massacre sites in Australia and identified three confirmed massacres located west of Goondiwindi (Crampton's Corner (1844-1847), Callandoon Station (1847) and Boonall Station (1847)) (Centre for 21st Century Humanities - Newcastle University 2019). While no massacres have been noted within close proximity to the Proposal area, a review of oral histories recorded by the NPWS Brigalow Belt studies in the early 2000s (NSW National Parks and Wildlife Service 2002b) identified a possible massacre of Aboriginal people that may have occurred at Kildonan Station on the Queensland border, but the location of this event is not accurately known.

8.3.3 Vegetation

RAPs identified that prior to European settlement, the native vegetation communities of the study area would have contained a variety of edible and otherwise useful plant species. Cross-referencing the results of the heritage surveys where RAPs identified numerous plant foods and medicines within the rail corridor with material published on bush foods (McKemey and White 2011) suggest a number of useful plant species utilised by Aboriginal people are located within the study area. Free and easy access to these bush resources was highlighted as an important aspect of the social significance of the publicly accessible components of the old Cumurra-Boggabilla railway (NS2B-19-IH1). RAPs identified that when community members would travel to neighbouring towns using the North Star Road, they would collect certain species such as Eurah/Euraba to give to relatives for their personal use. Likewise, the bumble tree (*Capparis mitchellii*) was singled out as an important women's business plant resources. Consultation with the survey team identified mature specimens of this tree as being of high cultural significance to local Aboriginal women.

8.3.4 Burials

RAPs noted that a burial site was located 1.5km east of the Proposal area on the Queensland side of the Macintyre River. The burials were uncovered at a sand quarry in 1992 and reburied adjacent to the quarry (Pardoe 1992). Limited information was able to be provided on the nature and location of the remains, however all RAPs identified the burial as being of exceptional heritage value to the local community. The identification of additional burials within sand dunes adjacent to Macintyre River was highlighted as a potential risk. The sand deposits appear to be unique to the Queensland side of the Macintyre and were not observed within the Proposal area during the survey.

8.4 Scientific (archaeological) value

Scientific value refers to the importance of a place in terms of its rarity, representativeness and the extent to which it may contribute further information (i.e., its research potential) (NSW Office of Environment & Heritage 2011).

8.4.1 Research potential

Research potential can be defined as the potential of an archaeological site to address what Bowdler (1981: 129) has referred to as "timely and specific research questions". These questions may relate to any number of issues concerning past human lifeways and environments and, as suggested by Bowdler's quote, will inevitably reflect current trends or problems in academic research (Burke & Smith 2004: 249). For their part, Bickford and Sullivan (1984: 23-4) suggest that the research potential of an archaeological site can be determined by answering the following series of questions:

1. Can the site contribute knowledge which no other resource can?
2. Can the site contribute knowledge which no other such site can?
3. Is this knowledge relevant to general questions about human history or other substantive subjects?

Several criteria can be used to assess the research potential of an archaeological site. Particularly important in the context of Aboriginal archaeology are the intactness or integrity of the site in question, its complexity (place contents) and its representativeness.

8.4.1.1 Complexity (place contents)

The complexity of a site refers primarily to the nature or character of the artefactual materials or features that constitute it but also includes site structure (e.g., the physical size of the site, spatial patterning in observed cultural materials). In the case of open artefact sites, for example, the principal criteria used to assess complexity are the site's size (i.e., number of artefacts and/or spatial extent), the presence, range and frequency of artefact and raw material types, and the presence of features such as hearths. Table 8.2 provides the assessment criteria for the complexity of the site.

Table 8.2 Complexity (place contents) criteria

Criteria	Value
No cultural heritage material	0
Place contains 1-25 artefacts	1
Place contains large number of artefacts but limited range of cultural heritage materials	2
Place contains large number of artefacts and diverse range of cultural heritage material and/or complexity of a site - site structure	3

8.4.1.2 Integrity/place condition

Integrity refers to the extent to which a site has been disturbed by natural and/or anthropogenic phenomena and includes both the state of preservation of particular remains (e.g., animal bones, plant remains) and, where applicable, stratigraphic integrity. Assessments of archaeological integrity are predicated on the notion that undisturbed or minimally disturbed sites are likely to yield higher quality archaeological and/or environmental data than those whose integrity has been significantly compromised by natural and/or anthropogenic phenomena. Establishing levels of preservation or integrity in the context of a surface survey is difficult. Nonetheless, useful rating schemes are available for 'open' sites (Coumts & Witter 1977: 34) and scarred trees (Long 2003). Table 8.3 provides the assessment criteria for the place's integrity.

Table 8.3 Integrity criteria for place's integrity

Criteria	Value
Place destroyed	0
Place demonstrates high degree of disturbance (mechanical disturbance) with some cultural materials remaining or has limited opportunity for deposit	1
Place in good condition with little disturbance	2
Place in excellent condition with minimum or no disturbance	3

8.4.1.3 Rarity and representativeness

Rarity and representativeness are related concepts. Rarity refers to the relative uniqueness of a site within its local and regional context. The scientific significance of a site is assessed as higher if it is unique or rare within either context. Conversely, it is considered to be of lower significance if it is common in one or both. The concept of representativeness, meanwhile, refers to the question of whether or not a site is "a good example of its type, illustrating clearly the attributes of its significance" (Burke & Smith 2004: 247). Representativeness is an important criterion as one of the primary goals of cultural heritage management is to preserve for future generations a representative sample of all archaeological site types in their full range of environmental contexts.

In common with rarity, assessments of representativeness within a region are dependent on the state of current knowledge concerning the number and type of archaeological sites present within that region. This is a critical point, for as suggested by Kuskie (2000) and others (e.g., Bowdler 1981; Godwin 2011; Pearson & Sullivan 1995), the absence across most of Australia of regional-scale quantitative data for Aboriginal sites and places represents a major constraint in assessments of representativeness and rarity. As stressed by Bowdler (1981) some 30 years ago, detailed regional-scale assessments of the Aboriginal archaeological record of Australia are required to address this issue. Table 8.4 provides the assessment criteria for the place's rarity.

Table 8.4 **Rarity criteria**

Criteria	Value
Very common occurrence within the geographical region	0
Common occurrence within the geographical region	1
Uncommon occurrence within the geographical region	2
Rare occurrence within the geographical region	3

8.4.2 Scientific significance rankings

Each cultural heritage site, is assessed against the above criteria and given a value. This value is then tallied and sites are ranked accordingly Table 8.5. It should be noted that this methodology only applies to scientific significance assessments and cannot be readily applied to cultural significance assessments.

Table 8.5 **Scientific significance ranking**

Scientific Significance Value	Value
No scientific significance	0
Low scientific significance	1-3
Moderate scientific significance	4-6
High scientific significance	7-9

8.4.3 Assessment of scientific significance

An assessment of the scientific significance of all sites within the study area is summarised below and presented in Table 8.6, Figure 8.1 and Figure 8.2. The significance rating is offered on the basis of the assessed research potential, rarity and representativeness on a local and regional scale.

8.4.3.1 High scientific significance

There are 21 Aboriginal archaeological sites of high scientific significance within the study area. These sites all satisfy multiple criteria such as: are considered rare or uncommon examples of their type; offer research potential; and opportunities to contribute to the understanding of Aboriginal occupation of the study area. Of these, 17 are culturally modified trees while the remaining four are large open sites:

- BBS Toomelah LALC Mobbindy Ck1 – 500+ artefact scatter with a wide variety of raw material and tool types
- NS2B-19-AS5 – 500+ artefact scatter with a wide variety of raw material and tool types
- NS2B-19-AS9 – 100+ artefact scatter with a wide variety of raw material and tool types, associated with a number of culturally modified trees and also broken emu shell
- NS2B-19-AS10 – interpreted as an extension of NS2B-19-AS9.

8.4.3.2 Moderate scientific significance

There are four Aboriginal archaeological sites of moderate scientific significance within the construction disturbance footprint. Each site has a unique feature but does not satisfy enough criteria for high significance. These sites include:

- NS2B-19-AS3 – small artefact scatter with a rare sandstone muller
- NS2B-19-AS7 – 50+ artefact scatter with a high ratio of cores (~1:2)

- NS2B-19-AS20 – artefact scatter located on the rim of an extinct cinder cone volcano
- NS2B-19-AS21 – artefact scatter located on the base of an extinct cinder cone volcano.

8.4.3.3 Low scientific significance

There are 28 Aboriginal archaeological sites of low scientific significance within the construction disturbance footprint:

- 15 low-density artefact scatters
- All 13 isolated artefacts.

Table 8.6 Scientific significance assessment

AHIMS ID	Site name	Complexity	Complexity value	Integrity	Integrity value	Rarity and representativeness	Rarity value	Scientific significance ranking
2-4-0003	Boggabilla Mungle	Three carved trees	3	Trees have been relocated to Australian Museum. Actual removal location not known	1	Carved trees are typically exceedingly rare, throughout Australia	3	High (n=7)
2-4-0046	BBS Toomelah LALC Mobbindry Ck1	Artefact scatter of 500+ artefacts with range of raw materials, manufacture and evidence of retouch	3	While artefacts are eroding out of the bank of Mobbindry Creek, the overall site appears intact. There is evidence of surface disturbance through recent vegetation clearance. Archaeological deposit expected.	2	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies. However larger artefact scatters (n=100+) are typically uncommon.	2	High (n=7)
2-4-0047	BBS Toomelah LALC Mobbindry Ck ST2	Culturally modified tree is a dual scar box gum with recently carved lizard motif	3	Tree is in good condition. Limited potential for deposit as nearby construction for rail and road bridge have caused significant disturbance	1	Culturally modified trees are an uncommon site. Dual culturally modified trees are considered rare.	2	High (n=7)
2-4-0103	NS2B-19-AS1	Artefact scatter of 11 artefacts including nine flakes, one bifacial artefact and one multidirectional core	1	Artefact scatter is located within land that has been disturbed by ploughing. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-4-0120	NS2B-19-AS2	Artefact scatter of two artefacts	1	Artefact scatter is located within land that has been cleared. Some erosion noted. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-4-0119	NS2B-19-AS3	Artefact scatter of five artefacts. One of these artefacts is a rare muller/grindstone which has potential for further research.	1	Artefact scatter is located within land that has been cleared. Limited potential for deposit	1	While artefact scatters are a common occurrence across Australia, grindstone are relatively rare implements.	2	Moderate (n=4)
2-4-0118	NS2B-19-AS4	Artefact scatter of two artefacts	1	Artefact scatter is located within land that has been disturbed by ploughing. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)

AHIMS ID	Site name	Complexity	Complexity value	Integrity	Integrity value	Rarity and representativeness	Rarity value	Scientific significance ranking
2-4-0117	NS2B-19-AS5	Artefact scatter of 500+ artefacts with range of raw materials, manufacture and evidence of retouch. One of these artefacts is a rare muller/grindstone which has potential for further research.	3	While most artefacts were recorded from contour banks, the overall site appears intact. There is some evidence of surface disturbance through recent vegetation clearance. Archaeological deposit expected.	2	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies. However larger artefact scatters (n=100+) are typically uncommon. Likewise the presence of a muller suggests that this site is an important camp site.	2	High (n=7)
2-4-0116	NS2B-19-AS6	Artefact scatter of 13 artefacts including 10 flakes and three cores	1	Artefact scatter is located within land that has been disturbed by the rail corridor. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-5-0088	NS2B-19-AS7	Artefact scatter of 65 artefacts including 43 flakes and 19 cores	2	Artefact scatter is located within land that has been disturbed by the rail corridor. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Moderate (n=4)
2-4-0115	NS2B-19-AS8	Artefact scatter of 22 artefacts including 17 flakes and five cores	1	Artefact scatter is located within land that has been disturbed by the rail corridor. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-4-0139	NS2B-19-AS9	Artefact scatter of 168 artefacts including 127 flakes, 21 cores and 20 flake tools with range of raw materials, manufacture and evidence of retouch. Associated with a number of culturally modified trees. Broken emu shell was also present. The presence of emus were confirmed during ecological assessments (refer Biodiversity Technical Report produced for the North Star to NSW/QLD border EIS).	3	Artefact scatter is located within land that is relatively intact and does not appear to have been historically extensively cleared. Archaeological deposit expected	3	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies. However larger artefact scatters (n=100+) are typically uncommon. As are large artefact scatters in association with a high number of culturally modified trees. Likewise the presence of potential datable material (emu egg shell) suggests potential for further research.	2	High (n=8)

AHIMS ID	Site name	Complexity	Complexity value	Integrity	Integrity value	Rarity and representativeness	Rarity value	Scientific significance ranking
2-4-0102	NS2B-19-AS10	Artefact scatter of 13 artefacts including 11 flakes, one cores and one flake tools. Site is likely an extension of NS2B-19-AS9 which test excavation will likely demonstrate	3	Artefact scatter is located within land that is relatively intact and does not appear to have been historically extensively cleared. Archaeological deposit expected	3	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies. However this site is considered an extension of NS2B-19-AS9	2	High – n=8
2-4-0101	NS2B-19-AS11	Artefact scatter of 18 artefacts including 17 flakes and one core	1	Artefact scatter is located within land that has been disturbed by the rail corridor. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-4-0100	NS2B-19-AS12	Artefact scatter of three artefacts including two flakes and one core	1	Artefact scatter is located within land that has been disturbed by ploughing. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-4-0099	NS2B-19-AS13	Artefact scatter of 10 artefacts including seven flakes, one flake tool and two cores	1	Artefact scatter is located within land that has been disturbed by the rail corridor. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-4-0098	NS2B-19-AS14	Artefact scatter of six artefacts including five flakes and one core	1	Artefact scatter is located within land that has been disturbed by the rail corridor. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-4-0097	NS2B-19-AS15	Artefact scatter of 17 artefacts including nine flakes, one flake tool and one hammerstone	1	Artefact scatter is located within land that has been disturbed by ploughing. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-4-0096	NS2B-19-AS16	Artefact scatter of 17 artefacts including 14 flakes and three cores	1	Artefact scatter is located within land that has been cleared of vegetation. Artefacts were mostly noted in erosion areas. Archaeological deposit may be present closer to the creek	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-4-0095	NS2B-19-AS17	Artefact scatter of two flakes	1	Artefact scatter is located within land that has been cleared of vegetation. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)

