EXTENT
PEOPLE-CENTRED
HERITAGE

8 June 2023

Attention: Alyse Phillips, Team Lead - Communications and Stakeholder Engagement
SMEC
74 Hunter Street
Newcastle, NSW 2300

Dear Alyse,

Re: Muswellbrook Pumped Hydro Energy Storage – Upper Reservoir Aboriginal Heritage Management

Extent Heritage Pty Ltd (Extent Heritage) has been engaged by SMEC to assess the potential for Aboriginal cultural heritage at 'the upper reservoir' at Bells Mountain, near Muswellbrook, New South Wales ('study area'). The upper reservoir will form part of an ongoing program of geological investigation into the location of the proposed pumped hydro pipeline and associated infrastructure in the area. That geological investigation will involve thirteen boreholes in as many locations.

The proposed boreholes would be drilled using a tracked drilling rig and rod carrier. This would cause localised ground disturbance in an area of some 25m x 25m at the drill site. The drilling rig and rod carrier would also be accompanied by various support vehicles including, but not limited to, MR sized rigid support trucks and water cart, LV 4wd vehicles, and the placement of water tanks. The work would also include less invasive activities in an area of some 25m x 25m around the boreholes (e.g., movement of heavy vehicles and pedestrian activity) and geophysical surveys (seismic refraction/reflection) which involves no ground disturbance or vegetation clearing. The program of borehole and test pit investigation would also involve the grading of tracks and management of tracks as illustrated in Figure 1.

To ensure full coverage during the cultural heritage survey a buffer was placed around all of the project works locations. A 30m x 30m area was surveyed for all drilling locations and a 10m corridor for all tracks. Applying this buffer ensured that the entire disturbance footprint was surveyed for any potential sites, including any within close proximity.

Those areas that were surveyed by archaeologists for this report are illustrated in Figures 14-45.

SMEC engaged Extent Heritage to assist it to meet its obligations under the *National Parks and Wildlife Act 1974* for the proposed geotechnical activities, as well as the NSW Minerals Industry *Due Diligence Code of Practice of the Protection of Aboriginal Objects in New South Wales* (NSW Minerals Council 2010) (Appendix A). This report has also been undertaken in

accordance with the principles contained in the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010) (Appendix A). This report, and the fieldwork that it is based on, did not involve engagement with representatives of the relevant Aboriginal community. This is also reflected in the recommendations contained in this report.

In summary, no Aboriginal artefacts or places were identified in the areas surveyed during the due diligence inspection. The areas surveyed have been disturbed by a number of different processes, including land and vegetation clearance for historic farming practices. These practices have impacted topsoils and as a result those parts are assessed as having low potential to contain significant Aboriginal cultural objects or sites.

The survey conducted on the study area was limited by dense vegetation and poor ground surface visibility. The increased rainfall over the previous three years has caused significant growth in vegetation across the project area. This vegetation limited the ground surface visibility and reduced the effectiveness of the cultural heritage survey.

Although the above limitations impacted the effectiveness of the survey, the survey team was able to assess the potential cultural heritage implications of the geotechnical works program in the upper reservoir, subject to those limitations. The proposed development is assessed as having low risk of harming Aboriginal objects or places there. Therefore, it is appropriate for the works to proceed with caution in the upper reservoir area, and in accordance with the recommendations below.

Should you have any queries in relation to our report, please do not hesitate to contact Reiner Mantei on 0422 486 468.

Yours sincerely,

Andrew Sneddon
Director | Extent Heritage

1. Introduction

Extent Heritage delivered an Aboriginal cultural heritage report on the 'lower reservoir' in December 2022. A previous version of this report on the 'upper reservoir' was provided in May. However, following review, the number of boreholes and test pits and their locations were refined to minimise the amount of clearing required. As a result of these changes, BH3, BH5, and TP10 were removed, BH1 and BH4 were relocated to the access track. TP8 was relocated to BH7, TP9 was relocated to BH6, TP11 was relocated to BH2, and TP12 was relocated to BHU4. A new borehole, BHU5 was added on the eastern side. The current study area consists of ~7km of access track, eleven boreholes, and four test pits (Figure 1). This report's impact assessment assumes that all locations for geotechnical investigation would be accessed directly from the site access track. Any boreholes or test pits located more than 10 m from the track will require additional clearing for access directly perpendicular to the track.

1.1 Report aims and objectives

This report:

- Identifies any Aboriginal objects or places within the study area identified by survey, desktop research and Register searches, including areas where there is elevated potential for Aboriginal objects to be present below the ground surface. The proposed geotechnical investigation would involve eleven boreholes and four test pits in eleven locations, with each potentially requiring vegetation clearance in an area measuring 25m x 25m.
- As several boreholes were located greater than 10m away from an existing track, a perpendicular access route to these locations was surveyed where possible. The survey underpinning this report achieved 100% coverage of BH1, BH2, BH4, BHU1, BHU2, BHU3, BHU4, BHU5, TP11, and TP12. Due to dense vegetation coupled with steep terrain the survey team was not able to effectively survey BH6, BH7, BH10, TP8, and TP9. Furthermore, the proposed branch to access BHU2 was not possible to survey, and the borehole was reached via an alternate route from the east.
- Assesses the scientific significance of any identified Aboriginal objects or places.
- Assesses and discusses the impacts of the proposed works on identified Aboriginal objects or places.
- Recommends baseline management measures for any known or potential impacts to identified Aboriginal objects or places.
- Has been completed in accordance with the following requirements and guidelines:
    - Statutory requirements under the *National Parks and Wildlife Act 1974.*
    - 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales' (Department of Environment, Climate Change & Water [DECCW] 2010a).

- ‘Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales’ (DECCW 2010b) (the ‘Due Diligence Code of Practice’).

To satisfy the objectives of this report, the following tasks have been completed:

- Review of existing archaeological data, including assessments previously completed within the vicinity of the study area and relevant heritage databases.
- Investigation of the environmental context of the study area.
- Synthesis of the background information into a predictive model to inform an assessment of archaeological potential across the study area.
- Completion of an archaeological survey of the study area to test the results of the predictive model and further inform an assessment of archaeological potential.

1.2 Limitations

The due diligence assessment is not a formal Aboriginal Cultural Heritage Assessment Report and cannot be used to support Aboriginal Heritage Impact Permit applications to Heritage NSW. It did not include detailed field investigations, test excavation or formal community consultation with Registered Aboriginal Parties.

The assessment is limited to advice regarding Aboriginal heritage risks and compliance requirements. It does not include consideration of risks that may be associated with historical archaeology, built heritage, locally listed heritage items, or Native Title.

The advice in the due diligence assessment is based on relevant Aboriginal heritage site register searches, desktop research, site inspection, and identification of any heritage constraints, risks and permit approval requirements.

The survey of the area was limited due to significant ground vegetation coverage and adverse weather conditions. This made some areas difficult to access. The Ground Surface Visibility (GSV) was generally poor across the study area due to good rainfall in the preceding three years.

1.3 Authorship

This report was authored by Extent Heritage Pty Ltd; specifically, Hannah Craig-Ward (Heritage Advisor), Kathy Lai (Research Assistant), and Reiner Mantei (Senior Heritage Advisor). Mapping was conducted by Alex Murphy and Sarah Gyngell. The report was reviewed for QA purposes by Dr Andrew Sneddon (Director).

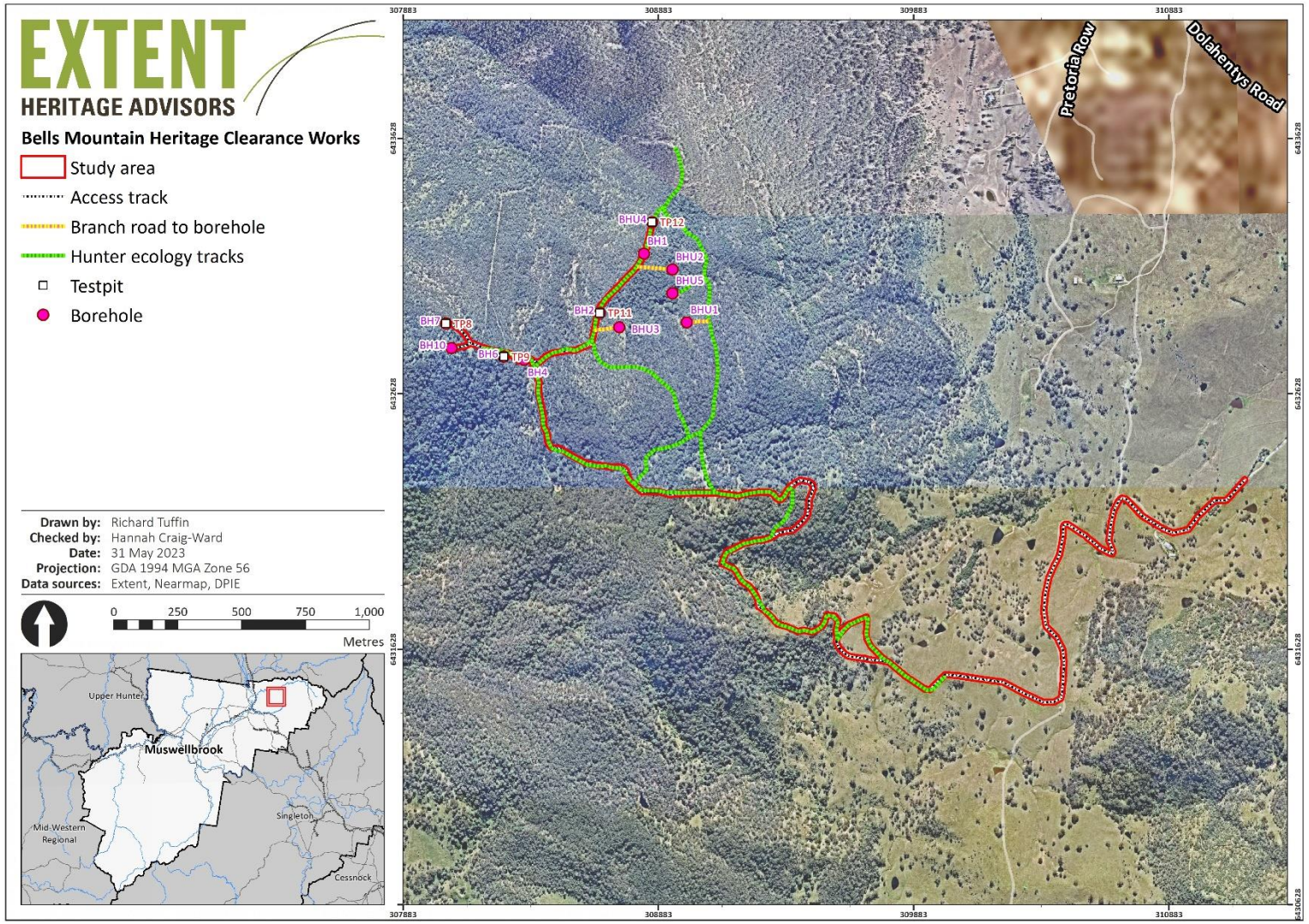


Figure 1. Overview of Upper Reservoir study area.

2. Legislative Protection for Aboriginal Heritage in NSW

In NSW all Aboriginal objects and places (whether recorded or as yet undiscovered) are protected by the *National Parks and Wildlife Act 1974* (the Act or NPW Act).

Under Section 86 of the Act, it is an offence to 'harm or desecrate' an 'Aboriginal object' or 'Aboriginal place' without the approval of the Director General of the Department of Planning, Industry and Environment (DPIE).

An 'Aboriginal object' is defined by the Act as:

> any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction and includes Aboriginal remains.

An 'Aboriginal place' is defined by the Act as:

> any place declared to be an Aboriginal place under section 84 (i.e., a gazetted place).

'Harm' excludes 'trivial or negligible' damage but is otherwise widely defined by the Act to mean 'any act or omission that':

> (a) destroys, defaces or damages the object or place, or
>
> (b) in relation to an object—moves the object from the land on which it had been situated, or
>
> (c) is specified by the regulations, or
>
> (d) causes or permits the object or place to be harmed in a manner referred to in paragraph (a), (b) or (c).

An offence under Section 86 of the Act could result in prosecution and significant penalties.

Heritage NSW has established a range of regulations, codes and guidelines as a framework for managing Aboriginal heritage in NSW. The staged risk management process can be summarised in the following steps:

1. Any proposed activity that may cause harm to known Aboriginal objects or places will require an Aboriginal Heritage Impact Permit (AHIP) approval prior to commencement of that activity.

   An Aboriginal Cultural Heritage Assessment (ACHAR) report must be completed in support of an AHIP application to Heritage NSW.

2. There are certain exemptions in relation to 'low impact activities' under Reg. 58 of the *National Parks and Wildlife Regulation 2019*. These exempted low impact activities are applicable only in areas that do not contain known Aboriginal objects or gazetted Aboriginal places.

3. The 'Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW' (DECCW, 2010) provides risk-based guidance regarding when an ACHAR report should be prepared in advance of a development proposal. The risk-based process is based around identification of projects that are 'likely' to harm Aboriginal objects or places.

There are Commonwealth government heritage requirements under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* and the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (ATSIHP) Act 1984*.

The EPBC Act will only apply to Aboriginal heritage places of National significance (of 'outstanding value to the nation') or those on the Commonwealth Heritage List and in the Commonwealth's care and control.

The ATSIHP Act empowers the Commonwealth minister to make a declaration to halt proposed activities that might harm a 'significant Aboriginal area', being a place 'of particular significance to Aboriginals in accordance with Aboriginal tradition'. The Commonwealth minister will only exercise that power where they are of the opinion that the State legislation does not include appropriate protections.

