NEW RICHMOND BRIDGE AND TRAFFIC IMPROVEMENTS
STAGE 2

Aboriginal Cultural Heritage Assessment

Prepared for Transport for New South Wales

Hawkesbury Local Government Area

October 2024

Ref. 2227

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Executive Summary

Transport for NSW (Transport) is proposing the New Richmond Bridge and Traffic Improvements project. The project aims to provide a longer term solution for reducing traffic congestion in the Richmond area. It would also include construction of a new bridge over the Hawkesbury River between Richmond and North Richmond. The project has been divided into two stages to deliver early safety benefits to the community. New Richmond Bridge and Traffic Improvements - Stage 1 includes upgrades to The Driftway between Londonderry and Blacktown Road. The remainder of the project will be delivered in the New Richmond Bridge and Traffic Improvements - Stage 2. Transport is preparing a Review of Environmental factors (REF) for Stage 2 of the New Richmond Bridge and Traffic Improvements project. Kelleher Nightingale Consulting Pty Ltd (KNC) was engaged by Transport to prepare an Aboriginal Cultural Heritage Assessment Report (ACHAR) for New Richmond Bridge and Traffic Improvements - Stage 2.

The archaeological assessment for the project included an archaeological field survey and test excavation, undertaken in accordance with the Heritage NSW *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* and Transport *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*. The assessment identified seven Aboriginal archaeological sites that would be at least partially impacted by the proposal: Beaumont Ave (BA-OS-1), Inalls Lane Richmond AFT 1, Inalls Lane Richmond AFT 2, Norfolk Place Hawkesbury River AFT 1, Southee Road Richmond AFT 1, Terrace Road Hawkesbury River AFT 1, and Terrace Road Redbank Creek AFT 1. Terrace Road Redbank Creek AFT 1 and Norfolk Place Hawkesbury River AFT 1 are considered to display moderate significance based on the scientific value of the information the sites contain. BA-OS-1, Inalls Lane Richmond AFT 1, Inalls Lane Richmond AFT 2, Southee Road Richmond AFT 1, and Terrace Road Hawkesbury River AFT 1 are considered to display low archaeological value and significance due to disturbance and low artefact densities. Consultation with the Aboriginal community has identified that the study area has cultural heritage value (social value) to the local Aboriginal community. Regarding the Aboriginal archaeological sites identified within the study area, no specific cultural/social, historic, aesthetic values expressed by these sites have been identified to date.

Archaeological impact mitigation (salvage excavation) is recommended where sites of at least moderate archaeological significance are to be impacted to recover a suitable sample of the information they contain. Salvage excavation is recommended for the impacted portions of Terrace Road Redbank Creek AFT 1 and Norfolk Place Hawkesbury River AFT 1. Salvage excavations must be completed prior to any activities which may harm Aboriginal objects at these site locations. Salvage mitigation for low significance sites BA-OS-1, Inalls Lane Richmond AFT 1, Inalls Lane Richmond AFT 2, Southee Road Richmond AFT 1, and Terrace Road Hawkesbury River AFT 1 are not warranted.

An Aboriginal Heritage Impact Permit (AHIP 4940) was previously issued to Sydney Water that includes parts of the proposal at North Richmond. The AHIP included provisions for archaeological salvage excavations within the impacted portions of Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542), Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541), and Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543) which are partially located within the proposal. Any works related to the current proposal undertaken within the boundary of the AHIP will be required to comply with the existing permit conditions. A land based AHIP should be obtained under section 90 of the *National Parks and Wildlife Act 1974* for the part of the New Richmond Bridge and Traffic Improvements - Stage 2 which is not already covered under existing AHIPs. The AHIP should include Aboriginal objects associated with the following sites:

Beaumont Ave (BA-OS-1)	45-5-2478	Low Significance	Total Impact
Inalls Lane Richmond AFT 1	45-5-5845	Low Significance	Partial Impact
Inalls Lane Richmond AFT 2	45-5-5844	Low Significance	Total Impact
Norfolk Place Hawkesbury River AFT 1	45-5-5542	Moderate Significance	Partial Impact
Southee Road Richmond AFT 1	45-5-5846	Low Significance	Total Impact
Terrace Road Hawkesbury River AFT 1	45-5-5541	Low Significance	Partial Impact
Terrace Road Redbank Creek AFT 1	45-5-5543	Moderate Significance	Partial Impact

The loss of the intrinsic Aboriginal cultural value of impacted Aboriginal archaeological sites often cannot be fully offset or mitigated; however, the recovery of surface artefacts from the impacted portion of the sites by the Aboriginal community prior to the proposed works is recommended. The AHIP should include provision for surface collection within the impacted site areas.

Management measures have been recommended for Aboriginal objects within the non-impacted portions of Inalls Lane Richmond AFT 1, Norfolk Place Hawkesbury River AFT 1, Terrace Road Hawkesbury River AFT 1, and Terrace Road Redbank Creek AFT 1 to ensure that these areas are avoided activities associated with the proposal. The non-impacted portion of the sites (outside of the AHIP boundary) should be marked as environmentally sensitive “no-go zones” on the Construction Environmental Management Plan prior to construction activities to ensure the site areas are avoided and not impacted by the proposed works. Workers should be inducted as to appropriate protection measures for Aboriginal heritage.

This ACHAR has been prepared to support the AHIP application. It has been prepared in accordance with Stage 3 of the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*, *Guide to investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*, *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW*, and *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*.

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1 Introduction

1.1 Project background

The bridge between Richmond and North Richmond provides a vital crossing of the Hawkesbury River and carries an average of 31,000 vehicles per day with a single lane in each direction. In 2013, Transport for NSW (Transport) prepared the *Richmond Bridge and approaches congestion study: Preferred short-term and long-term options* report. The study identified the need for additional bridge capacity and three intersection upgrades to improve travel times and journey time reliability and provide for future growth.

Transport for NSW (Transport) proposes to upgrade Bells Line of Road / Kurrajong Road between Crooked Lane, North Richmond and Old Kurrajong Road, Richmond and construct a new bypass south of Richmond town centre. This is known as New Richmond Bridge and traffic improvements – Stage 2 (the proposal). The proposal aims to reduce congestion between those centres, improve travel times, cater for future growth and improve connectivity for public and active transport. Transport has identified a preferred option for the new bridge and road alignment, following detailed analysis and engagement with key stakeholders and community members. The existing Richmond Bridge will remain in its current form.

When complete, the benefits of the New Richmond Bridge and traffic improvements are likely to include:

- improvement in road safety
- improvement in journey time reliability for private and public transport
- reduction in travel times
- improvement in active transport connections
- improvement in access during flood events between east and west of the Hawkesbury River.

1.2 Proponent and consultants

Transport is preparing a Review of Environmental factors (REF) for Stage 2 of the New Richmond Bridge and Traffic Improvements project. Kelleher Nightingale Consulting Pty Ltd (KNC) was engaged by Transport to prepare an Aboriginal Cultural Heritage Assessment Report (ACHAR) for New Richmond Bridge and Traffic Improvements - Stage 2. The ACHAR has been prepared in accordance with Stage 3 of the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Roads and Maritime Services 2011) and *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011a).

1.3 Location and scope of activity

Transport proposes to upgrade Bells Line of Road / Kurrajong Road between Crooked Lane, North Richmond and Old Kurrajong Road, Richmond and construct a new bypass south of Richmond town centre. The proposal is located about 50 kilometres north-west of the Sydney Central Business District (CBD) and about 33 kilometres north-west of Parramatta. It is in the Hawkesbury City Council local government area (LGA).

The proposal includes a new four-lane bridge over the Hawkesbury River about 30 metres downstream of the existing Richmond Bridge, widening of Bells Line of Road through North Richmond, and a new bypass to the south of the Richmond town centre. The bypass would extend about three kilometres across the floodplain between the Kurrajong Road / Old Kurrajong Road intersection and south of the Londonderry Road / Southee Road intersection.

The proposal would also provide an active transport corridor between North Richmond and Richmond. This would include a new shared path on the southern side of Kurrajong Road between Old Kurrajong Road and Chapel Street and the conversion of the existing Richmond Bridge into an active transport connection across the Hawkesbury River.

The key features of the proposal would include:

- A new 330-metre-long four-lane bridge over the Hawkesbury River about 30-60 metres downstream of the existing bridge, with two eastbound and two westbound lanes
- Widening of Bells Line of Road and Kurrajong Road to two lanes in each direction from the Terrace Road / Grose Vale Road intersection in North Richmond to just east of the Kurrajong Road / Old Kurrajong Road intersection in Richmond
- Additional capacity improvements to the Bells Line of Road / Terrace Road / Grose Vale Road intersection to provide an additional eastbound lane on Bells Line of Road

- A two-lane bypass south of Richmond town centre (one lane in each direction) between the Kurrajong Road / Old Kurrajong Road intersection and just south of the Londonderry Road / Southee Road intersection, including:
  - A new four-way signalised intersection connecting Kurrajong Road, Old Kurrajong Road, and the new bypass, including closure of the existing south leg of Old Kurrajong Road
  - A 160-metre-long bridge over a tributary to Mareh-Mareh lagoon (near Inalls Lane)
  - A 130-metre-long bridge over the floodplain parallel to Inalls Lane
  - A new roundabout at the Castlereagh Road / Inalls Lane / bypass intersection
  - A new signalised intersection at the junction of Londonderry Road, the new bypass and Vines Drive
  - Local road connections to Yarramundi Lane and Victoria Place from the bypass
  - Closure of Inalls Lane on either side of the bypass near Mareh-Mareh lagoon, with local road connections to Inalls Lane from the bypass via Yarramundi Lane and near Drift Road
  - Closure of the existing Drift Road intersection with Inalls Lane, with a local road connection to Drift Road from the bypass.
  - Closure of Southee Road at Castlereagh Road and Londonderry Road, with a local road connection to Southee Road from the bypass (opposite Valder Avenue)
  - Two new bus stops along the bypass near Hill Avenue (one eastbound and one westbound), with a footpath connection to Southee Road
  - Footpaths along the southern side of the bypass between Drive Road and Castlereagh Road and on each side of the Castlereagh Road / Inalls Lane / bypass intersection roundabout
- Widening of Bells Line of Road at its intersection with Crooked Lane to provide a dedicated right-turn lane into Crooked Lane
- An upgraded active transport network, including:
  - A new shared path along the southern side of Kurrajong Road between Old Kurrajong Road and Chapel Street, Richmond
  - Conversion of the existing Richmond bridge into an active transport only connection between North Richmond and Richmond
  - Active transport connections from the existing Richmond bridge through Hanna Park to an upgraded shared path on the northern side of Bells Line of Road
  - Footpaths, including along Bells Line of Road, Londonderry Road and the bypass between Drift Road and Castlereagh Road
- Retention of bus stops along Bells Line of Road, Kurrajong Road and Londonderry Road
- New drainage infrastructure, including swales and water quality basins.
- A noise mound and noise wall between Southee Road and the new bypass
- Utilities connections and upgrades (including electrical, gas, water, and telecommunications)
- New intelligent transport systems
- New maintenance access to the three new bridges
- Driveway adjustments and tie-ins, including along Bells Line of Road, Beaumont Avenue, Kurrajong Road, Old Kurrajong Road, Inalls Lane, Drift Road, Castlereagh Road and Londonderry Road
- Final roadworks including pavement, kerb and gutters, signs, landscaping, lighting and line marking.
- Construction activities, including:
  - A temporary roundabout at the Kurrajong Road / Chapel Street intersection
  - Civil earthworks, bridge structural works, retaining walls, drainage work, utilities relocations and tie-in work and adjustments to adjoining sections of road.
  - Establishment of temporary ancillary facilities to support construction, including compound sites, site offices, stockpile and laydown locations, temporary access tracks and water quality devices.

Ancillary Facilities

Seven potential ancillary facilities have been identified within the proposal area. These sites were identified as areas that maximised the use of existing infrastructure, buildings or vacant land and were readily accessible from other parts of the proposal area. However, the contractor would need to assess which or if all seven sites are to be used during construction.

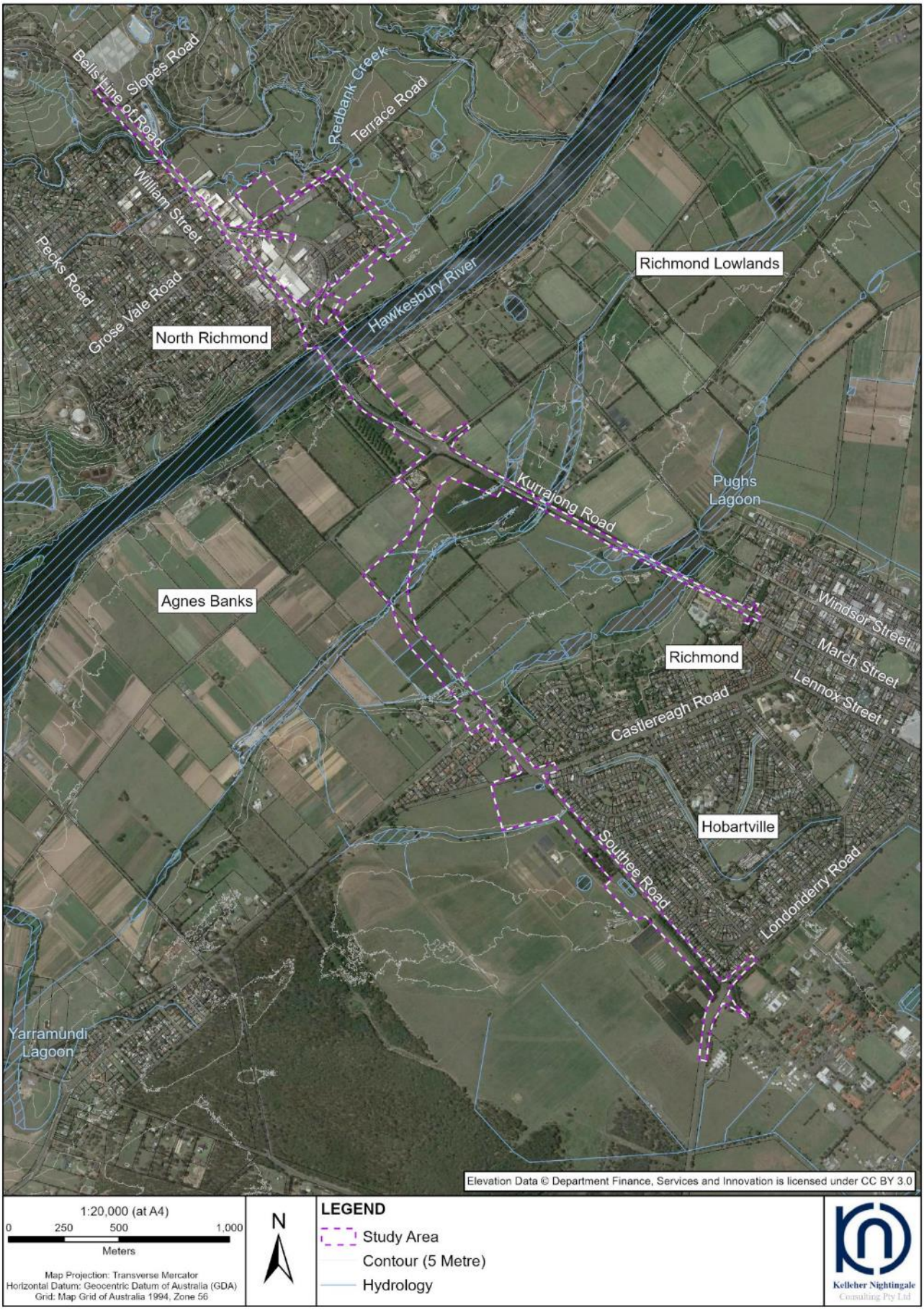

Figure 1. Location of the study area

These facilities would be located at:

- Terrace Road, North Richmond
- North Richmond Park & Hanna Park (east)
- Hanna Park (west)
- Eastern side of the Hawkesbury River
- Old Kurrajong Road
- Inalls Lane
- Castlereagh Road, Richmond

Initial work at these sites would be required at the start of construction. It could include vegetation clearing, environmental control installation, hardstand areas and access roads, and provision of additional or augmented utilities and services (where required). The study area for this assessment includes both the main construction works areas and ancillary facilities (Figure 1).

1.4 Statutory controls and development context

The proposal would be undertaken by Transport. An Aboriginal Heritage Impact Permit (AHIP 4940) was previously issued to Sydney Water that includes parts of the proposal at North Richmond. The AHIP included provisions for archaeological salvage excavations within the impacted portions of Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542), Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541), and Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543) which are partially located within the proposal. Any works related to the current proposal undertaken within the boundary of the AHIP will be required to comply with the existing permit conditions.

The remaining areas of proposal are subject to assessment under Part 5 of the *Environmental Planning and Assessment Act 1979*. Aboriginal objects would be harmed by the proposal and an application for an Aboriginal Heritage Impact Permit (AHIP) would be made under section 90A of the *National Parks and Wildlife Act 1974*.

The ACHAR has been prepared to support the environmental assessment and the AHIP application. It has been prepared in accordance with Heritage NSW *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) and related guidelines and requirements. The ACHAR complies with the Transport *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Roads and Maritime 2011).

1.5 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) is the primary statutory control dealing with Aboriginal heritage in New South Wales. Items of Aboriginal heritage (Aboriginal objects) or Aboriginal places (declared under section 84) are protected and regulated under the NPW Act.

Under the Act, an "Aboriginal object" is defined 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". As such, Aboriginal objects are confined to physical evidence and are commonly referred to as Aboriginal sites.

Aboriginal objects are protected under section 86 of the Act. It is an offence to harm or desecrate an Aboriginal object, either knowingly [section 86 (1)] or unknowingly [section 86 (2)].

There are offences and penalties relating to harm to, or desecration of, an Aboriginal object or declared Aboriginal place. Harm includes to destroy, deface, damage or move. Penalties are tiered according to offences, which include:

- a person must not harm or desecrate an Aboriginal object that the person knows is an Aboriginal object
- a person must not harm an Aboriginal object (strict liability offence)
- a person must not harm or desecrate an Aboriginal place (strict liability offence)
- failure to notify Heritage NSW of the location of an Aboriginal object (existing offence and penalty)
- contravention of any condition of an AHIP.

Under section 87 (1) it is a defence against prosecution if "(a) the harm or desecration concerned was authorised by an Aboriginal Heritage Impact Permit and (b) the conditions to which that Aboriginal Heritage Impact Permit was subject were not contravened".

Section 87 (2) of the Act provides a defence if "the defendant exercised due diligence to determine whether the act or omission constituting the alleged offence would harm an Aboriginal object and reasonably determined that no Aboriginal object would be harmed".

Section 89A of the Act relates to the notification of sites of Aboriginal objects, under which it is an offence if the location of an Aboriginal object is not notified to the Director-General in the prescribed manner within a reasonable time.

Under section 90 (1) of the Act "the Director-General may issue an Aboriginal Heritage Impact Permit". The regulation of Aboriginal Heritage Impact Permits is provided in Part 6 Division 2 of the Act, including regulations relating to consultation (section 90N).

An AHIP is required for an activity which would harm an Aboriginal object.

1.6 Objectives of the CHAR

The proposed infrastructure works would impact on some Aboriginal objects (sites). Approval obtained under the *National Parks and Wildlife Act 1974* would be required for these Aboriginal objects prior to any impact or harm. The proponent would apply for an AHIP under section 90A of the Act.

Clause 61 of the *National Parks and Wildlife Regulation 2019* requires that an application for an AHIP is accompanied by a CHAR. The CHAR is to provide information on:

- the significance of the Aboriginal objects or Aboriginal place that are the subject of the application
- the actual or likely harm to those Aboriginal objects or Aboriginal places from the proposed activity that is the subject of the application
- any practical measures that may be taken to protect and conserve those Aboriginal objects or Aboriginal places
- any practical measures that may be taken to avoid or mitigate any actual or likely harm to those Aboriginal objects or Aboriginal places.

The *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) provides further guidance on the preparation of a CHAR. This report has been prepared in accordance with the requirements of the Regulation and the OEH guide.

This ACHAR has been prepared to accompany an application for an AHIP made by Transport for Aboriginal objects within the impact area, including those associated with Beaumont Ave (BA-OS-1) (AHIMS 45-5-2478), Inalls Lane Richmond AFT 1 (AHIMS 45-5-5845), Inalls Lane Richmond AFT 2 (AHIMS 45-5-5844), Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542), Southee Road Richmond AFT 1 (AHIMS 45-5-5846), Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541), and Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543).

2 Landscape Context

2.1 Landform, hydrology, geology and soils

The study area is located in a transitional zone between two physiographic regions, where the western margin of the Cumberland Plain meets the eastern foothills of the Blue Mountains Plateau. The underlying geology of these physiographic regions strongly influences landform, soil types and hydrologic characteristics of the surrounding area.

When mapped at 1:100,000 scale, the study area intersects various geological formations (Figure 2). On the western side of the Hawkesbury River, the majority of the study area is located atop Ashfield Shale. Ashfield Shale formed during the Middle Triassic Period and consisted of dark-grey to black sideritic claystone and siltstone which grades upward into a fine sandstone-siltstone laminate (Clark and Jones 1991). Ashfield Shale remains as erosional remnants underlying the elevated ridgelines on the foothills of the predominantly sandstone plateau. The township of North Richmond occupies this higher ground on the western side of the river. The Hawkesbury Sandstone is the chief geological formation which forms the dissected plateau and foot slopes of the Blue Mountains, consisting of mostly medium-coarse grained lithic quartz sandstone, with minor laminated mudstone and siltstone lenses. Hawkesbury Sandstone outcrops along the various creek lines dissecting the foothills, including along Redbank Creek and other tributaries to the Nepean/Hawkesbury River.