AHIMS ID	Site name	Complexity	Complexity value	Integrity	Integrity value	Rarity and representativeness	Rarity value	Scientific significance ranking
2-4-0122	NS2B-19-AS18	Artefact scatter of eight flakes	1	Artefact scatter is located within land that has been disturbed by ploughing. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-4-0121	NS2B-19-AS19	Artefact scatter of two flakes	1	Artefact scatter is located within land that has been cleared of vegetation. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
11-1-0056	NS2B-19-AS20	Artefact scatter of 14 artefacts including nine flakes, three flake tools and two cores. Raw materials are all silcrete. A natural silcrete deposit exists at the base of the volcano.	1	Artefact scatter is located on top of an extinct cinder cone. While some clearing appears to have occurred, comments by a farmworker indicated that clearance was limited due to the volcanic geology. Archaeological deposit may be present, but will be shallow	2	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies. However artefact scatters associated with volcanoes are rare.	1	Moderate (n=4)
11-1-0055	NS2B-19-AS21	Artefact scatter of 28 artefacts including 14 flakes, three flake tools and 11 cores. Raw materials are all silcrete. A natural silcrete deposit exists at the base of the volcano.	2	Artefact scatter is located on top of an extinct cinder cone. While some clearing appears to have occurred, comments by a farmworker indicated that clearance was limited due to the volcanic geology. Archaeological deposit may be present, but will be shallow.	2	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies. However artefact scatters associated with volcanoes are rare.	1	Moderate (n=5)
2-5-0089	NS2B-19-AS22	Artefact scatter of two artefacts including one flakes and one multidirectional core	1	Artefact scatter is located within land that has not been subject to significant clearance. Limited potential for deposit	1	Artefact scatters are a common occurrence across Australia, particularly in association with waterbodies	1	Low (n=3)
2-4-0114	NS2B-19-IA1	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by ploughing. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)
2-4-0109	NS2B-19-IA2	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by vegetation clearance. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)

AHIMS ID	Site name	Complexity	Complexity value	Integrity	Integrity value	Rarity and representativeness	Rarity value	Scientific significance ranking
2-4-0108	NS2B-19-IA3	Isolated artefact – backed artefact	1	Isolated artefact is located within land that has been disturbed by grader action associated with the rail corridor. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)
2-4-0107	NS2B-19-IA4	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by ploughing. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)
2-4-0141	NS2B-19-IA5	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by grader action associated with the rail corridor and old North Star Road. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)
2-4-0140	NS2B-19-IA6	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by grader action associated with the rail corridor and old North Star Road. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)
2-4-0138	NS2B-19-IA7	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by vegetation clearance. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)
2-4-0137	NS2B-19-IA8	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by grader action associated with the rail corridor. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)
2-4-0136	NS2B-19-IA9	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by grader action associated with the rail corridor. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)
2-4-0113	NS2B-19-IA10	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by grader action associated with the rail corridor. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)

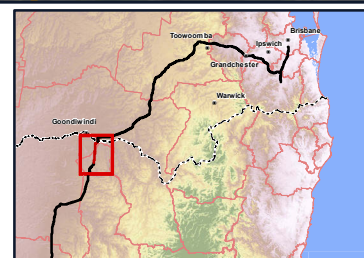
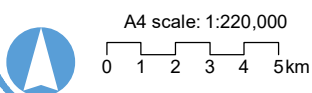
AHIMS ID	Site name	Complexity	Complexity value	Integrity	Integrity value	Rarity and representativeness	Rarity value	Scientific significance ranking
2-4-0112	NS2B-19-IA11	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by grader action associated with the rail corridor. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)
2-4-0111	NS2B-19-IA12	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by ploughing. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)
2-4-0110	NS2B-19-IA13	Isolated artefact	1	Isolated artefact is located within land that has been disturbed by vegetation clearance. Limited potential for deposit	1	Isolated artefacts are a common archaeological find in Australia	1	Low (n=3)
2-4-0104	NS2B-19-ST1	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is in poor condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0105	NS2B-19-ST2	Tree is a dual culturally modified poplar box gum	3	Tree is in good condition, scars are in poor condition or nearly healed over. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site. Dual culturally modified trees are considered rare.	3	High (n=8)
2-4-0106	NS2B-19-ST3	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is in poor condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0129	NS2B-19-ST4	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is in good condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0128	NS2B-19-ST5	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is in poor condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0127	NS2B-19-ST6	Tree is a multiple culturally modified poplar box gum, likely a 'possum tree'	3	Tree is in good condition, scars are in poor condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0126	NS2B-19-ST7	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is in good condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)

AHIMS ID	Site name	Complexity	Complexity value	Integrity	Integrity value	Rarity and representativeness	Rarity value	Scientific significance ranking
2-4-0125	NS2B-19-ST8	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is in good condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0124	NS2B-19-ST9	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is in good condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0135	NS2B-19-ST10	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is in good condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0134	NS2B-19-ST11	Tree is a single culturally modified poplar box gum, shows evidence of stone axe marks	3	Tree is in good condition, scar is in good condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0131	NS2B-19-ST12	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is in poor condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0132	NS2B-19-ST13	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is almost healed over. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0133	NS2B-19-ST14	Tree is a single culturally modified poplar box gum	3	Tree is dead and fallen over, scar is in poor condition. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0130	NS2B-19-ST15	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is almost healed over. Limited potential for deposit	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)
2-4-0123	NS2B-19-ST16	Tree is a single culturally modified poplar box gum	3	Tree is in good condition, scar is almost healed over. Potential for deposit associated with BBS Toomelah LALC Mobbindry Ck1 artefact scatter	2	Culturally modified trees are generally an uncommon Aboriginal cultural heritage site	2	High (n=7)



Legend

- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- ▬ Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border
- ▭ Construction footprint



Site sensitivity

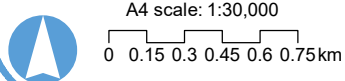
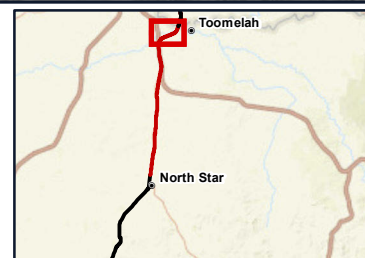
- High
- Moderate
- Low

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Legend

- - - Existing rail (non-operational)
- Major roads
- Minor roads
- - - NSW/QLD border
- Construction footprint



Site sensitivity

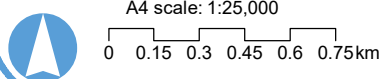
- High
- Moderate
- Low

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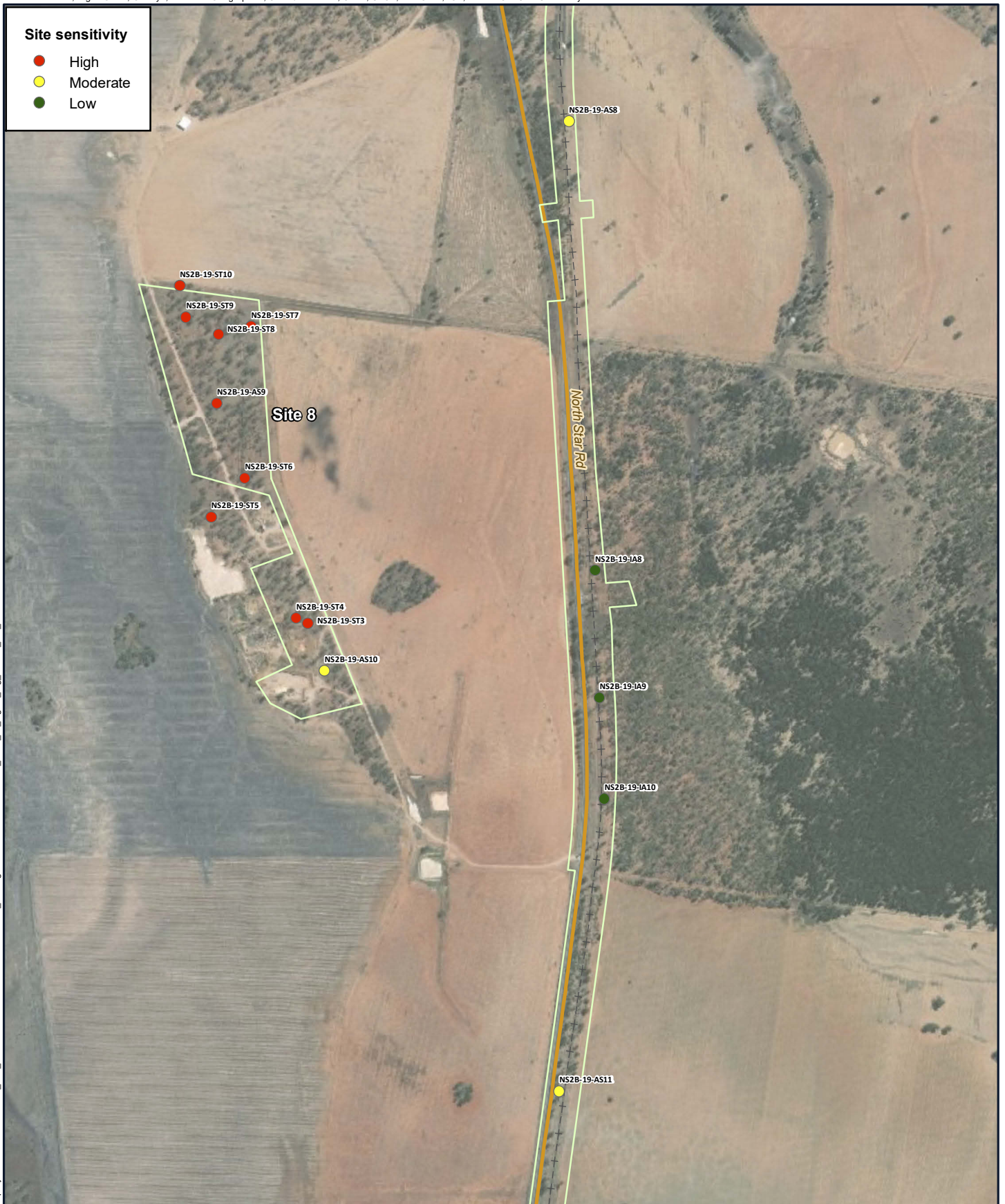
- + - Existing rail (non-operational)
- Major roads
- Minor roads
- Construction footprint



Site sensitivity

- High
- Moderate
- Low

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Legend

- + - Existing rail (non-operational)
- Major roads
- Minor roads
- Construction footprint



A4 scale: 1:15,000
 0 0.09 0.18 0.27 0.36 0.45km



Date: 17/02/2020 Version: 2
 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border
Figure 8.2c:
Significance assessment - Detail

Site sensitivity

- High
- Moderate
- Low

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FFJV_IH_Fig8.2_Sig_Assess_MB_v3.mxd Date: 19/02/2020 08:44



Legend

- +— Existing rail (operational)
- - - Existing rail (non-operational)
- Major roads
- Minor roads
- Construction footprint



A4 scale: 1:30,000
 0 0.15 0.3 0.45 0.6 0.75km



Date: 17/02/2020 Version: 2
 Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border
Figure 8.2d:
Significance assessment - Detail

Site sensitivity

- High
- Moderate
- Low

Horns Rd

Site 26

NS2B-19-AS18

Site 5

NS2B-19-IA13

NS2B-19-AS19

NS2B-19-ST15

NS2B-19-ST14

Legend

- Major roads
- Minor roads



A4 scale: 1:30,000
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Date: 17/02/2020 Version: 2
 Coordinate System: GDA 1994 MGA Zone 56

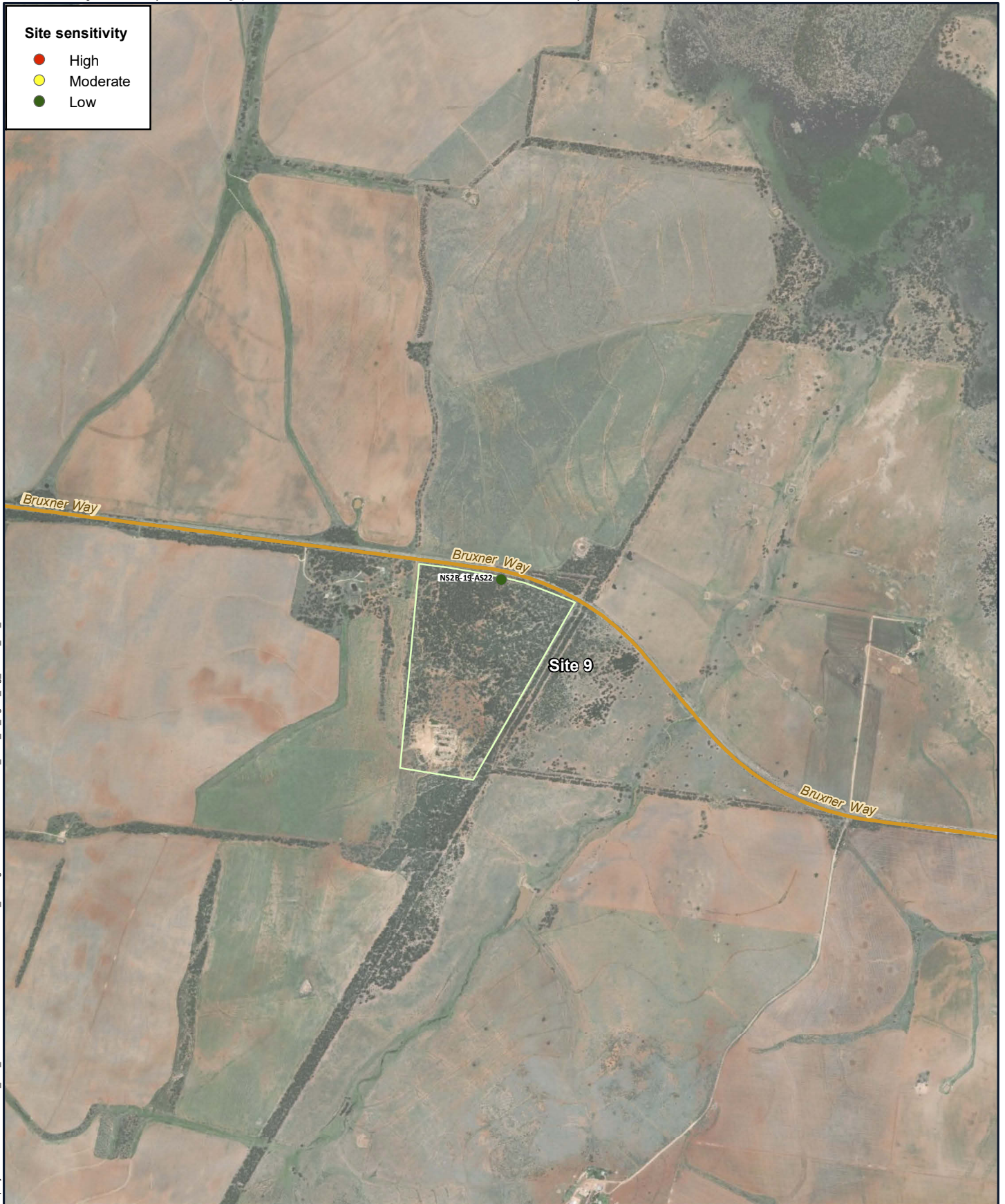
North Star to NSW/QLD border

Figure 8.2e:
Significance assessment - Detail

Site sensitivity

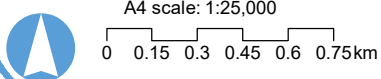
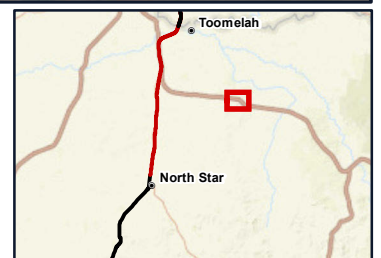
- High
- Moderate
- Low