The present report is intended to assist SMEC to meet its statutory obligations in relation to the borehole investigations and access tracks for the upper reservoir site having regard to the above legislation, especially the NPW Act. It is a Stage 1 investigation based on desktop research and supported by observations made during fieldwork at and around the upper reservoir. This report is not a full ACHAR. It is designed to inform a proposed 'geotech DA'. It may be augmented in the future to make a formal ACHAR for development in both the upper and lower reservoir. It is not presently an ACHAR sufficient to support an application for an AHIP in accordance with section 90 of the *National Parks and Wildlife Act 1974*.

There may be situations where an AHIP is not required. These include where the proposed activity is classified as State Significant Development under the *Environmental Planning & Assessment Act 1979*. This report assumes that the standard provisions of the *National Parks and Wildlife Act 1974* will apply to the proposed borehole excavations.

As noted above, an AHIP is also not required for activities identified as 'low impact' activities by the *National Parks and Wildlife Regulation 2009*. The legislation allows for permissible 'low impact' activities to occur, which includes drilling and/or geophysical subsurface investigations. These activities are considered low risk to cause damage to Aboriginal objects. This principle does not apply when Aboriginal heritage objects are known to be present or in areas which have no evidence of past ground disturbance. No Aboriginal heritage objects were identified during the survey described in this report.

3. Archaeological background

3.1 Physical description

The upper reservoir is located on Bells Mountain, a prominent feature 8km northwest of Muswellbrook and 2km southwest of McCully's Gap (Figure 1, above). The study area is mostly surrounded by level and low undulating agricultural and pastoral land, with a now closed, open-cut mine, Idemitsu's Muswellbrook Coal Company, located on its southwest. It rises rapidly to a height of 688m asl. The mountain is heavily forested with a mixture of native flora (including Ironbark, Red Gum and Spotted Gum) but some areas have been cleared to make way for dirt tracks and transmission lines. The study area is also characterised by shallow soils over occasional sandstone outcrops, increasing in number with elevation. The mountain's flanks include gullies between steep rock faces that appear to include rocky overhangs with the potential for past Aboriginal habitation. The Hunter River is c. 7km to the west fed by a number of creeks less than 2km distant.

At the time of the fieldwork inspection in March 2023, the area had experienced significant rainfall over the preceding three years, after prolonged dry seasons. Hence, the grass and vegetation cover was thicker than that which characterised the site during an earlier due diligence survey conducted in December 2020 by Reiner Mantei (Extent Heritage). During a follow up survey in May 2023, the underbrush had begun to die off due to drier weather, improving access and GSV.

3.2 Aboriginal archaeology in the wider area

Bells Mountain is located close to stone resources suitable for artefact manufacture. Prior to the area's settlement it contained abundant flora and fauna suitable for exploitation by Aboriginal people, and water sources were located in the vicinity. The area also includes rocky overhangs that have the potential for past human habitation. In other words, the wider area has high potential for archaeological evidence of Aboriginal habitation.

Although Aboriginal occupation of an area can produce a wide variety of archaeological material, the following site types are most common in the Muswellbrook region:

- **Surface scatters and isolated artefacts**—Surface artefacts of stone are the most common form of Aboriginal archaeological site in the region. These may be found as isolated artefacts, usually without any obvious association with other artefacts, particular landforms or other 'sites'. Commonly, they also occur as collections of surface artefacts termed 'scatters'. Surface finds are almost impossible to date, and the function of the individual stone artefacts is often difficult to determine beyond a general level. The context of their use is difficult to ascertain. Their find spot can often reflect natural processes like erosion and water deposition rather than human activity but can be an indicator—a surface expression—of subsurface archaeological remains. In research terms the significance of isolated finds is limited. Scatters (especially dense scatters) hold greater archaeological potential as a scientific resource. It is sometimes the case that surface scatters can be used to reconstruct human activity at a general landscape level.

- **Open camp sites**—Camp sites that were used for short periods are usually found on relatively flat landforms in close proximity to watercourses. Camp sites that were used repeatedly or continuously for a lengthy period are more typically located on elevated ground, especially at the confluence of principal creeks. Open campsites may contain stone artefacts and/or the remains of food (such as animal bones or shell). They are commonly characterised by evidence of food preparation (for example, ashy deposits where cooking facilities were located) and concentrations of food refuse (for example, shell middens). Some may also contain evidence of more permanent shelters (gunyas), although these remains are typically ephemeral and difficult to identify in the archaeological record. Open camp sites are often buried under deposited loess, alluvium or colluvium and are usually detected when they are observed eroding out of banks or due to other ground disturbance.

- **Quarry sites**—These sites reflect the extraction of raw stone materials for the making of stone tools (for example, axes or spear points). Quarry sites were favoured locations for Aboriginal people who often returned to the same quarry repeatedly and over many years. These sites may display evidence of both stone removal and tool manufacture.

- **Scarred trees**—These sites are created when the bark or wood of a tree is removed to manufacture a tool or implement; for example, a coolamon (elongated, oval wooden dish), shield, or canoe. Typically, this leaves a scar in the shape of the final product on the trunk. Scarred trees are usually mature specimens and, therefore, rarely survive in locations where tree clearing has occurred.

- **Grinding grooves**—Grinding grooves are usually found in sandstone outcrops in close proximity to water (water being an important part of the grinding process). They are typically 25–50 cm long, 5–8 cm wide and 3–5 cm deep and rounded in section (Dickson 1980). They are created by the repetitive grinding action necessary for the production of edged axes and adzes; that is, the edge of an axe 'blank' is ground against the sandstone base at an angle, in a backwards and forwards motion, which wears away the base in a straight line. By alternating the angle of the blank, a sharp edge can be formed. Grinding grooves are usually found in clusters of ten to several hundred. Grinding grooves are most common where the raw material for an axe head is also available (basalt being the preferred geology for the production of an axe/adze). Some grinding surfaces are created in the preparation of food, where a stone is used to grind grain against a stone surface. Such grinding 'grooves' are usually shorter, shallower and broader than those created in axe/adze manufacture.

- **Rock shelters**—In locations characterised by rocky outcrops, those with naturally occurring 'overhangs' were commonly utilised by Aboriginal people for habitation. Rock shelters are typically highly productive in archaeological terms, with deep soil deposits and datable stratigraphy, often containing artefacts that are informative in terms of chronology, activity areas, archaeobotany, technologies, etc. Some contain rock art.

- **Ceremony and spiritually significant places**—Some locations were favoured by Aboriginal people for the performance of ceremony (including corroborees, initiation grounds, etc). Typically, the material culture produced by these activities is ephemeral and particularly vulnerable to disturbance and destruction by later activities (for example, a cleared patch of earth made compact by repeated dancing). Initiation places might be

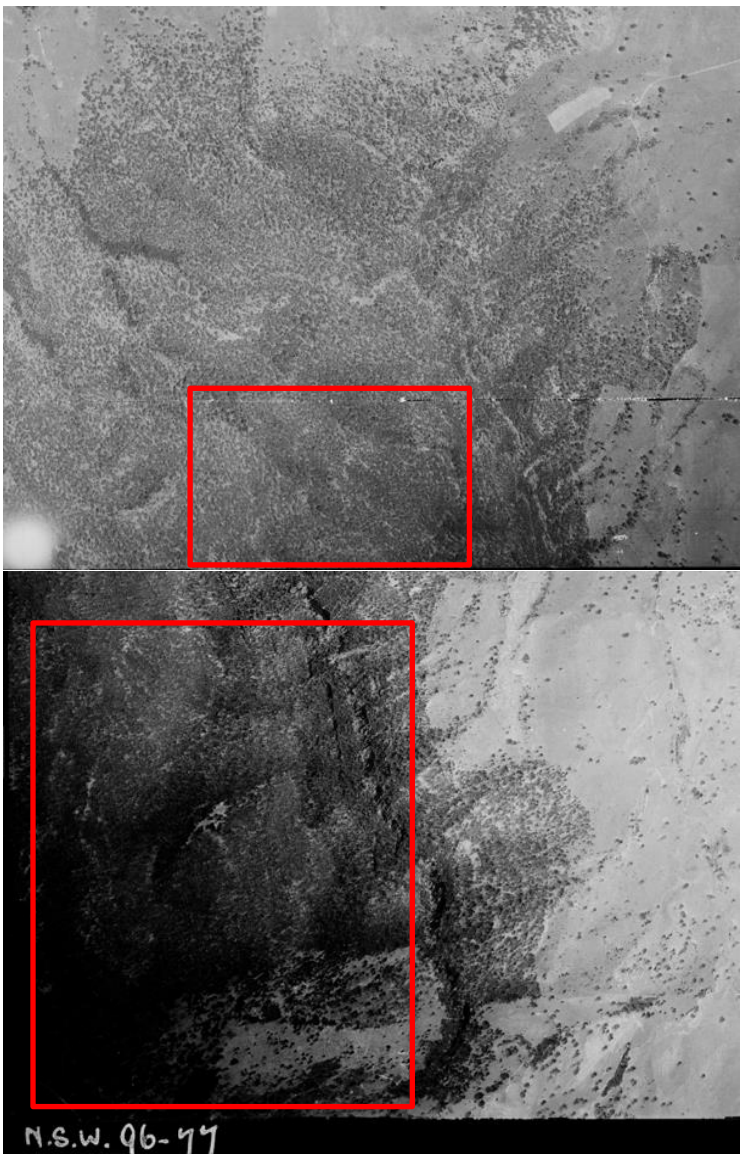
indicated by the presence of medium-sized stones (~300 mm diameter) configured into patterns on the ground surface (usually a ring or multiple rings, but also in narrow ‘alleys’ and other shapes). These locations are also vulnerable to disturbance by later activities. Some places of spiritual significance (e.g. story places) are not reflected by any physical remains at all. These usually cannot be identified without Aboriginal engagement.

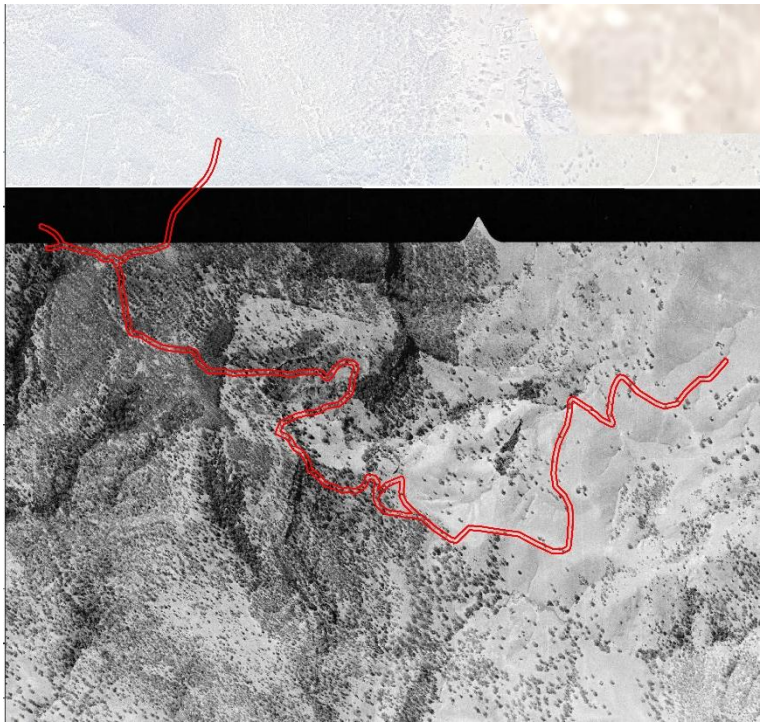
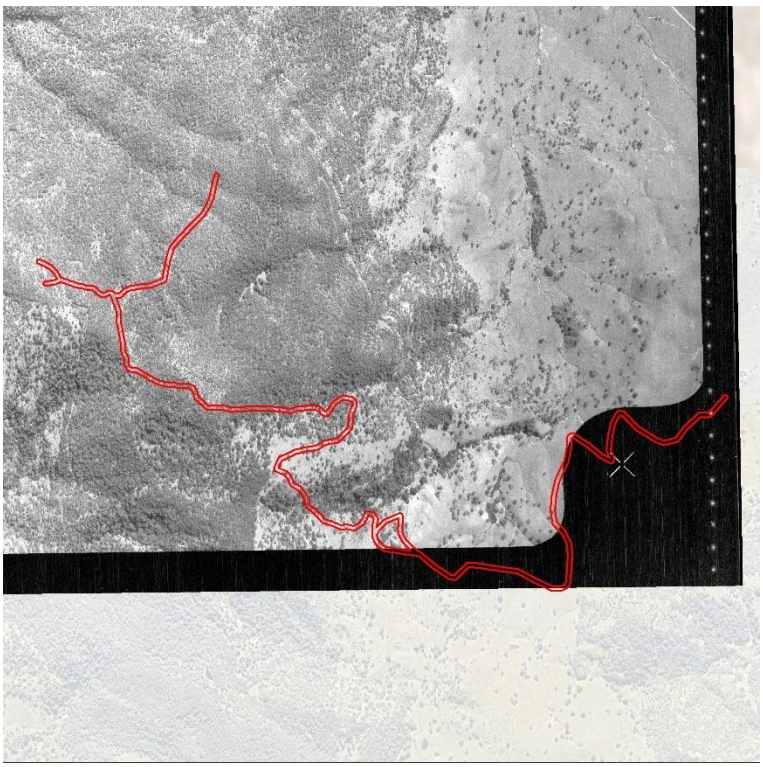
3.3 Previous disturbance

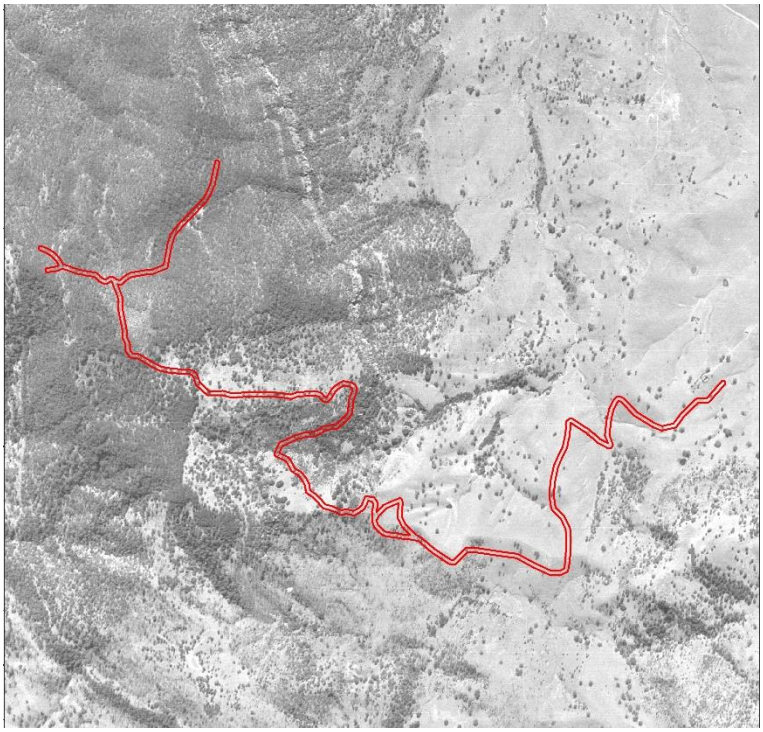
There are a number of processes that can reduce the potential for Aboriginal cultural heritage sites to survive in the archaeological record. These include physical processes that have disturbed the ground surface such as erosion, faunal and floral intrusion into deposits, human habitation, and land clearing and development activities.