Bordering the Nepean/Hawkesbury River is a wide band of Quaternary (Cainozoic) deposit known as the Lowlands Formation, which forms a broad, low terrace between Castlereagh and Pitt Town; within the study area it encompasses a narrow strip around northern side of the river as well as the broad area to the south of the river (Figure 2). The Lowlands Formation consists of basal gravels, grading upwards to sand, silt and clay. Fine lithic quartz sands occur in a thin band paralleling the present river course between Agnes Banks and Cordners Corner, near Windsor. The gravel component includes granite, porphyry, volcanics, basalt, quartz, quartzite, chert and sandstone. Gravel beds are present along the Hawkesbury/Nepean. The Lowlands Formation broadly corresponds with the extent of major flooding events (1-100 year) along this section of the Hawkesbury River east of Windsor and forms the modern floodplain.

South of the Lowlands Formation, underlying geology comprises the Clarendon Formation, a sheet deposit of clay, clayey sand and silt overlying the eroded remnant Tertiary level terrace. A steep scarp separates the higher level remnant terrace of the Clarendon Formation from the lower eroded terrace of the adjoining Lowlands Formation. The townships of Agnes Banks, Richmond and Clarendon occupy this higher level Tertiary terrace. A small deposit of Clarendon Formation is also present on the western side of the river, east of North Richmond along Terrace Road.

To the south of the study area, south of Richmond and Agnes Banks, older Tertiary deposits form the bulk of the landscape and include the Londonderry Clay and the Rickabys Creek Gravels, which together form the base of the Tertiary formation extending east from the river. Londonderry Clay is a plastic, relatively impervious clay with patches of sand and aggregates cemented by iron oxides, and represents the finer sediments deposited during fluvial conditions of the late Oligocene/early Miocene. This deposit occurs in combination with the larger clast Rickabys Creek braid plain gravels which form the basal layer of the Tertiary terrace, comprising quartzite, quartz, granite, chert, silicified tuff, silcrete, hornfels and others. The gravels outcrop around the perimeter of the terrace and where it is dissected by Rickabys Creek. Quaternary reworking has widely distributed this material across the northwestern Cumberland Plain and along the major tributaries to the Hawkesbury/Nepean system including South Creek and Eastern Creek. Fine-grained sand, silt and clay form Quaternary Alluvium deposits associated with these watercourses and with Rickabys Creek.

Soil landscapes within the study area are influenced by the underlying geology and topography, with the variety of soil landscapes present (Figure 2) highlighting the complex depositional environment associated with the river (Bannerman, Hazleton and Tille 1990). Residual soils of the Blacktown Soil Landscape occur on the more elevated Ashfield Shale underlying North Richmond on the western side of the river. These are primarily derived in situ from underlying lithologies and consist of shallow to moderately deep hard-setting red, brown and yellow podzolic soils. Soil fertility and soil drainage are low. Erosional susceptibility of this soil landscape is relatively low but is increased where surface vegetation is not maintained (Bannerman, Hazleton and Tille 1990). Blacktown soils have the capacity to conserve Aboriginal objects in situ, but their deflationary tendency means vertical stratigraphy is often lost.

Bordering the river and roughly analogous with the Lowlands Formation and modern floodplain are alluvial soils of the Freemans Reach Soil Landscape. These soils occur on level landforms with minor relief to meander scrolls, levees and backwater swamps and are part of current, active floodplains. Parent materials are derived from the surrounding Narrabeen Group and Wianamatta Group geologies. The Freemans Reach soil landscape consists of sandy loam, apedal sand and apedal sandy clay loam overlying sandy clay and has a high level of stream bank erosion in addition to permanently high water tables and seasonal waterlogging. Being an active flood plain, this soil landscape is dynamic, with streambank erosion and deposition occurring constantly. The floodplain is also subject to scour, sheet and rill erosion during flood events, with a varying depth of sedimentary material left behind once the waters recede. Archaeological potential is strongly dependent on topography and flood effects.

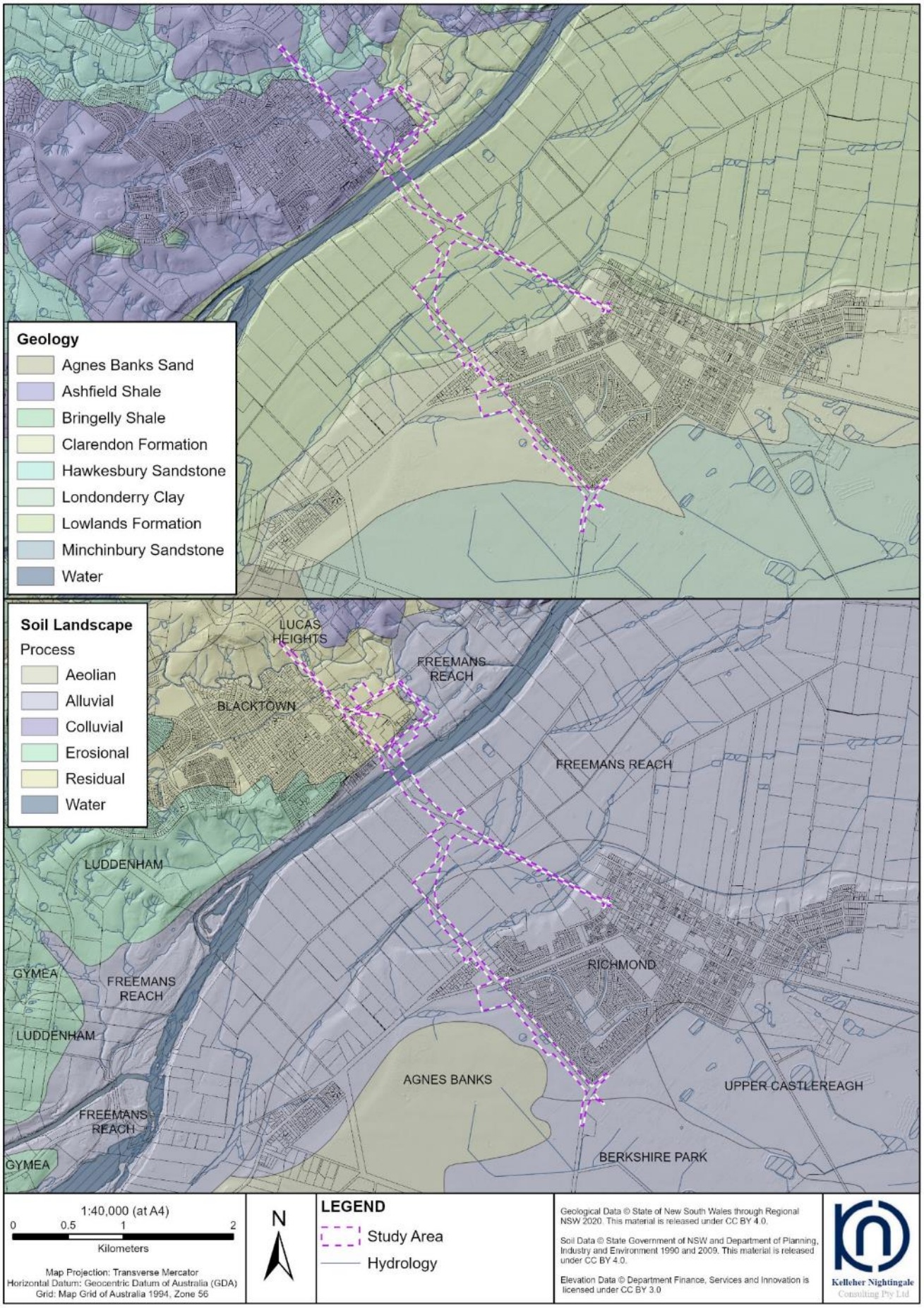

Figure 2. Geology and soil landscapes of the study area

The higher level terrace of the Clarendon Formation contains soils of the alluvial Richmond Soil Landscape. Richmond soils occupy the higher level Quaternary terraces of the Hawkesbury/Nepean River. Relief is mainly flat, with terrace edges, levees and splays providing low local relief of up to 10 metres. Soil materials comprise poorly structured orange to red clay loams, clays and sands with ironstone nodules. Red earths and red podzolics occur on terrace surfaces with earthy sand on edges and plastic clays in drainage lines. This soil landscape displays a high erosion hazard on terrace edges and localised waterlogging and flooding. Erodibility and erosion hazard is moderate to high depending on slope gradient and vegetation cover.

Hydrology around the study area is dominated by the Hawkesbury River, a major river of coastal NSW. The Hawkesbury River forms a boundary between the foothills of the Blue Mountains and the low lying, gently undulating hills and plains of the Cumberland Plain. Numerous lower order watercourses dissect the rolling low hills at the base of the Blue Mountains and the Tertiary terrace system to the east.

West of the river, the principal tributary within the study area is Redbank Creek, an east flowing third order tributary of the Hawkesbury River. The study area traverses one second order tributary of Redbank Creek which flows to the east. Farm dams and waterbodies have been constructed to capture the runoff of these minor drainage tributaries and have likely altered the original hydrology of the study area across the foothills. Redbank Creek has its confluence with the river proper approximately 1.4km downstream of the existing Richmond Bridge, at a low-lying swampy area. Between the higher terrace at Richmond township and the river, the Richmond Lowlands are dissected by chained lagoons and lower order drainage lines running in parallel to the river's current channel.

The confluence of the Grose and Nepean Rivers is the point at which the Nepean becomes the Hawkesbury, approximately 3km from the study area alignment at Inalls Lane. The nature of the river corridors has been subject to change over time, varying between well-defined single channels and banks, to broad braided channel systems many kilometres wide. Flood events are common and range from minor to extreme. The 1:100 year flood level at North Richmond is 17.5m AHD. A flood study undertaken for the Hawkesbury LGA indicates that flooding up to the 1:100 year flood level would affect almost the entirety of the study area south of the river, while a flood at Probable Maximum Flood (PMF) extent (26.5m AHD at North Richmond) would also inundate the township of Richmond and eastern part of North Richmond (approximate extent shown in Figure 4).

2.2 Vegetation and land use

Native vegetation within the study area has been extensively modified by European land use practices. European settlement of the area began in the in the late 18th century with several land grants made along the Hawkesbury River. The land grants were primarily utilised for growing maize, wheat and barley in addition to raising cattle, sheep, goats, pigs and horses. The occurrence of several floods in the late 18th and early 19th centuries prompted the establishment of settlements on the elevated landforms adjacent to the Hawkesbury River floodplain including Windsor, Richmond, Castlereagh, Wilberforce and Pitt Town. The fertile soil of the river's floodplain acted as the 'breadbasket' for the early colony, leading to early and widespread vegetation clearance, particularly across the Richmond Lowlands. Prior to this, a diverse range of flora and fauna would have been present across the various vegetation communities.

Prior to 1788, a mixture of native vegetation communities would have extended across the entirety of the Cumberland Plain with distribution determined by a combination of factors including soil, terrain and climate. The NSW National Parks and Wildlife Service (NPWS) in collaboration with other agencies and government bodies have produced bioregional assessment studies for specific areas in order to identify, describe and map vegetation communities and fauna habitats. The study area is located within the Cumberland Plain Western Sydney assessment area (NPWS 2002). The original vegetation communities give an indication of the natural resources that would have been available to past Aboriginal people in the area.

West of the river, the rolling foothills contained Shale/Sandstone Transitional Forest (both low and high sandstone influences) and Shale Plains Woodland, with Riparian Forest along the Hawkesbury. Alluvial Woodland and Freshwater Wetlands would have occupied the Richmond Lowlands, while the more elevated Tertiary terrace to the west of the study area was dominated by Shale Plains Woodland, Alluvial Woodland and Shale Gravel Transition Forest around the terrace edges. The variety of vegetation communities would have encouraged a diverse population of fauna and provided a wide range of resources for Aboriginal people.

Shale Plains Woodland (NPWS 2002: 52-54) was identified along the banks of Redbank Creek to the east of Bells Line of Road within the study area. This vegetation community also might occur in less drained areas that are infrequently inundated. Dominant tree species include Grey Box *(Eucalyptus moluccana)* and Forest Red Gum *(E.tereticornis)*, with Narrow-leaved Ironbark (known also as 'muggago' in Dharawal language) *(E.crebra)*, Thin-leaved Stringybark *(E. eugeniodes)*, and Spotted Gum *(Corymbia maculata)* occurring less frequently. Other species can also occur, such as Native Cherry *(Exocarpus cupressiformis)* and Black Wattle *(Acacia decurrens)*. Shrub stratum is dominated by Sweet Bursaria, while the ground species include Kidney Weed *(Dichondra repens)*, Threeawn Speargrass *(Aristida vagans)*, Blue Yam *(Brunoniella australis)* and Slender Tick-trefoil *(Desmodium varians)*.

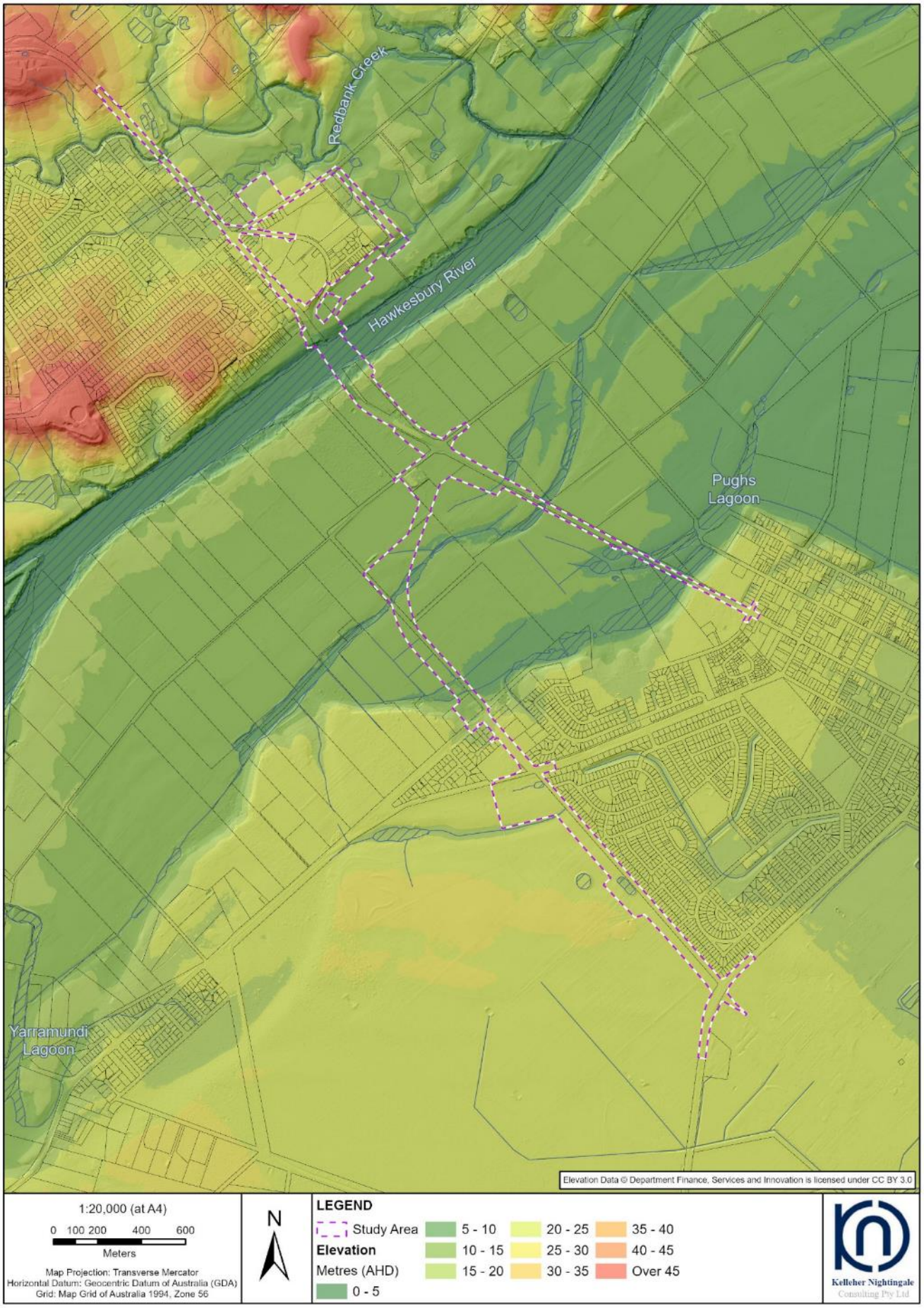

Figure 3. Topography and hydrology of the study area

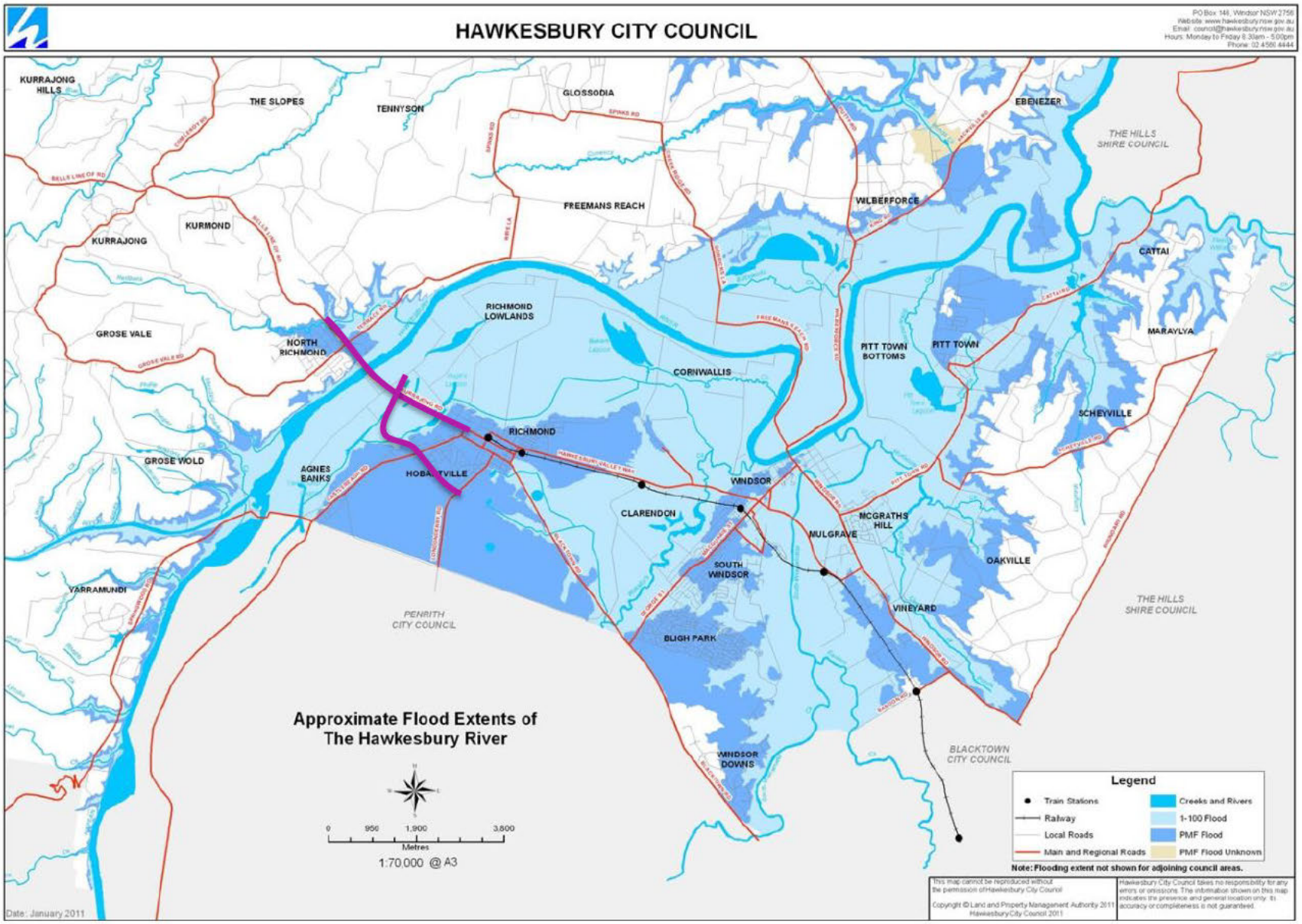

Figure 4. Hawkesbury LGA flood mapping (approximate location of study area shown in purple)

Shale Sandstone Transition Forest (High Sandstone Influence) (NPWS 2002: 22-24) was identified along the banks of Redbank Creek at the northern tip of the study area and to its immediate north-west. This vegetation community occurs within approximately 400 m of the shale/sandstone boundary and varies considerably in the degree of sandstone influence evident in the soil. It develops mainly on shallow, residual clay soils derived from Wianamatta Shale. However, it may also be found on high quartz sandstone-derived soils where there is a strong colluvial shale influence (e.g., the upper slopes of sandstone gullies adjoining shale soils). This vegetation community is dominated by Grey Gum (*E. punctata*) and Ironbark *(E.crebra)*, with Red Ironbark (*E. fibrosa*), Red Bloodwood (*Corymbia gummifera*) and Turpentines (*Syncarpia glomulifera*) occurring less frequently. A smaller tree stratum is usually present and is most often dominated by Black Sheoak *(Alocasuarina littoralis)*, Turpentine Tree *(Syncarpia glomulifera)*, Narrow-Leaved Geebung (*Persoonia linearis*) and Black Wattle *(Acacia decurrens)*. The community usually has a well-developed shrub layer which is more diverse in species than in communities with less sandstone influence in the soil. The shrub stratum is dominated by Tick Bush (*Kunzea ambigua*), Narrow-leaved Geebung *(Persoonia linearis)* and Blackthorn or Tasmanian and South Australian Christmas Bush *(Bursaria spinosa)*, with Dogwood *(Jacksonia scoparia)* becoming more common with increasing sandstone influence. The ground stratum is dominated by Wiry Panic *(Entolasia stricta)*, Kangaroo Grass *(Themeda australis)*, Spear Grass *(Stipa pubescens),* Variable Swordsedge *(Lepidosperma laterale),* Threeawn Speargrass *(Aristida vagans)* and *Pomax umbellata*.