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Legend

- Major roads
- Minor roads



Site sensitivity

- High
- Moderate
- Low



Legend

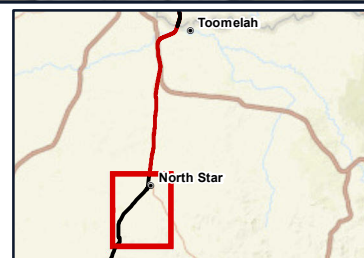
- Localities
- + - Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- Construction footprint

A4 scale: 1:60,000

0 0.35 0.7 1.05 1.4 1.75km



Date: 17/02/2020 Version: 2
 Coordinate System: GDA 1994 MGA Zone 56



North Star to NSW/QLD border

Figure 8.2g:
 Significance assessment - Detail

8.5 Aesthetic value

Aesthetic value refers to the sensory, scenic, architectural and creative aspects of a place and is manifested through a range of physical and non-physical attributes (OEH 2011:9).

Aesthetics including the physical setting of an archaeological site or a landscape contributes to its cultural heritage significance. Examples of archaeological sites that may have historic aesthetic values include rock art sites or sites located in environments that evoke strong sensory response. The surveyed study area is assessed as having low aesthetic significance as the natural landscape of the subject properties has been extensively altered by historical and contemporary land use practises. Even areas relatively untouched were still plagued by weed infestation such as cactus and introduced grasses.

Individual artefacts may hold aesthetic value and this would be elucidated from detailed analysis following salvage.

8.6 Statement of significance

This assessment finds that the Aboriginal heritage values of the study area rest principally with the archaeological sites identified within it but also are drawn from its place within the broader cultural landscape. Identified archaeological sites within the study area attest to its past use by Aboriginal people with these sites identified by RAPs as all highly significant. The locations and densities of surface artefacts/sites across the study area are suggestive of variability in use of the landscape with an emphasis on the utilisation of land adjacent to creeklines where more abundant and diverse food and plant resources were likely available. The majority of sites within the study area have been assessed as of low scientific significance with site attributes consistent with 'background scatter' and likely resulting from small-scale or limited episodes of lithic discard.

Four sites have been assessed as being of high scientific significance with flaked stone artefact assemblages from these locations interpreted as palimpsests of long-term occupation at these locations. This would have involved, amongst other activities, on-site core reduction and backed artefact manufacture or incorporating rarer or diagnostic artefact types (i.e., axes).

More broadly, the study area forms part of a larger and highly significant cultural landscape for Aboriginal people in the Border Rivers region with the Macintyre River, Whalan Creek and Mobbindry Creek being three culturally significant landscape features in the local area. These resources would have been exploited by Aboriginal people to access the diverse range of terrestrial, aquatic and avian resources associated with these features and surrounding wetlands.

Although situated within a broader landscape of high historical significance for contemporary Aboriginal people, the study area itself is assessed as having low historical significance with limited evidence of post-contact Aboriginal occupation identified within the Proposal footprint. More significant historical sites are associated with Toomelah and other key towns in the immediate region.

9 Impact assessment

9.1 Proposal activities

Activities proposed as part of the proposal have been categorised into four phases; construction, commissioning and reinstatement and operational. A description of proposal related activities is provided in Table 9.1.

Table 9.1 Description of proposal related activities associated with construction, commissioning and reinstatement and operational phase

Phase	Infrastructure activity	Description of activities
Construction	Site preparation	Vegetation clearing
		Topsoil stripping
		Construction of temporary site compounds
		Construction of rail access roads
		Installation of offices, hardstands, etc
		Stockpiling
	Utility diversions	Excavation
		Trenching
		Modification, diversion and realignment of utilities and associated infrastructure
	Drainage	Culvert installation
	Structures	Construction of bridges over main waterways
		Road/rail bridge construction
	Civil works	Cutting construction
		Embankment construction using cut to fill from rail alignment and borrow to fill from external borrow sources, where required
		Construction of temporary haul roads
		Drainage controls
	Road works	Road realignment
		Construction of permanent rail maintenance access roads
	Rail logistics	Sleeper stockpiling
		Rail stockpiling
	Rail construction	Drilling
		Ballast installation
		Sleeper placement
		Rail placement
		Installation train signals and communications infrastructure
		Demobilising site compounds
	Signals and communications installation	Removal of temporary fencing
Commissioning and reinstatement	Demobilisation/ reinstatement	Establish permanent fencing
		Restoration of disturbed areas, including revegetation where required
	Spoil mounds	Conversion of haul roads and construction access roads into permanent roads

Phase	Infrastructure activity	Description of activities
	Fencing	Train services
	Restoration	Minor maintenance works
	Road works	Bridge and culvert inspections
		Sleeper replacement
		Rail welding
		Rail grinding
		Ballast dropping
		Track tamping
		Major periodic maintenance
Operation	Train operations	Train movement along rail
	Operational maintenance	Ongoing vehicle movement within rail corridor

9.2 Potential impacts

The potential impacts on Aboriginal cultural heritage values are assessed using criteria developed from the *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties* (ICOMOS 2011), *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW Department of Environment Climate Change & Water 2010b) and *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (NSW Office of Environment & Heritage 2011). This document was prepared by the International Council on Monuments and Sites (ICOMOS), the peak professional body working for the conservation of cultural heritage places, and provides a comprehensive method for assessing impacts at all types of heritage places.

Under ICOMOS guidelines, cultural heritage places can be of differing levels of importance, or significance: local, State, National and World (Australia ICOMOS 2013). Places of local significance are important only to their immediate community, places of state significance to the wider region, and places of national significance to the country as a whole. Places of world significance are important to all of humanity, possessing one or more outstanding universal values.

Places of differing heritage significance have differing sensitivity to impact. Places of world heritage significance will be more vulnerable to change than a local heritage site and aspects of a world heritage place that represent outstanding universal values are the most sensitive of all. The differing significance of a place's heritage values and their relative sensitivity to impact is summarised in Table 9.2.

Table 9.2 Levels of cultural heritage sensitivity

Sensitivity	Justification	Status
Extreme	Attributes which convey outstanding universal values of World heritage place.	Fulfil criteria for local, state, national and international listing.
Very High	Exceptional, rare or outstanding attributes demonstrating important themes in national or international history and heritage.	Fulfil criteria for local, state, national or potentially international listing.
High	Attributes demonstrating important themes in state history and heritage.	Fulfil criteria for local and state listing.
Moderate	Attributes demonstrating important themes in local history and heritage.	Fulfil criteria for local listing and may fulfil criteria for state listing.
Low	Attributes demonstrating minor themes in local history and heritage.	May fulfil criteria for local listing and does not fulfil criteria for state listing.
Negligible	Attributes that have no heritage significance.	Does not fulfil criteria for local or state listing.

The degree of impact an activity will have on a cultural heritage place is assessed in terms of the magnitude of change to the acknowledged heritage values of a place as summarised in Table 9.3. These impacts may be direct, such as the demolition of heritage buildings, or indirect, such as changes to the views or setting of a cultural heritage place. In some cases, indirect impacts might also cause physical damage to a cultural heritage place, such as excessive vibration causing structural damage, or excessive pollution causing damage to surfaces.

Table 9.3 Determining magnitude of change

Magnitude	Example criteria
Major	Change to all or most significant aspects of the place, such that its heritage values are substantially reduced or destroyed.
Medium	Change to some significant aspects of the place, such that some of its heritage values are partially reduced.
Low	Minor change to significant aspects of the place, such that some of its heritage values are slightly reduced.
Negligible	Changes to insignificant aspects of the places, such that its heritage values are not reduced.
No Change	No change.

The final assessment of the significance of impact on a cultural heritage place is a factor of the cultural heritage sensitivity of the place, combined with the predicted magnitude of change, as outlined in Table 9.4. A prediction of impact significance can be made both before and after the implementation of identified mitigation measures, allowing the efficacy of the measures to be assessed and revealing residual impacts that need to be taken into account.

Table 9.4 Estimating impact significance

Significance of impact		Magnitude of change				
		Major	Medium	Low	Negligible	No change
Cultural heritage sensitivity	Extreme	Very large	Large/very large	Moderate/large	Slight	Neutral
	Very high	Very large	Large/very large	Moderate/large	Slight	Neutral
	High	Large/very large	Moderate/large	Slight/moderate	Slight	Neutral
	Moderate	Moderate/large	Moderate	Slight	Neutral/slight	Neutral
	Low	Slight/moderate	Slight	Neutral/slight	Neutral/slight	Neutral
	Negligible	Slight	Neutral/slight	Neutral/slight	Neutral	Neutral

Table note:

Shaded boxes indicate a significant effect in terms of EIS

9.3 Potential impacts to Identified Aboriginal Cultural Heritage Sites

Impacts on heritage sites can be divided into two main types: direct and indirect. Direct impacts occur if a cultural heritage place or site is located directly in a development area and/or would be physically impacted by development. Such impacts include the disturbance of an archaeological site. Indirect impacts, alternatively, are those that alter the surrounding physical environment in such a way that a cultural heritage place or site is affected. Indirect impacts might include extra vibration from construction activities or subsequent traffic load, as well as additional water runoff or sediment deposition due to changing hydrology that can affect culturally modified trees. The effects of direct or indirect impacts are measured in terms of the extent to which they alter the cultural heritage values of a cultural heritage place. This is represented as the 'magnitude of change' (refer Section 9.2).

Consideration of the location of sites related directly to the proposed North Star to Border easement impacts indicated that 43 of the 54 identified archaeological sites will be directly impacted by the proposal. Table 9.5 provides a detailed breakdown of the potential impacts to each site. A geographical overview is presented in Figure 9.1 and Figure 9.2 for Aboriginal archaeological heritage sites and Figure 9.3 for intangible Aboriginal heritage sites.

Table 9.5 Magnitude of change to Aboriginal archaeological sites prior to mitigation

AHIMS	Site name	Site type	Sensitivity	Type of harm	Degree of harm	Consequence of harm	Magnitude of change prior to mitigation	Significance of impact
2-4-0003	Boggabilla Mungle	Carved Trees	Very High	<ul style="list-style-type: none"> No impact Trees have been salvaged 	None	No loss of value	No change	Neutral
2-4-0046	BBS Toomelah LALC Mobbindy Ck1	Artefact Scatter	High	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint Part of the site can be avoided, outside the construction disturbance footprint 	Partial	Partial loss of value	Major	Large/very large
2-4-0047	BBS Toomelah LALC Mobbindy Ck ST2	Culturally modified Tree	High	<ul style="list-style-type: none"> Indirect Impact Tree is located immediately outside disturbance corridor Risk of vibration impact, dust, and potential impact Change in access to water for the tree 	Partial	Partial loss of value	Medium	Moderate/large
2-4-0103	NS2B-19-AS1	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0120	NS2B-19-AS2	Artefact Scatter	Low	<ul style="list-style-type: none"> No Impact Site is located immediately outside disturbance footprint. 	None	No loss of value	No Change	Neutral
2-4-0119	NS2B-19-AS3	Artefact Scatter	Moderate	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint 	Total	Total loss of value	Major	Moderate/large
2-4-0118	NS2B-19-AS4	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0117	NS2B-19-AS5	Artefact Scatter	High	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint Part of the site can be avoided, outside the construction disturbance footprint 	Partial	Partial loss of value	Major	Large/very large

AHIMS	Site name	Site type	Sensitivity	Type of harm	Degree of harm	Consequence of harm	Magnitude of change prior to mitigation	Significance of impact
2-4-0116	NS2B-19-AS6	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-5-0088	NS2B-19-AS7	Artefact Scatter	Moderate	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Moderate/large
2-4-0115	NS2B-19-AS8	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0139	NS2B-19-AS9	Artefact Scatter	High	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Large/very large
2-4-0102	NS2B-19-AS10	Artefact Scatter	High	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Large/very large
2-4-0101	NS2B-19-AS11	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0100	NS2B-19-AS12	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Slight/moderate
2-4-0099	NS2B-19-AS13	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0098	NS2B-19-AS14	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0097	NS2B-19-AS15	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Slight/moderate