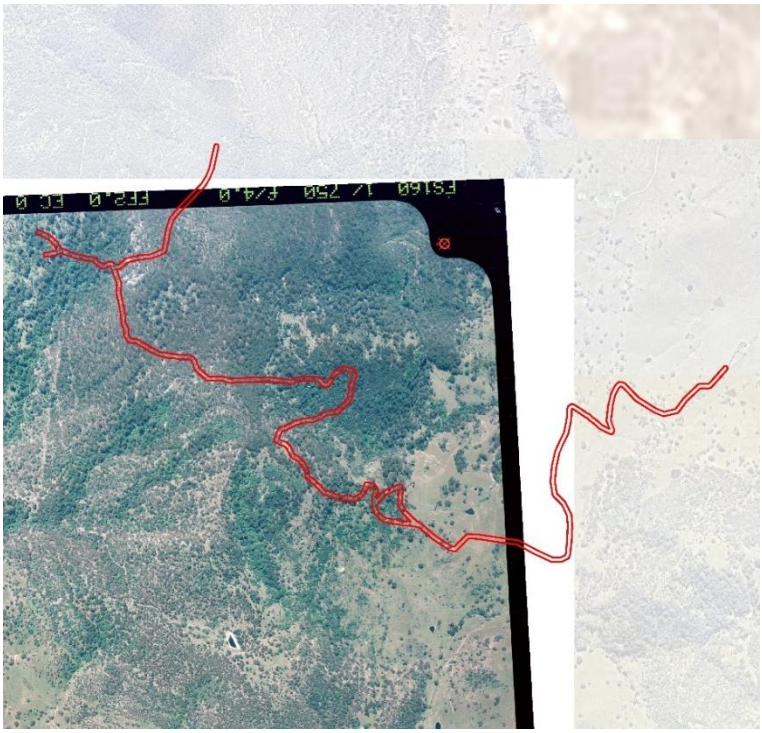
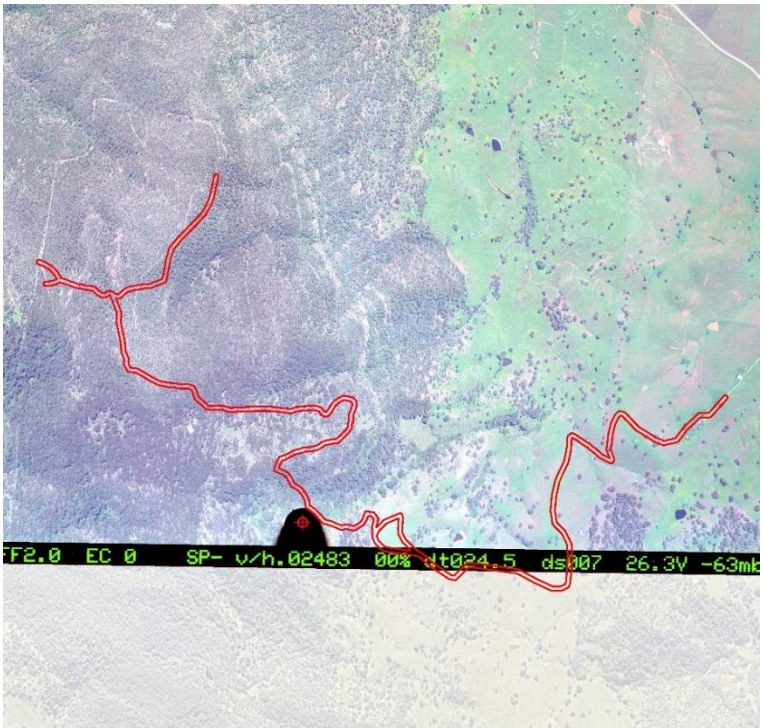
Table 1, below presents a series of historical aerial photographs (1953, 1964, 1972, 1989 and 1998) of the study area. The historical aerials indicate that parts of the study area have been largely undeveloped with the only works around the study area being vehicle tracks, and a small dam to the south of the study area. The biggest change in the immediate surrounds of the study area is the tree removal on the western slopes of Bells Mountain from 1964 onwards. Although the top of Bells Mountain appears to undergo thinning sometime between 1972 and 1989, the study area had been mostly maintained tree cover with only some sections of tree removal for tracks, transmission lines and livestock herding within the proposed borehole and test pit locations. Significantly larger sections of clearing all occur on part of or outside of the access tracks at this time.

Table 1. A series of historical aerials of the study area. *Source*: Historical Imagery Viewer (HAPE) 2020; Nearmap (2022).

Year	Description	Historical Aerial
1953	▪ Tree cover present ▪ Section of cleared vegetation over the middle section. ▪ Land to the west of Bells Mountain is already cleared by this time.	

Year	Description	Historical Aerial
1958	▪ Tree removal and clearing has begun on the eastern side of the mountain, extending up from previously cleared pastoral land.	 Figure 2. Historical aerial of the study area (hard red line), 1958. Source: Nearmap (2022).
1964	▪ Tree removal on western slopes of Bells Mountain visible. ▪ Thinning of trees extending out from cleared area on south slopes of mountain. ▪ Does not reach borehole/test pit area	 Figure 3. Historical aerial of the study area (hard red line), 1964. Source Nearmap (2022).

Year	Description	Historical Aerial
1972	▪ Tree removal on western slopes of Bells Mountain visible. ▪ Thinning of trees extending out from cleared area on south slopes of mountain. ▪ Does not reach borehole/test pit area	 Figure 4. Historical aerial of the study area (hard red line), 1972. Source: Nearmap (2022).
1989	▪ Tree thinning across the top of Bells Mountain. The property owner said anecdotally that a bushfire went through in the 1980s.	 Figure 5. Historical aerial imagery of the study area (hard red line), 1989. Source: Nearmap (2022).

Year	Description	Historical Aerial
1993	▪ Regrowth present along the eastern side of the mountain.	 Figure 6. Historical aerial imagery or the study area (hard red line), 1993. Source: Nearmap (2022).
1998	▪ Foliage regrowth post thinning. ▪ Tree removal for tracks and transmission lines present. ▪ Regrowth present.	 Figure 7. Historical aerial imagery of the study area (hard red line), 1998. Source: Nearmap (2022).

4. Site register searches

4.1 AHIMS search

The Heritage NSW Aboriginal Heritage Information Management System (AHIMS) is a database that includes recorded Aboriginal objects and places, as well as potential archaeological deposits (PADs).

AHIMS should be treated as indicative only. Many archaeological sites that are included on the database have not been ground-truthed by archaeologists, and some of the locational data predate accurate GPS technology.

It is important that any records included on the AHIMS are verified during ACHAR assessments to establish site status and confirm site locations.

A search of the Heritage NSW AHIMS database was carried out on 25 January 2023 (Client ID: 748209) (Appendix B).

There are no registered Aboriginal sites within the 'upper reservoir' study area (Figure 8).

A previous search of the study area shows that four registered AHIMS sites are located more than 2km from the 'upper reservoir' proposed project footprint. They are within close proximity to the 'lower reservoir' (<100m), but all those sites are outside the proposed project footprint and the planned geotechnical works program.

4.2 EPBC Act Search

A search indicates that the subject land does not include any items included on the National, Commonwealth or World Heritage lists.

4.3 ATSIHPA declarations search

We understand that SMEC has not received notification that the study area is subject to an application pursuant to Section 9 or declaration pursuant to Section 10 of the ATSIHP Act.

A search of the Commonwealth Government Gazette indicates that there are no Section 9 (emergency declaration) or Section 10 (other declaration) declarations currently applicable to the study area

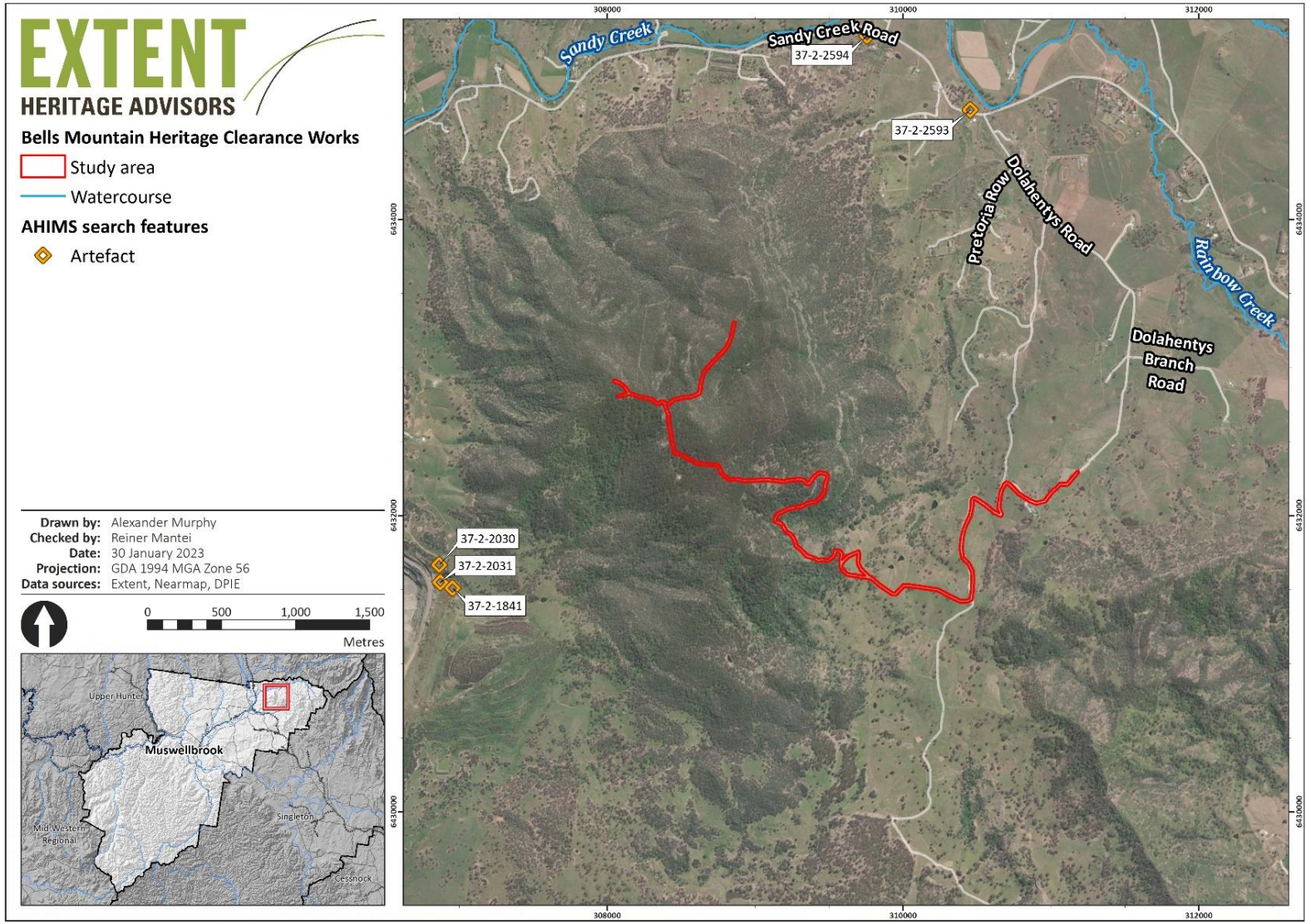


Figure 8. AHIMS registered sites in the wider area surrounding the Upper Reservoir study area.