Riparian Forest (NPWS 2022: 46-7) was identified along and adjacent to both banks of Hawkesbury River within the study area. This vegetation community occurs within Holocene alluviums and on terraces immediately adjacent to the Hawkesbury River. There are no particular tree species occurring frequently, with Bangalay *(E. botryoides)*, River White Gum *(E.elata)*, Broad-leaved Apple *(Angophora subveluntina)* and Rough-barked Apple *(Angophora floribunda)* dominating. A small tree stratum is usually present and often contains varieties of *Acacia* species including Coast Myall *(A.binervia)*, Native Wattle Tree *(A.floribunda)* and Black Wattle *(A.mearnsii)*. Common species in the ground stratum include Creeping Shade Grass *(Oplismenus aemulus)*, Bracken Fern *(Pteridium esculentum)*, Burra Weeping Grass *(Microlaena stipoides)* and Hedgehog Grass *(Echinopogon ovatus)*. This community falls within the definition of the endangered ecological community 'Sydney Coastal River Flat Forest' as defined by the *NSW Threatened Species Act.*

Freshwater Wetlands are ecosystems that are affected by permanent or temporary inundation and are located generally below 20m of elevation on level areas. Plants and animals are influenced by water regime such as timing, frequency, duration, extent, depth and variability of inundation, and therefore produce wetlands that are variable not only between different locations, but within each wetland itself. Wetlands support an abundance of micro-invertebrates, crustaceans, fish, frogs and water birds. Vegetation species are dominated by herbaceous plants and have very few woody species. Areas that lack standing water most of the time are usually dominated by dense grassland or sedgeland vegetation, often forming a turf less than 0.5m tall and dominated by amphibious plants including Water Couch *(Paspalum distichum)*, Swamp Rice-grass *(Leersia hexandra)*, Mud Grass *(Pseudoraphis spinescens)* and Tussock Sedge *(Carex appresa)*. Where an area is subject to regular inundation dominant species include large sedges over 1m tall, such as Jointed Rush *(Baumea articulata)*, Australian Giant Hairgrass *(Eleocharis equisetina)* and Grey Sedge *(Lepironia articulata)*, as well as emergent or floating herbs such as Frogbit *(Hydrocharis dubia)*, Frogsmouth *(Philydrum lanuginosum)*, Water Primrose *(Ludwigia peploides* subs. *montevidensis)*, Nardoo *(Marsilea mutica)* and Milfoils *(Myriophyllum spp.)*. As standing water becomes deeper or more permanent, floating and submerged aquatic herbs become more abundant, and include Hornwort *(Ceratophyllum demersum)*, Water Thyme *(Hydrilla verticillate)*, Duckweeds *(Lemna spp.)*, Giant Waterlily *(Nymphaea gigantea)*, Water Snowflake *(Nymphoides indica)*, Swamp Lily *(Ottelia ovalifolia)* and Pondweeds *(Potamageton spp.)*.

Land use practices have had a variable impact on the landscape within the study area. Existing road and rail corridors have modified the landscape by creating cuttings and artificial embankments in addition to modifying the course of several waterways. A number of dams and drainage line modifications have been constructed throughout the area, altering the area's hydrology and smaller-scale drainage patterns. Diversion and regulation of water flows for irrigation of inland crops has also had a profound effect. As a result, they continue to be degraded and reduced in aera. Intensive cropping has taken place across the lower river terrace and vegetation clearance has contributed to the erosion of exposed soils along fence lines and infrastructure corridors. Ongoing rural and residential development has also contributed to disturbance.

3 Ethnohistoric context

Historic accounts of the Indigenous inhabitants of the Sydney area provide an insight into Aboriginal life at the time of initial European exploration and settlement. The study area lies within a landscape which was important to, and intensively used by, past Aboriginal peoples (Attenbrow 2002). Aboriginal people living in the Sydney region at the time of first European contact were distinguished by various language groups. Languages recorded across the region included the Darug, Darkingung, Gandangarra and Tharawal. Included in these were various dialects spoken across territorial ranges. People appear to have been organised into economic units of small residential groups or 'bands' who had an association with certain areas of land and spoke the same dialect of language. The study area lies in a landscape traditionally considered the province of the Darug people.

Darug was first described as a language (or dialectic group) by surveyor, anthropologist and linguist R H Mathews in the early 20th century. He described the extensive range of this language group as follows: "the Dharruk [Darug] speaking people adjoined the Thurrawal on the north, extending [up] to the Hawkesbury River, and inland to what are now Windsor, Penrith, Campbelltown and intervening towns" (Mathews and Everitt 1900). Since then, most historic and linguistic research has suggested that the Darug were principally an 'inland' group, associated with the Cumberland Plain and distinct from Aboriginal groups who frequented the coast. The Darug language group included a number of sub-groups often referred to as 'clans' or 'tribes', based upon family groupings and associations with particular areas of country.

A clan of the Darug group called the Buruberongal were recorded by Governor Phillip as inhabiting lands to the northwest of Parramatta. It is likely that the study area falls within the traditional area of the Buruberongal people, who were associated with Yarramundi and nearby Richmond Hill. Ethnohistorical sources suggest that despite differences in words used, customs and material culture, the Buruberongal people and other Darug 'clans' would have interacted with neighbouring language groups for ceremonies, intermarriage, dispute resolution, trade and access to certain resources in the region.

The expedition led by Governor Phillip in 1789 to explore the Hawkesbury-Nepean provides the earliest European historical accounts of the region. Various journals kept by members of the party describe the landscape and their first interactions with Aboriginal people of the region. The party reached the junction of the Grose and Nepean Rivers in July 1789, where Captain Hunter recorded they "found the river to divide into two narrow branches, from one of which the stream came down with considerable velocity, and with a fall over a range of stones which seemed to lye across its entrance", with "...too little water for the boats which we had with us to advance any farther, and the stream was very strong". Aboriginal people were clearly inhabiting the area at that time, with Hunter recording various signs of life and occupation at the river confluence:

> *On the banks here also we found yams and other roots, and had evident marks of the natives frequenting these parts in search of them for food. They have no doubt some method of preparing these roots, before they can eat them; for we found one kind which some of the company had seen the natives dig up; and with which being pleased, as it had much the appearance of horse-radish, and had a sweetish taste, and having swallowed a small quantity, it occasioned violent spasms, cramps in the bowels, and sickness at the stomach: it might probably be the casada root.* (Hunter 1793 [1968])).

Hunter later concluded that the Aboriginal people he had seen eating the yams must process them in some way to make them safe for consumption, noting that they "no doubt have some way of preparing these roots, before they can eat them". Other recorders including Captain Watkin Tench (1793:230) also observed Aboriginal use of this resource, noting that for inland people "they depend but little on fish, as the river yields only mullets, and that their principal support is derived from small animals which they kill, and some roots (a species of wild yam chiefly) which they dig out of the earth". These wild yams were found in considerable quantities along the banks of the Hawkesbury-Nepean River and would have formed an important food resource for Aboriginal people living in the area.

Similarly, Kohen (1986:77) records that inland Aboriginal people living between Parramatta and the Blue Mountains were not as dependant on fish and shellfish as groups closer to the coast but relied on small animals and plant foods in addition to seasonally available freshwater mullet and eels. The Hawkesbury-Nepean River and the lands adjacent were a major resource for Aboriginal people living on the western Cumberland plain. The swamps, wetlands and anabranch channels related to the rivers were a rich source of various birds, shellfish, eels, water rats and fish.

Berries, Banksia flowers and wild honey were also recorded as foods of the local inhabitants (Collins 1798). Small animals provided the protein component of the Aboriginal diet on the wider Cumberland Plain, with hunting comprising a major economic role of the men. Along the river, traps and snares were set for bandicoots and wallabies, while decoys for snaring birds were also a commonly employed technique, "these are formed of underwood and reeds, long and narrow, shaped like a mound raised over a grave, with a small aperture at one end for the admission of the prey" (Tench 1793). During the expedition of Governor Hunter, Aboriginal traps were identified at Richmond Hill, southwest of the study area, with Captain Collins recording the following:

> *At the foot of Richmond Hill, I once found several places constructed expressly for the purpose of ensnaring animals or birds. These were wide enough at the entrance to admit a person without much difficulty; but tapering away gradually from the entrance to the end, and terminating in a small wickered grate. It was between forty and fifty feet in length; on each side the earth was thrown up; and the whole was constructed of weeds, rushes, and brambles: but so well secured, that an animal once within it could not possibly liberate itself. We supposed that the prey, be it beast or bird, was hunted and driven into this toil; and concluded, from finding one of them destroyed by fire, that they force it to the grated end, where it is soon killed by their spears. In one I saw a common rat, and in another the feathers of a quail.* (Collins 1798: Appendix IV)

Possums and gliders were also particularly common in the open woodland across the Cumberland Plain and probably formed the main sources of animal food. These were hunted in a number of ways, including smoking out the animal by lighting a fire in the base of a hollow tree, burning large tracts of land and gathering the stranded animals, as well as cutting toe-holds in trees (Kohen 1993:10; Tench 1793:82). The western Sydney basin was also known for a hunting method called 'Walbunga' where kangaroos were flushed out of areas and toward awaiting hunters by way of small grass fires.

Aboriginal firing of the landscape is also considered at least partially responsible for the open, 'park-like' appearance of the lands along the Nepean/Hawkesbury and Cumberland Plain as described by early European accounts. Hunter described how "the trees stand very wide of one another, and have no underwood; in short the woods ... resemble a deer park, as much as if they had been intended for such a purpose". Hunter believed that the fires were set in order to clear underbrush from frequently travelled routes and to make more accessible the roots and tubers found below ground. An additional benefit, as recorded by Philip, were the possums, sugar gliders and other animals which succumbed to the fires and provided a ready source of food (Attenbrow 2002:42). Firing of the landscape may also have ensured the fruiting of certain plant species and allowed for new vegetation growth, which encouraged kangaroos to graze (Attenbrow 2002:42).

The open landscape and fertile soils of the Hawkesbury-Nepean floodplain were encouraging to early recorders as they appeared to present suitable farmland to feed the growing colony. In 1791, Phillip undertook a second expedition through the area in order to determine if the Nepean and Hawkesbury were in fact the same watercourse. This time, two Aboriginal men from Sydney, Colbee and Ballederry, accompanied the party to act as translators. In the vicinity of the current study area, the party encountered three Aboriginal men of a group known as the Buruberongal, who Colbee referred to as 'climbers of trees'. Interactions with the Buruberongal were friendly and the three spent the evening with the European party: Gomberee, his son Yellowmundee (better known as Yarramundi) and young grandson Djimba.

Gomberee gifted two stone hatchets and two spears to Phillip and received two European axes and some bread in return. Gomberee also demonstrated tree-climbing to the Europeans, speedily climbing up a tree by using toe-hold notches cut into the bark as he went. Tench described Yarramundi as a "Car-ad-yee, or Doctor of renown", indicating that he held special status as a medicine man, as evidenced by a ceremonial operation performed on Colbee that evening (Tench 1793). According to Tench, Ballederry described the Buruberongal as a tribe full of Car-ad-yee of "especial note and skill". The three men left early the next morning and parted on friendly terms.

Unfortunately, subsequent European relations with the Aboriginal inhabitants of the region were not as pleasant. As the Hawkesbury was opened up for land grants and farms were established, European use of land and resources began to seriously impede Aboriginal people's traditional use of the landscape and conflicts inevitably followed. Fearing that the fledgling settlements along the Hawkesbury would have to be abandoned due to raiding and skirmishes with the local Aboriginal inhabitants, Lieutenant-Governor Paterson ordered extreme reprisals against the Darug, ordering the Corps to "kill any Darug they found and hang their bodies from gibbets as a warning to the rest" (Connor 2002:38). Richmond Hill, within the "Belmont" property to the southwest of the study area, was the site of a reported battle between local Darug people and the NSW Corps in May and June of 1795 and is considered to be the first recorded battle between Aboriginal people and the white settlers. As a result, a detachment of the military remained in the district for more than 50 years.

The property where the 'Battle of Richmond Hill' took place is approximately two kilometres west of the study area, along Grose Vale Road. The original grant included Lots 11 and 12, DP 1134453. A portion of this property, comprising Lot 11 DP 1134453, is currently being considered for accession onto the NSW State Heritage Register for its historic values as an estate, including the mansion and associated gardens. The draft register listing and associated nomination documents also acknowledge that "the larger Belmont Park property on which it is sited may have state significance for its associations with the local Aboriginal people… The property includes an Aboriginal Memorial Garden in the form of a turtle. This is a place of peace, reflection and reconciliation which commemorates Richmond Hill as the site of a fierce battle in 1795 between the Dharug Aboriginal inhabitants and the British colonists. This memorial is considered to be significant". No Aboriginal archaeological values associated with this heritage register listing have been identified to date, but the inclusion of Aboriginal cultural significance of the property in the draft listing indicates the area retains strong cultural value to the Aboriginal community. The Belmont property is located outside of the study area.

4 Archaeological Context

The current scientific understanding of the human occupation of the Australian continent is that Aboriginal people have lived in Australia for at least the last 40,000 years (Attenbrow 2010: 182). Archaeological evidence shows that the Sydney Region has been occupied since at least 18,000 years ago (Attenbrow 2010: 3). Aboriginal archaeological sites with deposits that have returned earlier dates have been reported; however, these dates are problematic due to the limitations of the technology and evidence being used.

Archaeological investigation is reliant on the artefacts or physical evidence of human activities which have survived anywhere from centuries to thousands of years. The oldest of these artefacts are likely to represent a small fraction of the objects that were used by Aboriginal people with even the most robust organic materials unlikely to survive in contexts older than 6,500 years (Attenbrow 2010: 3). As a result, activities involving objects made from less survivable materials are almost invisible within the archaeological record of the region and the spatial distribution of Aboriginal archaeological sites in the region is unlikely to be an accurate indicator of the extent or nature of the land use practices of past Aboriginal people.

The most numerous surviving artefacts in the Sydney Region were made from stone and were discarded in either open landscape settings or within closed landscape settings, primarily rock shelters. The accumulation of stone artefacts in both settings may have occurred over a large time span and have been subject to a range of geomorphic processes and human activities; however, due to the nature of closed context sites, the artefacts deposited within these sites may retain some level of chronological association within stratigraphically distinct units while open context sites are generally palimpsests in which chronological association between stone artefacts and any datable features present are often difficult to determine.

Archaeological investigations have shown that significant changes have occurred within the types of artefacts used, artefact raw materials and the spatial distribution and density of Aboriginal archaeological sites in addition to the landscape and environment. Around 10,000 years ago, the artefact assemblage from Aboriginal archaeological sites in the region was characterised by a preference for relatively large artefacts made from indurated mudstone/tuff (IMT) using free hand percussion. Formal tools were predominantly retouched flakes while flaked pebble tools have also found at some sites dating to this phase.

Approximately 5,000 years ago, there was a general decline in the proportion of IMT artefacts within artefact assemblages in the region while artefact density was generally higher. There was an increase in the proportion of smaller artefacts made from locally available material, which for much of the Cumberland Plain was silcrete. Backed artefacts and edge ground artefacts are believed to have been introduced into the region around this time. Backed artefacts were generally created from suitable small flakes which had been modified by steep retouch (known as backed artefacts) to remove sharp edges and form specific shapes. Backed artefact were extensively made across the region between 3,500 and 1,500 years ago (Robertson, Attenbrow, and Hiscock 2009: 296). Residue and use-wear analysis of backed artefacts indicate that they were used for cutting, incising, and scraping of animal and plant materials (Robertson, Attenbrow, and Hiscock 2009: 298).

Edge ground hatchets, which are frequently referred to by the British during the late eighteenth and early nineteenth centuries, occur in the archaeological record of southeastern Australia from around 4,000 years ago while significantly older examples have been recovered in the north of Australia (Attenbrow 2012: 102). Edge ground hatchets were made primarily made from water worn metamorphic stone that was ground on an abrasive surface, such as sandstone, to produce an edge and were used primarily for cutting wood, stripping bark and other woodworking tasks (Corkill 2005: 48; Stokes 2015: 70). Analysis of edge ground hatchets from the region have shown that the metamorphic and igneous stone required were only accessible at certain locations such as the Hawkesbury/Nepean River and the Shoalhaven River (Stokes 2015). The distribution of sandstone outcrops would have also influenced the creation and maintenance of edge ground hatchets.

During the last 1,500 years, the use of backed artefacts substantially decreased or disappeared across the region and there was a general increase in edge ground hatchets. Along the coast and within sandstone geology, archaeological assemblages from this period contain a larger proportion of quartz and bipolar artefacts while silcrete and IMT continued to be used on the western Cumberland Plain. The general variation in artefact assemblages between coastal and inland sites has been interpreted as suggesting social changes occurred during this period which restricted the access of coastal groups to the raw materials of the western Cumberland Plain (Attenbrow 2012: 156).

4.1 New Richmond Bridge and Traffic Improvements – Stage 2: Archaeological Assessment Report

An archaeological assessment was undertaken for the proposed New Richmond Bridge and Traffic Improvements – Stage 2 (KNC 2024). The assessment included a desktop review of the environmental context and previous archaeological investigations within and in the vicinity of the study area, an archaeological field survey and an archaeological test excavation. The review of the environmental context is presented in Section 2 and the results of the assessment are summarised in the following sections.

4.1.1 Desktop assessment

The desktop review was undertaken to determine the extent of previous investigations, verify the location of previously recorded Aboriginal archaeological sites and identifying locations within the study area where there was potential for Aboriginal archaeological sites to occur.

A search was undertaken of the Aboriginal Heritage Information Management System (AHIMS), a database operated by Heritage NSW and regulated under section 90Q of the *National Parks and Wildlife Act 1974,* during the desktop review to determine the nature and extent of known Aboriginal archaeological sites in the region (Figure 5). The search area contained eight previously recorded Aboriginal archaeological sites that included four sites that were registered within the current study area: Beaumont Ave (BA-OS-1) (AHIMS 45-5-2478), Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542), Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541), and Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543).

A review of available AHIMS site information found several recorded sites within the vicinity of the study area had incorrect spatial information and/or site types. The AHIMS recorded location of a rock shelter with art site, Wilton Allens Creek Bridge Site 8 (AHIMS 52-2-0851), was approximate 640 metres southeast of the current study area, on the floodplain south of the river; however, the AHIMS information for the site shows that the actual site location was near the township of Wilton, approximately 69 kilometres south of the study area. The AHIMS recorded location of an area of grinding grooves, North Richmond (AHIMS 45-5-0259), on the floodplain south of the river was also found to be incorrect, with the actual site location on the northern riverbank.

Several archaeological investigations which had been undertaken in the wider region since the 1990s and included archaeological field surveys, test excavations and salvage excavations. Previous archaeological investigations were generally undertaken in association with land rezoning, residential redevelopment, and infrastructure projects. In areas where redevelopment and infrastructure projects occurred prior to the 1990s, such as within the urban areas of North Richmond and Richmond, significantly fewer Aboriginal archaeological sites were recorded than in areas where similar projects had occurred afterwards. The number of recorded archaeological sites were also lower where limited redevelopment and infrastructure project had occurred.

Beaumont Ave (BA-OS-1) (AHIMS 45-5-2478) was a surface artefact scatter that was situated on a lower terrace landform . The artefacts consisted of complete flakes, flake fragments and cobble cores of IMT and silcrete that were located within recently disturbed spoil below a sandstone retaining wall. The retaining wall had been constructed along the southern edge of an upper terrace where residential properties are now located. The artefacts were considered likely to be from the immediate vicinity but had been shifted during earthworks and movement of soils. The recording noted that the site had been extensively disturbed by bulk earthworks and fill during the construction of playing fields.

A series of archaeological investigations, including archaeological field survey and archaeological test excavation, were undertaken as part of the planning for the Richmond System Wastewater Upgrade at Richmond and North Richmond, which included parts of the current study area at North Richmond (KNC 2021a). The archaeological field survey included parts of the current study area on the north and eastern edges of the North Richmond township. Ground surface visibility was low due to dense vegetation, concrete and asphalt surfaces, and built structures; however, the survey identified five areas of archaeological sensitivity (Areas 1-5) due to landscape context and topographic similarities to previously identified Aboriginal archaeological sites.

The five areas were situated on well-defined elevated locations above the Hawkesbury floodplain, Redbank Creek and major tributary creeks where visible disturbance was low. No Aboriginal objects were identified at the five areas due to low visibility; however, the areas were considered to exhibit potential for intact subsurface archaeological deposits

The current study area traverses three of the areas (Areas 3 - 5) identified during the assessments for the Richmond System Wastewater Upgrade. Area 3 was situated on the crest and upper slope of a spur that descended to the confluence of several unnamed tributaries of Redbank Creek in the northeast. The area was located within a cleared paddock and was bound by the open depressions of unnamed tributary creeks to the north, east and south, .