AHIMS	Site name	Site type	Sensitivity	Type of harm	Degree of harm	Consequence of harm	Magnitude of change prior to mitigation	Significance of impact
2-4-0096	NS2B-19-AS16	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Part of site is located with the construction disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0095	NS2B-19-AS17	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0122	NS2B-19-AS18	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Slight/moderate
2-4-0121	NS2B-19-AS19	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Slight/moderate
11-1-0056	NS2B-19-AS20	Artefact Scatter	Moderate	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Moderate/large
11-1-0055	NS2B-19-AS21	Artefact Scatter	Moderate	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Moderate/large
2-5-0089	NS2B-19-AS22	Artefact Scatter	Low	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Slight/moderate
2-4-0114	NS2B-19-IA1	Isolated Artefact	Low	<ul style="list-style-type: none"> No Impact Site is located immediately outside disturbance footprint. 	None	No loss of value	No Change	Neutral
2-4-0109	NS2B-19-IA2	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0108	NS2B-19-IA3	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate

AHIMS	Site name	Site type	Sensitivity	Type of harm	Degree of harm	Consequence of harm	Magnitude of change prior to mitigation	Significance of impact
2-4-0107	NS2B-19-IA4	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0141	NS2B-19-IA5	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0140	NS2B-19-IA6	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located just within the construction disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0138	NS2B-19-IA7	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0137	NS2B-19-IA8	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0136	NS2B-19-IA9	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0113	NS2B-19-IA10	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0112	NS2B-19-IA11	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Slight/moderate
2-4-0111	NS2B-19-IA12	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Slight/moderate
2-4-0110	NS2B-19-IA13	Isolated Artefact	Low	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Slight/moderate

AHIMS	Site name	Site type	Sensitivity	Type of harm	Degree of harm	Consequence of harm	Magnitude of change prior to mitigation	Significance of impact
2-4-0104	NS2B-19-ST1	Culturally modified Tree	High	<ul style="list-style-type: none"> Indirect Impact Tree is located immediately outside disturbance corridor Risk of vibration impact, dust, and potential impact Change in access to water for the tree 	Partial	Partial loss of value	Medium	Moderate/large
2-4-0105	NS2B-19-ST2	Culturally modified Tree	High	<ul style="list-style-type: none"> Indirect Impact Tree is located immediately outside disturbance corridor Risk of vibration impact, dust, and potential impact Change in access to water for the tree 	Partial	Partial loss of value	Medium	Moderate/large
2-4-0106	NS2B-19-ST3	Culturally modified Tree	High	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Large/very large
2-4-0129	NS2B-19-ST4	Culturally modified Tree	High	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Large/very large
2-4-0128	NS2B-19-ST5	Culturally modified Tree	High	<ul style="list-style-type: none"> Indirect Impact Tree is located immediately outside disturbance corridor Risk of vibration impact, dust, and potential impact Change in access to water for the tree 	Partial	Partial loss of value	Medium	Moderate/large
2-4-0127	NS2B-19-ST6	Culturally modified Tree	High	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Large/very large
2-4-0126	NS2B-19-ST7	Culturally modified Tree	High	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Large/very large
2-4-0125	NS2B-19-ST8	Culturally modified Tree	High	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Large/very large

AHIMS	Site name	Site type	Sensitivity	Type of harm	Degree of harm	Consequence of harm	Magnitude of change prior to mitigation	Significance of impact
2-4-0124	NS2B-19-ST9	Culturally modified Tree	High	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Large/very large
2-4-0135	NS2B-19-ST10	Culturally modified Tree	High	<ul style="list-style-type: none"> Indirect Impact Tree is located immediately outside disturbance corridor Risk of vibration impact, dust, and potential impact Change in access to water for the tree 	Partial	Partial loss of value	Medium	Moderate/large
2-4-0134	NS2B-19-ST11	Culturally modified Tree	High	<ul style="list-style-type: none"> Direct impact Site is located with the permanent disturbance footprint 	Total	Total loss of value	Major	Large/very large
2-4-0131	NS2B-19-ST12	Culturally modified Tree	High	<ul style="list-style-type: none"> Potential for direct impact Site is located with the construction disturbance footprint 	Total	Total loss of value	Major	Large/very large
2-4-0132	NS2B-19-ST13	Culturally modified Tree	High	<ul style="list-style-type: none"> Indirect Impact Tree is located immediately outside disturbance corridor Risk of vibration impact, dust, and potential impact Change in access to water for the tree 	Partial	Partial loss of value	Medium	Moderate/large
2-4-0133	NS2B-19-ST14	Culturally modified Tree	High	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Large/very large
2-4-0130	NS2B-19-ST15	Culturally modified Tree	High	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Large/very large
2-4-0123	NS2B-19-ST16	Culturally modified Tree	High	<ul style="list-style-type: none"> No Impact No disturbance is planned in the vicinity of this site. 	None	No loss of value	No Change	Neutral

AHIMS	Site name	Site type	Sensitivity	Type of harm	Degree of harm	Consequence of harm	Magnitude of change prior to mitigation	Significance of impact
N/A	NS2B-19-RT1	Potentially culturally modified tree	High	<ul style="list-style-type: none"> Indirect Impact Tree is located immediately on boundary of permanent disturbance corridor Risk of vibration impact, dust, and potential impact Change in access to water for the tree 	Partial	Partial loss of value	Medium	Moderate/large
N/A	NS2B-19-IH1	Plant Resources	High	<ul style="list-style-type: none"> Direct impact Site is located with the construction disturbance footprint (borrow pit) 	Total	Total loss of value	Major	Large/very large
N/A	NS2B-19-IH2	Watercourses	High	<ul style="list-style-type: none"> No disturbance is planned in the vicinity of this site. 	Partial	Partial loss of value	Medium	Moderate/large

Significance of Impact

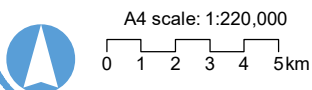
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- Moderate/Large
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- Slight
- Slight/Moderate

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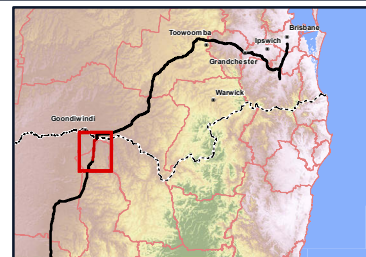


Legend

- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border
- Construction footprint



Date: 14/02/2020 Version: 4
Coordinate System: GDA 1994 MGA Zone 56



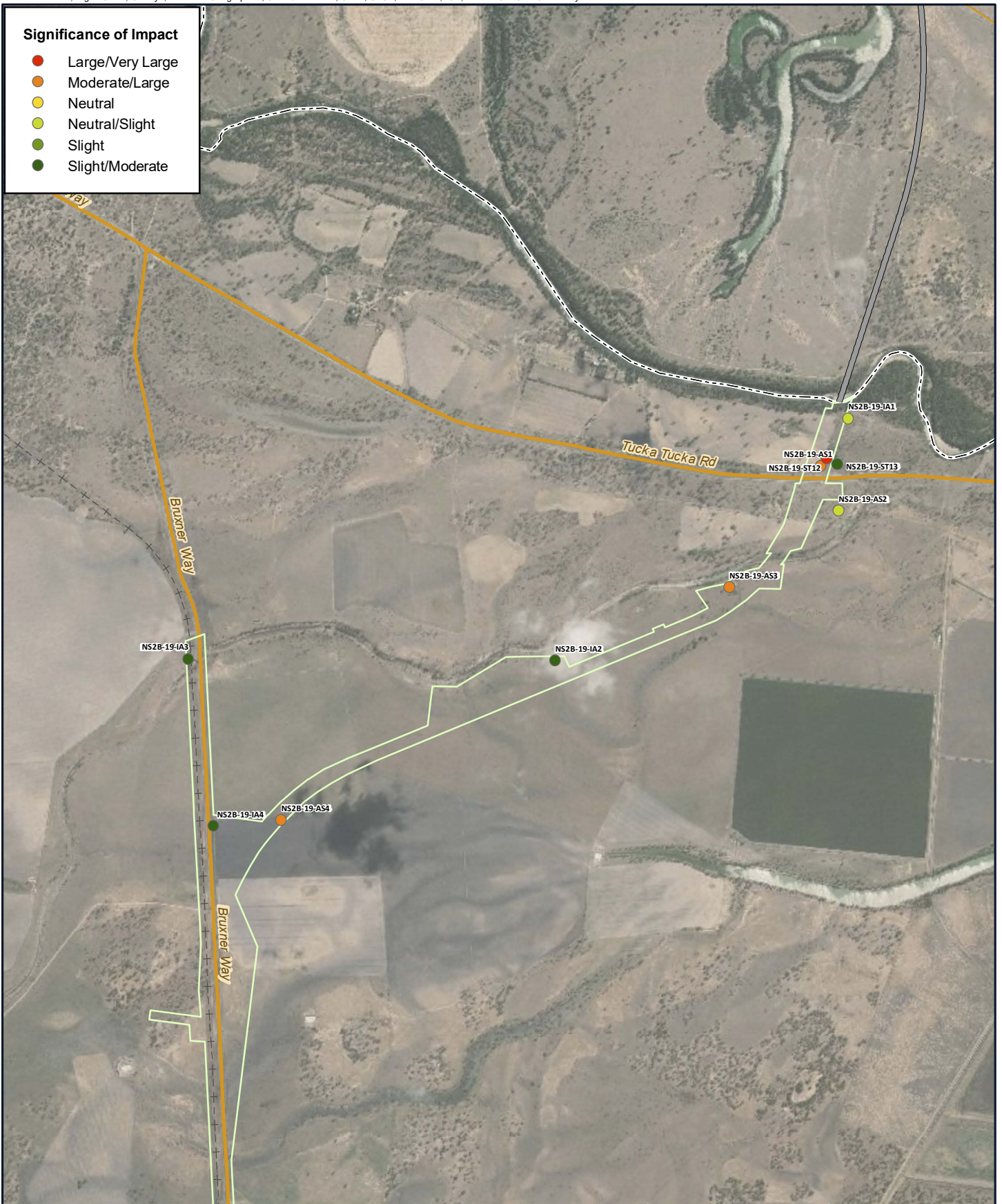
North Star to NSW/QLD border

Figure 9.1:
Impact Assessment

Significance of Impact

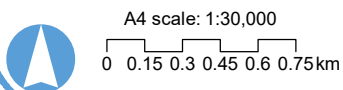
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- Slight/Moderate

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Legend

- - - Existing rail (non-operational)
- NSW/QLD border
- Major roads
- Minor roads
- Borrow pits
- Construction footprint



Date: 17/02/2020 Version: 2
 Coordinate System: GDA 1994 MGA Zone 56

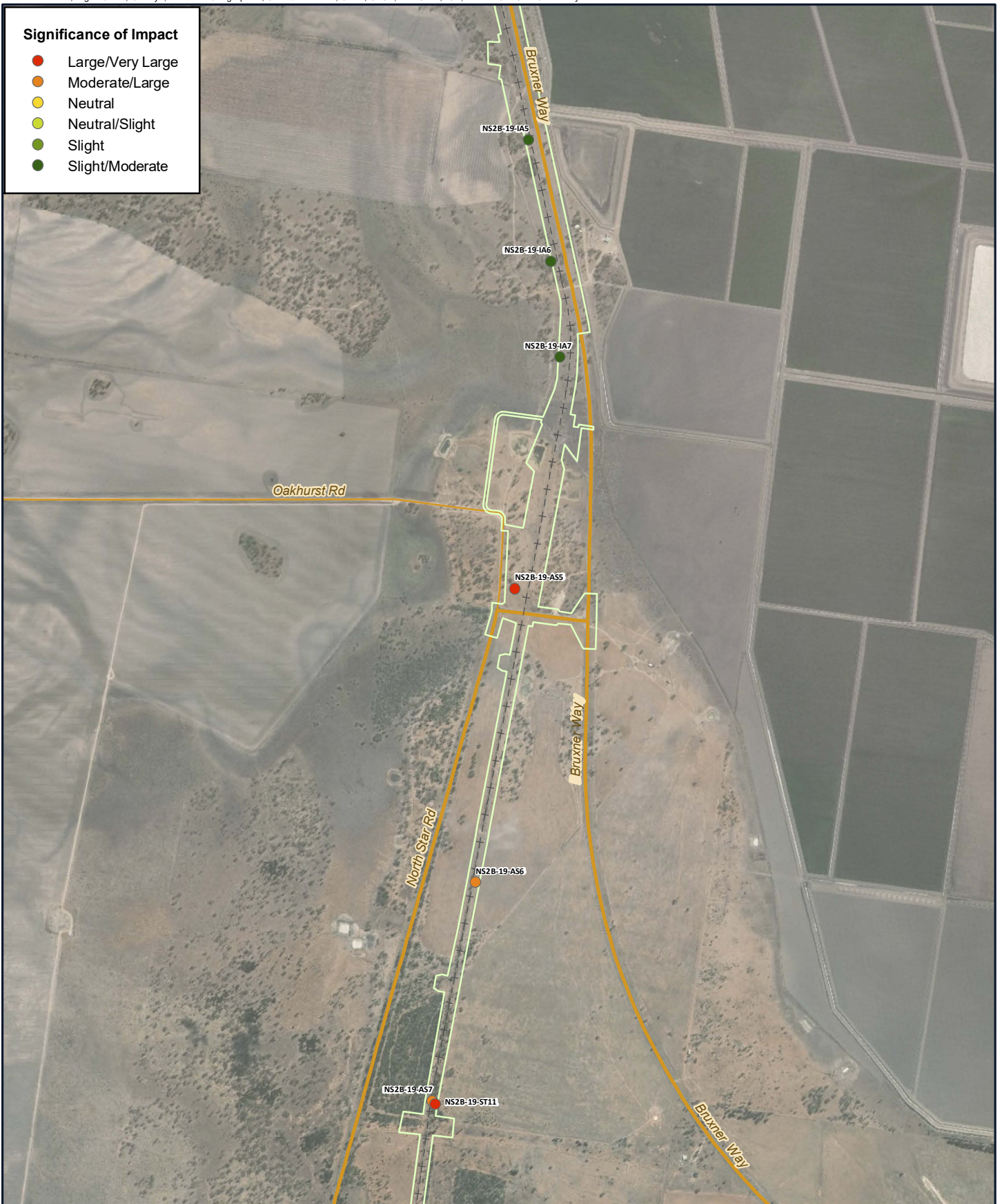
North Star to NSW/QLD border

Figure 9.2a:
 Impact Assessment - Detail

Significance of Impact

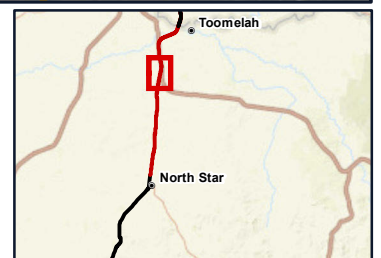
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- Moderate/Large
- Neutral
- Neutral/Slight
- Slight
- Slight/Moderate