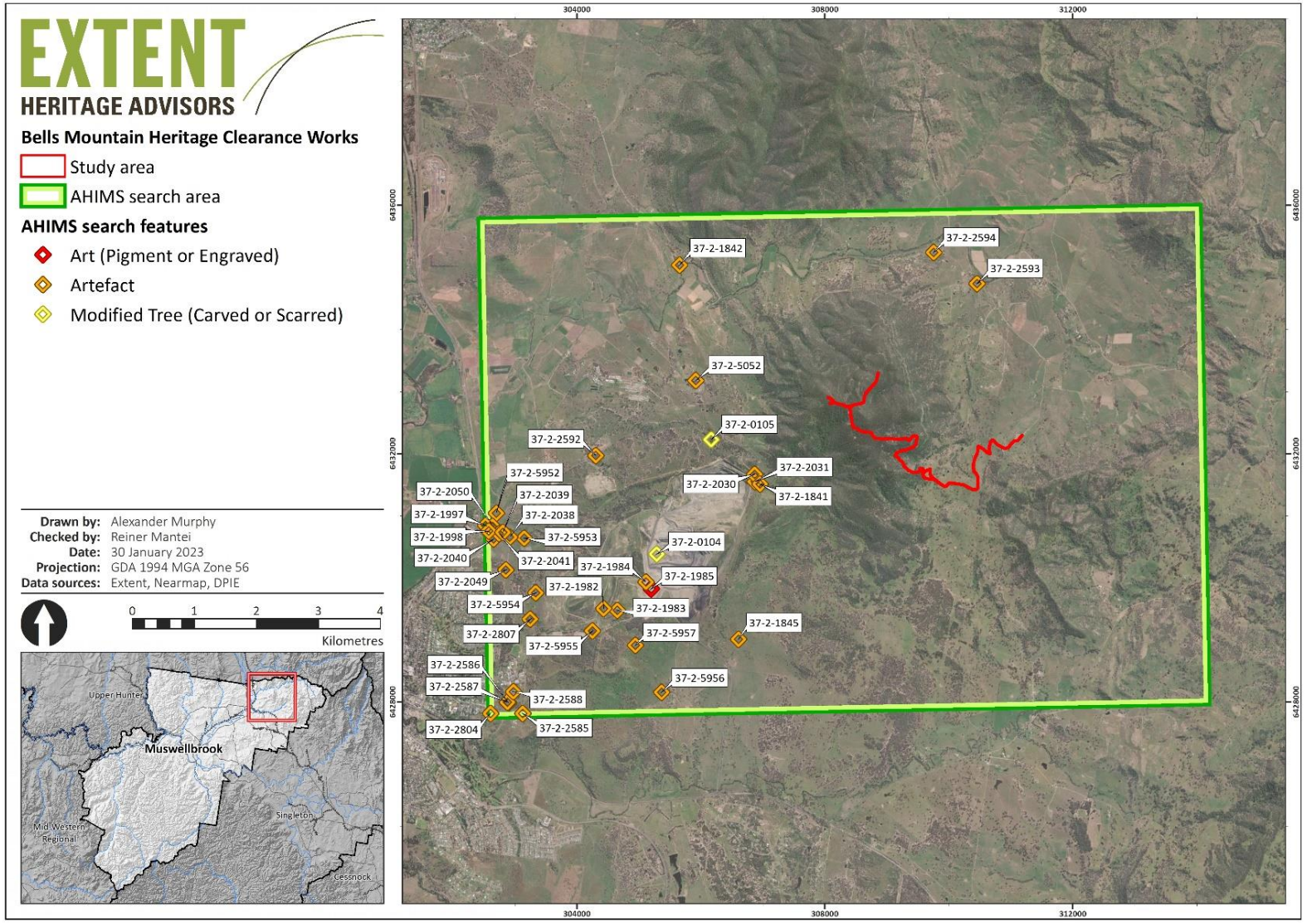


Figure 9. AHIMS sites located within the Register search area that includes the study area.

5. Desktop research

5.1 Environment and landscape

5.1.1 Soil landscape mapping

The soil landscape mapping indicates the access track to the study area is a combination of Colonel, Rosevale and Scrumlo soil landscapes (OEH 2015a) (Figure 10). The locations of the proposed boreholes and test pits are entirely within the Colonel soil landscape.

The Colonel soil landscape covers rolling hills and rolling mountains and includes Grey Clays (Ug6.11) on mid slopes, and Red Clays (ug5.37) on mid – lower slopes. Terra Rossa soils (Uf5.21) occur on limestone outcrops. Other soils typical in Colonel landscapes include Yellow Solodic Soils (Dy4.12, Dy4.12, Dy3.81) and Prairie Soil – Lithosol intergrades (Gn3.42) on sediments, all the soils in Colonel landscapes are classified as stony (OEH 2015b).

The Rosevale soil landscape covers rolling hills and includes red and brown podzolic soils (Dr3.11, Dr4.21, Db2.21) on the upper to lower slopes and on the steeper sections of footslopes of the Isismurra and Woolooma Formations. Euchrozems (Gn3.13) occur on upper slopes and Yellow Soloths (Dy5.42) on midslopes on dacitic ignimbrite. There are Chocolate Soils (Dd3.12) on slopes of Woolooma Formation, shallow clays and sands (Lithosols – Uf6.1, Uc5.21) on upper slopes and Brown Earths (Gn2.42) on mid to lower slopes of the Isismurra Formation. Rock outcrop is common in some areas (OEH 2015c).

The Scrumlo soil landscape covers undulating to rolling hills and includes Yellow Podzolic Soils (Dy4.11, Dy3.41) on the steeper slopes with Yellow and Brown Solodic Soils and Soloths (Dy3.12, Db2.42, Db1.42) on breaks with easier slopes. Siliceous and Earthy Sands (Uc5.11, Gn1.82) occur on conglomerate where rock outcrop is common (OEH 2015d).

5.1.2 Hydrology

The study area is located ~ 2 km from Sandy Creek, ~5km from Muscle Creek and ~9 km from the Hunter River at their closest points. Figure 11, below, is a map illustrating the watercourses around the study area and the wider area of Muswellbrook. The map indicates that there is a gully, several creeks and major rivers (i.e., Hunter River), around the study area, with the closest being Sandy and Muscle Creeks.

Further analysis of topographical mapping and satellite imagery indicates the study area is in close proximity to two ephemeral watercourses which drain into Sandy Creek in the north. The site access route crosses several ephemeral watercourses which drains into Muscle Creek in the south.

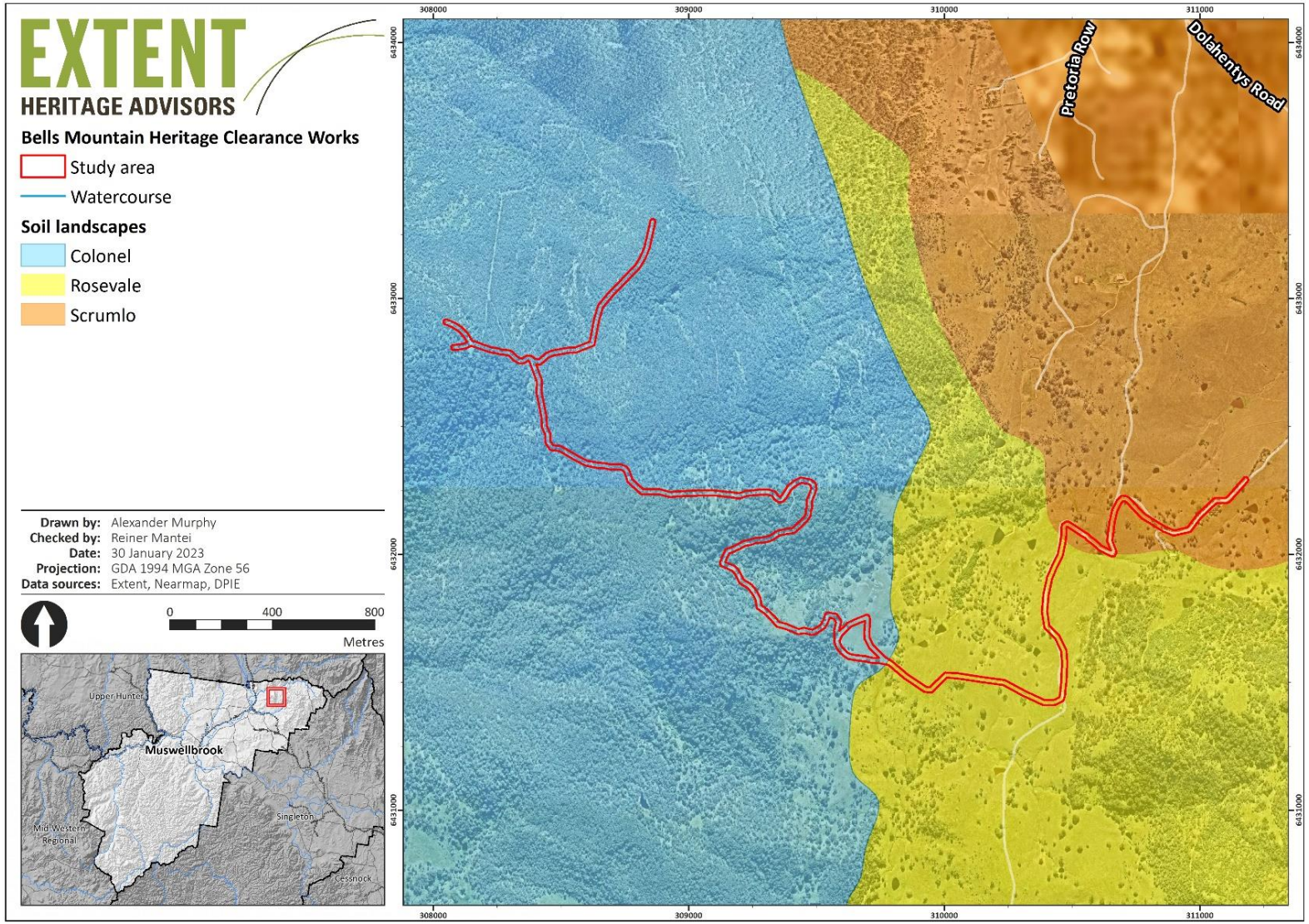


Figure 10. Map illustrating the soil landscapes present within and around the study area.

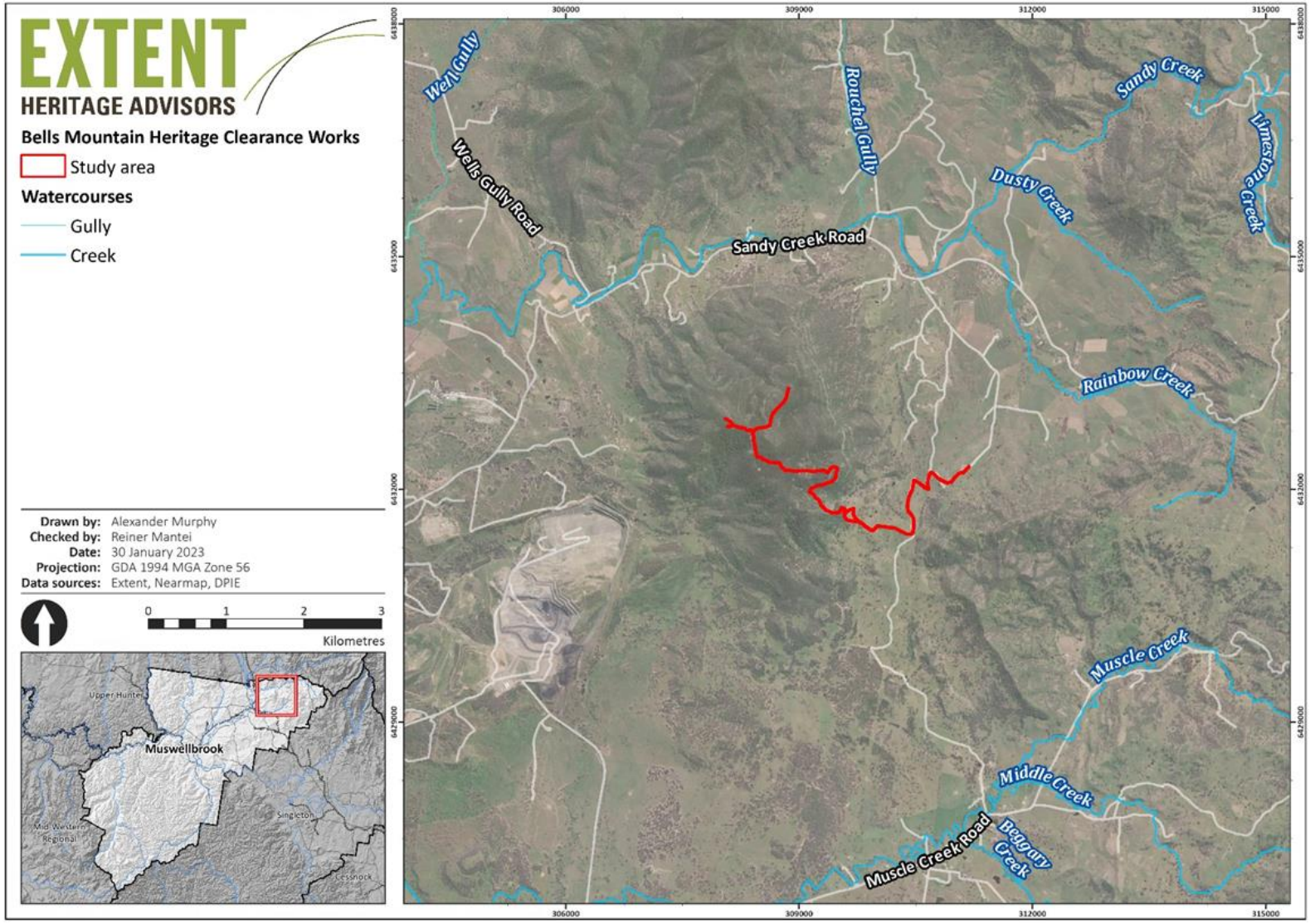


Figure 11. Map illustrating the watercourses around the study area.