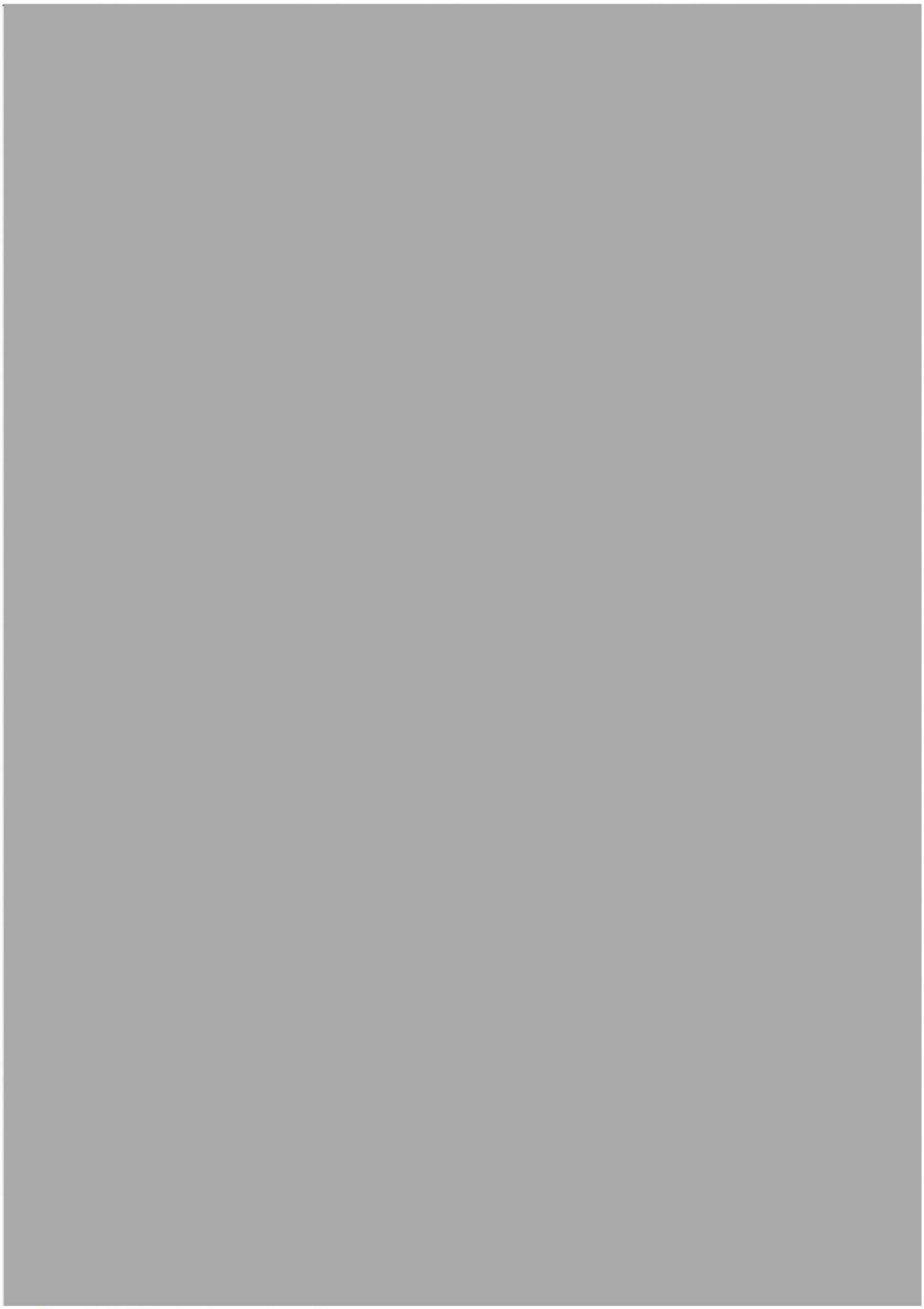

Figure 5. AHIMS extensive search results

Area 4 was situated on the crest and upper slope of a north-east oriented ridge that formed the watershed of Redbank Creek in the north and an unnamed tributary creek in the south. The area was located within a cleared paddock and was bound by a creek flat on the southern side of Redbank Creek in the north, ridge crest to the east, the open depressions of unnamed tributary creeks to the south, [redacted]. Area 5 was situated on the crests and upper slopes of two ridgelines and the lower terraces adjacent to an unnamed tributary of Redbank Creek. The area was located within cleared paddocks between Redbank Creek to the north and east, [redacted].

The remainder of the investigation area was assessed as displaying low archaeological potential due to flooding, unfavourable landform and/or extensive land use disturbance from road construction, installation of existing utilities, and buried infrastructure. The archaeological field survey did not identify any Aboriginal objects, archaeological sites or areas of Aboriginal archaeological sensitivity/potential east of the Hawkesbury River, on the active floodplain, or within areas of existing infrastructure west of the river.

Archaeological test excavations were subsequently undertaken at four of the identified areas of archaeological sensitivity (Area 1 and Areas 3-5). Area 1 was located on the lower terrace landform [redacted] and approximately 80 metres southeast of the current study area. The test area contained the deepest deposits of any of the tested areas and modern inclusions, including glass, ceramic and metal were noted to a depth of 60 centimetres. The soil profiles within the tested squares at Area 1 were characterised by very fine alluvial silt which were indicative of intermittent overbank deposition, consistent with the terrace elevation and positioning adjacent to the river. No Aboriginal artefacts were recovered during the excavation at Area 1 with the area displaying high levels of natural and artificial disturbance.

The test excavation program at Area 3 comprised 10 test squares that each measured 50 squares centimetres horizontally and were excavated along a northwest-southeast oriented transect. The deposit within the test squares varied between the different landform elements of the crest and slope. The deepest profiles, containing deposits over 60 centimetres deep, were located on the highest part of the crest while the test squares on the adjacent slopes tended to be shallower with average depth of 40 centimetres. The remnant terrace deposit consisted of a pale grey brown silty soil of medium to hard compaction, overlying a loose yellowish brown silty sand, and a reddish to yellowish sandy basal clay. Some limited historical disturbance was observed in the form of wire and brick fragments scattered within the upper profile at several squares on the crest. Scattered flecks of charcoal with occasional larger fragments were also common throughout the deposit.

The excavation at Area 3 recovered 202 lithics that consisted of 175 diagnostic artefacts and 27 non-diagnostic angular fragments. The test squares with the highest artefact densities were located on the crest of the spur where four test squares contained between 26 and 61 artefacts. Artefact density diminished on the slopes where six squares contained six or less artefacts with the majority (n=4) containing less than two artefacts. The artefact assemblage from Area 3 comprised four cores, 51 complete flakes and 119 flake fragments. The flake fragments consisted of 29 proximal, 31 medial and 59 distal fragments. The average mean artefact density of the squares excavated at Area 3, extrapolated to one square metre, was 70 artefacts per square metre. The Minimum Number of Flakes (MNF) Index for the assemblage from Area 3 was 110, giving an overall minimum artefact count of 115 artefacts. Extrapolated to square metres, the minimum artefact density at Area 3 was 46 artefacts per square metre.

The artefacts recovered from the test excavation at Area 3 were predominantly IMT (n=110) while smaller quantities of silcrete (n=52), quartz (n=7) and fine grained material (n=5) artefacts were also identified. The assemblage contained 13 artefacts that were identified as exhibiting formal retouch or modification, including one angular fragment, and a further 40 artefacts exhibited edge damage that could be macroscopically interpreted as use wear. Artefacts were primarily recovered from the upper 50 centimetres of the soil profile, with eight artefacts recovered from depths of 50-60 centimetres. As a result of the test excavations, Area 3 was registered on AHIMS as Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542).

The test excavation program at Area 4 comprised three test squares that each measured 50 squares centimetres horizontally and were excavated along a northwest-southeast oriented transect. The test squares at Area 4 contained a shallow deposit with a general depth of 25 centimetres. The deposit consisted of brown silty loam overlying yellow basal clay. Nodules of iron/manganese were noted throughout the deposit and interpreted as representing some intermittent waterlogging. Some mixing of the basal clay and overlying silt was noted across the tested area and was interpreted as the result of tree roots and possibly past agricultural practices.

The test squares at Area 4 contained 13 lithics that consisted of 11 artefacts and 2 non-diagnostic angular fragments. The artefact assemblage comprised one complete flake and 10 flake fragments. The flake fragments consisted of three proximal, two medial and five distal fragments. The average mean artefact density of the squares excavated at Area 4, extrapolated to one square metre, was 15 artefacts per square metre. The MNF Index for the assemblage from Area 4 was six, giving an overall minimum artefact count of six artefacts. Extrapolated to square metres, the minimum artefact density at Area 4 was 8 artefacts per square metre.

The artefacts were predominantly made from IMT (n=7) with four silcrete artefacts also recovered. One retouched artefact was recorded, comprising a distal flake fragment of chert from TS39. Three other artefacts displayed macroscopic edge damage interpreted as usewear. As a result of the test excavations, Area 4 was registered on AHIMS as Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541).

The test excavation program at Area 5 comprised 23 test squares, each measuring 50 square centimetres horizontally, that were positioned along two northwest-southeast oriented transects that traversed the lower slopes and terrace adjacent to the tributary creek and the adjacent crest of the northern ridge, and one southwest-northeast oriented transect that ran [redacted] along the crest of the south ridge.

The deposit within the test squares showed some variation in composition and depth. The test squares excavated along the transect on the crest of the ridge, [redacted], contained deposits between 40 and 70 centimetres deep. The soil profile within the test squares consisted of pale greyish brown silty to sandy loam overlying yellowish brown sand clay. The deposit contained iron/manganese nodules which increase in frequency with depth and were interpreted as indicating intermittent waterlogging within the deposit. Visible disturbance was low and limited to rare glass inclusions and bioturbation.

The test squares situated on the gentle slopes and lower terrace adjacent to the unnamed tributary contained moderately deep deposit of between 30 and 40 centimetres. Several test squares contained deposits with duplex profiles of brown silt loam overlying pale brown to grey silt loam and yellowish brown silty clay. Iron/manganese nodule were abundant in the lower A horizon. The test squares excavated along the crest of the northern ridge contained deposits with a mean depth of 40 centimetres and consisting of medium to dark brown clay loam above orange clay. Fine charcoal flecking and baked clay nodules were noted in the lower A horizon that were interpreted as potentially the result of past land clearance activities or bushfires.

The test squares excavated at Area 5 contained 202 artefacts and 101 non-diagnostic angular fragments. The artefacts were predominantly (n=67) recovered from the test squares located on crest of the northern ridge between Redbank Creek and the unnamed tributary creek with most squares (n=5) containing between nine and 11 artefacts. The squares also contained the majority of non-diagnostic angular fragments (n=81) with 50 fragments recovered from three squares. The majority of the non-diagnostic angular fragments recovered had been affected by heat (n=68) and were predominantly IMT; however, silcrete and quartz fragments were also recovered from the test squares in this area.

The artefact assemblage from Area 5 consisted of nine cores, 37 complete flakes and 57 flake fragments. The flake fragments comprised 11 proximal, 12 medial and 32 distal fragments. The average mean artefact density of the squares excavated at Area 5, extrapolated to one square metre, was 18 artefacts per square metre. The MNF Index for the assemblage from Area 5 was 69, giving an overall minimum artefact count of 78 artefacts. Extrapolated to square metres, the minimum artefact density at Area 5 was 14 artefacts per square metre.

The artefacts were predominantly IMT (n=51) as were the cores (n=8); however, a large proportion of artefacts were silcrete (n=44), including one core, and a small proportion of quartz artefacts (n=6) were also recovered. Non-diagnostic angular fragments constituted 50 percent of the total lithics recovered from Area 5; however, the proportion of angular fragments varied within the three materials present in the assemblage. Angular fragments represented 58 percent of the IMT lithics (n=58), 35 percent of the silcrete lithics (n=24) and 50 percent of the quartz lithics (n=6).

The cores recovered from the test excavations at Area 5 were all multidirectional with between three and eight negative flake scars. Cortex was limited to between 1-30 percent on seven cores with approximately 50 percent cortex on the remaining core, which was also the largest core in the assemblage and had six negative flake scars. The silcrete core did not retain cortex. The majority of cores (n=5) were recovered from the test squares excavated on the crest of the northern ridge and four were recovered from the squares on the crest of the ridge while the remaining core was recovered from the northern-most square which was the closest square to Redbank Creek.

The majority of the cores (n=7) retained 1-30 percent cortex; however, one core retained approximately 50 percent cortex and was the largest in the assemblage, with a size range of 30-34 millimetres in size and six negative flake scars. The silcrete core did not retain cortical surfaces and was the smallest core recovered, with a size range of 10-14 millimetres and five negative flake scars. No retouched, backed or formal tool type artefacts were identified at Area 5. Four artefacts were recorded with edge damage macroscopically interpreted as usewear. These included three silcrete and one chert (two complete flakes and two distal flake fragments), found across the central and northern parts of the test area. As a result of the test excavation program at Area 5, the site was registered on AHIMS as Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543).

An ACHAR was completed for the Richmond System Wastewater Upgrade at Richmond and North Richmond, which included parts of the current study area at North Richmond (KNC 2021b). The ACHAR included consultation with 16 Aboriginal community individuals and groups who generally supported the recommendations of the assessment. Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542), Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541), and Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543) were assessed as having moderate archaeological

significance due to the potential for the archaeological assemblages within the sites to provide further information on Aboriginal landscape use and the impact of natural processes on subsurface deposits. The assessment determined that the three sites were to be partially impacted by the proposed works and recommended that an AHIP should be sought for the impacted portions of the three sites, the land and associated objects within the boundaries of the impact area. The assessment recommended that the AHIP include provisions for archaeological salvage excavations within the impacted portions of the three sites to mitigate the impact of the proposed works on the archaeological significance of the sites.

AHIP 4940 was issued on 21 June 2022 for the Richmond System Wastewater Upgrade at Richmond and North Richmond, which included parts of the current study area at North Richmond. The AHIP included provisions for archaeological salvage excavations within the impacted portions of Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542), Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541), and Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543) which are partially located within the current study area. Any works related to the current proposal undertaken within the boundary of the AHIP will be required to comply with the existing permit conditions.

The desktop review determined that, due to the variable nature and extent of previous archaeological investigations in the region, the spatial distribution of previously registered Aboriginal archaeological sites was unlikely to be an accurate representation of archaeological site distribution across the region; however, it was determined that general spatial patterns were visible that allowed for the identification of other areas where Aboriginal archaeological sites may occur due to similarities in landform, geology and land use practices.

The Aboriginal archaeological sites that were previously recorded in the region were predominantly located in open contexts and contained surface stone artefacts (n=34); however, three areas of grinding grooves and two rock shelters containing art and stone artefacts were also recorded. The spatial distribution of the rock shelters sites and open context sites with grinding groove features were restricted to areas where there were suitable outcrops of underlying sandstone geology.

Rock shelters were restricted to areas where the underlying Hawkesbury Sandstone formed steep slopes overlooking the Grose River while areas of grinding grooves were identified on flat sandstone outcrops within Redbank Creek and along the northern bank of the Hawkesbury River. The lack of sandstone outcrops across the region south of the Hawkesbury River would have influenced the creation and use of ground edge hatchets and further demonstrate the organised utilisation of the landscape by past Aboriginal people.

Previous studies generally found higher stone artefact densities within sites that were located on upper terrace landforms above the active floodplain of the Hawkesbury River or relatively elevated landforms along the margins of creeks (especially those offering permanent water), potentially reflecting repeated or more intensive use. Elevated locations on hilltops and ridge crests further from water sources tended to display a different archaeological signature, chiefly a sparser stone artefact distribution which indicate these areas were utilised differently. Lower lying areas within the active floodplain of the Hawkesbury River have generally been impacted by periodic flooding and intensive agriculture which have resulted in the disturbance of any archaeological deposits which may have been present.

The sites were predominantly identified, due to visible surface artefacts or favourable landforms, during archaeological field surveys; however, several had been subject to subsurface archaeological investigations. Archaeological test and salvage excavations undertaken at Aboriginal archaeological sites in the vicinity of the current study area generally found variation between density, nature and extent of surface and subsurface artefacts. Several excavations were undertaken at Aboriginal archaeological sites containing subsurface artefacts where no surface artefacts had been recorded and which had been identified on the basis of distance to and permanency of water, landform, degree of slope, soil landscape and/or proximity to environmental resources.

The landscape context and previous archaeological investigations indicated that the survivability of archaeological sites containing subsurface stone artefacts within the study area was variably affected by natural processes and land use practices. Fluvial activity within the river systems of the region influences the stability and integrity of deposits within the adjacent floodplains. In areas subject to high energy flooding, subsurface stone artefacts may be removed from an Aboriginal archaeological site and redeposited elsewhere. Undercutting of banks and the impact of flooding on vegetation retention in these areas are also likely to disturb subsurface archaeological deposits. Conversely, in areas where low energy flooding occurs, sediment may accumulate above Aboriginal archaeological sites containing surface and/or subsurface stone artefacts, helping to preserve the sites.

The desktop assessment determined that areas of archaeological sensitivity were likely to be associated with elevated landforms adjacent to the Hawkesbury River and Redbank Creek that were subject to limited or low energy flooding. The assessment noted that the potential of deposits with subsurface stone artefacts that exhibit archaeological potential increased in areas where disturbance levels were low.

4.1.2 Archaeological field survey

Archaeological field surveys of the study area were carried out by archaeologists from KNC and representatives from Deerubbin Local Aboriginal Land Council (DLALC) on multiple dates between 2019 and 2023 (to accommodate changes in project design). The survey focused on identifying Aboriginal objects and determining the spatial extent of any associated subsurface deposits with archaeological potential. Areas of exposed sediment were closely inspected for stone artefacts and the condition of subsurface deposits while mature trees were inspected for evidence of Aboriginal bark removal or carving.

Areas of exposed ground surface/sediment were generally found in areas where natural processes, such as erosion, or land use practices, such as vehicle movement and recent earthworks had removed vegetation or restricted its growth. Limitations to visibility within these areas included leaf litter, vegetation growth and introduced material such as blue metal along the road corridors. The ground surface was not visible within the majority of the study area due to exotic grasses and other vegetation cover in addition to built structures, concrete footpaths and sealed roads. In some areas of the lower terrace and floodplain, topsoil removal had exposed clay subsoils with patchy vegetation regrowth.

The survey inspected the four Aboriginal archaeological sites (Beaumont Ave (BA-OS-1), Norfolk Place Hawkesbury River AFT 1, Terrace Road Hawkesbury River AFT 1, and Terrace Road Redbank Creek AFT) that had been previously identified within the study area. No surface stone artefacts were identified at the sites.

The terrace at BA-OS-1 appeared to be elevated above the extent of high energy flooding associated with the Hawkesbury River but was significantly lower on the western side of the road. The terrace exhibited visual indicators of extensive modification from land use practices including the cuttings of a former road and railway corridor adjacent to the current road, a filled in drainage channel or paleochannel which ran parallel to the river, in addition to other landscaping and construction associated with the use of the area as a . Due to the extent of the remediation works and level of vegetation at time of survey, it was not possible to determine the extent of this disturbance beyond the visible areas and due to the presence of previously recorded surface artefacts, the landform was assessed as having some potential for subsurface archaeological deposits.

The survey noted that the portions of previously identified Aboriginal archaeological sites Norfolk Place Hawkesbury River AFT 1 and Terrace Road Hawkesbury River AFT 1 where the previous test excavations had found subsurface deposits with moderate to high artefact densities were located within the AHIP 4940 area while the remaining portions of the sites within the current study area were generally located on slope landforms which were more likely to contain subsurface disturbance. As such, these areas were assessed as having low archaeological potential apart from the most elevated section of Norfolk Place Hawkesbury River AFT 1.

The current study area overlapped the mapped extent of previously identified site Terrace Road Redbank Creek AFT in two locations. The first was a narrow corridor The second location was a rectilinear area between an unnamed tributary of Redbank Creek in the north . The survey noted that the nature and extent of the subsurface deposit at the site within parts of the current study area, whilst inferred from the results of the previous investigations, was largely unknown due to the distance of the previous test areas from these areas. As such, it was recommended that further archaeological test excavation be undertaken at the site to provide additional information on the nature and extent of any archaeological deposits that may be present within these areas.

The survey identified three areas with potential for subsurface archaeological deposits due to topography and low visible disturbance: Inalls Lane Richmond PAD 1, Inalls Lane Richmond PAD 2, Southee Road Richmond PAD 1. Inalls Lane Richmond PAD 1 was located on a terrace landform overlooking the active floodplain on the southern side of the Hawkesbury River. The property at 22 Inalls Lane was a historical property known as Mountain View with homestead initially constructed in the early nineteenth century and was listed on the NSW State Heritage Registry (SHR Item 00044) for its historical significance.

The area was identified as an area of potential archaeological deposit due to topographic location, low visible disturbance and soils that appeared to be intact and of moderate depth. It was hypothesized that the area may retain subsurface archaeological deposits containing stone artefacts due to the early establishment of the homestead on the property which may have restricted disturbance from subsequent land use.

Inalls Lane Richmond PAD 2 was situated on a terrace landform overlooking an unnamed drainage channel and the active floodplain on the southern side of the Hawkesbury River. The site was identified as an area of potential archaeological deposit due to topographic location and low visible disturbance.