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FFJV_IH_Fig9.2_Impact_Assess_MB_v3.mxd Date: 19/02/2020 08:47



Legend

- + - Existing rail (non-operational)
- Major roads
- Minor roads
- Borrow pits
- Construction footprint



A4 scale: 1:25,000
 0 0.15 0.3 0.45 0.6 0.75km



Date: 17/02/2020 Version: 2
 Coordinate System: GDA 1994 MGA Zone 56

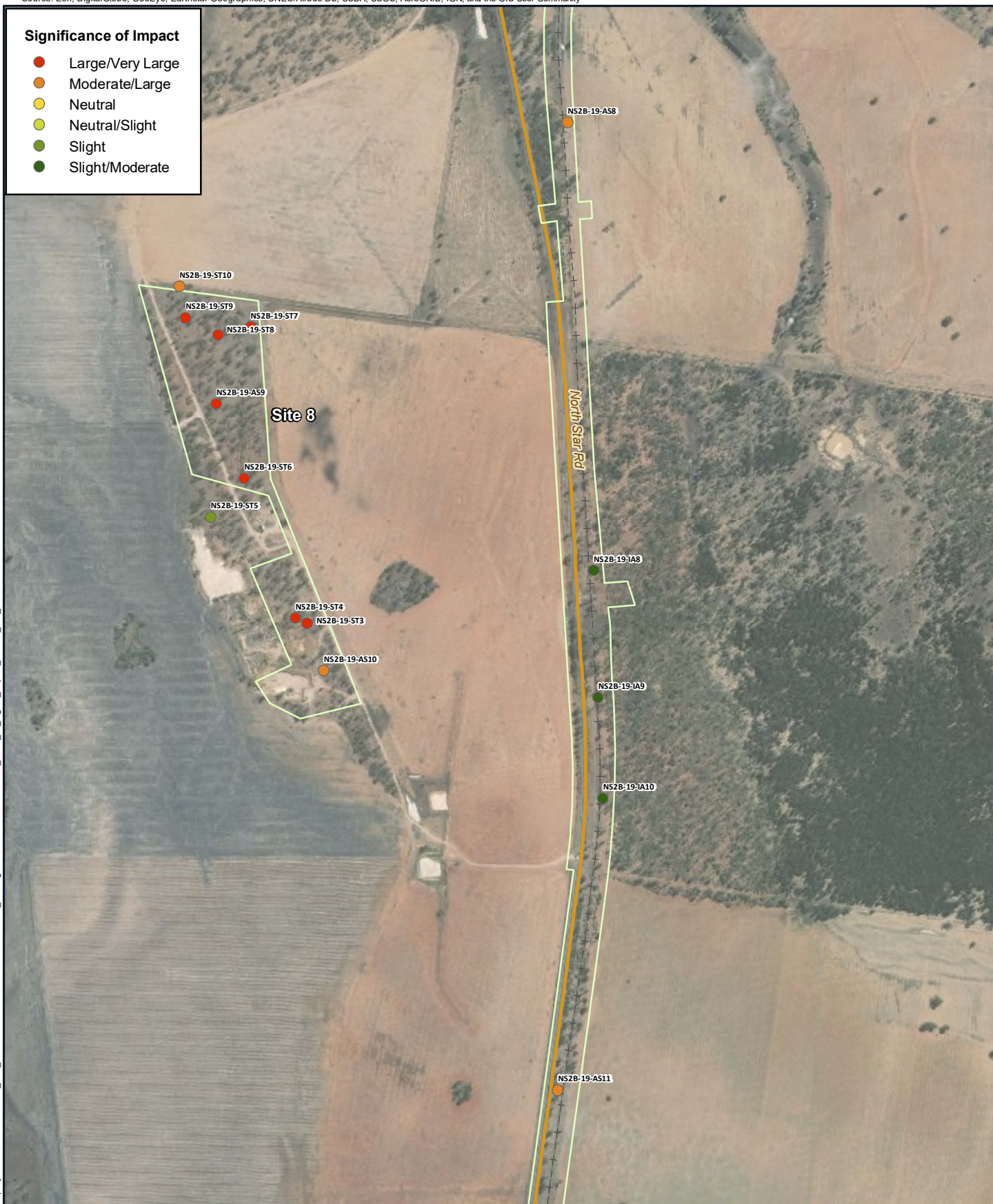
North Star to NSW/QLD border

Figure 9.2b:
Impact Assessment - Detail

Significance of Impact

- Large/Very Large
- Moderate/Large
- Neutral
- Neutral/Slight
- Slight
- Slight/Moderate

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FFJV_IH_Fig2_Impact_Assess_MB_v3.mxd Date: 19/02/2020 08:47



Legend

- + - Existing rail (non-operational)
- Major roads
- Minor roads
- Borrow pits
- Construction footprint



A4 scale: 1:15,000
0 0.09 0.18 0.27 0.36 0.45km



Date: 17/02/2020 Version: 2
Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 9.2c:
Impact Assessment - Detail

Significance of Impact

- Large/Very Large
- Moderate/Large
- Neutral
- Neutral/Slight
- Slight
- Slight/Moderate

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FF\JV_IH_Fig9.2_Impact_Assess_MB_v3.mxd Date: 19/02/2020 08:47



Legend

- Existing rail (operational)
- - - Existing rail (non-operational)
- Major roads
- Minor roads
- Borrow pits
- Construction footprint



A4 scale: 1:30,000
 0 0.15 0.3 0.45 0.6 0.75km



Date: 17/02/2020 Version: 2
 Coordinate System: GDA 1994 MGA Zone 56



North Star to NSW/QLD border

Figure 9.2d:
 Impact Assessment - Detail

Significance of Impact

- Large/Very Large
- Moderate/Large
- Neutral
- Neutral/Slight
- Slight
- Slight/Moderate

Horns Rd

Site 26

NS2B-19-AS18

Site 5

NS2B-19-IA13

NS2B-19-AS19

NS2B-19-ST15

NS2B-19-ST14

Legend

- Major roads
- Minor roads
- Borrow pits



Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FFJV_IH_Fig9.2_Impact_Assess_MB_v3.mxd Date: 19/02/2020 08:47



A4 scale: 1:30,000
 0 0.15 0.3 0.45 0.6 0.75km



Date: 17/02/2020 Version: 2
 Coordinate System: GDA 1994 MGA Zone 56

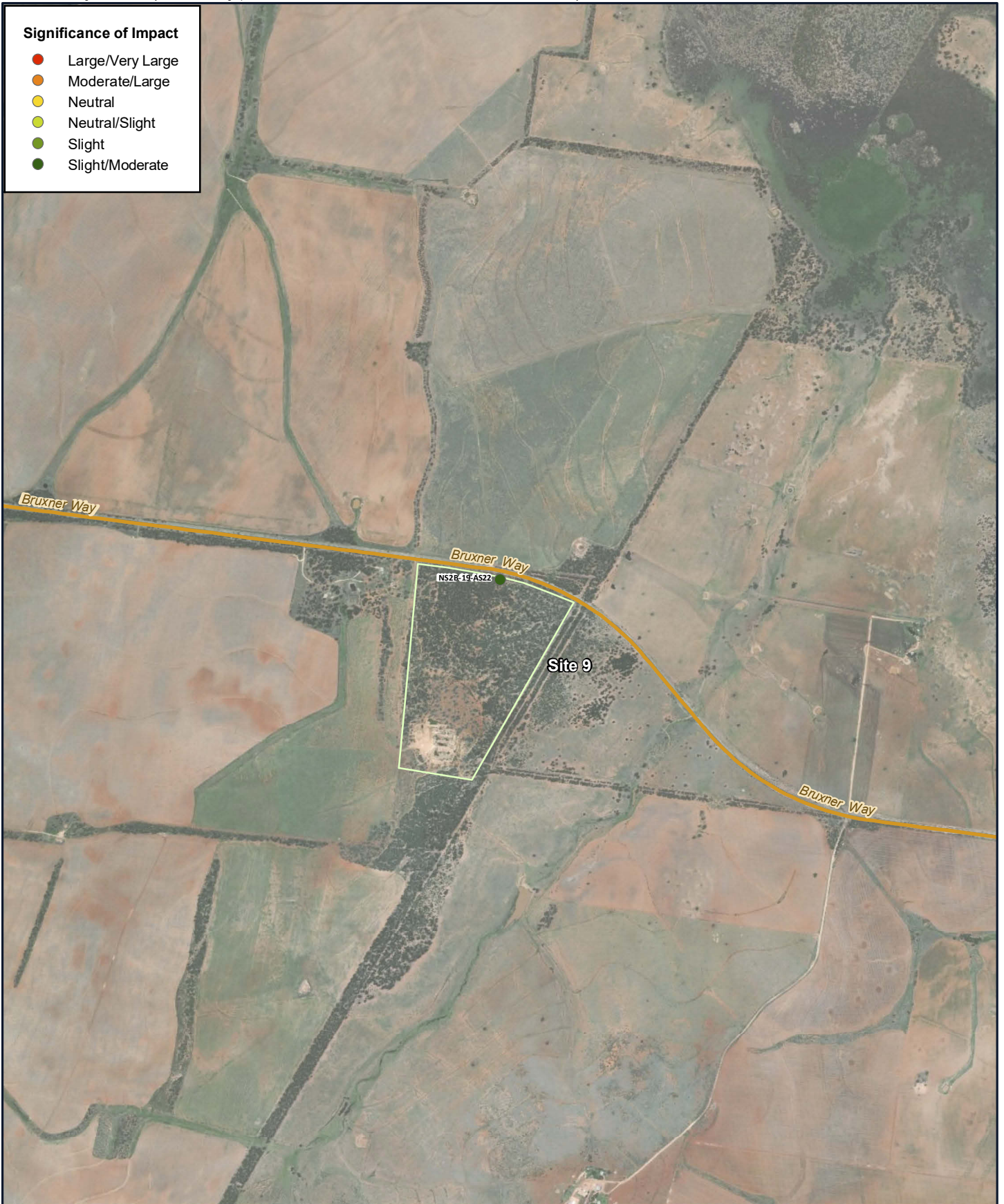
North Star to NSW/QLD border

Figure 9.2e:
Impact Assessment - Detail

Significance of Impact

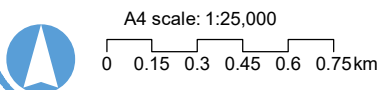
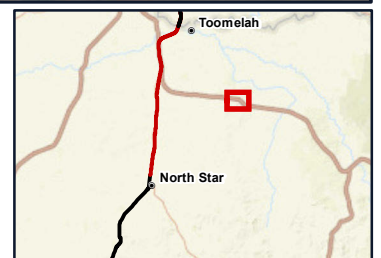
- Large/Very Large
- Moderate/Large
- Neutral
- Neutral/Slight
- Slight
- Slight/Moderate

Map by: MEF\GN Z\GIS\GIS_270_NS2B\Tasks\270-ECH-201910221331_Heritage\270-ECH-201910221331_FFJV_IH_Fig9.2_Impact_Assess_MB_v3.mxd Date: 19/02/2020 08:47



Legend

- Major roads
- Minor roads
- Borrow pits



Significance of Impact

- Large/Very Large
- Moderate/Large
- Neutral
- Neutral/Slight
- Slight
- Slight/Moderate



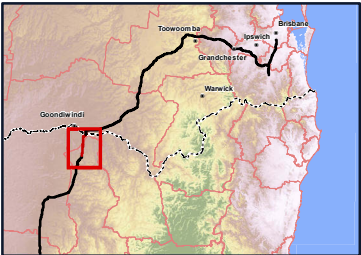
Legend

- Localities
- + - Existing rail (non-operational)
- Adjoining alignments
- Major roads
- Minor roads
- Borrow pits
- Construction footprint



0 0.35 0.7 1.05 1.4 1.75km





● Localities
 —+— Existing rail (operational)
 -+- Existing rail (non-operational)
 ■ Adjoining alignments
 — Major roads
 — Minor roads



Future Freight
Integrating Community, Environment and Engineering

Figure 9.3:
Intangible Aboriginal heritage sites - impact assessment

9.4 Proposed mitigation measures

The accepted methodology for managing impacts on heritage places is to avoid wherever possible, minimise as far as is practical and then mitigate where avoidance and minimisation is not possible (ICOMOS 2011). Measures to achieve these aims are outlined in Table 9.6 and applied to the Aboriginal cultural heritage places in Table 9.7.