5.1.3 Landforms

Heritage NSW specifies five landscape features which are likely to indicate the presence of Aboriginal objects (DECCW, 2010):

- Within 200 m of waters.
- Within a sand dune system.
- On a ridge top, ridge line or headland.
- Within 200 m below or above a cliff face.
- Within 20 m of or in a cave, rock shelter, or a cave mouth.

Based on analysis of topography and aerial photography, the study area is situated above a cliff face on the eastern side of the mountain. There is also a ridge line running approximately north to south, upon which part of the access track follows (see Figure 12, below). Therefore, the study area is categorised as a high risk landscape by Heritage NSW.

5.2 Past vegetation

Figure 13, below, illustrates the pre-clearance vegetation types within the study area. Most of the study area consisted of Narrow-leaved ironbark – Native Olive shrubby open forest of the central and upper Hunter Valley. Areas of derived grassland of the NSW South-Western Slopes, and narrow- leaved ironbark- Grey Box grassy woodland of the central and upper Hunter Valley area also present in the study area. The native vegetation in areas with Colonel soil landscape (see Part 5.1.1, above), have been identified as woodland with White Box, Silver top Stringybark, Red and Yellow box, with red ironbark and narrow-leaved red ironbark that occurs on Lithosols (OEH 2015b). The native vegetation typically found in regions with Rosevale soil landscapes consists of woodland communities of yellow box, silvertop stringybark, manna gum, white box and grey gum. Forest oak and broad-leaved red ironbark may occur. Largely cleared for unimproved and improved pasture (OEH 2015c). The native vegetation in areas with Scrumlo soil landscape consist of woodland of forest red gum and rough-barked apple. Where cleared there is grazing of stock on improved subclover pastures (OEH 2015d).

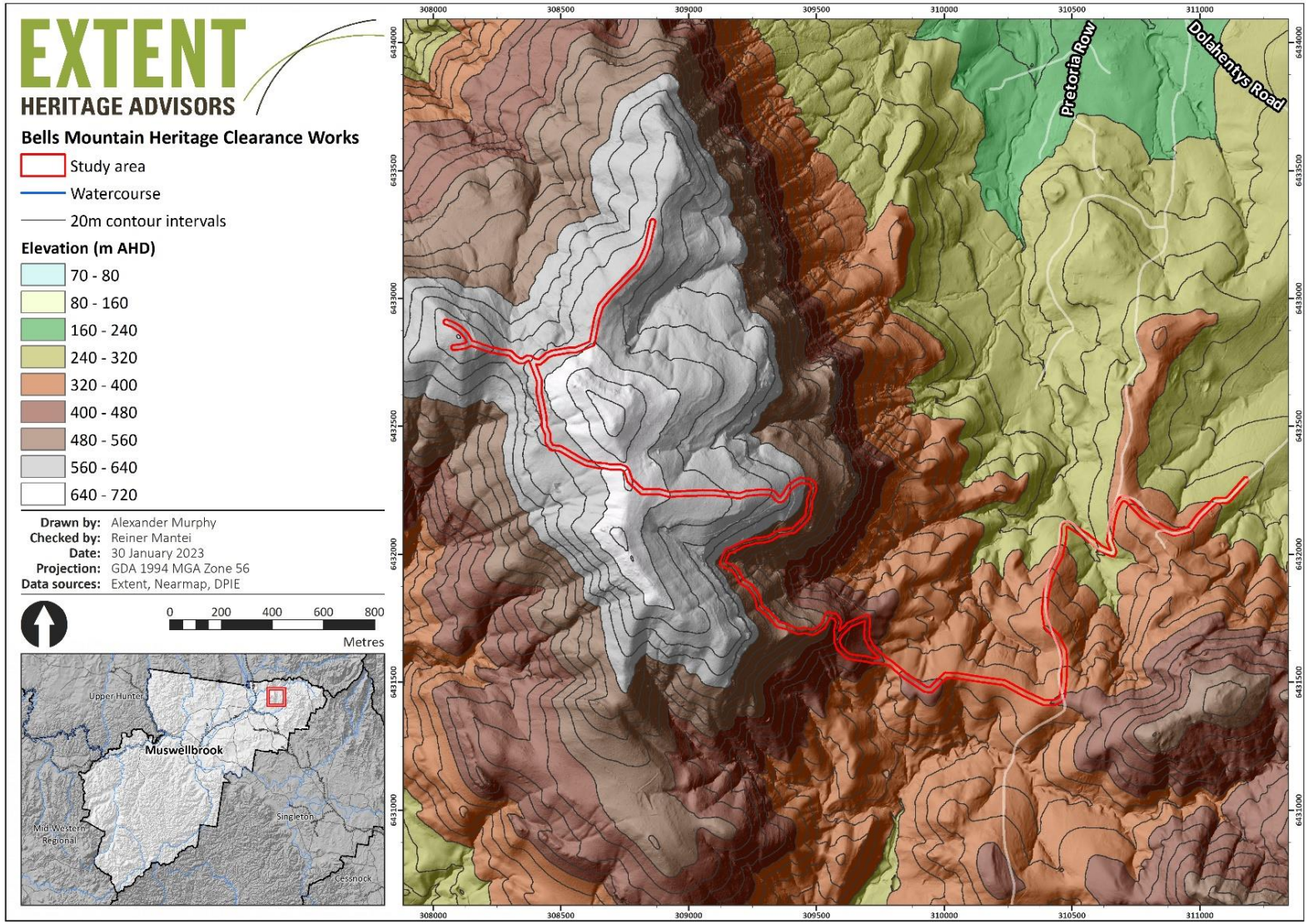


Figure 12. Map illustrating the topography within and around the study area.

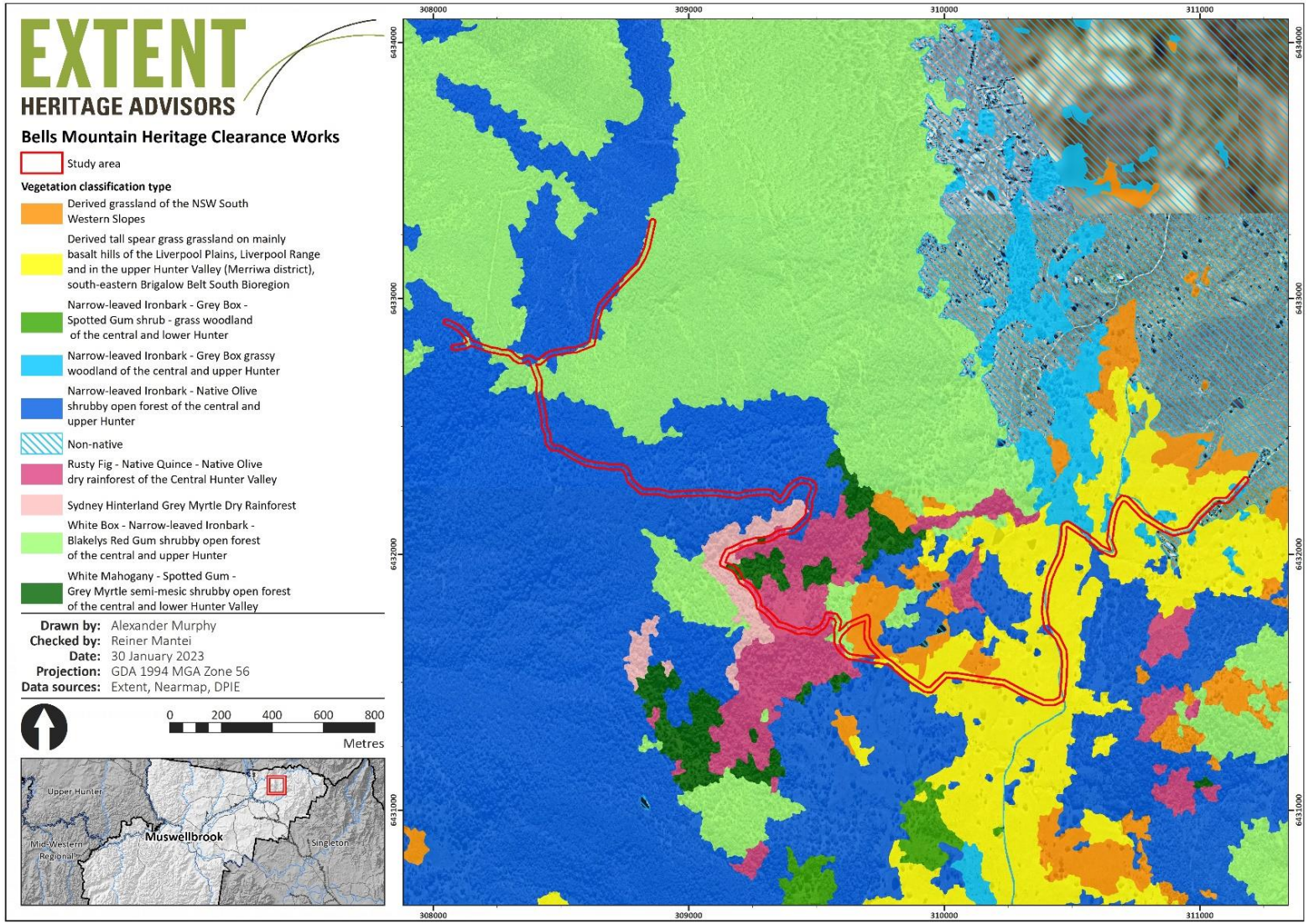


Figure 13. Map illustrating the types of pre-clearance identified within and around the study area.

6. Site inspection

6.1 Fieldwork

A site inspection was undertaken on 15 March 2023 by Hannah Craig-Ward (Archaeologist/ Heritage Advisor, Extent Heritage) and Lisa Flemwell (fieldwork assistant, Extent Heritage). Following revision of the borehole locations and improved site access, a follow-up survey was conducted on 18 May 2023 by Hannah Craig-Ward. The site inspections involved a surface survey of the upper reservoir on private freehold land, Bells Mountain. The surveys were conducted as a pedestrian and visual survey only, with no excavations being conducted during the fieldwork.

Exposed ground surfaces were inspected to identify whether or not any surface artefact scatter or shell midden deposits are present. Mature native trees were identified and inspected for any potential cultural modifications.

To ensure full coverage during the cultural heritage survey a buffer was placed on all project works. Where possible, a 30m x 30m area was surveyed for all drilling locations and a 10m corridor for all tracks. Applying this buffer ensured that the entire disturbance footprint was surveyed for potential sites, including any within close proximity.

7. Results

The upper reservoir study area was overgrown with thick grass and other vegetation and cut by a number of rills and gullies created by surface water. Within the study area, there were several human-made tracks, which were previously cleared for transporting livestock through the area.

Some areas within the private property showed clear signs of previous ground disturbance such as clearing, the establishment of fence lines, and the movement of LV's using the tracks to move around the boundary. Cattle were not present at the time of the survey; however, the study area had been used in the past for grazing as evident from the fence lines and presence of a molasses lick feeder.

The field survey of the study area on 15 March 2023 also encountered overgrown land with thick vegetation cover, including long grass and low shrubs. However, during the survey on 18 May 2023, dense vegetation was still present in some areas but in others the sticky bush and grass had reduced due to drier and colder weather, allowing some previously inaccessible areas and areas with low GSV to be surveyed.

Off track, the vegetation cover significantly reduced GSV to approximately 10-20% in some areas, which constitutes a limitation on this report and its conclusions. GSV varied at boreholes located away from pre-existing tracks with ~80% GSV at best and <10% at worst. Preceding the May survey, the main access track had been slashed, removing the sticky bush and grass cover, therefore improving GSV significantly.

Unfortunately, due to dense vegetation coupled with steep terrain, BH6, BH7, BH10, TP8 and TP9 could not be accessed. The proposed branch to BHU2 was also densely vegetated, limiting access, and the borehole location was accessed from the eastern track instead.

In the surveyed parts of the study area, no Aboriginal artefacts or places were identified.

The photos below were taken during the field survey by the Extent Heritage team. The photos capture the upper reservoir study on 15 March 2023 and 18 May 2023. Figures 14 – 17, below, illustrate the conditions of the study area during the March survey and Figures 18 – 21 demonstrate the conditions during May.

Figure 14 Photo demonstrating thick vegetation cover limiting access and GSV.

Figure 15 Photo of the general vegetation across the survey area.

Figure 16 Photo of the general groundcover in the study area.

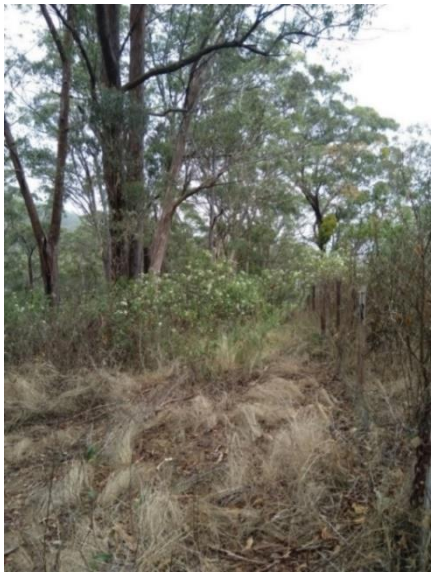


Figure 17 Example vegetation in the study area. Cleared areas bordered by sticky hop bush.

Figure 18 Photo demonstrating a recently slashed access track, taken in May 2023.

Figure 19 Photo of the general vegetation off-track, taken in May 2023.

Figure 20 Photo of sticky bush still prevalent in areas of the study area, taken in May 2023.

Figure 21 Photo of track recently cleared of sticky bush and grass cover, taken in May 2023.