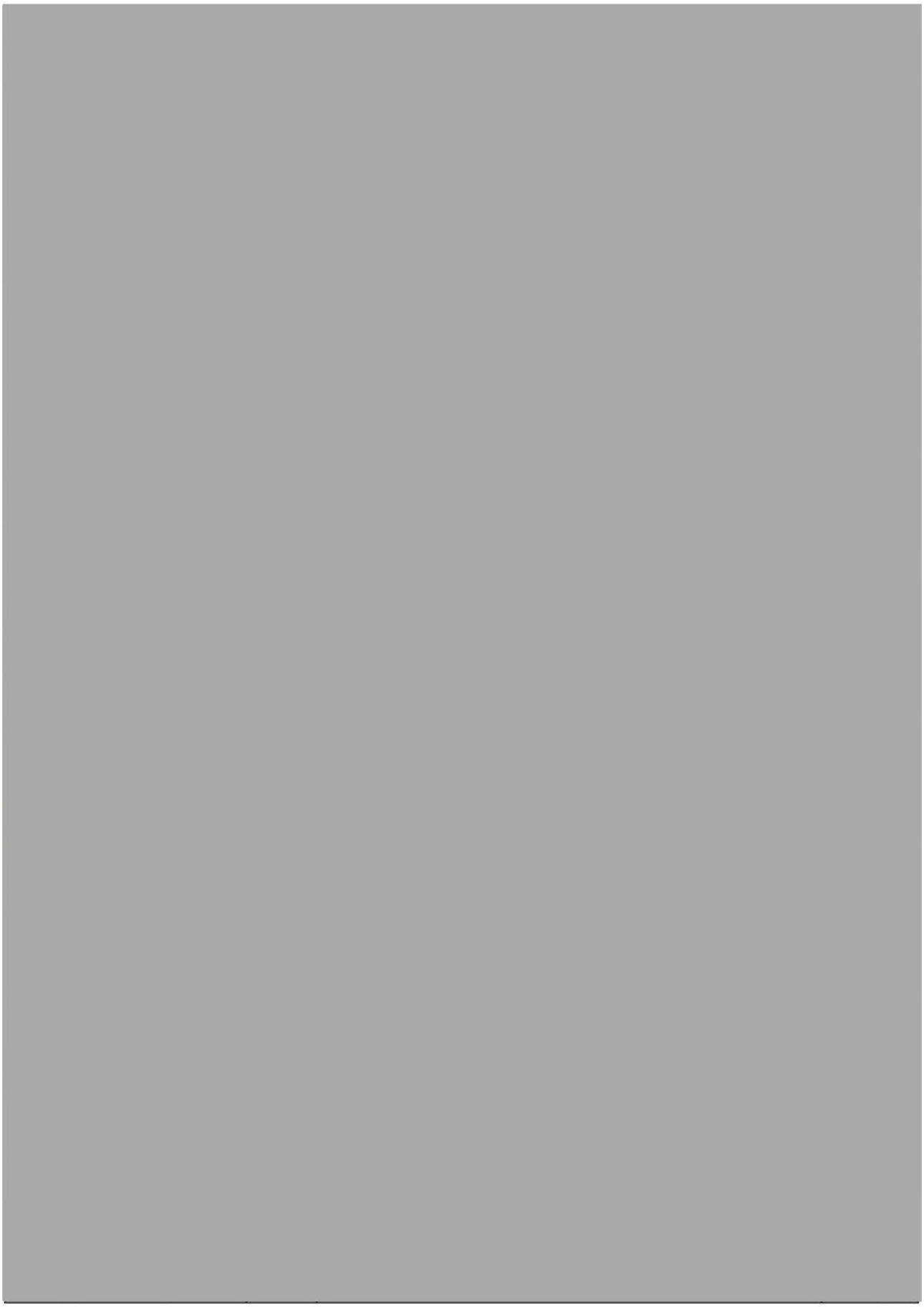

Figure 6. Results of archaeological desktop assessment and field survey

Southee Road Richmond PAD 1 was situated on a terrace landform between two northwest flowing drainage channels. Southee Road Richmond PAD 1 was identified as an area of potential archaeological deposit due to topographic location and low visible disturbance.

The survey found that low lying areas of the study area contained no potential for subsurface archaeological deposits due to ground surface disturbance from high energy flooding events and land use practices including agriculture (market gardens), the construction of buildings and roads, the installation of above and below ground utilities, and drainage works. Outside of the identified Aboriginal archaeological sites and areas of potential archaeological deposit, the study area had low archaeological potential due to ground surface disturbance from land use practices and natural processes, including erosion.

The assessment determined that the results of the survey and previous archaeological investigations were unable to provide sufficient information to sufficiently characterise the subsurface archaeological deposits within the proposed impact area at two previously identified Aboriginal archaeological sites BA-OS-1 and Terrace Road Hawkesbury River AFT 1, and within the three areas of potential archaeological deposit (Inalls Lane Richmond PAD 1, Inalls Lane Richmond PAD 2, Southee Road Richmond PAD 1) due to low surface visibility, limited or absent surface artefacts and suspected disturbance from land use practices. An archaeological test excavation was recommended to acquire additional information on the nature and extent of subsurface archaeological deposits within these areas.

4.1.3 Archaeological test excavation

Archaeological test excavations were undertaken at Aboriginal archaeological sites Beaumont Ave (BA-OS-1) and Terrace Road Hawkesbury River AFT 1, and within the three areas of potential archaeological deposit (Inalls Lane Richmond PAD 1, Inalls Lane Richmond PAD 2, Southee Road Richmond PAD 1). The test excavation program was carried out in May 2023 and between December 2023 and January 2024 by archaeologists from KNC and representatives of the registered Aboriginal stakeholder groups in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010a).

The test excavation program aimed to provide additional information on the nature and extent of any subsurface archaeological deposits within the tested areas in order to determine archaeological significance. A total of 77 test squares, each measuring 50 square centimetres horizontally, were excavated at the five test areas. The test excavations confirmed the presence of subsurface stone artefacts at the three areas of potential archaeological deposit (Inalls Lane Richmond PAD 1, Inalls Lane Richmond PAD 2, Southee Road Richmond PAD 1) and provided additional information regarding the subsurface archaeological deposits at sites Beaumont Ave (BA-OS-1) and Terrace Road Hawkesbury River AFT 1. The results are summarised below.

The test excavation at BA-OS-1 was primarily focused on the along the western edge of the terrace where it was hypothesised that activities may have been focused in the past. A second area was also test excavated that was located within the eastern most extent at the base of the retaining wall to determine the nature of the deposit in this area, which historical aerial photographs indicated formed part of a drainage channel prior to being levelled .

A total of 18 test squares were excavated in the western portion and comprised 11 test squares which were excavated along the western boundary . The deposit within the 11 squares varied in composition and depth between north and south with the northern squares containing highly disturbed shallow to moderately deep deposits of fill overlying basal clay. The southern squares contained moderate to deep deposits with an upper humic layer and one or more bands of clay or sandy fill overlying a homogenous deposit of dark grey brown sandy loam. The lower deposit was interpreted as representing the result of past agricultural activities, such as ploughing, which had uniformly mixed the deposit. A total of five artefacts were recovered from three of the 11 test squares. The artefacts were recovered from fill layers in two squares in the north and below the fill layer within the homogenous sandy loam in one square in the south. The artefacts consisted of one chert flake, one quartzite flake, two silcrete flake fragments and one IMT flake fragment.

The remaining seven test squares were excavated in areas where there was low visible disturbance . The test squares contained moderate to deep deposits of humic sandy loam overlying bands of sandy loam and basal clay. The lower deposit within some squares containing thin bands of charcoal which were interpreted as representing fluvial deposition whilst the moderately deep homogenous upper layer that was present within the squares was interpreted as the result of past agricultural use. No artefacts were recovered from the seven test squares.

Figure 7. Archaeological test excavation results – North Richmond

The test excavation program in the eastern portion consisted of three test squares that were excavated at the base of large retaining wall and approximately 20 metres to the south of the retaining wall (with the aim to find any remnant deposit at the edge of the disturbance). The test squares excavated in the eastern portion contained highly disturbed deposits. The eastern most square contained a recent humic layer overlying a mixture of clay, gravels and plastic fill to a depth of approximately 20 centimetres, under which was a dark grey brown, sandy loam to a depth of 70 centimetres which was interpreted as representing the result of past agricultural activities, such as ploughing, which had uniformly mixed the deposit. The remaining two squares contained an upper fill layer of clay, gravels, and modern inclusions above a shallow pale grey silty loam and basal clay or directly onto basal clay. A total of four artefacts were recovered from one test square excavated in the eastern portion . The artefacts were recovered from the shallow pale grey silty loam in the middle square at depths between 40 and 50 centimetres and consisted of one IMT flake, two IMT flake fragments and one quartz flake fragment.

The test excavations at BA-OS-1 demonstrated that the terrace landform had generally been subject to high levels of subsurface disturbance and that while stone artefacts were present at the site, they were generally recovered from highly disturbed contexts and, as a result were of limited archaeological significance.

The test excavation at Inalls Lane Richmond PAD 1 was restricted to narrow proposed impact area along the nature strip and consisted of five test squares that were positioned along one transect . The deposit within the five test squares was between 30 and 60 centimetres deep and was generally characterized by an upper humic layer of sandy loam that transitioned to a bleached sandy loam with iron/manganese nodules overlying basal clay. Most test squares contained imported clay fill material of varying frequency to the depths of approximately 20 centimetres which was interpreted as the result of adjacent road verge and landscape modification works. The presence of iron/manganese nodules was interpreted as indicating the area was subject to periodic waterlogging or inundation.

A total of nine artefacts were recovered from four of the test squares excavated at Inalls Lane Richmond PAD 1. Most of the artefacts were recovered from depths between 10 and 30 centimetres in the southernmost test square which corresponded to the spits containing the interface of the fill and natural soils below. The artefacts consisted of three quartzite flakes, one IMT flake, one chert flake, two IMT flake fragments, one quartzite flake fragment, and one silcrete flake fragment. The results of the test excavation at Inalls Lane Richmond PAD 1 indicated that a small remnant deposit was present at the site in areas where disturbance from past land use had not removed it. The deposit was assessed as likely to extend into western portion of the adjacent property, where subsurface disturbance may be lower. Following test excavation, the site was renamed Inalls Lane Richmond AFT 1.

The test excavation at Inalls Lane Richmond PAD 2 consisted of four test squares that were excavated within an area of low visible disturbance on the lower terrace landform and one test square that was excavated on the active floodplain adjacent to the drainage channel to examine the soil profiles in this area. The four test squares contained shallow deposits of mid brown sandy loam overlying pale brown sandy loam and basal clay with degrading shale bedrock fragments. The two eastern most squares contained a humic deposit and fill layers to a depth of approximately 40 centimetres above the natural deposit. The test square at Inalls Lane Richmond PAD 2 that was excavated on the active floodplain contained a moderately deep homogenous deposit of dark brown silty loam overlying silty clay. The deposit was interpreted as the result of the mixing of alluvial deposits by past land use practices or fluvial activity.

A total of four lithics comprising one backed artefact, one flake fragment and two non-diagnostic angular fragments were recovered from the test excavation at Inalls Lane Richmond PAD 2. The lithics were recovered from two of the four squares excavated on the terrace and the two diagnostic artefacts were located within a square that contained a very shallow deposit overlying basal clay with visible degrading shale bedrock. The test excavation demonstrated that while a subsurface archaeological deposit was present at the site, the archaeological significance of the deposit was low due to the shallow nature of the deposit and visible disturbance. As a result of the test excavation, the site was renamed Inalls Lane Richmond AFT 2

The test excavation at Southee Road Richmond PAD 1 consisted of 24 test squares that were located on an elevated landform between two drainage lines and a further two test squares . The 24 test squares were either positioned along one southwest to northeast oriented transect or several smaller transects that were aligned at right angles to the transect. The deposit was homogenous across the tested area and consisted of shallow to moderately deep brown sandy loam overlying pale grey sandy loam with iron/manganese nodules and basal clay. The deposit was waterlogged during the excavation.

A total of 16 lithics were recovered from nine of the 24 test squares excavated between the two drainage lines. No lithics were recovered from the additional test squares. The lithics consisted of 14 artefacts and two non-diagnostic angular fragments. The artefacts were dispersed across the test area while the highest artefact density (n=5) was recovered from a square in the southeastern portion of the test area. The artefact assemblage from Southee Road Richmond PAD 1 comprised one retouched IMT proximal flake fragment, one igneous flake, three IMT flakes, three silcrete flakes, three IMT flake fragments, one quartz distal flake fragment, and two silcrete flake fragments.

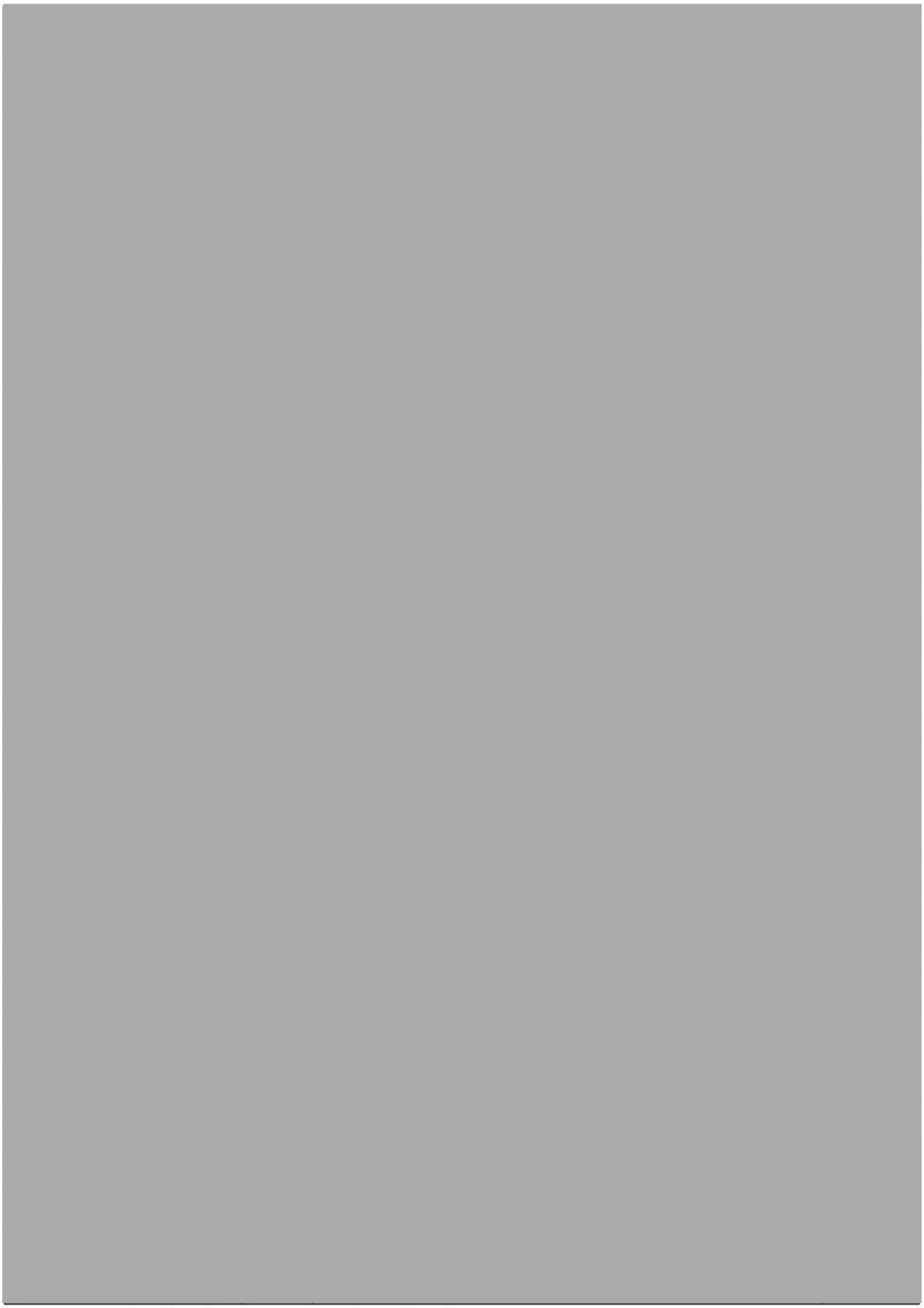

Figure 8. Archaeological test excavation results –Richmond

The test excavation demonstrated that while a subsurface archaeological deposit was present at the site, the archaeological significance of the deposit was low due to agricultural disturbance and flooding resulting in a low artefact density and dispersed deposit. Following the test excavation, the site was renamed Southee Road Richmond AFT 1.

The test excavation at Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543) was undertaken within the two locations where the study area overlapped the site. The first location was located on the crest and upper slope landforms of a ridge immediately south of Redbank Creek . The test area was restricted to a narrow corridor, approximately 10 metres wide, within the westernmost portion of the recorded site extent.

A total of five test squares were excavated at the first location along one transect . The deposit within the test squares was moderate to deep and consisted of dark brown silty loam with iron/manganese and sandstone small sandstone fragments overlaying basal clay. The size and poor sorting of gavels within the deposit was interpreted as consistent with low energy flood deposition. Modern glass was noted within some test squares and other visible disturbance was noted within the easternmost portion of test squares, possibly due to activities associated with the construction of an adjacent retaining wall. A trench cutting and associated pipe were also noted within one of the test squares.

A total of 45 lithics comprising 38 artefacts and eight non-diagnostic angular fragments were recovered from four of the five test squares. The lithics were predominantly located within the squares (n=11 and 23) which were located in the centre of the transect. The artefacts consisted of five cores, nine complete flakes, and 23 flake fragments. Useware was noted on one of the complete flakes. The artefacts were predominantly fine grained siliceous materials including IMT and chert while artefacts of silcrete (n=8), quartz (n=3), quartzite (n=1) and volcanics (n=3) were also recovered. Most the artefacts were recovered from between 10 and 20 centimetres below the ground surface.

The second test excavation location at Terrace Road Redbank Creek AFT 1 was situated on the crest and upper slope of the southern ridge . The test excavation at the second location consisted of 17 test squares that were positioned along two southeast to northwest oriented transects that descended the crest onto the upper slope and a southwest to northeast oriented transect that traversed the base of the slope adjacent to the unnamed tributary creek. The test squares contained a shallow to moderately deep deposit of mid brown sandy loam overlying light brown sandy loam with iron/manganese nodules and gravels above basal clay. The deposit was generally shallow within the squares in the southeast which were located on the highest portion of the tested area and those at the base of the slope.

A total of 134 lithics were recovered from the 17 test squares which consisted of 63 artefacts and 71 non-diagnostic angular fragments. The angular fragments were predominantly IMT and had been affected by crazing, pot lidding or other heat damage. The artefacts were recovered from 16 of the 17 test squares and were generally dispersed across the tested area in low densities. Moderate to high artefact densities were recovered from the test squares along the southeastern transect with the southeastern most square containing the highest artefact density (n=11) while three other squares along the transect contained between seven and nine artefacts. The artefacts were predominantly complete flakes (n=30) and flake fragments (n= 29) while four cores were also recovered. Retouch was noted on one flake and one distal flake fragment, both of which were IMT. Useware was identified on two IMT artefacts and one silcrete artefact. The artefacts were predominantly recovered from the upper 20 centimetres of the deposit (n=27) and between 20 and 30 centimetres (n=20).

The test excavations at Terrace Road Redbank Creek AFT 1 demonstrated that the previously recorded subsurface deposit continued into the current study area. The proportion of artefact types and materials recovered during the test excavation were similar to those from the previous excavation and indicated that the archaeological deposit was of a similar nature to across the tested area. The high proportion of non-diagnostic angular fragments was also consistent with the previous test excavation at the site and may be indicative of past land clearance or bushfires.

The results of the test excavations demonstrated that the spatial distribution of Aboriginal archaeological sites within the study area had been impacted by land use and natural processes; however, some spatial patterning and evidence of Aboriginal land use remained. Overall, elevated landforms appeared to retain the most stable soils, and subsurface archaeological deposits. Low lying landforms adjacent to the Hawkesbury River and Redbank Creek were found to be vulnerable to fluvial activity resulting in the truncation and deposition of sediments and potentially Aboriginal objects. Almost all the artefacts recovered during the test excavations were made from IMT which correlated to known sources of IMT within the gravels of the Nepean/Hawkesbury River.

5 Consultation Process

5.1 Aboriginal stakeholder consultation

Transport is committed to effective consultation with Aboriginal communities regarding Transport activities and their potential for impact on Aboriginal cultural heritage. The PACHCI was developed to provide a consistent means of effective consultation with Aboriginal communities regarding activities which may impact on Aboriginal cultural heritage and a consistent assessment process for Transport activities across NSW.

The aim of consultation is to integrate cultural and archaeological knowledge and ensure registered Aboriginal parties have information to make decisions on Aboriginal cultural heritage. For the preparation of this ACHAR, consultation with Aboriginal people has been undertaken in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010b) and the requirements of Clause 60 of the *National Parks and Wildlife Regulation 2019*.

Transport advertised in local media (Appendix A) and contacted potential Aboriginal stakeholders identified from government agency notification responses. Transport invited Aboriginal people who hold knowledge relevant to determining the cultural heritage significance of Aboriginal objects and Aboriginal places in the area in which the proposed activity is to occur to register an interest in a process of community consultation. Investigations for the proposal have included consultation with Aboriginal community groups and individuals listed in Table 1 below.

Table 1. Registered Aboriginal parties

Registered Aboriginal party	Representative and/or Contact Person
A1 Indigenous Services	Carolyn Hickey
Aragung Aboriginal Cultural Heritage Site Assessments	James Eastwood
Baiyan Cultural Services	Kayelene Terry
Barraby Cultural Services	Lee Field
Butucarbin	Jenny Beale
Corroboree Aboriginal Corporation	Marilyn Carroll-Johnson
Darug Aboriginal Corporation	Justine Coplin
Deerubbin Local Aboriginal Land Council	Steven Randall
Dharug Ngurra Aboriginal Corporation	Dirk Schmitt
Didge Ngunawal Clan	Paul Boyd & Lilly Caroll
Gilay Consultants	Carolyn Slater
Ginninderra Aboriginal Corporation	Krystle Carroll-Elliott
Goobah	Basil Smith
Gunjeewong Cultural Heritage	Shayne Dickson
Gunya Aboriginal Cultural Heritage Services	Adam Gunther
Kamilaroi-Yankuntjatjara Working Group	Phil Khan
Koori Digs	Koori Currell
Muragadi Heritage Indigenous Corporation	Jesse Johnson
Murra Bidgee Mullangari Aboriginal Corporation	Ryan Johnson
RAW Cultural Healing	Raymond Weatherall
Waawaar Awaa Aboriginal Corporation	Rodney Gunther
Widescope	Donna & Stephen Hickey
Woka Aboriginal Corporation Preservation of Culture & Heritage	Steve Johnson
Wurrumay	Vicky Slater
Yulay Cultural Services	Arika Jalomaki
Yurrandaali	Bo Field

The formal consultation process has included:

- advertising for registered Aboriginal parties (Appendix A);
- government agency notification letters;
- notification of closing date for registration;
- notification of registrant list to Heritage NSW and Deerubbin Local Aboriginal Land Council;
- ongoing compilation of registrants list;
- provision of project information;
- provision of proposed cultural heritage report assessment methodology (allowing 28 day review) outlining the proposed test excavation and PACHCI Stage 3 assessment methodologies;
- an Aboriginal Focus Group (AFG) meeting was on 23 March 2023 to discuss results of PACHCI Stage 2 assessment and proposed assessment methodology;
- provision of draft ACHAR for review (allowing 28 day review);
- an AFG meeting was held on 2 May 2024 to discuss the findings of the test excavation program, the draft ACHAR and the proposed mitigation; and,
- ongoing consultation with the local Aboriginal community including regular project updates.