Table 9.6 Proposed management and mitigation measures

Measure		Description
Avoidance		<ul style="list-style-type: none"> Consider options to alter disturbance footprint and avoid direct or indirect impacts
Minimisation		<ul style="list-style-type: none"> Tailor construction methodology to limit noise, vibration and dust impacts Consider ways to limit, vibration and dust impacts during operation Implement protocols for responding to unexpected heritage finds Monitor sites that have potential for indirect impacts
Mitigation	Archaeological survey	<ul style="list-style-type: none"> Undertake detailed archaeological survey to map all elements of archaeological sites, and identify areas of possible subsurface deposit If sites to be disturbed have not yet been surveyed, undertake a site clearance survey prior to disturbance
	Archaeological excavation	<ul style="list-style-type: none"> If warranted by results of archaeological survey, undertake a two-stage archaeological excavation: <ul style="list-style-type: none"> Stage 1 – test excavation to confirm subsurface deposit Stage 2 – salvage excavation of subsurface deposits (if required)
	Archaeological surface collection	<ul style="list-style-type: none"> Collect archaeological artefacts on the ground surface <ul style="list-style-type: none"> Depending on nature of site may be undertaken in conjunction with, or in place of, archaeological excavation Storage of archaeological artefacts in designated keeping place during construction Implement return to country program for selection of artefacts
	Salvage of non-artefact scatter sites	<ul style="list-style-type: none"> Develop custom methodology for each site that requires salvage following best practice

Table 9.7 Proposed mitigation measures for each heritage place

AHIMS ID	Site name	Mitigation
2-4-0003	Boggabilla Mungle	<ul style="list-style-type: none"> Aboriginal Site Impact Recording form to be appended to existing site card in AHIMS to state that site has been salvaged No further mitigation required, other than unexpected finds
2-4-0046	BBS Toomelah LALC Mobbindy Ck1	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools) Radiometric dating to be undertaken if suitable preservation conditions identified Use of part of site not impacted as 'on country' keeping place
2-4-0047	BBS Toomelah LALC Mobbindy Ck ST2	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to monitored every six months and at the end of construction for changes in condition

AHIMS ID	Site name	Mitigation
2-4-0103	NS2B-19-AS1	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0120	NS2B-19-AS2	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0119	NS2B-19-AS3	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Sandstone muller to be investigated for residue analysis
2-4-0118	NS2B-19-AS4	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0117	NS2B-19-AS5	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools and muller) Radiometric dating to be undertaken if suitable preservation conditions identified
2-4-0116	NS2B-19-AS6	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required

AHIMS ID	Site name	Mitigation
2-5-0088	NS2B-19-AS7	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required A program of test excavation is to be considered as per the requirements of the relevant Code and approved HMPs in areas where surface artefact densities are 10 per 10m² and ground surface integrity is established
2-4-0115	NS2B-19-AS8	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0139	NS2B-19-AS9	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools) Radiometric dating to be undertaken if suitable preservation conditions identified
2-4-0102	NS2B-19-AS10	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved heritage management plan (HMP) An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools) Radiometric dating to be undertaken if suitable preservation conditions identified
2-4-0101	NS2B-19-AS11	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0100	NS2B-19-AS12	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required

AHIMS ID	Site name	Mitigation
2-4-0099	NS2B-19-AS13	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0098	NS2B-19-AS14	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0097	NS2B-19-AS15	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0096	NS2B-19-AS16	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required A program of test excavation is to be considered as per the requirements of the relevant Code and approved HMPs in areas where surface artefact densities are 10 per 10m², ground surface integrity is established and the area of site will be impacted
2-4-0095	NS2B-19-AS17	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0122	NS2B-19-AS18	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0121	NS2B-19-AS19	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required

AHIMS ID	Site name	Mitigation
11-1-0056	NS2B-19-AS20	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
11-1-0055	NS2B-19-AS21	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools and muller) Radiometric dating to be undertaken if suitable preservation conditions identified
2-5-0089	NS2B-19-AS22	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools and muller) Radiometric dating to be undertaken if suitable preservation conditions identified
2-4-0114	NS2B-19-IA1	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0109	NS2B-19-IA2	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0108	NS2B-19-IA3	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required

AHIMS ID	Site name	Mitigation
2-4-0107	NS2B-19-IA4	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0141	NS2B-19-IA5	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0140	NS2B-19-IA6	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0138	NS2B-19-IA7	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0137	NS2B-19-IA8	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0136	NS2B-19-IA9	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0113	NS2B-19-IA10	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0112	NS2B-19-IA11	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required

AHIMS ID	Site name	Mitigation
2-4-0111	NS2B-19-IA12	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0110	NS2B-19-IA13	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0104	NS2B-19-ST1	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0105	NS2B-19-ST2	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0106	NS2B-19-ST3	<ul style="list-style-type: none"> Site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0129	NS2B-19-ST4	<ul style="list-style-type: none"> Site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0128	NS2B-19-ST5	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0127	NS2B-19-ST6	<ul style="list-style-type: none"> Site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0126	NS2B-19-ST7	<ul style="list-style-type: none"> Site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0125	NS2B-19-ST8	<ul style="list-style-type: none"> Site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place

AHIMS ID	Site name	Mitigation
2-4-0124	NS2B-19-ST9	<ul style="list-style-type: none"> Site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0135	NS2B-19-ST10	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0134	NS2B-19-ST11	<ul style="list-style-type: none"> Site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0131	NS2B-19-ST12	<ul style="list-style-type: none"> Site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0132	NS2B-19-ST13	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0133	NS2B-19-ST14	<ul style="list-style-type: none"> Site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0130	NS2B-19-ST15	<ul style="list-style-type: none"> Site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0123	NS2B-19-ST16	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
N/A	NS2B-19-RT1	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
N/A	NS2B-19-IH1	<ul style="list-style-type: none"> Species of value to local Aboriginal community to be considered for rehabilitation Consideration of publicly accessible rehabilitation Consideration of avoidance of impact to two mature bumble tree specimens
N/A	NS2B-19-IH2	<ul style="list-style-type: none"> Impacts will be managed under the Construction Environment Management Plan for the proposal

9.5 Residual impacts

The significance of predicted residual impacts to each of the sites is assessed in Table 9.8 using the rankings established in the previous sections. While the majority of sites will still be directly impacted, the mitigation measures particularly around surface collection and salvages proposed are evaluated as reducing the magnitude of this impact except instances where significantly large sites cannot be avoided.

Table 9.8 Assessment of significance of mitigated impacts

AHIMS	Site name	Sensitivity	Magnitude of change before mitigation	Magnitude of change after mitigation	Significance of impact after mitigation (residual impact)
2-4-0003	Boggabilla Mungle	Very High	No change	No change	Neutral
2-4-0046	BBS Toomelah LALC Mobbindry Ck1	High	Major	Major	Large/very large
2-4-0047	BBS Toomelah LALC Mobbindry Ck ST2	High	Medium	Low	Slight/Moderate
2-4-0103	NS2B-19-AS1	Low	Major	Medium	Neutral/Slight
2-4-0120	NS2B-19-AS2	Low	No change	No change	Neutral
2-4-0119	NS2B-19-AS3	Moderate	Major	Medium	Moderate
2-4-0118	NS2B-19-AS4	Low	Major	Medium	Slight
2-4-0117	NS2B-19-AS5	High	Major	Major	Large/very large
2-4-0116	NS2B-19-AS6	Low	Major	Medium	Slight
2-5-0088	NS2B-19-AS7	Moderate	Major	Medium	Moderate
2-4-0115	NS2B-19-AS8	Low	Major	Medium	Slight
2-4-0139	NS2B-19-AS9	High	Major	Major	Large/very large
2-4-0102	NS2B-19-AS10	High	Major	Major	Large/very large
2-4-0101	NS2B-19-AS11	Low	Major	Medium	Slight
2-4-0100	NS2B-19-AS12	Low	Major	Medium	Slight
2-4-0099	NS2B-19-AS13	Low	Major	Medium	Slight
2-4-0098	NS2B-19-AS14	Low	Major	Medium	Slight
2-4-0097	NS2B-19-AS15	Low	Major	Medium	Slight
2-4-0096	NS2B-19-AS16	Low	Major	Medium	Slight
2-4-0095	NS2B-19-AS17	Low	Major	Medium	Slight
2-4-0122	NS2B-19-AS18	Low	Major	Medium	Slight
2-4-0121	NS2B-19-AS19	Low	Major	Medium	Slight
11-1-0056	NS2B-19-AS20	Moderate	Major	Medium	Slight
11-1-0055	NS2B-19-AS21	Moderate	Major	Medium	Slight
2-5-0089	NS2B-19-AS22	Low	Major	Medium	Slight
2-4-0114	NS2B-19-IA1	Low	No change	No change	Neutral
2-4-0109	NS2B-19-IA2	Low	Major	Medium	Slight
2-4-0108	NS2B-19-IA3	Low	Major	Medium	Slight
2-4-0107	NS2B-19-IA4	Low	Major	Medium	Slight
2-4-0141	NS2B-19-IA5	Low	Major	Medium	Slight
2-4-0140	NS2B-19-IA6	Low	Major	Medium	Slight
2-4-0138	NS2B-19-IA7	Low	Major	Medium	Slight
2-4-0137	NS2B-19-IA8	Low	Major	Medium	Slight

AHIMS	Site name	Sensitivity	Magnitude of change before mitigation	Magnitude of change after mitigation	Significance of impact after mitigation (residual impact)
2-4-0136	NS2B-19-IA9	Low	Major	Medium	Slight
2-4-0113	NS2B-19-IA10	Low	Major	Medium	Slight
2-4-0112	NS2B-19-IA11	Low	Major	Medium	Slight
2-4-0111	NS2B-19-IA12	Low	Major	Medium	Slight
2-4-0110	NS2B-19-IA13	Low	Major	Medium	Slight
2-4-0104	NS2B-19-ST1	High	Medium	Medium	Moderate/large
2-4-0105	NS2B-19-ST2	High	Medium	Medium	Moderate/large
2-4-0106	NS2B-19-ST3	High	Major	Medium	Moderate/large
2-4-0129	NS2B-19-ST4	High	Major	Medium	Moderate/large
2-4-0128	NS2B-19-ST5	High	Medium	Low	Slight/moderate
2-4-0127	NS2B-19-ST6	High	Major	Medium	Moderate/large
2-4-0126	NS2B-19-ST7	High	Major	Medium	Moderate/large
2-4-0125	NS2B-19-ST8	High	Major	Medium	Moderate/large
2-4-0124	NS2B-19-ST9	High	Major	Medium	Moderate/large
2-4-0135	NS2B-19-ST10	High	Medium	Low	Slight/moderate
2-4-0134	NS2B-19-ST11	High	Major	Medium	Moderate/large
2-4-0131	NS2B-19-ST12	High	Major	Medium	Moderate/large
2-4-0132	NS2B-19-ST13	High	Medium	Low	Slight/moderate
2-4-0133	NS2B-19-ST14	High	Major	Medium	Moderate/large
2-4-0130	NS2B-19-ST15	High	Major	Medium	Moderate/large
2-4-0123	NS2B-19-ST16	High	No change	No change	Neutral
N/A	NS2B-19-RT1	High	Medium	Negligible	Slight
N/A	NS2B-19-IH1	High	Major	Low	Slight/moderate
N/A	NS2B-19-IH2	High	Major	Low	Slight/moderate

9.6 Cumulative impact assessment

9.6.1 Assessment of Ecologically Sustainable Development

In NSW, the NPW Act provides the legislative framework for the protection of Aboriginal objects and places. Clause 2A(2) of the NPW Act stipulates that such protection is to be achieved by applying the principles of ecologically sustainable development. Ecologically sustainable development requires the integration of economic and environmental considerations (including cultural heritage) in decision-making processes and, in the context of Aboriginal cultural heritage, can be achieved through the implementation of two key principles: intergenerational equity and the precautionary principle.

Intergenerational equity is the principle whereby the present generation should ensure the health, diversity and productivity of the environment for the benefit of future generations. With regards to Aboriginal heritage, intergenerational equity can be assessed in terms of cumulative impacts to Aboriginal objects and places in a region. Central to any assessment of intergenerational equity is the proposition that regions with fewer Aboriginal objects and places necessarily retain fewer opportunities for future generations of Aboriginal people to enjoy their cultural heritage. Accordingly, information regarding the known and potential Aboriginal heritage resource of a given region is critical to any assessment of intergenerational equity.

The precautionary principle holds that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation. In NSW, the precautionary principle is relevant to the Department of Premier and Cabinet's consideration of potential impacts to Aboriginal cultural heritage in situations where:

- The proposed development involves a risk of serious or irreversible damage to Aboriginal objects or places or to the value of those objects or places; and
- There is uncertainty about the Aboriginal cultural heritage values or scientific or archaeological values, including in relation to the integrity, rarity or representativeness of the Aboriginal objects or places proposed to be impacted.

In these instances, the Department of Premier and Cabinet's has indicated that a precautionary approach should be taken and all cost-effective measures implemented to prevent or reduce damage to Aboriginal objects and/or places. In addition to these measures, a cumulative impact assessment should be undertaken to gain an understanding and appreciation of the impacts development will have on NSW's Aboriginal cultural heritage resource.

It should be noted that the results of cumulative impact assessments undertaken for cultural heritage sites and places, Aboriginal or otherwise, must be interpreted with caution, not least because they are based (in part) on heritage datasets that are inevitably incomplete and contain various inconsistencies and errors. Godwin (2011b), in particular, has questioned the value of cumulative impact assessments to cultural heritage management in Australia, arguing that the 'fundamentals' necessary for undertaking such assessments simply do not exist. The 'fundamentals' Godwin is referring are robust regional and national data sets for measuring proposed impacts and the determination of acceptable scientific and cultural impact thresholds. While recognising the validity of the issues raised by Godwin (2011b), current the Department of Premier and Cabinet's guidelines necessitate that a cumulative impact assessment be undertaken as part of any Aboriginal cultural heritage assessment in NSW.

9.6.2 Intergenerational equity - cumulative impact assessment

Two avenues for assessing the cumulative impact of the proposal on Aboriginal heritage can be pursued:

- A comparison, using the results of AHIMS searches, of the identified Aboriginal archaeological resource of the study area with that of the surrounding region, defined here as an arbitrary 20 x 20 km (400 km²) area roughly centred on the study area; and
- The use of existing environmental data sources (e.g., digital land use data and topographic maps) to identify the potential open artefact resource of the study region as a whole.

9.6.3 Known resource

Alongside sites identified within the study area, existing open artefact sites in the study region offer opportunities for future research, conservation and education. Accordingly, it is necessary to quantify the impacts of the proposed development on this resource.

The impact assessment undertaken in Section 9.3 has identified that 51 Aboriginal sites have the potential to be directly or indirectly impacted. AHIMS data obtained from the Department of Premier and Cabinet in October 2019 indicates that these sites represent 12% of the valid extant open artefact resource and 1% of the valid culturally modified tree resource of the study region, with searches of the AHIMS database returning 112 'Valid' sites for this search region.