7.1 BH10, BH7, and TP8

BH10, BH7, and TP8 are situated in an open woodland environment with high elevation on the western peak of Bells Mountain. A section of the planned access track traverses a clearing in the vegetation with low to knee-high grasses. The soils in this location are shallow, and there are large boulders present as well as small to medium rough natural cobbles (c.10-20cm). Exposed rocky areas were inspected for any signs of Aboriginal objects or activity; however, no artefacts or places were identified. In addition, no workable material was identified.

BH7 and TP8 are located on a steep uphill slope surrounded by woodland vegetation and high shrubs. BH10 is located to the south, on a downwards slope and near a possible drop off. The vegetation in the vicinity is predominantly ironbark trees and sticky hop bush, as well as tall grasses and weeds. Due to rough terrain, and dense vegetation, these locations were not directly sighted or surveyed. Dense sticky hop bush approximately 2m high and vegetation restricted access to BH7 and TP8, and a combination of sticky hop bush, high grass limiting ground surface visibility, and poor footing on the downward slope restricted access to BH10. The access track in this section of the mountain was partially clear with grass cover, however

approximately 30m of track between a closed gate and fence-line, and the clearing, had become overgrown with sticky hop bush. No Aboriginal artefacts or places were identified along the access track towards BH10, BH7, and TP8 although access was limited.

The general area had very poor GSV (0-10%) due to dense scrub, leaf litter, and grass cover. Some small to medium natural cobbles were visible in places, as well as large boulders, but no Aboriginal objects were identified in the area that was accessible. Based on the shallow soil profile, there is low potential for in situ subsurface Aboriginal archaeology to be disturbed by the proposed works. Similarly, there is low potential for surface Aboriginal archaeological material to be disturbed by the proposed works in this vicinity.

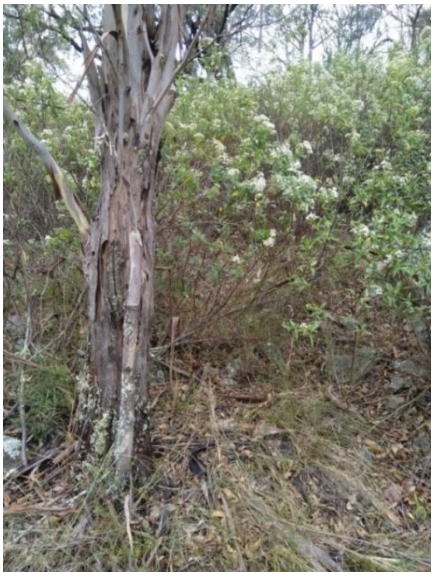


Figure 22 Facing west, looking uphill towards the location of BH7 and TP8.

Figure 23 Facing south-west, looking uphill in the vicinity of BH7 and TP8.

Figure 24 Facing approximately north-west towards the location of BH10.

Figure 25 Facing west towards the location of BH10.

Figure 26 Cleared grassy area along the planned access track to BH7 and TP8, facing south-east.

Figure 27 Facing east towards cleared grassy area along planned access track to BH10.

7.2 BH6 and TP9

BH6 and TP9 are located south of a pre-existing cleared track traversing east-west across the top of Bells Mountain. They are situated in an area of open woodland characterised by immature Ironbark and other gum trees, as well as shrubs and weeds. Prior to the May survey, the access track had been slashed and cleared of grass and sticky bush, resulting in excellent GSV. Off-track, GSV is generally low (0-20%) due to leaf litter, grass cover, fallen logs, and other vegetation. The soils in this location appear to be shallow, and in some areas exposed rock and surface cobbles are visible.

The pre-existing track to the north of the borehole and test pit location is bordered by open woodland and scrub. The general area along this track has excellent GSV due to recent clearing. Based on the shallow soil profiles at the locations, and observed levels of disturbance, there is low potential for in situ subsurface Aboriginal archaeology to be impacted by the works there. Similarly, there is low potential for surface Aboriginal material to be disturbed by the proposed works.

Due to the steep slope and dense vegetation, it was not possible to access the exact location of BH6 and TP9.

No Aboriginal artefacts or places were identified during the inspection of the general area along the access track near BH6 and TP9. It is evident that the access track had already experienced a high level of disturbance prior to the inspection due to previous clearing in the vicinity.

In areas of ground surface exposure, medium sub-angular and rounded cobbles were visible at times through the ground cover. No artefacts were identified.

Figure 28 General location of BH6 and TP9. Facing south-west.

Figure 29 General location of the access track, facing south towards BH6 and TP9 (off track).

7.3 BH4

BH4 is located along the pre-existing track surrounded by an open woodland environment consisting of immature ironbark and other species of gum tree. Stands of sticky bush bordered the general area. The area around BH4 pre-clearing had poor GSV due to grass cover and leaf litter, however, had excellent GSV for the follow-up survey.

The soils in this area were particularly shallow with exposed conglomerate outcropping and medium sub-angular cobbles on the surface. The surrounding vegetation consisted of immature trees and sticky bush.

No Aboriginal artefacts or places were identified during the inspection of this borehole, although ground surface visibility was mixed with areas of no visibility and areas of exposed conglomerate outcropping with good visibility. Based on the shallow soil profile, and observed levels of disturbance, there is low potential for in situ subsurface Aboriginal archaeology to be disturbed by the proposed works there. Similarly, there is low potential for surface Aboriginal archaeological material at these locations to be disturbed by the proposed works.

Figure 30 Location of BH4, facing north.

Figure 31 General location of BH4, post clearing, facing south. Photo taken in May 2023.

7.4 BH2, BHU3 and TP11

BH2 and TP11 are located together just east of a pre-cleared track bordered by dense sticky hop bush approximately 2m high and scrub. Clearing prior to the May survey resulted in excellent GSV. No artefacts were identified in this area.

BHU3 is located approximately 95m east of the pre-existing track in a grassy clearing of open woodland. Due to thinning of vegetation, it was possible to traverse an access route perpendicular to the path and survey the borehole location. GSV was generally fair (~30%) with grass cover and leaf litter, and some exposed rocky surfaces. No artefacts were identified.

Figure 32 General vegetation in vicinity of BH2 and TP11, facing east.

Figure 33 General area of access track near BH2 and TP11, facing south**, taken in May 2023**.

Figure 34 General vegetation along access route to BHU3, facing north.

Figure 35 Location of BHU3, facing south-east.

Figure 36 Average GSV at BHU3 location

Figure 37 Exposed rock in vicinity of BHU3

7.5 BHU1, BHU2 and BHU5

BHU1 is located on the eastern side of the top of Bells Mountain in open woodland forest, near the planned dam axis. To the north was a previously constructed dam, and a gully running east-west. BHU1 was accessed via a previously cleared track running approximately north-south along the eastern side of the mountain. The location of BHU1 had poor GSV due to grass, leaf litter, and some shrubs. Stands of immature ironbark and other gum trees were present in the area. No artefacts were identified in this location.

BHU2 is located on a steep slope above the gully. It is surrounded by vegetation consisting of some mature ironbark trees and immature gum trees. A dense stand of sticky bush restricted access to the borehole location from the west. From the east, access was still difficult with no GSV. The location of the borehole is surrounded by sticky bush and grass cover, with very poor GSV. No Aboriginal artefacts, culturally modified trees, or Aboriginal places were identified in this area.

BHU5 is located at a man-made dam in a clearing in the vicinity of a pre-existing track. GSV was poor to fair (~10-30%) with grass cover and leaf litter. No artefacts were identified.

Figure 38 General GSV around BHU1.

Figure 39 General area around BHU1, south-west.

Figure 40 Sticky bush in vicinity of BHU2, facing south.

Figure 41 Facing north-east, in location of BHU2.

Figure 42 General location of BHU5, facing north

Figure 43 General ground cover at BHU5, facing west

7.6 BH1, BHU4 and TP12

BH1 is located on a pre-cleared track in open woodland forest on the eastern side of Bells Mountain. Due to recent clearing, GSV in this vicinity was excellent. Some sub-angular conglomerate cobbles were observed. The wider area was surveyed however access was restricted by dense sticky hop bush approximately 2m high bordering the track. No artefacts were observed in this area.

BHU4 and TP12 are located north of BH1 on the pre-cleared track. GSV in this area was fair (~30%) with short grass and leaf litter, however off-track access was restricted by dense vegetation. There was also a steep slope on the eastern side of the track. No artefacts were identified.

This area aside from the tracks has not previously been cleared.

Figure 44 General location of BH1, facing north.

Figure 45 General location of BH1, facing south.

Figure 46 General location of BHU4 and TP12, facing north-east.

Figure 47 Average ground cover at BHU4 and TP12.

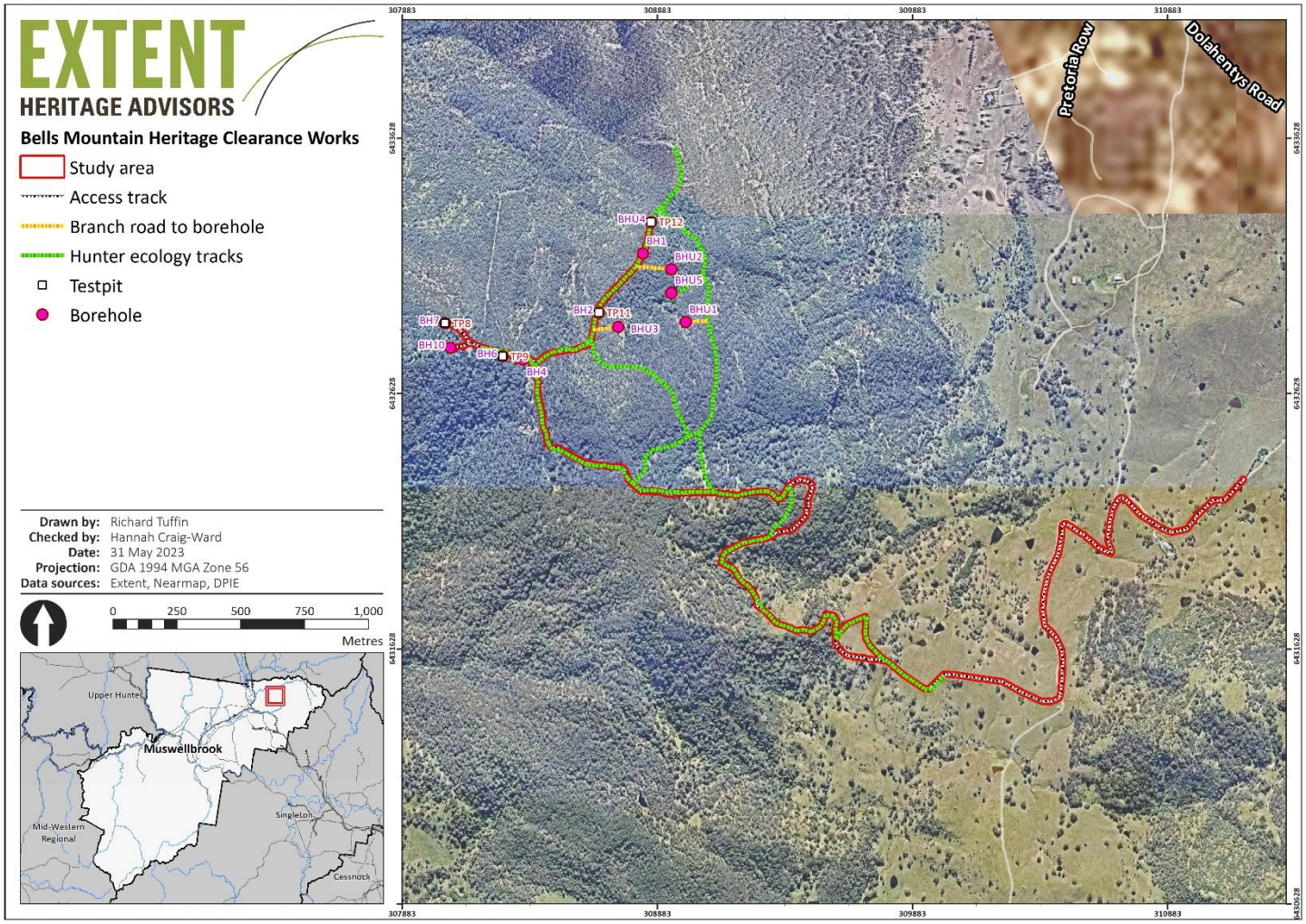


Figure 48 Location of the boreholes and test pits in the study area

8. Conclusions

8.1 The study area generally

A sampling strategy was adopted for the field survey in the upper reservoir area. One hundred percent coverage of the wider study area was not achieved. In those areas that were accessible and surveyed, GSV was poor (with occasional exceptions).

Even in good conditions, it is likely that GSV in the study area will remain fairly poor. Later survey in drier conditions may improve the survey results to a degree but it is unlikely that survey will ever be able to achieve highly accurate results.

No Aboriginal objects were identified in the surveyed parts of the study area.

There are no sites registered on AHIMS located in the study area's general vicinity. The area is in the vicinity of watercourses and has formerly been characterised by abundant flora and fauna, which is likely to have made it attractive for Aboriginal occupation. There are stone resources that were suitable for the manufacture of stone implements by Aboriginal people.

Notwithstanding levels of ground disturbance caused by tree clearing, and pastoral, agricultural and mining activities, there remains potential for Aboriginal archaeology (surface and sub-surface) to exist within the study area generally.

If such archaeology were to exist, it would be likely to comprise isolated artefacts and surface scatters in disturbed contexts, of low scientific significance. If sub-surface artefacts were identified, in undisturbed contexts, these would be likely to be of higher scientific significance. However, the potential for such sites to exist is relatively lower.