5.2 Provision of proposed ACHAR and test excavation methodology

All registered stakeholders were provided with a copy of the proposed text excavation methodology and ACHAR methodology. Stakeholders were requested to review the information and provide any comments or cultural information that may affect, inform or refine the methodology.

Stakeholders were also invited to attend an AFG which was held on 23 March 2023 to discuss results of PACHCI Stage 2 assessment and proposed assessment methodology.

No formal responses to the proposed ACHAR and test excavation methodology were received from the registered Aboriginal parties during the review period.

5.3 Review of draft ACHAR

All registered stakeholders were provided with a copy of the draft ACHAR for review and comment. All registered Aboriginal stakeholders were provided a minimum 28 day period for review (closing date 17/05/2024). Formal responses to the draft ACHAR and proposed salvage excavation methodology were received from Baiyan Cultural Services, Kamilaroi-Yankuntjatjara Working Group, and Murra Bidgee Mullangari Aboriginal Corporation

Baiyan Cultural Services stated that they had read and revied the draft ACHAR (email received 24/04/2024).

Kamilaroi-Yankuntjatjara Working Group Pty Ltd advised that they agreed with and supported the recommendations of the draft ACHAR (email received 7/05/2024)

Murra Bidgee Mullangari Aboriginal Corporation stated that they had read the draft ACHAR and endorsed the recommendations made (email received 3/05/2024).

Stakeholders were also invited to attend a second AFG meeting which was held on 2 May 2024. The findings of the test excavation program, the draft ACHAR and the proposed mitigation were discussed during the meeting.

Formal responses received from the registered stakeholders during the review are attached in full in Appendix B.

5.4 Aboriginal cultural values

It has been identified during the initial consultation process that the wider study area has cultural heritage value to the local Aboriginal community. Some of the Aboriginal cultural heritage values expressed by stakeholders include:

- strong association with the land
- responsibility to look after the land, including the heritage sites, plants and animals, creeks and the land itself
- artefact sites and landscape features
- connection of sites throughout the landscape
- indigenous plants and animals
- general concern for burials, as their locations are not always known and they can be found anywhere.

6 Summary and Analysis of Background Information

Analysis of the background information presented in the preceding chapters allows an assessment of the cultural heritage values within the study area to be made. Combining data from historical/ethnographic sources, Aboriginal community consultation, landscape evaluation and archaeological context provides an insight into how the landscape within and around the study area was used and what sort of events took place in the past.

The study area and surrounding region are known to have been important to and extensively used by past Aboriginal people. The resources of the Hawkesbury, Nepean and Grose Rivers in addition to Redbank Creek and other tributary creeks were utilised by Aboriginal people living in the region prior to the British occupation. The subsequent British occupation these areas restricted access to and removed resources used by Aboriginal people. Response to the occupation varied between groups, individuals and over time due to proximity to the occupied areas, personal association and external factors, such as periods of drought.

Archaeological investigations have been undertaken in the region over several decades that have revealed physical traces of a range of Aboriginal land use activities which have survived in the form of Aboriginal archaeological sites. Investigations have shown that changes occurred in the spatial distribution and density of Aboriginal archaeological sites, the types of artefacts and artefact raw materials over the last 10,000 years that are likely to reflect the adaptation of Aboriginal people to an ever-changing landscape and environment while variations between the artefact assemblages of coastal and inland Aboriginal archaeological sites in the last 1,500 years may reflect social changes.

The Aboriginal archaeological sites identified in the vicinity of the study area predominantly contain stone artefacts in either surface and/or subsurface contexts of varying density and integrity. Grinding grooves and rock shelters with associated art and artefacts have also been documented in the region which forms part of a transitional zone between the shale-based Cumberland Plain and the more rugged sandstone country of the Blue Mountains.

Soil landscape, vegetation and land use practices have been identified as factors influencing the preservation of Aboriginal archaeological sites in the region. Soil landscapes subject to high levels of erosion or fluvial activity are unlikely to retain in situ Aboriginal objects while areas where the sediment has been deposited contain Aboriginal objects that lack the contextual information important for archaeological research. Land use practices, including vegetation clearance, construction, trenching and bulk earthworks have had variable effects on the preservation of Aboriginal archaeological sites in the region. Conversely, stone artefacts are often identified within these areas due to the disturbance of underlying deposits and increased visibility from the removal or restricted growth of vegetation. These processes, and the intensity of previous archaeological studies, distort the spatial distribution of known sites.

Despite this imbalance, general trends can still be observed. Previous archaeological investigations have shown that the distribution of Aboriginal archaeological sites in the region has been highly influenced by the reliability and permanence of fresh water sources in addition to certain underlying geology, such as sandstone outcropping. Investigations in the region have found higher stone artefact density and site frequency along the margins of major watercourses including the Hawkesbury River and Redbank Creek where elevated and stable micro-topographic landforms have suffered minimal disturbance.

6.1 Summary of known Aboriginal sites within the proposal area

Review of background information, Aboriginal community consultation and archaeological assessment, including a test excavation program, has resulted in the identification of seven Aboriginal archaeological sites containing Aboriginal objects within the study area. The locations of the sites are shown on Figure 7 and the sites are listed in Table 2. Site summaries are provided below.

Table 2. Identified Aboriginal archaeological sites within the proposal area

Name	AHIMS Number	Site Feature
Beaumont Ave (BA-OS-1)	45-5-2478	Artefact
Inalls Lane Richmond AFT 1	45-5-5845	Artefact
Inalls Lane Richmond AFT 2	45-5-5844	Artefact
Norfolk Place Hawkesbury River AFT 1	45-5-5542	Artefact
Southee Road Richmond AFT 1	45-5-5846	Artefact
Terrace Road Hawkesbury River AFT 1	45-5-5541	Artefact
Terrace Road Redbank Creek AFT 1	45-5-5543	Artefact

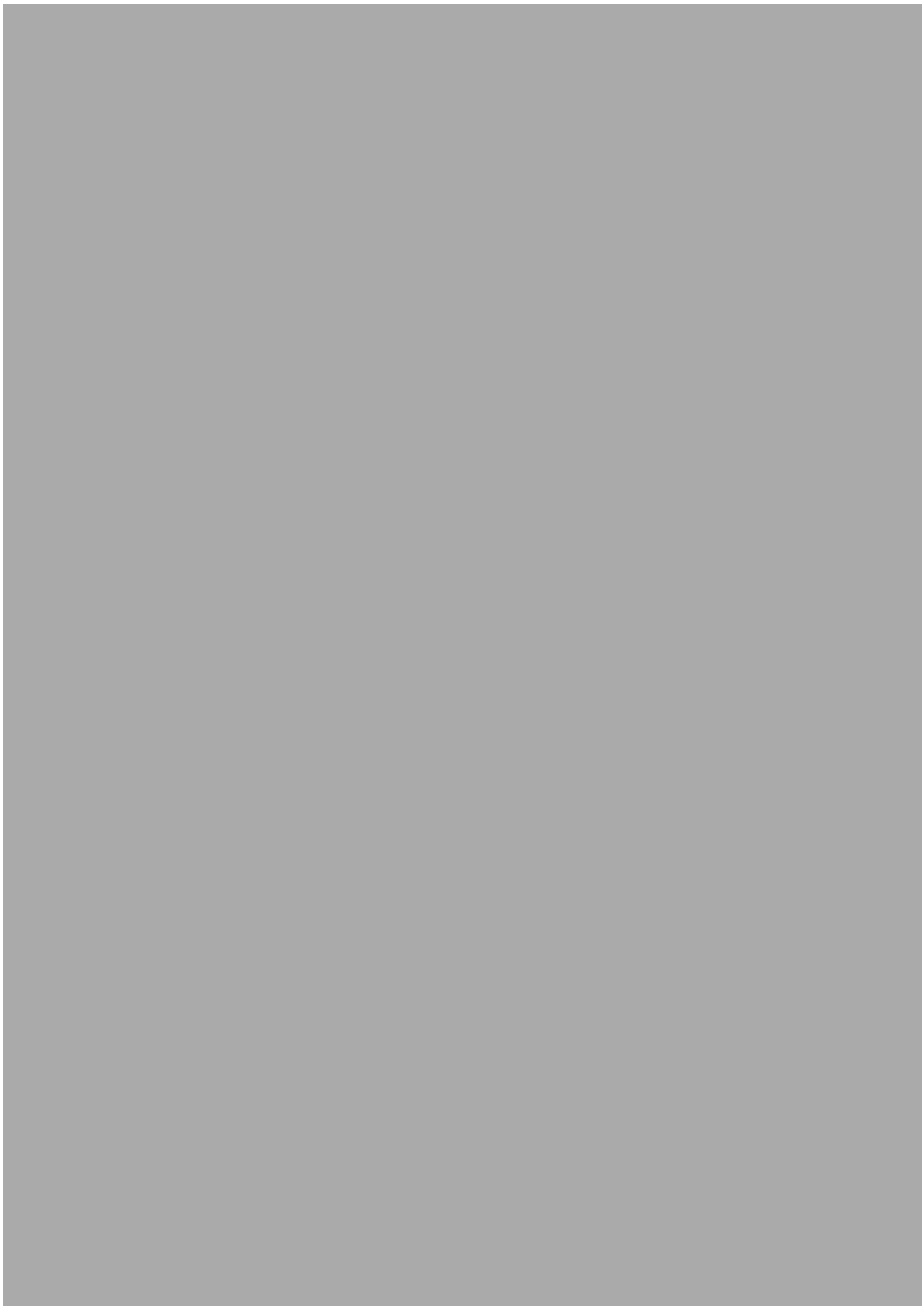

Figure 9. Sites within the study area

6.2 Aboriginal sites within the study area

6.2.1 Beaumont Ave (BA-OS-1) (AHIMS 45-5-2478)

Beaumont Ave (BA-OS-1) was a surface artefact scatter and several isolated low density subsurface archaeological deposits that were located on a lower terrace on the northern side of the Hawkesbury River. The site was initially identified as a surface artefact scatter that was located on disturbed ground at the base of a retaining wall. The area was assessed as being highly disturbed by past land use practices which had included bulk earthworks.

The terrace was identified as an area of potential archaeological deposit during the archaeological assessment for the current project (see Section 4.1.2) due to topographic location and the previously identified surface artefacts. The site was revisited during the archaeological field survey for the current project and was assessed as exhibiting variable levels of visible disturbance with high levels of disturbance associated with the former railway cutting ; however, surface visibility was generally low across the landform and it was recommended that test excavations be undertaken at the site to determine if areas where visible disturbance was not high contained archaeologically significant deposits.

An archaeological test excavation was undertaken at the site as part of the current project (see Section 4.1.3). The test excavation at BA-OS-1 focused on two areas. The first area was along the western edge of the terrace where it was hypothesised that activities may have been focused in the past while the second area was at the eastern most extent of the terrace at the base of the retaining wall to determine the nature of the deposit in this area, which historical aerial photographs indicated formed part of a drainage channel prior to being levelled .

A total of 18 test squares were excavated in the western portion and three test squares were excavated in the eastern portion . The test squares excavated in the northwestern portion contained deposits of fill overlying basal clay while the southwestern squares generally contained deposits of sandy loam over basal clay; however, some contained upper layers of fill. The composition of the sandy loam varied in the southwestern test pits with some squares containing deposits that indicated fluvial deposition while others contained homogenous deposits that may have been the result of past agricultural practices. A total of five artefacts were recovered from three of the test squares in the western portion of the terrace. The artefacts were recovered from fill layers in two squares in the north and below the fill layer within the homogenous sandy loam in one square in the south. The artefacts consisted of one chert flake, one quartzite flake, two silcrete flake fragments and one IMT flake fragment.

The test squares excavated in the eastern portion contained highly disturbed deposits of fill or fill overlying homogeneous sandy loam or shallow remnant bleached A2 soils. A total of four artefacts were recovered from one test square excavated in the eastern portion . The artefacts were recovered from the shallow remnant A2 horizon at depths between 40 and 50 centimetres and consisted of one IMT flake, two IMT flake fragments and one quartz flake fragment.

The test excavations at BA-OS-1 demonstrated that the terrace landform had generally been subject to high levels of subsurface disturbance and that while stone artefacts were present at the site, they were generally recovered from highly disturbed contexts and, as a result were of limited archaeological significance.

6.2.2 Inalls Lane Richmond AFT 1 (AHIMS 45-5-5845)

Inalls Lane Richmond AFT 1 was a low density subsurface archaeological deposit that was located on a terrace landform overlooking the active floodplain on the southern side of the Hawkesbury River. The site encompasses the nature strip and . The property at 22 Inalls Lane contains a homestead initially constructed in the early nineteenth century and is listed on the NSW State Heritage Registry (SHR Item 00044) for its historical significance.

The site was identified as an area of potential archaeological deposit (Inalls Lane Richmond PAD 1) during the archaeological field survey for the current project due to topographic location, low visible disturbance and soils that appeared to be intact and of moderate depth (see Section 4.1.2). It was hypothesized that the area may retain subsurface archaeological deposits containing stone artefacts due to the early establishment of the homestead on the property which may have restricted disturbance from subsequent land use.

An archaeological test excavation was undertaken at the site as part of the current project (see Section 4.1.3). The test excavation was restricted to the proposed impact area along the nature strip on the northern side of Inalls Lane and outside the SHR item curtilage. The test excavation consisted of five test squares that were positioned along one transect . The deposit within the five test squares was between 30 and 60 centimetres deep and was generally characterized by an upper humic layer of sandy loam that transitioned to a bleached sandy loam with iron/manganese nodules overlying basal clay. Most test squares contained imported clay fill material of varying frequency to the depths of approximately 20 centimetres which was interpreted as the result of adjacent modification works.

A total of nine artefacts were recovered from four of the test squares excavated at Inalls Lane Richmond PAD 1. Most of the artefacts were recovered from depths between 10 and 30 centimetres in the southernmost test square which corresponded to the spits containing the interface of the fill and natural soils below. The artefacts consisted of three quartzite flakes, one IMT flake, one chert flake, two IMT flake fragments, one quartzite flake fragment, and one silcrete flake fragment. The results of the test excavation at Inalls Lane Richmond PAD 1 indicated that a small remnant deposit was present at the site within the existing road corridor in areas where disturbance from past land use had not removed it. The deposit was assessed as likely to extend into western portion of the adjacent property, , where subsurface disturbance may be lower.

6.2.3 Inalls Lane Richmond AFT 2 (AHIMS 45-5-5844)

Inalls Lane Richmond AFT 2 was a low density subsurface archaeological deposit that was located on a terrace landform overlooking an unnamed drainage channel and the active floodplain on the southern side of the Hawkesbury River. The site was identified as an area of potential archaeological deposit (Inalls Lane Richmond PAD 2) during the archaeological field survey for the current project due to topographic location, and low visible disturbance (see Section 4.1.2).

An archaeological test excavation was undertaken at the site as part of the current project (see Section 4.1.3). The test excavation consisted of four test squares that were excavated within an area of low visible disturbance on the lower terrace landform and one test square that was excavated on the active floodplain adjacent to the drainage channel to examine the soil profiles in this area. The test squares on the terrace contained shallow deposits of mid brown sandy loam overlying pale brown sandy loam and basal clay with degrading shale bedrock fragments. The two eastern most squares contained a humic deposit and fill layers to a depth of approximately 40 centimetres above the natural deposit. The test square that was excavated on the active floodplain contained a moderately deep homogenous deposit of dark brown silty loam overlying silty clay.

A total of four lithics comprising one backed artefact, one flake fragment and two non-diagnostic angular fragments were recovered from the test excavation at Inalls Lane Richmond PAD 2. The lithics were recovered from two of the four squares excavated on the terrace and the two diagnostic artefacts were located within a square that contained a very shallow deposit overlying basal clay with visible degrading shale bedrock. The test excavation demonstrated that while a subsurface archaeological deposit was present at the site, the archaeological significance of the deposit was low due to the shallow nature of the deposit and visible disturbance.

6.2.4 Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542)

Norfolk Place Hawkesbury River AFT 1 was a low to high density subsurface archaeological deposit that was located on the crest and upper slope of a spur that descended to the confluence of several unnamed tributaries of Redbank Creek in the northeast. The site was bound by the open depressions of unnamed tributary creeks to the north, east and south, .

The site was identified as an area of potential archaeological deposit (Area 3) during an archaeological field survey and was subsequently test excavated as part of the planning process for the proposed Richmond System Wastewater Upgrade at Richmond and North Richmond (see Section 4.1.1). The test excavation program comprised 10 test squares that each measured 50 squares centimetres horizontally and were excavated along a northwest-southeast oriented transect. The deposit within the test squares varied between the different landform elements of the crest and slope with the deepest profiles, containing deposits over 60 centimetres deep, located on the highest part of the crest while the test squares on the adjacent slopes tended to be shallower with average depth of 40 centimetres.

The test excavation recovered 202 lithics that consisted of 175 diagnostic artefacts and 27 non-diagnostic angular fragments. The test squares with the highest artefact densities were located on the crest of the spur where four test squares contained between 26 and 61 artefacts. Artefact density diminished on the slopes where six squares contained six or less artefacts. The artefact assemblage comprised four cores, 51 complete flakes and 119 flake fragments. The flake fragments consisted of 29 proximal, 31 medial and 59 distal fragments. The artefacts recovered from the test excavation were predominantly IMT (n=110) while smaller quantities of silcrete (n=52), quartz (n=7) and fine grained material (n=5) artefacts were also identified. The assemblage contained 13 artefacts that were identified as exhibiting formal retouch or modification, including one angular fragment, and a further 40 artefacts exhibited edge damage that could be macroscopically interpreted as use wear.

AHIP 4940 was issued on 21 June 2022 for the Richmond System Wastewater Upgrade at Richmond and North Richmond, which included parts of the current study area at North Richmond and provisions for archaeological salvage excavation within the impacted portion of Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542) which are partially located within the current study area. Any works related to the current proposal undertaken within the boundary of the AHIP will be required to comply with the existing permit conditions. Outside of AHIP 4940, a small portion of the remaining site located on the upper (relatively level) slope exhibits moderate archaeological significance (complementing the portion impacted by AHIP 4940).

6.2.5 Southee Road Richmond AFT 1 (AHIMS 45-5-5846)

Southee Road Richmond AFT 1 was a low density subsurface archaeological deposit that was situated on a terrace landform between two northwest flowing drainage channels. . The site was identified as an area of potential archaeological deposit (Southee Road Richmond PAD 1) during the archaeological field survey for the current project due to topographic location, and low visible disturbance (see Section 4.1.2).

An archaeological test excavation was undertaken at the site as part of the current project (see Section 4.1.3). The test excavation consisted of 24 test squares that were located on an elevated landform between the two drainage lines and a further two test squares . The deposit was homogenous across the tested area and consisted of shallow to moderately deep brown sandy loam overlying pale grey sandy loam with iron/manganese nodules and basal clay. The deposit was waterlogged during the excavation.

A total of 16 lithics were recovered from nine of the 24 test squares excavated between the two drainage lines. No lithics were recovered from the additional test squares. The lithics consisted of 14 artefacts and two non-diagnostic angular fragments. The artefacts were dispersed across the test area while the highest artefact density (n=5) was recovered from a square in the southeastern portion of the test area. The artefact assemblage comprised one retouched IMT proximal flake fragment, one igneous flake, three IMT flakes, three silcrete flakes, three IMT flake fragments, one quartz distal flake fragment, and two silcrete flake fragments. The test excavation demonstrated that while a subsurface archaeological deposit was present at the site, the archaeological significance of the deposit was low due to the low density and dispersed nature of the deposit caused by agricultural activity and low energy flooding.

6.2.6 Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541)

Terrace Road Hawkesbury River AFT 1 was a low to moderate density subsurface archaeological deposit that was located on a north-east oriented ridge that formed the watershed of Redbank Creek in the north and an unnamed tributary creek in the south. The site was bound by a creek flat on the southern side of Redbank Creek in the north, ridge crest to the east, the open depressions of unnamed tributary creeks to the south, .

The site was identified as an area of potential archaeological deposit (Area 4) during an archaeological field survey and was subsequently test excavated as part of the planning process for the proposed Richmond System Wastewater Upgrade at Richmond and North Richmond (see Section 4.1.1). The test excavation program comprised three test squares that each measured 50 squares centimetres horizontally and were excavated along a northwest-southeast oriented transect. The test squares contained a shallow deposit with a general depth of 25 centimetres.

A total of 13 lithics were recovered during the test excavation that consisted of 11 artefacts and 2 non-diagnostic angular fragments. The artefact assemblage comprised one complete flake and 10 flake fragments. The flake fragments consisted of three proximal, two medial and five distal fragments. The artefacts were predominantly made from IMT (n=7) with four silcrete artefacts also recovered. One retouched artefact was recorded, comprising a distal flake fragment of chert from TS39. Three other artefacts displayed macroscopic edge damage interpreted as usewear.

AHIP 4940 was issued on 21 June 2022 for the Richmond System Wastewater Upgrade at Richmond and North Richmond, which included parts of the current study area at North Richmond and provisions for archaeological salvage excavation within the impacted portion of Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541) which are partially located within the current study area. Any works related to the current proposal undertaken within the boundary of the AHIP will be required to comply with the existing permit conditions.