While this calculation gives us a starting point to assess cumulative impact, it is important to acknowledge that the simplistic comparison of the site category 'open artefact scatter' or 'culturally modified tree' makes the following assumptions:

- AHIMS comprehensiveness – While cumulative assessments of this type are useful in intensively studied areas of NSW like the Sydney and Hunter Basins, more remote regional areas typically have seen less research and survey. As demonstrated by the AHIMS search results, the majority of land within the wider regional area has not been physically inspected for Aboriginal archaeological sites. As such, site types are skewed towards location either through project impact assessment requirements or cultural importance (Boobera Lagoon). This is typified in the AHIMS search undertaken for this area, where the majority of sites are recorded on roads or along other linear features.
- All sites are equal – Typically this is rarely the case and in these instances categories like 'open artefact scatter' are condensing isolated artefacts with major campsites of 10,000+ artefacts that extend several hundred metres. These larger sites also likely represent several hundred years of occupation as opposed to a single discard event. The impact of impacting four isolated artefacts cannot be readily compared to the impact of a site of much higher cultural and scientific significance.
- Types of artefacts – Within the current constraints of the AHIMS database, it is impractical to review all of the paper records relating to surrounding archaeological sites to determine if certain sites present important artefacts or assemblage mixes that present research opportunities that enhance the known archaeological resource within the study area or demonstrate how limited the assemblages might be. FFJV understands that the Department of Premier and Cabinet is in the process of modernising the AHIMS database to mirror other current systems such as the Victorian Aboriginal Cultural Heritage Register and Information System database, which will allow multi-site comparisons for a fraction of the cost and time required to invest in assessing available AHIMS data.
- Recorder temporal and cultural bias – The sites recorded by AHIMS in the regional area cover a time period of almost 40 years, and in that time recording methodologies have changed as the discipline of Aboriginal archaeology has developed to face the challenges of legislative requirements and incorporate advancements in technology. In addition to this, many practitioners can have widely varying artefact identification skills or approaches to recording artefacts typified by early researchers collectively describing what today would be called low density artefact scatters as isolated artefacts.

Given the above and that many of the impacted sites are considered to be of low scientific significance, this suggests that this cumulative impact may not be as significant as it first appears.

9.6.4 Potential resource

AHIMS results only represent a fraction of the likely archaeological resource present within a region, as these results are only representative of land that has been subject to archaeological investigations. Accordingly, an assessment of the potential Aboriginal cultural heritage resource of an approximate 20 x 20 km study region centred on the study area is also a useful guide. For the present analysis, land use data (dated 2017) obtained from the Land Assessment Unit at the Department of Premier and Cabinet was utilised (refer Table 9.9).

As a starting point, it is necessary to quantify the amount of land within the study region that has the potential to retain to open artefact sites. A basic assumption here is that grossly disturbed terrain is unlikely to retain such sites whereas non-grossly disturbed terrain does, both in surface and subsurface contexts. Analysis of available digital land use data for the study region is summarised in Table 9.9.

Table 9.9 Land use analysis for study region (20 x 20 km)

Existing land use	Hectares	%	Archaeological potential?
Cropping	2,841.35	46.74%	Some
Grazing native vegetation	2,683.80	44.14%	Yes
Irrigated cropping	347.18	5.71%	Some
Grazing modified pastures	114.22	1.88%	Some
Other minimal use	38.69	0.64%	No
Transport and communication	18.91	0.31%	No
Reservoir/dam	15.01	0.25%	No
Residential and farm infrastructure	13.79	0.23%	No
Quarries (Borrow Pits)	6.56	0.10%	No
Total	6,079.52	100.00%	

Source: NSW Landuse Data 2013 obtained from the Department of Premier and Cabinet

While acknowledging the fact that the nature and distribution of such deposits will vary markedly in relation to environmental variables (such as landform and the availability of potable water), analysis of available land use data does help to quantify the extent of the region's potential Aboriginal open artefact resource. Viewed from an Aboriginal archaeological perspective, the results of the land use analysis presented in Table 9.9 suggest that approximately 44 per cent of the study region (c.2,683 km²) can reasonably be considered to comprise a potential open artefact resource. As indicated, land upon which open artefact deposits are unlikely to survive accounts for just over 1.54 per cent of land within the region. This figure increases to 55.87 per cent if cropping and grazing land on non-native vegetated lands is included.

However, as indicated by the results of numerous Aboriginal archaeological investigations, both within and outside of the study region, cropped and grazed areas can and frequently do retain significant surface and subsurface stone artefact records. It can, therefore, be concluded that around 98.47 per cent of land within the study region has the potential to retain open artefact deposits in surface and subsurface contexts. Moreover, it provides a basis from which assess the cumulative impact of the proposed development on this resource.

In order to quantify the impact of the proposed development on the potential open artefact resource of the study region it is necessary to compare the amount of impacted land within the study area that could be considered a potential open artefact resource (i.e., 5,986.5 ha) with that available in the search area (c.6,076.5 km²). On this basis, it can be stated that the proposal will result in an approximate 4% decline in the study area's potential open artefact resource (assuming total impact of the proposal site). As such, it can be concluded that the impact of the proposal on the potential Aboriginal archaeological resource of the region will be low.

With regards to the existence, outside of the study area, of environmental contexts that have the potential to contain sites comparable to those identified within it, an examination of relevant topographic maps for the study region indicates that many such contexts exist including waterholes and creek lines in the region. On the basis of this evidence, it can be confidently concluded that land outside of the current study area but within the wider region contains a significant, as yet unidentified, open artefact site resource.

9.6.5 The Precautionary Principle

The precautionary principle holds that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

In the context of the current assessment, it can be stated that FFJV has adopted a precautionary approach in our assessment of the impacts of the proposed development on the Aboriginal archaeological resource of the study area and that this approach is reflected in our proposed management strategy.

9.6.6 Avoiding and minimising harm

This ACHAR finds that the Aboriginal heritage values of the study area rest principally with the Aboriginal archaeological sites that have been identified within it. Archaeological survey across the study area has identified a total of 54 Aboriginal archaeological sites, all of which have been registered on the Department of Premier and Cabinet's AHIMS database.

As indicated in Section 9.3, proposed development activities within the study area are anticipated to directly or indirectly impact up to 51 Aboriginal sites. Impacted sites have been assessed as of being of high, moderate and low scientific significance. Avoidance of impacts to the previously and newly identified Aboriginal sites within the study area is unfeasible given the respective locations of these sites in relation to the proposed development.

Areas of subsurface archaeological sensitivity within the study area were identified in association with a number of unnamed first and second order streams. These areas were assessed, on the basis of field observations, RAP field comments and existing local and regional archaeological data, as retaining a reasonable potential for the presence of subsurface archaeological deposits.

In view of the above, management strategies to minimise harm to the identified heritage values of the study area are required. These strategies, which include a recommendation for an archaeological salvage program for all impacted sites, are detailed in Section 10.

10 Management recommendations

The following management recommendations are made regarding the identified Aboriginal cultural heritage values of the study area, with recommendations made on the basis of:

- A review of previous archaeological investigations completed within and surrounding the study area
- The results of the archaeological investigation described in Section 7
- The significance and impact assessments detailed in Section 8 and 9
- Consultation with RAPs identified in Section 4.

10.1 Statutory requirements

As indicated in Section 1, this ACHAR forms part of an EIS being prepared by FFJV to support ARTC's application for approval of the proposal under Part 5.1 of the EP&A Act.

This ACHAR documents the results of FFJV's assessment and has been compiled with reference to the NSW Office of Environment and Heritage's *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (NSW Department of Environment Climate Change & Water 2010a), *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW Department of Environment Climate Change & Water 2010b) and *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (NSW Office of Environment & Heritage 2011).

10.2 Management strategy

The impact assessment undertaken in Section 9 has identified that 51 Aboriginal sites have the potential to be directly or indirectly impacted. A management strategy to address the impacts of the proposal on the known and potential Aboriginal archaeological resource of the study area is summarised in Table 10.1 and detailed below.

Table 10.1 Summary of strategy elements

Strategy Element	Section
Aboriginal Cultural Heritage Management Plan	Section 10.2.1
Avoidance of Impact	Section 10.2.2
Archaeological salvage - Lithics	Section 10.2.3
Archaeological salvage – Cultural Modified Trees	Section 10.2.4
Ring Tree (NS2B-19-RT1)	Section 10.2.5
Plant Resources (NS2B-19-IH1)	Section 10.2.6
Circular Feature Investigations	Section 10.2.7
Aboriginal Cultural heritage Awareness Training	Section 10.2.9
Unexpected Finds Procedures	Section 10.2.10
Management of suspected human remains	Section 10.2.11
AHIMS Site Cards	Section 10.2.12
Aboriginal Heritage Site Database	Section 10.2.13
Interpretation Strategy	Section 10.2.14

10.2.1 Aboriginal Cultural Heritage Management Plan

It is recommended that this strategy be detailed in an Aboriginal Cultural Heritage Management Plan (ACHMP) for the proposal, prepared in consultation with RAPs, and to the satisfaction of the Department of Premier and Cabinet and DPIE. Subject to Development Consent under Part 5, Division 5.1 of EP&A Act, the ACHMP will guide the management of the known and potential Aboriginal archaeological resource of the proposal site, as well identified Aboriginal cultural heritage values.

10.2.2 Avoidance of Impact

All Aboriginal sites not impacted by the proposal should be conserved in-situ. The two culturally modified tree site (AHIMS#2-4-0047 and NS2B-18-ST1) should be protected via temporary fencing during construction and appropriate associated signage. Protection measures should include:

- Site fencing is to be erected after consultation with a qualified archaeologist and RAP representatives and should encompass both tree's driplines.
- All relevant staff and contractors are to be made aware of the nature and locations of all sites as well as ARTC's legal obligations with respect to them.
- Protected sites will need to be identified on all relevant site plans.
- Details for the care of protected sites should be incorporated into the ACHMP.

10.2.3 Archaeological salvage - Lithics

An archaeological salvage program for lithics (stone artefacts) should be undertaken for the proposal prior to the commencement of any ground disturbance works within the study area. The salvage program should incorporate the following components:

1. Surface collection of all impacted open artefact sites. Surface collection is considered an appropriate and effective mitigation option for these sites given their content and level of archaeological significance. Table 10.3 presents a summary of management mitigation measures for identified Aboriginal cultural heritage sites within the study area.
2. Provision of a list of sites to be surface collected. Collected artefacts should be relocated to an area nominated as a temporary keeping place.
3. A program of archaeological test excavation will be undertaken within areas of identified high Aboriginal archaeological sensitivity. Test excavation will include 0.25m² test pits excavated to B horizon soils placed at 20 m intervals. Should test pit expansions be required to further define the nature and extent of archaeological materials encountered these would be undertaken during this time.
4. Open area salvage excavation may be required should the archaeological test excavation program identify significant archaeological features including high densities of archaeological material, hearths, heat treatment pits, etc.

All archaeological salvage works should be undertaken by a combined field team of archaeologists and RAP field representatives. Post-salvage work for the excavation component of the archaeological salvage program should, at minimum, include:

- The analysis and cataloguing of all recovered Aboriginal objects (e.g., stone artefacts, hearths etc.) by a suitably qualified person or persons;
- The submission, where deemed appropriate by a qualified archaeologist and/or geomorphologist, of excavated charcoal samples for conventional or Accelerator Mass Spectrometry radiocarbon dating;
- The submission, where deemed appropriate by a qualified geomorphologist, of excavated sediment samples for Optically Stimulated Luminescence dating;

- The submission, where deemed appropriate by a qualified archaeologist, of a selection of stone artefacts for functional use-wear/residue analysis; and
- The submission, where deemed appropriate by a qualified archaeologist, of a selection of non-artefactual rock samples to a qualified geologist for the purposes of raw material identification.

All Aboriginal objects salvaged as part of the excavation program should be curated in an appropriate manner, as determined through consultation with RAPs, the Department of Premier and Cabinet and DPIE during preparation of the ACHMP. Temporary off-site storage of salvaged objects should be allowed for the purposes of analysis and recording.

Aboriginal Site Impact Recording forms for all salvaged sites should be submitted to the Department of Premier and Cabinet at the completion of the salvage program.

ARTC will, in consultation with the RAPs, investigate options for an on country keeping place for archaeological materials salvaged prior and during construction works. All artefacts salvaged will be managed under a care and custodianship agreement. The AHMP will document the requirements for care and conservancy of salvaged materials and provide a framework for 'return to country' of artefacts post-construction.

10.2.4 Archaeological salvage – Culturally Modified Trees

Sixteen culturally modified trees will be impacted by the proposal (refer Table 10.3). It is proposed that these trees be salvaged by qualified arborists archaeologist and RAP representatives prior to impact using a standardised methodology such as the *Scarred Trees Relocation Procedures* produced by Rio Tinto (2009). The methodology proposed involves three key steps:

- Archival Recording Prior to Removal - Prior to the removal of the tree, the general context of the tree is to be photographed, along with all marks on the trunk
- Removal – Prior to removal, arborists wrapped the tree trunk with protective fabric (such as hessian or an alternative material) to protect the surface from any damage. It is then bound it with plastic cabling to help support the trunk and minimise the potential for collapse. The upper limbs of the tree are removed to reduce the size of the trunk being salvaged, which is then secured to a crane using soft slings to minimise any surface damage, the base of the trunk cut away, allowing the crane to slowly lower the tree to the ground.
- Storage - Once on the ground, the trunk can be relocated to its future storage location either by crane or flatbed truck. The trunk is been placed on concrete railway sleepers at its storage location to minimise the potential for invasion by pests, and the build-up of moisture leading to fungal attack and decay. Little additional conservation is required for dead trees, however living trees may require some element of conservation to protect from damage (Rio Tinto Coal Australia 2009).

In addition to the 16 definite culturally modified trees, 26 trees were identified by survey participants that could not be convincingly demonstrated to be cultural or natural scars. It is recommended that these trees be subject to an arborist inspection, with the participation of RAP representatives, prior to proposal impacts, in order to assess their status as Aboriginal culturally modified trees. Should it be determined the scars on these trees are of Aboriginal origin they should be removed using the previously described methodology under the supervision of a qualified arborist, archaeologist and RAP representatives prior to impacts.

Details for the culturally modified tree assessment, and possible removal, transport and long-term storage should be incorporated into the revised AHMP. Should it be determined they are not Aboriginal culturally modified trees they will not be managed as Aboriginal archaeological sites.

10.2.5 Ring Tree (NS2B-19-RT1)

The ring tree is located on the eastern boundary of the permanent disturbance footprint. Review of the proposed viaduct location and the location of the tree has identified that the tree should be able to be avoided during construction and operation.

If the tree is able to be avoided:

- Temporary fencing should be erected to identify this tree as being culturally sensitive
- The tree should be included in construction planning
- The tree's location and significance should be noted in daily toolboxes for works within 200 metres of the tree.