The trees in the study area could not be fully assessed. There were a number of mature specimens observed. There is some potential for culturally scarred trees to exist in the study area.

Within the study area of the upper reservoir, no rocky overhangs were observed, however there are cliffs on the eastern face of Bells Mountain that could not be accessed during the survey. Rocky overhangs in and near the study area could not be accessed during the survey. Rock shelters were favoured locations for Aboriginal people and where they were utilised for shelter there is high potential for scientifically significant archaeology to be present.

8.2 Test pits, boreholes, and access tracks

All *existing* track locations were surveyed and demonstrated to be disturbed and to contain no surface artefacts.

The *proposed* tracks extending west to BH7 and TP8, and BH10 could not be surveyed due to dense vegetation and rough terrain. A proposed access track to BHU2 could also not be surveyed due to the same reasons, although the borehole was accessed from the east. A small

branch providing access to BH6 and TP9 could also not be surveyed fully due to dense vegetation. However, these amount to only approximately 300m of track. Given that several kilometres of track were surveyed during the fieldwork underpinning this report, in directly analogous environmental conditions, and no artefacts were identified along them, this report concludes that there is low potential for Aboriginal archaeology to exist along these proposed tracks also.

In relation to the proposed test pits and borehole locations, ten of the fifteen locations were surveyed. Dense stands of sticky hop bush greatly impacted the ability to access several locations. There is low potential for Aboriginal archaeology to exist at the ten surveyed test pit and borehole locations. Based on the survey of two-thirds of the 15 locations, all being in directly analogous environments and where no artefacts were identified, this report concludes that there is low potential for Aboriginal archaeology to exist at the five unsurveyed locations.

Therefore, subject to the qualifications noted above (regarding poor GSV, access difficulties etc):

- There is low potential for Aboriginal objects to exist on the existing and proposed access tracks, which might be impacted during the proposed works. If any were to exist, they would likely be isolated surface artefacts of low scientific significance.
- There is low potential for Aboriginal objects to exist at the proposed borehole locations and their immediate surrounds, which might be impacted during the boring process.

Nevertheless, given the qualifications identified above, the following recommendations adopt a cautious approach.

This report confines itself to scientific observations that can be made without Aboriginal community consultation. To ascertain any other forms of Aboriginal cultural heritage that may exist in the study area (e.g., places of spiritual significance or bush medicine resources), engagement with the relevant Aboriginal party would be necessary.

Table 2 Details of the cultural heritage survey over geotechnical locations

Geotechnical Location	Cultural heritage survey
BH1	Location was fully surveyed and has been subject to significant ground disturbance and vegetation clearance in the past due to the establishment of a track.
BH2 and TP11	Location was fully surveyed and has been subject to significant ground disturbance and vegetation clearance in the past due to the establishment of a track.
BH4	Location fully surveyed and has been subject to significant ground disturbance and vegetation clearance in the past due to the establishment of a track.
BH6 and TP9	Unable to be accessed and surveyed due to dense vegetation. Area has not been cleared in the past however experienced some thinning in the 1980s.

Geotechnical Location	Cultural heritage survey
BH7 and TP8	Unable to be accessed and surveyed due to dense vegetation. Area has not been cleared in the past however experienced some thinning in the 1980s.
BH10	Unable to be accessed and surveyed due to dense vegetation. Area has not been cleared in the past however experienced some thinning in the 1980s.
BHU1	Location was fully surveyed. Area has not been cleared in the past, however, has been used for grazing cattle.
BHU2	Location was fully surveyed. Area has not been cleared in the past.
BHU3	Location was fully surveyed. Area has not been cleared in the past.
BHU4 and TP12	Location was fully surveyed and has been subject to significant ground disturbance and vegetation clearance in the past due to the establishment of a track.

9. Recommendations

It is appropriate for the proposed works to proceed in the study area.

In relation to those few locations and stretches of track that could not be fully accessed/surveyed, a cautious approach should be adopted, including a Chance Finds Procedure and monitoring by a qualified archaeologist.

If unexpected artefacts are identified during project works, an AHIP may be required to proceed with the works.

Due to limited access, dense vegetation and poor GSV across the top of Bells Mountain, the locations of BH6 and TP9, BH7 and TP8, and BH10 were inaccessible. These areas have historically undergone low levels of ground disturbance with much of the area appearing to have never been cleared or otherwise disturbed. However, given that they are in directly analogous environments to those locations that were accessed, and where no artefacts were identified, it is reasonable to conclude that these locations also have low potential for Aboriginal artefacts to exist there. It would be appropriate for works to proceed there without engagement with Registered Aboriginal Parties. However, if unexpected artefacts were identified during project works at any of these locations, an AHIP may be required to proceed with the works. Further, the works in these locations should only proceed subject to a Chance Finds Procedure that would include allowance for the monitoring of ground disturbance works by a qualified archaeologist.

As future programs of development are refined, this due diligence assessment should be refined through further surface survey by archaeologists when better conditions (especially improved GSV) exist.

The area along the top of Bells Mountain is assessed as having an elevated potential for Aboriginal objects due to the presence of a ridgeline and cliffs along the eastern face, applying the NSW guidelines, as per Section 5.1.3 of this report. This area has historically undergone minimal ground disturbance, with much of the area never being cleared (aside from the establishment of access tracks). This area has been used for cattle grazing in some parts, fence lines have been established, and ground disturbance has occurred with the construction of a dam and a well, but it is otherwise quite undisturbed.

This report may be included in any Development Application, Statement of Environmental Effects (SEE) or Review of Environmental Factors (REF) for the geotechnical investigations works. However, if any Aboriginal objects are later identified within the study area, this report cannot be used to support an application for an Aboriginal Heritage Impact Permit (AHIP). Such an application would require a more detailed investigation involving a formal process of Aboriginal community consultation and the preparation of an Aboriginal Cultural Heritage Assessment report (ACHAR).

If human skeletal material is ever identified in the study area, strict statutory processes apply, beginning with the notification of the NSW Police. Further advice would need to be sought if those remains proved to be Aboriginal ancestral remains.

The above observations are confined to the scientific significance of potential archaeological sites within the study area. To ascertain other kinds of heritage that the study area might embody (e.g., ceremony places, places of spiritual significance) it would be necessary to engage with the relevant Traditional Owners.

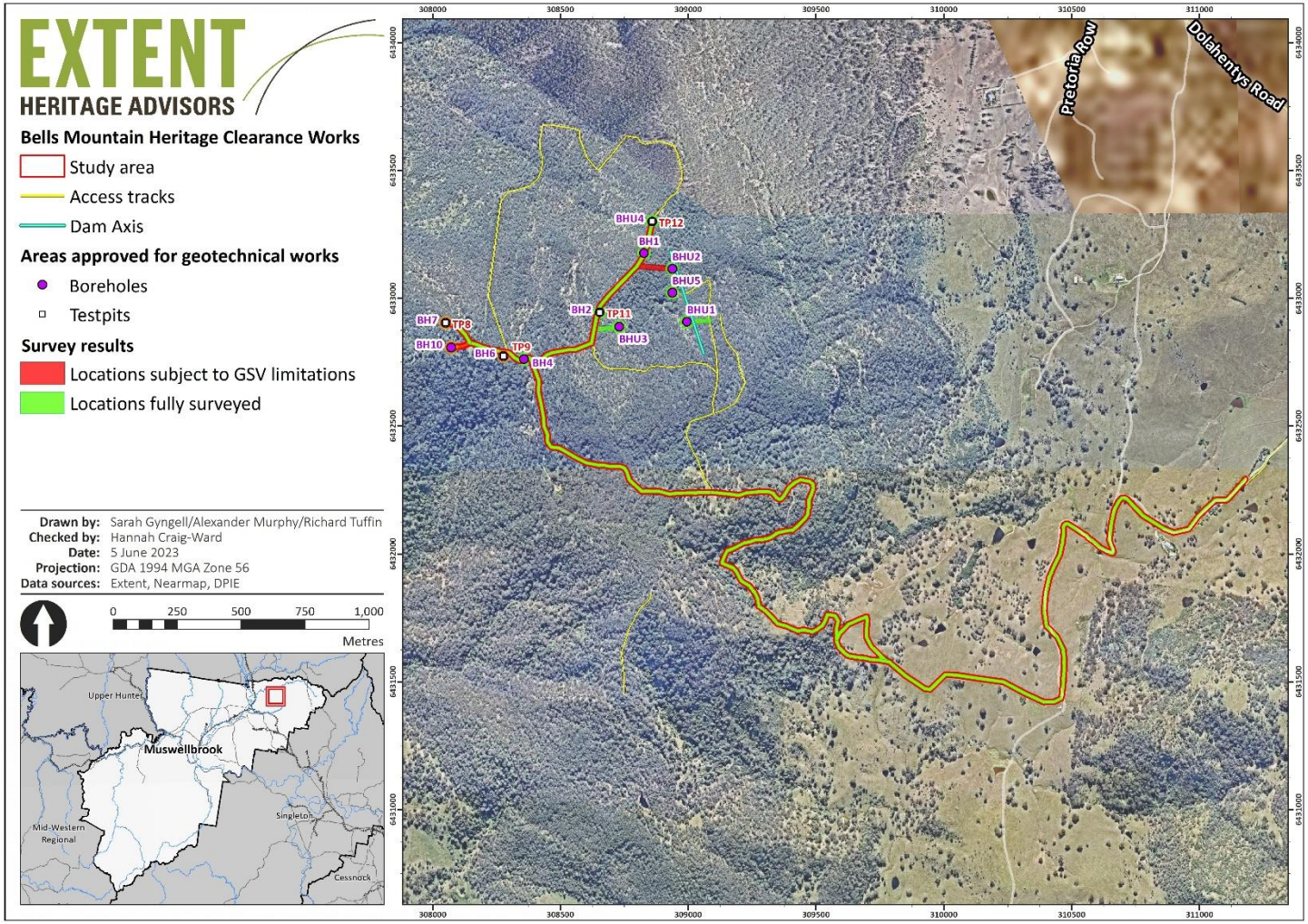


Figure 49 Map illustrating where survey was completed (although subject to GSV limitations in places).

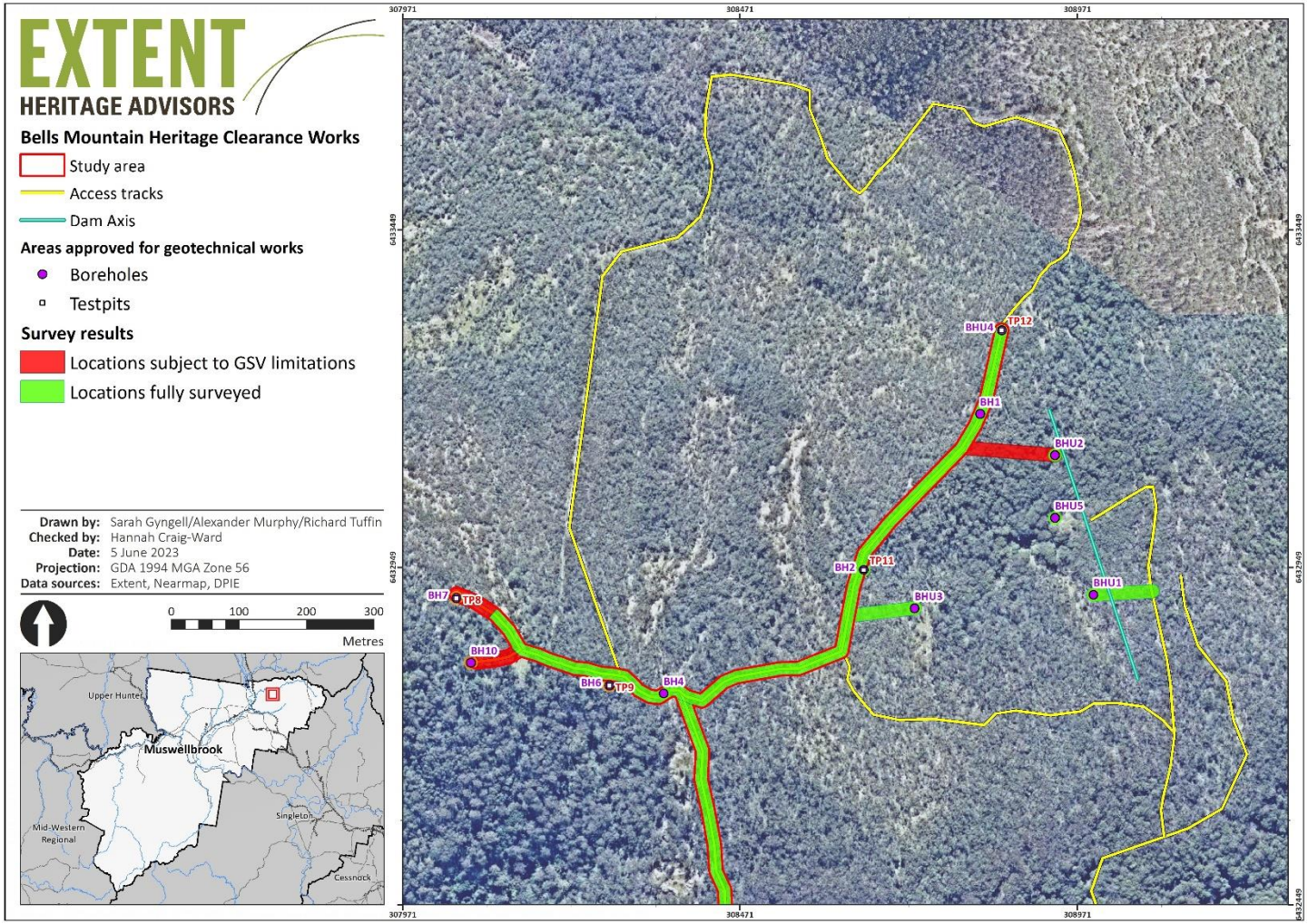


Figure 50 Map illustrating short stretches of track where survey was not possible.