6.2.7 Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543)

Terrace Road Redbank Creek AFT 1 was a subsurface archaeological deposit containing stone artefact that was situated on the crests and upper slopes of two ridgelines and the lower terraces adjacent to an unnamed tributary of Redbank Creek.

The site has been subject to two test excavation programs. The initial test excavation program was undertaken after being identified as an area of potential archaeological deposit (see Section 4.1.1). The test excavation consisted of 23 test squares, each measuring 50 square centimetres horizontally, that were positioned along three transects to sample the two ridge crest and the lower terrace landforms. The deposit within the test squares showed some variation in composition and depth. The test squares excavated along the transect on the crest of the ridge, , contained deposits between 40 and 70 centimetres deep. The test squares situated on the gentle slopes and lower terrace adjacent to the unnamed tributary contained moderately deep deposit of between 30 and 40 centimetres.

A total of 101 artefacts and 101 non-diagnostic angular fragments were recovered during the test excavation at Terrace Road Redbank Creek AFT 1. The artefacts were predominantly (n=67) recovered from the test squares located on crest of the northern ridge between Redbank Creek and the unnamed tributary creek with most squares (n=5) containing between nine and 11 artefacts. The squares also contained the majority of non-diagnostic angular fragments (n=81) with 50 fragments recovered from three squares. The majority of the non-diagnostic angular fragments recovered had been affected by heat (n=68) and were predominantly IMT; however, silcrete and quartz fragments were also recovered from the test squares in this area.

The artefact assemblage consisted of nine cores, 37 complete flakes and 57 flake fragments. The flake fragments comprised 11 proximal, 12 medial and 32 distal fragments. The artefacts were predominantly IMT (n=51) as were the cores (n=8); however, a large proportion of artefacts were silcrete (n=44), including one core, and a small proportion of quartz artefacts (n=6) were also recovered. Non-diagnostic angular fragments constituted 50 percent of the total lithics recovered; however, the proportion of angular fragments varied within the three materials present in the assemblage. Angular fragments represented 58 percent of the IMT lithics (n=58), 35 percent of the silcrete lithics (n=24) and 50 percent of the quartz lithics (n=6). No retouched, backed or formal tool type artefacts were identified; however, four artefacts were recorded with edge damage macroscopically interpreted as usewear.

The site was inspected as part of an archaeological field survey that was undertaken for the current project (see Section 4.1.2). The survey noted that the landforms on which the previous test excavation had recovered subsurface artefacts extended beyond the previously tested areas and into the current study area. Visible disturbance was limited in these areas to past tree clearance, unsealed tracks, and fence lines.

The survey noted that the nature and extent of any archaeological deposits beyond the previously test excavated areas within the current study area, whilst inferred from the results of the previous investigations, were largely unknown due to the distance of these areas from the previous test excavations. The survey recommended that additional archaeological test excavation be undertaken at the site to provide additional information on the nature and extent of any archaeological deposits that may be present within these areas.

Further archaeological test excavations were undertaken at the site as part of the current project (see Section 4.1.3). The test excavations were undertaken within the two locations where the study area overlapped the site. The first location was located on the crest and upper slope landforms of a ridge immediately south of Redbank Creek . The test area was restricted to a narrow corridor, approximately 10 metres wide, within the westernmost portion of the recorded site extent. A total of five test squares were excavated at the first location along one transect r. The deposit within the test squares was moderate to deep.

A total of 45 lithics comprising 38 artefacts and eight non-diagnostic angular fragments were recovered from four of the five test squares. The lithics were predominantly located within the squares (n=11 and 23) which were located in the centre of the transect. The artefacts consisted of five cores, nine complete flakes, and 23 flake fragments. Useware was noted on one of the complete flakes. The artefacts were predominantly fine grained siliceous materials including IMT and chert while artefacts of silcrete (n=8), quartz (n=3), quartzite (n=1) and volcanics (n=3) were also recovered. Most the artefacts were recovered from between 10 and 20 centimetres below the ground surface.

The second test excavation location at Terrace Road Redbank Creek AFT 1 was situated on the crest and upper slope of the southern ridge . The test excavation at the second location consisted of 17 test squares that were positioned along two southeast to northwest oriented transects that descended the crest onto the upper slope and a southwest to northeast oriented transect that traversed the base of the slope adjacent to the unnamed tributary creek. The test squares contained a shallow to moderately deep deposit of mid brown sandy loam overlying light brown sandy loam with iron/manganese nodules and gravels above basal clay. The deposit was generally shallow within the squares in the southeast which were located on the highest portion of the tested area and those at the base of the slope.

A total of 134 lithics were recovered from the 17 test squares which consisted of 63 artefacts and 71 non-diagnostic angular fragments. The angular fragments were predominantly IMT and had been affected by crazing, pot lidding or other heat damage. The artefacts were recovered from 16 of the 17 test squares and were generally dispersed across the tested area in low densities. Moderate to high artefact densities were recovered from the test squares along the southeastern transect with the southeastern most square containing the highest artefact density (n=11) while three other squares along the transect contained between seven and nine artefacts. The artefacts were predominantly complete flakes (n=30) and flake fragments (n= 29) while four cores were also recovered. Retouch was noted on one flake and one distal flake fragment, both of which were IMT. Useware was identified on two IMT artefacts and one silcrete artefact. The artefacts were predominantly recovered from the upper 20 centimetres of the deposit (n=27) and between 20 and 30 centimetres (n=20).

AHIP 4940 was issued on 21 June 2022 to Sydney Water for the Richmond System Wastewater Upgrade that included parts of the current study area at North Richmond. The AHIP included provisions for archaeological salvage excavations within the impacted portions of Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542), Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541), and Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543) which are partially located within the current study area. Any works related to the current proposal undertaken within the boundary of the AHIP will be required to comply with the existing permit conditions.

7 Cultural Heritage Values and Statement of Significance

7.1 Significance Assessment Criteria

One of the primary steps in the process of cultural heritage management is the assessment of significance. Not all sites are equally significant and not all are worthy of equal consideration and management (Sullivan and Bowdler 1984; Pearson and Sullivan 1995:7). The determination of significance can be a difficult process as the social and scientific context within which these decisions are made is subject to change (Sullivan and Bowdler 1984). This does not lessen the value of the heritage approach but enriches both the process and the long term outcomes for future generations as the nature of what is conserved and why, also changes over time.

Significance assessments can generally be described under three broad headings (Pearson and Sullivan 1995:7):

- Value to groups such as Aboriginal communities
- Value to scientists and other information gatherers
- Value to the general public in the context of regional, state and national heritage.

The assessment of significance is a key step in the process of impact assessment for a proposed activity as the significance or value of an object, site or place will be reflected in resultant recommendations for conservation, management or mitigation.

The *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH 2010b) requires significance assessment according to criteria established in the *Australia ICOMOS Burra Charter* (Australia ICOMOS 2013). The *Burra Charter* and its accompanying guidelines are considered best practice standard for cultural heritage management, specifically conservation, in Australia. Guidelines to the *Burra Charter* set out four criteria for the assessment of cultural significance:

- Aesthetic value - relates to the sense of the beauty of a place, object, site or item
- Historic value - relates to the association of a place, object, site or item with historical events, people, activities or periods
- Scientific value - scientific (or research) value relates to the importance of the data available for a place, object, site or item, based on its rarity, quality or representativeness, as well as on the degree to which the place (object, site or item) may contribute further substantial information
- Social value - relates to the qualities for which a place, object, site or item has become a focus of spiritual, political, national or other cultural sentiment to a group of people. In accordance with the Heritage NSW *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*, the social or cultural value of a place (object, site or item) may be related to spiritual, traditional, historical or contemporary associations. According to Heritage NSW, "social or cultural value can only be identified though consultation with Aboriginal people" (OEH 2011a:8).

The significance assessment for the Aboriginal archaeological sites identified within the study area has focussed on the social/cultural, historic, scientific and aesthetic significance of Aboriginal heritage values as identified in *The Burra Charter*.

Cultural/Social Values
This area of assessment concerns the value/s of a place, feature or site to a particular community group, in this case the local Aboriginal community. Aspects of social significance are relevant to sites, objects and landscapes that are important or have become important to the local Aboriginal community. This importance involves both traditional links with specific areas as well as an overall concern by Aboriginal people for sites generally and their continued protection. Aboriginal cultural significance may include social, spiritual, historic and archaeological values.

It has been identified during the consultation process that the study area has cultural heritage value (social value) to the local Aboriginal community. Regarding Aboriginal sites identified within the study area, no specific cultural or social values expressed by these sites have been identified to date.

Historic Values
Community consultation and historical research have not identified any information regarding specific historical significance within the study area to date.

Scientific Values

For archaeologists, scientific significance refers to the potential of a site to contribute to current research questions. Alternately, a site may be an *in situ* repository of demonstrably important information, for example rare artefacts of unusually high antiquity.

Scientific significance is assessed using criteria to evaluate the contents of a site, state of preservation, integrity of deposits, representativeness of the site type, rarity/uniqueness and potential to answer research questions on past human behaviour. The recommended criteria for assessing archaeological significance include:

- Archaeological Research Potential - significance may be based on the potential of a site or landscape to explain past human behaviour and can incorporate the intactness, stratigraphic integrity or state of preservation of a site, the association of the site to other sites in the region (connectivity), or a datable chronology.
- Representativeness - all sites are representative of those in their class (site type/subtype) however the issue here relates to whether particular sites should be conserved to ensure a representative sample of the archaeological record is retained. Representativeness is based on an understanding of the regional archaeological context in terms of site variability in and around the study area, the resources already conserved and the relationship of sites across the landscape.
- Rarity – which defines how distinctive a site may be, based on an understanding of what is unique in the archaeological record and consideration of key archaeological research questions (i.e., some sites are considered more important due to their ability to provide certain information). It may be assessed at local, regional, state and national levels.

High significance is usually attributed to sites which are so rare or unique that the loss of the site would affect our ability to understand an aspect of past Aboriginal use/occupation of an area. In some cases, a site may be considered highly significant because it is now rare due to destruction of the archaeological record through development.

Moderate (medium) significance is attributed to sites which provide information on an established research question. Sites with moderate significance are those that offer the potential to yield information that will contribute to the holistic understanding of the Aboriginal cultural landscape of the study area. Archaeological investigation of moderately significant sites will contribute knowledge regarding site type interrelationships, cultural use of landscape features and occupation patterns.

Low significance is attributed to sites which cannot contribute new information about past Aboriginal use/occupation of an area. This may be due to site disturbance or the nature of the site's contents.

Aesthetic Values

Aesthetic values are often closely related to the social values of a site or broader cultural landscape. Aspects may include scenic sights, smells and sounds, architectural fabric and creative aspects of a place.

No specific aesthetic values for the Aboriginal archaeological sites within the study area have been identified to date.

7.2 Statements of significance

The study area contains seven extant Aboriginal archaeological sites as defined under the *National Parks and Wildlife Act 1974*. Consultation with the Aboriginal community has identified that the study area has cultural heritage value (social value) to the local Aboriginal community. Regarding the Aboriginal archaeological sites identified within the study area, no specific cultural/social, historic, aesthetic values expressed by these sites have been identified to date. Based on the values assessment, the following statements of significance were ascribed to the sites:

Beaumont Ave (BA-OS-1)

Beaumont Ave (BA-OS-1) represents a commonly occurring type of site in the region, consisting of a low-density surface artefact scatter and associated dispersed low density subsurface archaeological deposit. The artefacts are typical of the region in terms of type and raw material. The results of test excavations undertaken at the site have demonstrated that the subsurface deposit has been significantly disturbed by past construction activities and indicate that the deposit was disturbed by agricultural practices and fluvial activity. The recovered artefacts were predominately within fill layers, and it is unlikely that further archaeological investigation at the site would provide significant archaeological information. Based on the intactness, representativeness and research potential of the site, Beaumont Ave (BA-OS-1) is determined to have *low archaeological significance*.

Inalls Lane Richmond AFT 1

Inalls Lane Richmond AFT 1 represents a commonly occurring type of site in the region, consisting of a low density subsurface archaeological deposit. The artefacts are typical of the region in terms of type and raw material. The results of test excavations undertaken at the site have demonstrated that the subsurface deposit within the study area has been partially disturbed by past construction activities and it is unlikely that further archaeological investigation within the study area at this site would provide significant archaeological information. Based on the intactness, representativeness and research potential of the site, Inalls Lane Richmond AFT 1 is determined to have *low archaeological significance*.

Inalls Lane Richmond AFT 2

Inalls Lane Richmond AFT 2 represents a commonly occurring type of site in the region, consisting of a low density subsurface archaeological deposit. The artefacts are typical of the region in terms of type and raw material. The results of test excavations undertaken at the site have demonstrated that the subsurface deposit within the study area has been partially disturbed by past land use activities and only a shallow deposit remains at the site. It is unlikely that further archaeological investigation within the study area at this site would provide significant archaeological information. Based on the intactness, representativeness and research potential of the site, Inalls Lane Richmond AFT 2 is determined to have *low archaeological significance*.

Norfolk Place Hawkesbury River AFT 1

Norfolk Place Hawkesbury River AFT 1 represents a commonly occurring type of site in the region, consisting of a low to moderate density subsurface archaeological deposit. The artefacts are typical of the region in terms of type and raw material. The results of test excavations undertaken at the site have demonstrated that the subsurface deposit within the crest landform at the site contains the most potential to contribute significant archaeological information; however, only the remaining relatively level upper crest exhibits moderate archaeological information. Apart from the elevated area the remainder of the site was either impacted under an existing AHIP (AHIP 4940) or is located on higher gradient landforms which contained lower artefact densities and integrity. Based on the intactness, representativeness and research potential of the site, Norfolk Place Hawkesbury River AFT 1 the portion located on the elevated crest is determined to have *moderate archaeological significance*.

Southee Road Richmond AFT 1

Southee Road Richmond AFT 1 represents a commonly occurring type of site in the region, consisting of a low density subsurface archaeological deposit. The artefacts are typical of the region in terms of type and raw material. The results of test excavations undertaken at the site have demonstrated that the subsurface deposit within the study area is dispersed and may have been disturbed by past agricultural activity or fluvial processes. It is unlikely that further archaeological investigation within the study area at this site would provide significant archaeological information. Based on the intactness, representativeness and research potential of the site, Southee Road Richmond AFT 1 is determined to have *low archaeological significance*.

Terrace Road Hawkesbury River AFT 1

Terrace Road Hawkesbury River AFT 1 represents a commonly occurring type of site in the region, consisting of a low to moderate density subsurface archaeological deposit. The artefacts are typical of the region in terms of type and raw material. The results of test excavations undertaken at the site have demonstrated that the subsurface deposit within the crest landform at the site contains the most potential for contribute significant archaeological information; however, this area is within an existing AHIP (AHIP 4940), and it is unlikely that further archaeological investigation within the remaining portion of the site in the current study area would provide significant archaeological information. Based on the intactness, representativeness and research potential of the site, Terrace Road Hawkesbury River AFT 1 is determined to have *low archaeological significance*.

Terrace Road Redbank Creek AFT 1

Terrace Road Redbank Creek AFT 1 represents a commonly occurring type of site in the region, consisting of a low to high density subsurface archaeological deposit. The artefacts are typical of the region in terms of type and raw material. The results of test excavations undertaken at the site have demonstrated that the subsurface deposit within the crest landform at the site contains the potential for contribute significant archaeological information and it is likely that further archaeological investigation of the portion of the site within the study area would provide significant archaeological information. Based on the intactness, representativeness and research potential of the site, Terrace Road Redbank Creek AFT 1 is determined to have *moderate archaeological significance*.

8 The Proposed Activity and Impact Assessment

Transport for NSW (Transport) proposes to upgrade Bells Line of Road / Kurrajong Road between Crooked Lane, North Richmond and Old Kurrajong Road, Richmond and construct a new bypass south of Richmond town centre. Construction activities would include, but are not limited to:

- Project start-up activities including:
  - Precondition land surveys
  - Survey
  - Ancillary facilities establishment
  - Environmental control establishment such as erosion and sediment controls and exclusion zones
  - Utility search and potholing
- Clearing and grubbing of vegetation
- Earthworks including demolition
- Kerb and stormwater drainage
- Electricity utilities relocation (HV and LV)
- Sewage protection and relocation
- Water protection and relocation
- Gas protection and relocation
- Optical fibre relocation
- Abutment and bridge, noise wall and retaining wall construction
- Pavement construction including asphalt and concrete pavement
- Footpath construction, landscaping and finishing works including asphalt concrete surfacing.

Ancillary Facilities

Temporary ancillary facilities would be established to support construction of the proposal, including:

- Site compounds that incorporate site offices, car parking, sheds, workshops, and storage
- Areas for the delivery and storage of bridge structural elements and construction of the bridge over the Hawkesbury River
- Areas for capturing and treating water from construction areas.
- Stockpile sites for materials, spoil, and mulch.
- Ancillary facilities would be returned to pre-existing conditions or rehabilitated upon completion of construction in agreement with the landowner.

8.1 Impact assessment

Based on the proposed activities outlined in the preceding section, the seven Aboriginal archaeological sites which have been identified within the study area would be at least partially impacted by the proposal. Proposed impacts to sites identified within the study area are detailed in Table 3 and shown in Figure 10.

Table 3. Proposed impact to Aboriginal archaeological sites within the proposal area

Name	AHIMS Number	Significance	Type/ Degree of Harm	Consequence of Harm
Beaumont Ave (BA-OS-1)	45-5-2478	Low	Direct / Total	Total loss of value
Inalls Lane Richmond AFT 1	45-5-5845	Low	Direct / Partial	Partial loss of value
Inalls Lane Richmond AFT 2	45-5-5844	Low	Direct / Total	Total loss of value
Norfolk Place Hawkesbury River AFT 1	45-5-5542	Moderate (at crest) Low (on slopes)	Direct / Partial	Partial loss of value
Southee Road Richmond AFT 1	45-5-5846	Low	Direct / Total	Total loss of value
Terrace Road Hawkesbury River AFT 1	45-5-5541	Low	Direct / Partial	Partial loss of value
Terrace Road Redbank Creek AFT 1	45-5-5543	Moderate	Direct / Partial	Partial loss of value

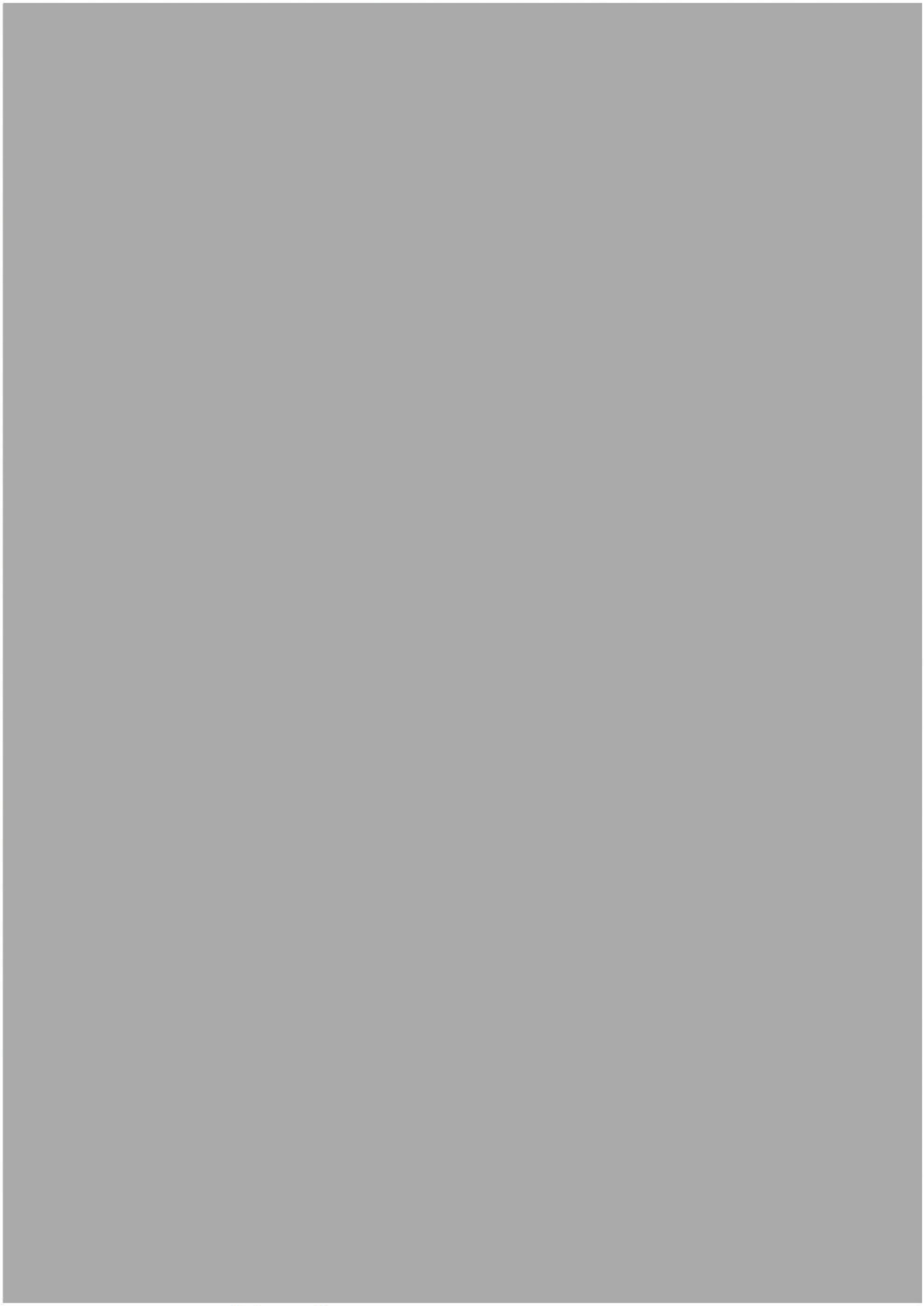

Figure 10. Impact area and Aboriginal heritage

9 Mitigating Harm

Aboriginal archaeological sites and objects are non-renewable resources that, in addition to the landscape in which they are located, exhibit cultural heritage value (significance) to the contemporary Aboriginal community, archaeologists and other stakeholders (see Section 7). The identified Aboriginal archaeological sites have been considered by Transport in relation to the proposed new Richmond Bridge and traffic improvements.