If impacts to the tree are unable to be avoided (either partially or wholly), then:

- Additional consultation with each registered Aboriginal Party should be undertaken
- The reasons for why the tree has to be impacted are to be documented
- Culturally appropriate mitigation measures identified during consultation would be implemented for the tree.

10.2.6 Plant Resources (NS2B-19-IH1)

10.2.6.1 Revegetation

A significant proportion of publicly accessible plant resources to the Toomelah/Boggabilla community and surrounding Aboriginal communities are located within the proposed rail corridor. Observations of these species during the survey, confirmed their compatibility with the disturbed landscape of the railway corridor. Consideration should be given in rehabilitation efforts post construction to replanting of these species particularly Euraba/Eurah (*Eremophila bignoniiflora*) which was highlighted by field representatives as an important culturally economic species.

10.2.6.2 Avoidance

While there is an understanding that the proposal will involve vegetation clearance for the safe construction and operation of the rail line, field representatives highlighted the bumble tree (*Capparis mitchellii*) as an important cultural tree for women and general food plant for community. It was requested that where possible examples of the bumble tree should be avoided with two mature specimens in particular highlighted (refer Table 10.2). If avoidance is possible, specimens should be temporarily fenced off and daily tool boxes within proximity to the specimen should highlight their location and cultural importance.

Table 10.2 Mature bumble tree specimens to avoid

Tree ID	Location/Chainage
Bumble Tree #1	8200
Bumble Tree #2	Site 26 – Borrow Pit

10.2.7 Watercourses (NS2B-19-IH2)

Apart from Whalan Creek and the Macintyre River, all other watercourses have been previously impacted by the Cumurra-Boggabilla railway line. Impacts to these watercourses will be managed and mitigated under the Construction Environment Management Plan for the proposal.

10.2.8 Circular feature investigations

To investigate this feature further, the following steps are recommended to be conducted in this order:

1. Undertake oral history interview with current and past landowner to determine if they know what the circular feature is and also understand why the nearby paddock has an uncleared area in it

2. Undertake general review of known ceremonial grounds in the wider Kamilaroi and summarise their features
3. In consultation with community, undertake lidar scanning via drone of circular feature as well as surrounding evidence to identify if they may be hidden features in the landscape
4. Undertake geophysical investigations which may include compaction or electrical resistivity testing
5. Undertake limited soil testing and comparison analysis between soil within circular feature and soil immediately outside of the feature
6. Presentation of findings and further steps (oral presentation and plain-English report) to RAP in order to reach agreement on management of feature.

10.2.9 Aboriginal cultural heritage awareness training

An Aboriginal cultural heritage awareness training package should be developed for use throughout the life of the proposal. This package should be developed in consultation with RAPs and completed prior to the commencement any ground disturbance works within the proposal site. A register of all persons having completed the training package should be maintained throughout the life of the proposal.

Aboriginal cultural awareness training should be mandatory for all staff and contractors whose roles may reasonably bring them into contact with Aboriginal sites and/or involve consultation with local Aboriginal community members. Training should also be offered on a voluntary basis to all other staff and contractors.

ARTC should ensure that as part of all standard site inductions, an Aboriginal cultural heritage component is included. At a minimum, this should outline current protocols and responsibilities with respect to the management of Aboriginal cultural heritage within the study area, provide an overview of the diagnostic characteristics of potential Aboriginal site types (e.g. culturally modified trees) and procedures for reporting the identification of Aboriginal archaeological sites (refer Section 10.2.10).

10.2.10 Unexpected finds procedure

Provisions regarding the appropriate management action(s) for previously unrecorded Aboriginal archaeological evidence identified within the study area throughout the operational life of the proposal are to be incorporated into the ACHMP. Management action(s) will vary according to the type of evidence identified, its significance (both scientific and cultural) and the nature of potential impacts.

The unexpected finds protocol will include the following steps if an Aboriginal object is identified or harmed:

1. All activity to cease within a 10 m buffer of the suspected find, and the area to be cordoned off using temporary fencing.
2. Site Supervisor is to be immediately notified who will then engage a qualified Heritage Advisor to assess the find.
3. If the find is determined to be Aboriginal cultural heritage, the Department of Premier and Cabinet and the RAPs are to be notified immediately of the find. The Heritage Advisor is to consult with the RAPs on the management of the object and prepare a site card for submission to the AHIMS register.
4. No work is to recommence at the particular location unless authorised in writing by the Department of Premier and Cabinet.

10.2.11 Management of suspected human remains

If any suspected human remains are discovered during any activity works, they must be initially assumed under the provisions of the *Coroners Act 2009* to be a crime scene and treated accordingly, the following standard procedure should be followed (New South Wales Police Force 2015; NSW Health 2013):

1. The remains are to be left in place and all activity in the vicinity must cease immediately with the Site Supervisor to be notified. It is important to use best judgement and restrict all movement in the immediate vicinity around the discovery until directed otherwise by the Police as this could contaminate a potential crime scene. Likewise, do not set up temporary fencing unless directed by the Police.
2. The Police must be notified immediately of the discovery by the Site Supervisor or appointed supervisor in charge of the works area.
3. The Police will establish a crime scene and appoint a forensic expert to assess the find. If the appointed expert investigating the find under the relevant *Coroners Act 2009* believes that there are reasonable grounds to believe the remains to be:
 - A crime scene, the Police will provide direction on the management of the discovery
 - Aboriginal ancestral remains, the Department of Premier and Cabinet to be contacted as soon as practical (T:13 15 55), providing any details of the Aboriginal remains including its location
 - Historical remains, the Department of Premier and Cabinet to be contacted as soon as practical (T:13 15 55), providing any details of the historical remains including its location.

10.2.12 Aboriginal Heritage Information Management System site cards

AHIMS sites cards have been completed and submitted on 29 October 2019 to the Department of Premier and Cabinet for all newly recorded sites within the study area. AHIMS site cards are provided in Appendix E. In the event that a previously unidentified Aboriginal heritage site is discovered within the Proposal area at any point during the operational life of the proposal, an AHIMS site card for that site should be submitted to the Department of Premier and Cabinet as promptly as possible. Timing protocols for the submission of AHIMS site cards should be included in the ACHMP for the proposal.

10.2.13 Aboriginal Site Database

A comprehensive Aboriginal Site Database for the study area and its immediate environs should be established upon commencement of the proposal. ARTC will be responsible for the creation and maintenance of this database which will, at a minimum, contain the site ID, type, extent, spatial coordinates and status of all Aboriginal sites within and directly adjacent to the study area. The database should be regularly updated throughout the operational life of proposal. Printed site lists and maps should be made available to RAPs upon request.

10.2.14 Interpretation strategy

Field representatives for the RAPs expressed a strong desire for their culture to be recognised as part of an interpretation strategy for the proposal. This interpretation strategy should investigate and develop approaches to exploring local Aboriginal heritage including:

- Tourist signage along the Inland Rail route identifying key aspects of cultural heritage on the North Star to Border regions. It should be explored as to whether this should be done as part of an information panel, or whether additional technologies such as interactivity with QR codes could be investigated.
- Landscaping for the proposal should consider incorporation of a variety of regional bush plant resources along the easement as opposed to a homogenous revegetation strategy. Particularly important to the local Aboriginal representatives on survey was the desire that this proposal could promote the regeneration of bush resources in the region as demonstrated by the species hardiness in an otherwise disturbed existing rail corridor.

10.3 Summary of management mitigation measures

Table 10.3 presents a summary of management mitigation measures for identified Aboriginal cultural heritage sites within the study area.

Table 10.3 Summary of site management

AHIMS ID	Site name	Site type	Management
2-4-0003	Boggabilla Mungle	Carved Trees	<ul style="list-style-type: none"> Aboriginal Site Impact Recording form to be appended to existing site card in AHIMS to state that site has been salvaged No further mitigation required, other than unexpected finds
2-4-0046	BBS Toomelah LALC Mobbindy Ck1	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools) Radiometric dating to be undertaken if suitable preservation conditions identified Use of part of site not impacted as 'on country' keeping place
2-4-0047	BBS Toomelah LALC Mobbindy Ck ST2	Culturally modified Tree	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0103	NS2B-19-AS1	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0120	NS2B-19-AS2	Artefact Scatter	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0119	NS2B-19-AS3	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Sandstone muller to be investigated for residue analysis
2-4-0118	NS2B-19-AS4	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required

AHIMS ID	Site name	Site type	Management
2-4-0117	NS2B-19-AS5	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools and muller) Radiometric dating to be undertaken if suitable preservation conditions identified
2-4-0116	NS2B-19-AS6	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-5-0088	NS2B-19-AS7	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required A program of test excavation is to be considered as per the requirements of the relevant Code and approved HMPs in areas where surface artefact densities are 10 per 10m² and ground surface integrity is established
2-4-0115	NS2B-19-AS8	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0139	NS2B-19-AS9	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools) Radiometric dating to be undertaken if suitable preservation conditions identified

AHIMS ID	Site name	Site type	Management
2-4-0102	NS2B-19-AS10	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools) Radiometric dating to be undertaken if suitable preservation conditions identified
2-4-0101	NS2B-19-AS11	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0100	NS2B-19-AS12	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0099	NS2B-19-AS13	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0098	NS2B-19-AS14	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0097	NS2B-19-AS15	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0096	NS2B-19-AS16	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required A program of test excavation is to be considered as per the requirements of the relevant Code and approved HMPs in areas where surface artefact densities are 10 per 10m², ground surface integrity is established and the area of site will be impacted

AHIMS ID	Site name	Site type	Management
2-4-0095	NS2B-19-AS17	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0122	NS2B-19-AS18	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0121	NS2B-19-AS19	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
11-1-0056	NS2B-19-AS20	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
11-1-0055	NS2B-19-AS21	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools and muller) Radiometric dating to be undertaken if suitable preservation conditions identified
2-5-0089	NS2B-19-AS22	Artefact Scatter	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS A program of test excavation is to be undertaken as per the requirements of the relevant Code and approved HMPs An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required Selection of artefacts to be analysed for residue analysis (preferably tools and muller) Radiometric dating to be undertaken if suitable preservation conditions identified
2-4-0114	NS2B-19-IA1	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required

AHIMS ID	Site name	Site type	Management
2-4-0109	NS2B-19-IA2	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0108	NS2B-19-IA3	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0107	NS2B-19-IA4	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0141	NS2B-19-IA5	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0140	NS2B-19-IA6	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0138	NS2B-19-IA7	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0137	NS2B-19-IA8	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0136	NS2B-19-IA9	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required

AHIMS ID	Site name	Site type	Management
2-4-0113	NS2B-19-IA10	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0112	NS2B-19-IA11	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0111	NS2B-19-IA12	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0110	NS2B-19-IA13	Isolated Artefact	<ul style="list-style-type: none"> Aboriginal artefacts are to be surface collected as per the Aboriginal Heritage Code of Practice (NSW Department of Environment Climate Change & Water 2010b) Individual artefacts are mapped using tablet devices and/or handheld differential GPS An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required
2-4-0104	NS2B-19-ST1	Culturally modified Tree	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0105	NS2B-19-ST2	Culturally modified Tree	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0106	NS2B-19-ST3	Culturally modified Tree	<ul style="list-style-type: none"> If site is to be impacted, site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0129	NS2B-19-ST4	Culturally modified Tree	<ul style="list-style-type: none"> If site is to be impacted, site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place

AHIMS ID	Site name	Site type	Management
2-4-0128	NS2B-19-ST5	Culturally modified Tree	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0127	NS2B-19-ST6	Culturally modified Tree	<ul style="list-style-type: none"> If site is to be impacted, site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0126	NS2B-19-ST7	Culturally modified Tree	<ul style="list-style-type: none"> If site is to be impacted, site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0125	NS2B-19-ST8	Culturally modified Tree	<ul style="list-style-type: none"> If site is to be impacted, site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0124	NS2B-19-ST9	Culturally modified Tree	<ul style="list-style-type: none"> If site is to be impacted, site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0135	NS2B-19-ST10	Culturally modified Tree	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition
2-4-0134	NS2B-19-ST11	Culturally modified Tree	<ul style="list-style-type: none"> If site is to be impacted, site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0131	NS2B-19-ST12	Culturally modified Tree	<ul style="list-style-type: none"> If site is to be impacted, site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) Salvaged tree to be conserved as per best practice Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0132	NS2B-19-ST13	Culturally modified Tree	<ul style="list-style-type: none"> Site location to be clearly identified during construction to avoid impact Site is to be temporarily fenced during constructions works Site location is to be noted and discussed in tool box for all works occurring in vicinity Site to be monitored every six months and at the end of construction for changes in condition

AHIMS ID	Site name	Site type	Management
2-4-0133	NS2B-19-ST14	Culturally modified Tree	<ul style="list-style-type: none"> ■ If site is to be impacted, site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) ■ Salvaged tree to be conserved as per best practice ■ Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0130	NS2B-19-ST15	Culturally modified Tree	<ul style="list-style-type: none"> ■ If site is to be impacted, site to be salvaged in accordance with industry standards (Long 2005; Rio Tinto Coal Australia 2009) ■ Salvaged tree to be conserved as per best practice ■ Consultation with Registered Aboriginal Parties on suitable keeping place
2-4-0123	NS2B-19-ST16	Culturally modified Tree	<ul style="list-style-type: none"> ■ Site location to be clearly identified during construction to avoid impact ■ Site is to be temporarily fenced during constructions works ■ Site location is to be noted and discussed in tool box for all works occurring in vicinity ■ Site to be monitored every six months and at the end of construction for changes in condition
N/A	NS2B-19-RT1	Potentially culturally modified tree	<ul style="list-style-type: none"> ■ Site location to be clearly identified during construction to avoid impact ■ Site is to be temporarily fenced during constructions works ■ Site location is to be noted and discussed in tool box for all works occurring in vicinity ■ Site to be monitored every six months and at the end of construction for changes in condition
N/A	NS2B-19-IH1	Plant resources	<ul style="list-style-type: none"> ■ Species of value to local Aboriginal community to be considered for rehabilitation ■ Consideration of publicly accessible rehabilitation ■ Consideration of avoidance of impact to two mature bumble tree specimens
N/A	NS2B-19-IH2	Watercourses	<ul style="list-style-type: none"> ■ Impacts will be managed under the Construction Environment Management Plan for the proposal

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