10. References

AHIMS (Aboriginal Heritage Information Management System). 2022. 'AHIMS Basic Search.' Heritage NSW. Last modified 2022. https://www.environment.nsw.gov.au/awssapp/MySearches.aspx.

DECCW (Department of Environment, Climate Change and Water). 2010. *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*. Sydney: Department of Environment, Climate Change and Water.

Historical Imagery Viewer (HAPE) 2020 Spatial Collaboration Portal. New South Wales Government (website). Last modified 2022. https://portal.spatial.nsw.gov.au/portal/apps/webappviewer/index.html

OEH (Office of Environment and Heritage). 2015a. 'eSPADE NSW Soil and Land information System (SALIS).' New South Wales Government (website). 30 October 2018. https://www.environment.nsw.gov.au/topics/land-and-soil/information/espade.

OEH. 2015b. 'E-cn Colonel Soil Landscape.' New South Wales Government. PDF File. https://www.environment.nsw.gov.au/Salis5app/resources/spade/reports/SI5601cn.pdf.

OEH. 2015c. 'E-rv Rosevale Soil Landscape.' New South Wales Government. PDF File https://www.environment.nsw.gov.au/Salis5app/resources/spade/reports/SI5601rv.pdf

OEH. 2015d. 'E-sc Scrumlo Soil Landscape.' New South Wales Government. PDF File https://www.environment.nsw.gov.au/Salis5app/resources/spade/reports/SI5601sc.pdf

Appendix A. Due Diligence Flow Charts

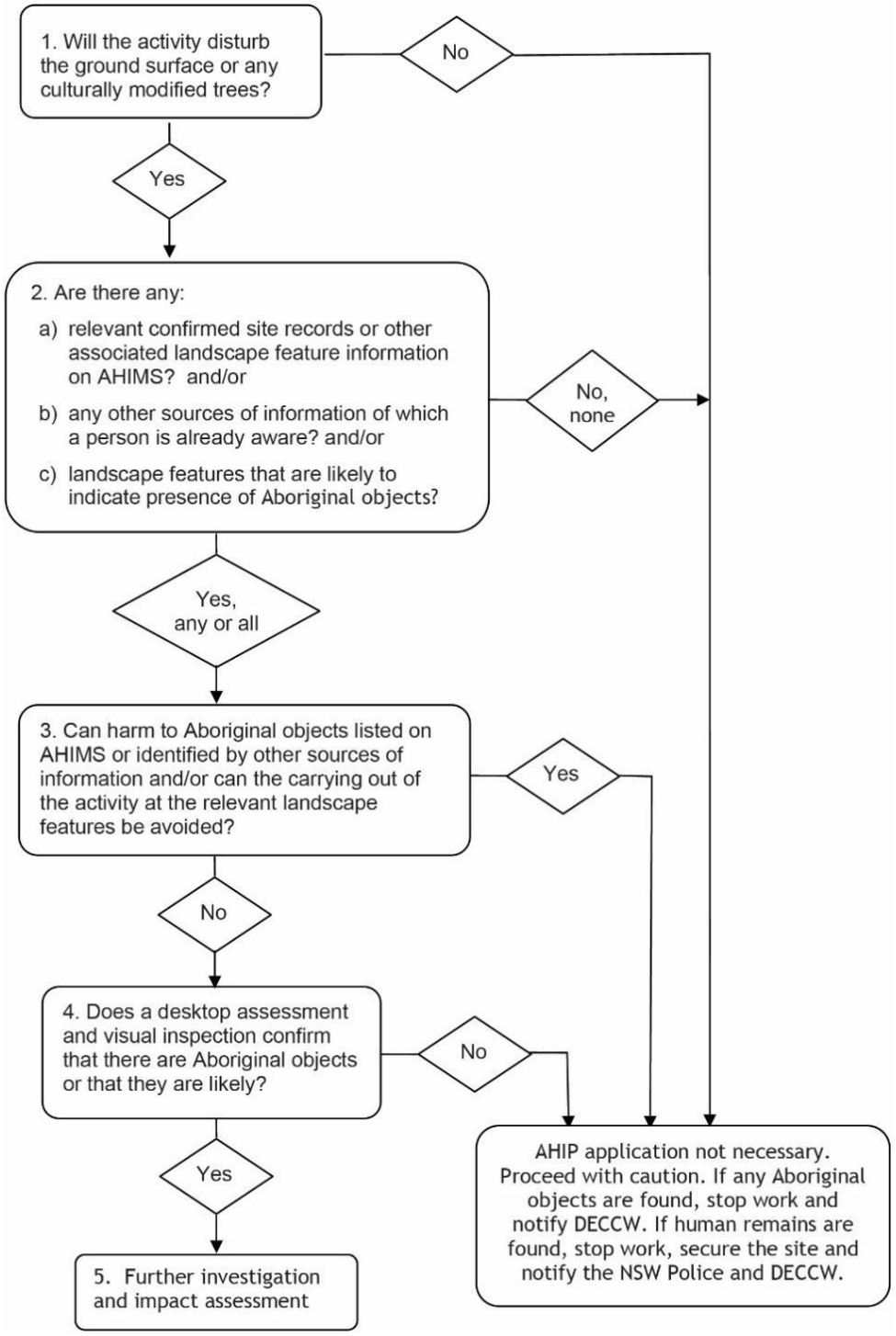


Figure 51. The generic due diligence process (DECCW 2010)

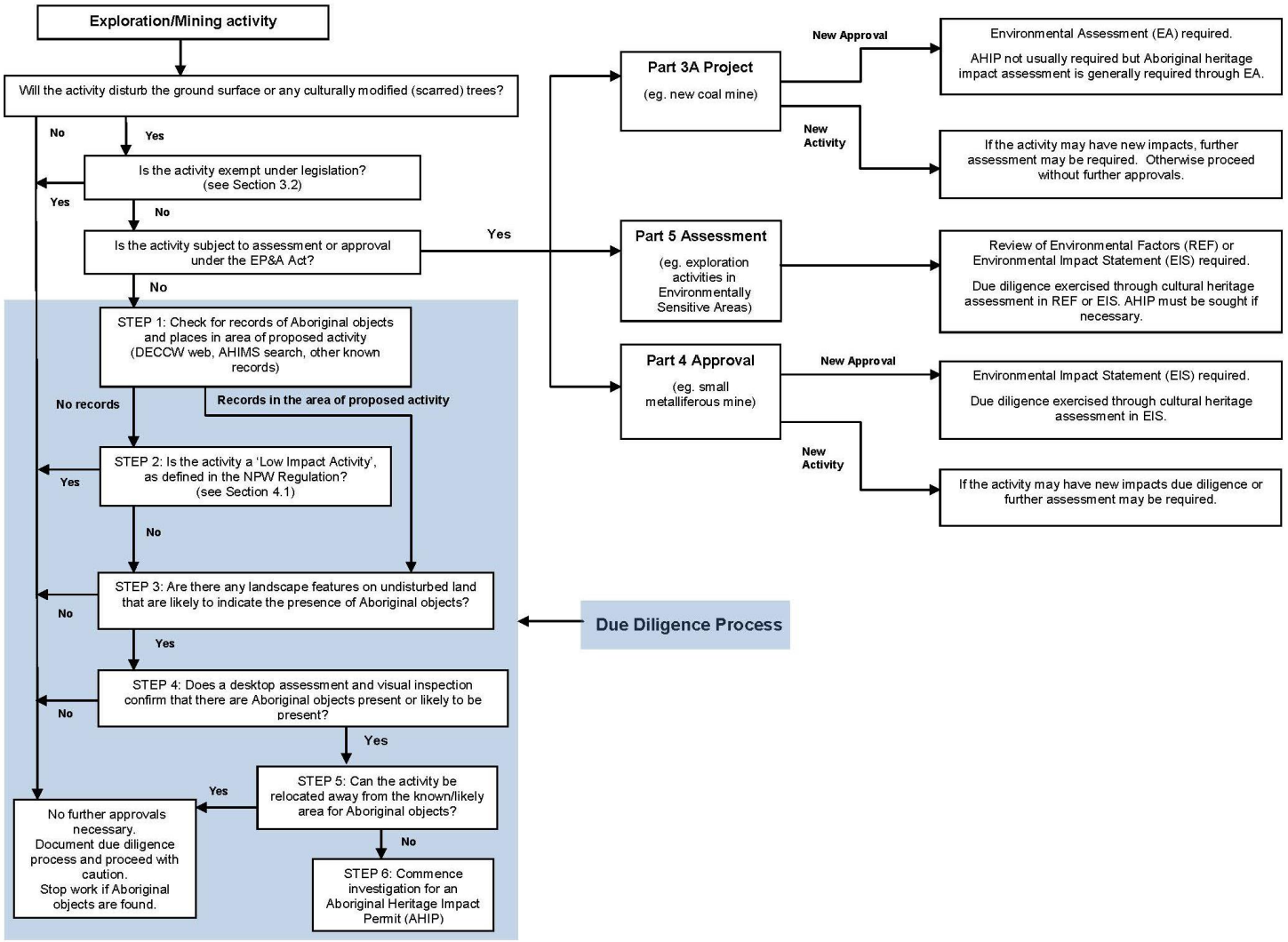


Figure 52. Process for the protection of Aboriginal Cultural heritage for the NSW Mineral Industry (NSW Minerals Council 2010)

Appendix B. AHIMS search

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : 0721040

Client Service ID : 748209

Extent Heritage Pty Ltd - Pyrmont - Individual users

3/73 Union Street
Pyrmont New South Wales 2009

Attention: Kathy Lai

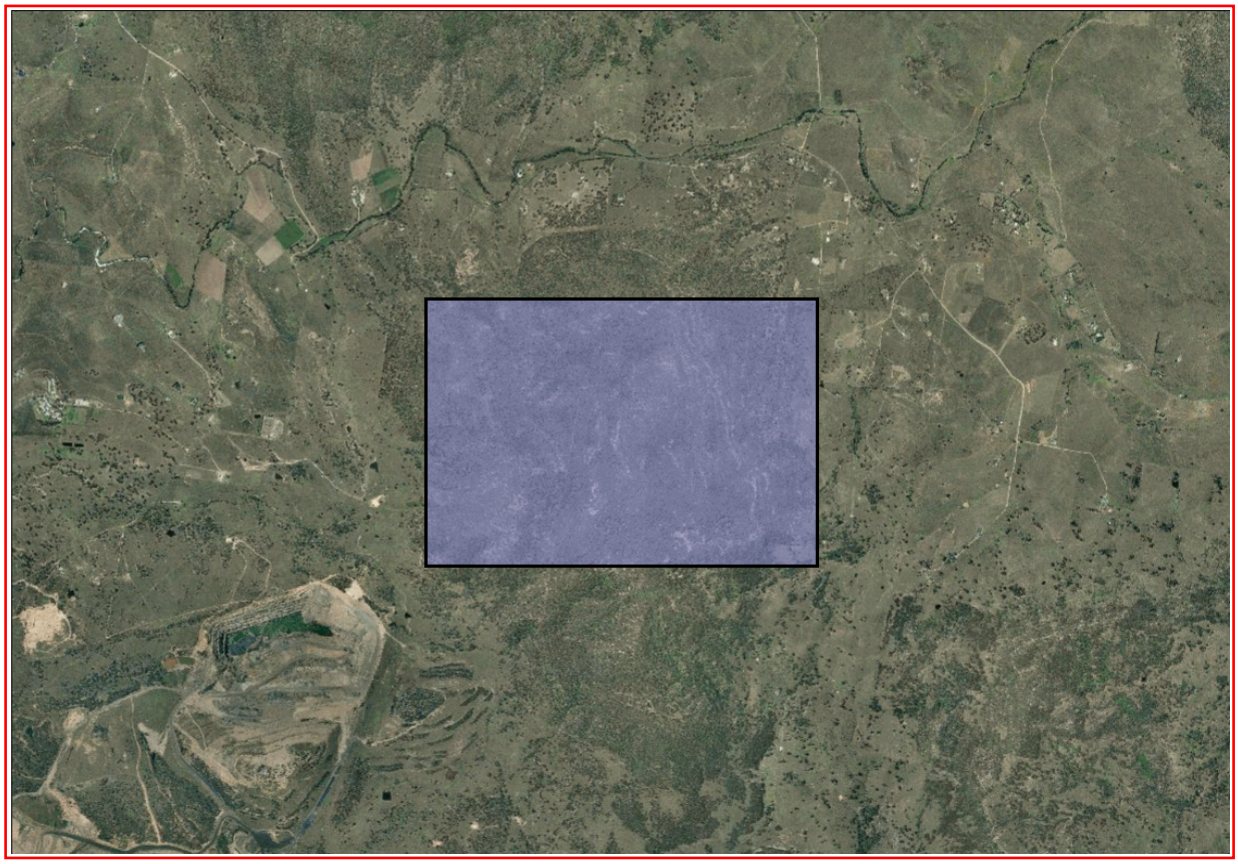
Email: klai@extent.com.au

Date: 25 January 2023

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -32.2316, 150.9532 - Lat, Long To : -32.2134, 150.9841, conducted by Kathy Lai on 25 January 2023.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Level 6, 10 Valentine Ave, Parramatta 2150
Locked Bag 5020 Parramatta NSW 2124
Tel: (02) 9585 6345

ABN 34 945 244 274
Email: ahims@environment.nsw.gov.au
Web: www.heritage.nsw.gov.au