The assessment applied the principles of Ecologically Sustainable Development (ESD) to the current proposal. The principles of Ecologically Sustainable Development are defined in Section 6 of the NSW *Protection of the Environment Administration Act 1991*. The ESD principles relevant to Aboriginal cultural heritage within the proposal area are the Precautionary Principle and the Principle of Inter-Generational Equity. The application of these principles in relation to the current proposal is discussed below.

9.1 The Precautionary Principle

The Precautionary Principle states "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 measures to prevent environmental degradation".

Scientific confidence in the nature and extent of archaeological resources within the study area and wider region has been achieved through the results of previous archaeological work in addition to archaeological field survey and archaeological test excavation undertaken for the current project (Section 4). Regarding the cultural/social, historical, or aesthetic value/significance of the Aboriginal archaeological sites and objects within the study area, Aboriginal community consultation was undertaken in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010b) and the requirements of *Clause 60 of the National Parks and Wildlife Regulation 2019* (Section 5).

9.2 The Principle of Inter-Generational Equity

The Principle of Inter-Generational Equity states "that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations".

Aboriginal archaeological sites and objects are non-renewable resources. As such, the conservation of archaeological sites is generally seen as a method of increasing intergenerational equity in relation to archaeological (scientific) value (Bonnie 2011). Conservation is often promoted due to the potential that archaeological investigations in the future will be able to harness yet unknown technological innovations or research to derive more archaeological value from archaeological sites than we could today.

Aboriginal archaeological sites and objects, in addition to the landscape in which they are located, may have differing heritage values for the Aboriginal community, archaeologists and others (see Section 7). In general, activities that modify the landscape, such as bulk earthworks and construction, result in serious and often irreversible damage to the heritage values of the impacted areas and have a cumulative impact on the heritage values of the wider region. As such, the avoidance of areas with heritage value by such activities is often advocated as a form of conservation; however, avoidance does not generally equate to conservation and may not be the best outcome or even necessary for intergenerational equity in relation to archaeological (scientific) value.

Natural processes and land use practices, amongst other issues have been noted as causing significant difficulties when conserving archaeological sites (Bonnie 2011; Willems 2012; Williams 2014). The Aboriginal archaeological sites within the study area have been impacted by past land use activities and natural processes that have included tree clearance, erosion and fluvial activity. The impact to the Aboriginal archaeological sites from current land use practices and natural processes over the long term would further diminish the archaeological (scientific) value of the sites. The conservation of the sites in relation to their archaeological (scientific) value would require the construction and maintenance of works to stabilise the deposit and associated artefacts until an unknown future date. Such works would not be possible for the current project and are generally limited to Aboriginal archaeological sites of unique significance.

The archaeological value of Aboriginal archaeological sites and objects varies; however, it is often related to the information they contain or can provide (see Section 7). As discussed in Section 4, archaeological investigations have identified Aboriginal archaeological sites in the region that predominantly contained the same features as the sites identified within the study area. Many of the Aboriginal archaeological sites were recorded during investigations undertaken as part of the planning process for residential, commercial or infrastructure projects and were subsequently destroyed by associated works. As such, known Aboriginal archaeological sites have become rarer due to the cumulative impact of these projects; however, the nature and extent of Aboriginal archaeological sites in the wider region is largely unknown, and as such, the overall rarity of specific site type can only be inferred from the results of previous investigations.

The results of previous archaeological investigations indicate that similar site types are likely to occur on elevated landforms in the vicinity of water sources and in particular permanent water sources, such as the Hawkesbury, Nepean and Grose Rivers, and major creeks where disturbance from natural processes and land use practices are low. Several state and national parks are located in the wider region and contain similar landforms to the study area that are likely to have been less disturbed by land use practices.

The study area is approximately three kilometres north of the Yellomundee Regional Park which extends for approximately 8.6 kilometres along the western side of the Nepean River and includes similar landforms to those within the study area. The plan of management for the Yellomundee Regional Park identifies the protection of all components of indigenous cultural heritage in partnership with the Aboriginal community as a strategy that will be implemented (NPWS 2009: 5). As such, similar landforms to those within the study area will be conserved within the regional park as will any associated Aboriginal archaeological sites.

9.3 Management and mitigation measures

The study area contains seven Aboriginal archaeological sites that would be at least partially impacted by the proposal. Recommendations for mitigating the impact of the proposed works on the identified Aboriginal archaeological sites have been developed based on the principles of Ecologically Sustainable Development (ESD), environmental context and condition, background research, and consultation with stakeholders.

Transport has determined that the Aboriginal archaeological sites identified within the study area cannot be avoided by the proposal due to the limited area in which the works can be undertaken and the requirements of the project. This will result in serious and irreversible damage to the archaeological value of the sites within the study area. The sites display low to moderate archaeological (scientific) significance.

In instances where impacts to Aboriginal archaeological sites exhibiting moderate or higher archaeological value are unavoidable, archaeological salvage excavations are recommended to conserve a representative sample of the artefacts and associated contextual information contained within the impacted area for future generations. The conservation of artefacts and contextual information from salvaged archaeological sites would allow further study by future generations; however, this may not be possible due to conflicting cultural mitigation strategies, such as the reburial of stone artefacts. In instances where the reburial of stone artefacts is required to mitigate the impact on cultural values, detailed recording and additional analysis may be required to offset the impact to intergenerational equity.

Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543) and Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542) are considered to display moderate archaeological (scientific) significance based on scientific value and potential to inform on Aboriginal landscape use within the northwestern Cumberland Plain. Archaeological salvage excavation is recommended for the impacted portions of Terrace Road Redbank Creek AFT 1 and Norfolk Place Hawkesbury River AFT 1.

The impacted portions of sites Beaumont Ave (BA-OS-1) (AHIMS 45-5-2478), Inalls Lane Richmond AFT 1 (AHIMS 45-5-5845), Inalls Lane Richmond AFT 2 (AHIMS 45-5-5844), Southee Road Richmond AFT 1 (AHIMS 45-5-5846) and Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541) are considered to display low archaeological (scientific) significance based on the disturbed nature of the area and lack of a subsurface archaeological deposit. Aboriginal archaeological sites exhibiting low archaeological (scientific) significance are unlikely to provide significant archaeological information and do not warrant avoidance or mitigation on archaeological grounds.

The loss of the intrinsic Aboriginal cultural value of impacted Aboriginal archaeological sites often cannot be fully offset or mitigated; however, the recovery of surface artefacts from the impacted areas of the seven Aboriginal archaeological sites by the Aboriginal community may help to mitigate the impact of the proposed works.

An AHIP is required for impacts to land and identified sites/objects prior to the commencement of pre-construction or construction activities associated with the proposal that would affect the sites. Measures for mitigating harm to the sites are outlined in Table 4 below.

Table 4. Management and mitigation measures for impacted Aboriginal archaeological sites

Name	Degree of Harm	Significance of Harm	Management and Mitigation Measures
Beaumont Ave (BA-OS-1)	Total	Low	AHIP required prior to commencement of works affecting the site. A surface collection of Aboriginal objects to be completed prior to commencing construction works.
Inalls Lane Richmond AFT 1	Partial	Low	AHIP required prior to commencement of works affecting the site. A surface collection of Aboriginal objects within impacted area to be completed prior to commencing construction works. Barrier fencing to be erected on the AHIP boundary for the extent of the area to ensure that no construction impact extends into the portion of the site outside the proposal area. Portion of area outside of proposal area should be identified on the CEMP as environmentally sensitive no-go zone to ensure no impact.
Inalls Lane Richmond AFT 2	Total	Low	AHIP required prior to commencement of works affecting the site.
Norfolk Place Hawkesbury River AFT 1	Partial	Moderate (at crest) Low (on slopes)	AHIP required prior to commencement of works affecting the site. Archaeological salvage excavation of impacted area to be completed prior to commencing construction works. A surface collection of Aboriginal objects within impacted area to be completed prior to commencing construction works. Barrier fencing to be erected on the AHIP boundary for the extent of the area to ensure that no construction impact extends into the portion of the site outside the proposal area. Portion of area outside of proposal area should be identified on the CEMP as environmentally sensitive no-go zone to ensure no impact.
Southee Road Richmond AFT 1	Total	Low	AHIP required prior to commencement of works affecting the site. A surface collection of Aboriginal objects to be completed prior to commencing construction works.
Terrace Road Hawkesbury River AFT 1	Partial	Low	AHIP required prior to commencement of works affecting the site. Archaeological salvage excavation of impacted area to be completed prior to commencing construction works. Barrier fencing to be erected on the AHIP boundary for the extent of the area to ensure that no construction impact extends into the portion of the site outside the proposal area. Portion of area outside of proposal area should be identified on the CEMP as environmentally sensitive no-go zone to ensure no impact.
Terrace Road Redbank Creek AFT 1	Partial	Moderate	AHIP required prior to commencement of works affecting the site. Archaeological salvage excavation of impacted area to be completed prior to commencing construction works. A surface collection of Aboriginal objects within impacted area to be completed prior to commencing construction works. Barrier fencing to be erected on the AHIP boundary for the extent of the area to ensure that no construction impact extends into the portion of the site outside the proposal area. Portion of area outside of proposal area should be identified on the CEMP as environmentally sensitive no-go zone to ensure no impact.

10 Summary and Recommendations

A total of seven Aboriginal sites are situated within the study area. An AHIP is being sought for Aboriginal objects within the boundaries of the proposal area, incorporating the Aboriginal archaeological sites listed in Table 5.

Aboriginal Heritage Impact Permit
An application for an Aboriginal Heritage Impact Permit should be made under section 90A of the *National Parks and Wildlife Act 1974* for the land and associated objects within the boundaries of the proposal area, excluding the area within the boundary AHIP 4940 (Figure 11).

AHIP 4940 was issued on 21 June 2022 for the Richmond System Wastewater Upgrade at Richmond and North Richmond, which included parts of the current study area at North Richmond. The AHIP included provisions for archaeological salvage excavations within the impacted portions of Norfolk Place Hawkesbury River AFT 1 (AHIMS 45-5-5542), Terrace Road Hawkesbury River AFT 1 (AHIMS 45-5-5541), and Terrace Road Redbank Creek AFT 1 (AHIMS 45-5-5543) which are partially located within the current study area. Any works related to the current proposal undertaken within the boundary of the AHIP will be required to comply with the existing permit conditions.

An AHIP should also be sought for the specified Aboriginal sites and Aboriginal objects contained within the sites listed below in Table 5.

Table 5. Aboriginal archaeological sites and scope for which an AHIP is being sought.

Name	AHIMS Number	Significance	Scope of AHIP
Beaumont Ave (BA-OS-1)	45-5-2478	Low	Total Impact
Inalls Lane Richmond AFT 1	45-5-5845	Low	Partial Impact
Inalls Lane Richmond AFT 2	45-5-5844	Low	Total Impact
Norfolk Place Hawkesbury River AFT 1	45-5-5542	Moderate (at crest) Low (on slopes)	Partial Impact
Southee Road Richmond AFT 1	45-5-5846	Low	Total Impact
Terrace Road Hawkesbury River AFT 1	45-5-5541	Low	Partial Impact
Terrace Road Redbank Creek AFT 1	45-5-5543	Moderate	Partial Impact

Site Protection
The boundary of the AHIP area adjacent to the non-impacted portion of sites Inalls Lane Richmond AFT 1, Norfolk Place Hawkesbury River AFT 1, Terrace Road Hawkesbury River AFT 1, and Terrace Road Redbank Creek AFT 1 should be demarcated with protective fencing and listed in the CEMP. These areas should be identified as “no-go zones” on the CEMP maps and workers inducted as to appropriate protection measures and requirements to comply with conditions in the adjacent AHIP.

Salvage Excavation
The AHIP would include provision for impact mitigation through archaeological salvage excavation. Salvage excavation would be required at site Terrace Road Redbank Creek AFT 1 and Norfolk Place Hawkesbury River AFT 1. Salvage excavation must be completed prior to any activities (including pre-construction activities) which may harm Aboriginal objects at these locations. Salvage excavation activities would be undertaken in accordance with the methodology attached as Appendix C.

Surface Collection
The AHIP should include provision for impact mitigation through surface collection at the Aboriginal archaeological sites within the AHIP area. Surface collection must be completed prior to any activities (including pre-construction activities) which may harm Aboriginal objects at the sites. Surface collection would be undertaken in accordance with the methodology outlined below:

- Surface artefact collection within the sites would be restricted to the approved AHIP area.
- The collection of surface artefacts would be undertaken with Aboriginal site officers.
- Photographs and the details of each artefact collected, including attributes and location/context would be recorded during the surface collection.
- The AHIMS site records would be updated to include the details of the collected surface artefacts.

Management of Salvaged and Collected Aboriginal Objects

The short term management of Aboriginal objects would be as follows:

- Any Aboriginal objects that are removed from the land by actions authorised by an AHIP, must be moved as soon as practicable to the temporary storage location (see below) pending any agreement reached about the long term management of the Aboriginal objects.
- The temporary storage location: Kelleher Nightingale Consulting Pty Ltd, Suite 505-507, 155 King Street, Sydney NSW 2000.
- Any Aboriginal objects stored at the temporary storage location must not be further harmed, except in accordance with the conditions of the AHIP.

The long term management of collected Aboriginal objects would be determined in consultation with the project's registered Aboriginal stakeholders and in accordance with the conditions of the AHIP.

- If objects are to be transferred under a Care and Control Agreement to an Aboriginal person or organisation representing Aboriginal people in accordance with Section 85A(1)(c) of the *National Parks and Wildlife Act 1974*, an application for a Care Agreement must be completed.
- If reburial is to be undertaken of objects, Requirement 26 "Stone artefact deposition and storage" in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* must be complied with, unless the registered Aboriginal stakeholders agree to an alternative deposition method.
    - If reburial is to take place, registered Aboriginal stakeholders would be notified and given the opportunity to attend, and the reburial recorded on AHIMS

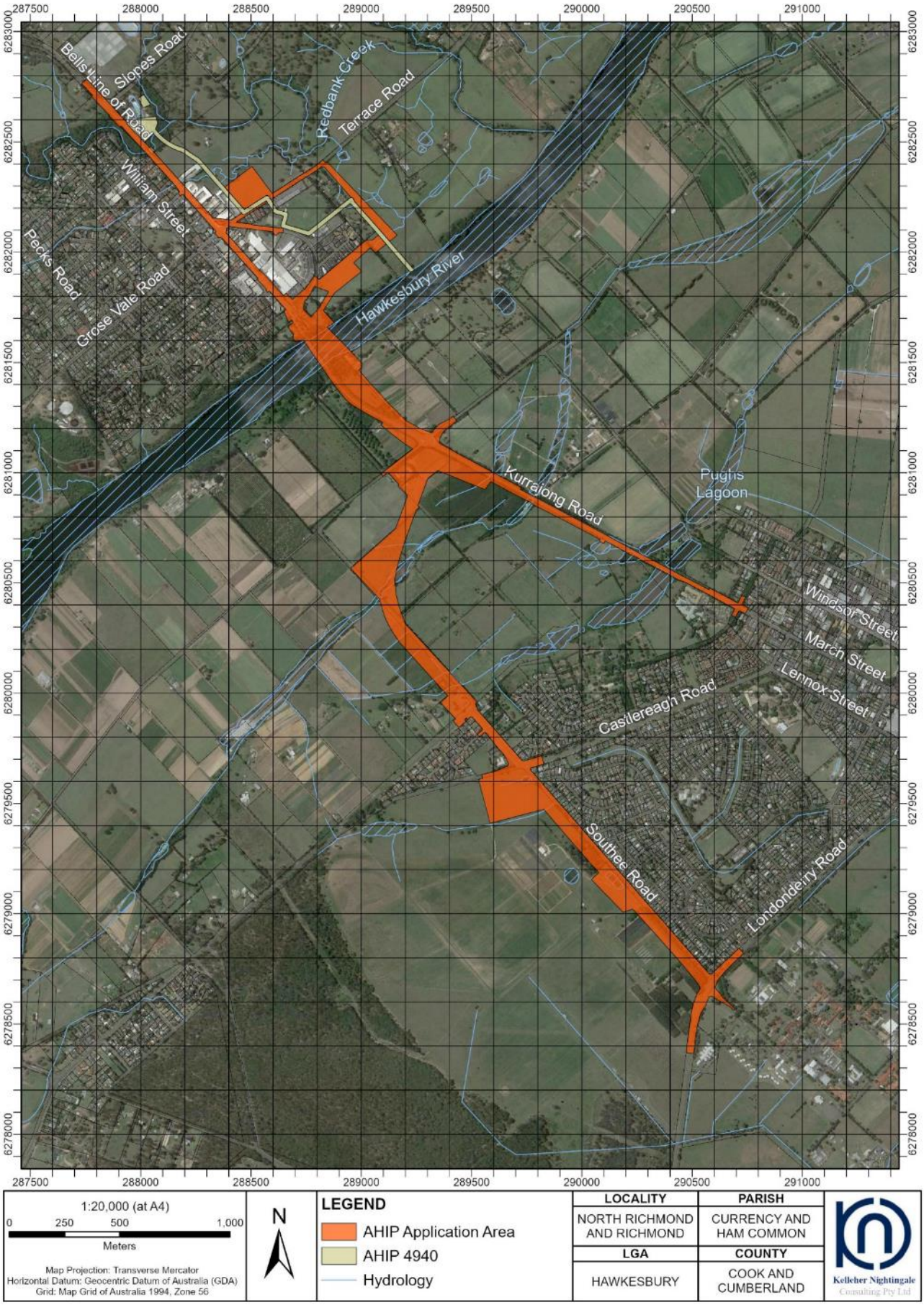

Figure 11. AHIP application area boundary

Glossary of Terms

Aboriginal Object (as defined in the NPW Act)	Any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction and includes Aboriginal remains.
Aboriginal Place (as defined in the NPW Act)	A place declared under s.84 of the NPW Act that, in the opinion of the Minister, is or was of special significance to Aboriginal culture.
Anvil	An object used as a stable base for producing stone artefacts. This will have percussion pitting from the impact of reducing an anvil rested core.
Artefact	Any object that has been physically modified by humans or that is unmodified but is out of its natural context and considered to have been brought to the location by humans (a manuport).
Attribute	A physical characteristic of an artefact
Backed Artefact	A tool made from a flake or flake fragment, with steep blunting retouch along one or opposite margin after the flake was removed from the core. Includes geometric microliths of various shapes and asymmetric Bondi points.
Backed Broken	Fragments of backed or partly backed flakes. Breakage often occurred during manufacture.
Backing Debitage	Small retouching flakes produced from the backing process using an anvil rested technique along its thick margin. May have bidirectional scars or a small distal cone from rebounding off an anvil.
Bipolar Core	A core reduced using the bipolar technique, being placed on an anvil and struck with a hammerstone.
Bipolar Flake	A flake with proximal and distal crushing produced by bipolar flaking technique. These may have a flattened ventral surface/bulb of percussion. Some flakes may only have crushing/step fractures at proximal end, having been removed before reaching the base of the core.
Bondi Point	An asymmetrical backed artefact which is widest at the proximal end and pointed at the distal end. The length of a bondi point is generally over twice the artefact width.
Bulb of Percussion	An attribute on the ventral surface of a flake during the detachment of the flake from a core by the movement of force from a blow applied to a single point. The bulb of percussion is characteristically a bulge which occurs just below the point of force application.
Bulbar (Éraillure) Scar	A scar on the ventral surface of a flake which sometimes occurs during the removal of the flake from a core by the force of percussion.
Chert	A fine rock of sedimentary origin, made up mostly of microcrystalline quartz, but sometimes with a chalcedony or opal component. Chalcedony is a microporous mass of silica. Includes banded varieties.
Cobble	An edge rounded stone more than 6.4 centimetres in size. e.g. core blank, hatchet blank, or hammerstone.
Colour	Recorded with particular reference to silcrete to determine if artefacts were heat altered material versus unheated stone.
Conchoidal	Exhibiting the characteristics of direct percussion such as a bulb of percussion or ripple marks
Cone-Split Broken Flake	A flake broken longitudinally through its point of force application (pfa) /cone. Retains some of the striking platform and point of impact. These are recorded as left or right half of the flake when viewing its ventral surface CSBF/Left, or CSBF/Right.
Conjoin	Two or more stone artefacts which are part of a knapping event that can be refitted to each other.
Core	Any stone used as a nucleus or blank for removing flakes large enough for use as implements. These must have negative flakes scars, although large retouched flakes used as cores may still retain a remnant ventral surface. Subsequent use as a core must intercept the old ventral surface. A core may be made on a cobble, pebble, flake, broken flake, flake fragment, heat shatter or naturally fragmented rock.

Core Flaking Pattern	The pattern of negative flake scars on cores, used to determine stone reduction strategies. Sometimes a core may have evidence of more than one flaking pattern. These include: • Unifacial – scars show that useable flakes have been removed one edge at a time in one direction. Sometimes reduction continued in this way after the core was rotated. Flakes should have a flat unmodified platform. • Bifacial – scars show that larger potentially useable flakes were struck off both opposing faces of an edge. Core edges often appear 'wavy' when viewed in plan. • Asymmetric alternating – tiny preparation flakes are first removed off the core platform, then larger useable flakes struck off the opposing face. The preparation scars can be seen on flakes with faceted platforms and are sometimes still present on abandoned cores or core fragments. • Bipolar – small negative step scars or crushing at opposing ends of a core, from it being rested on an anvil and struck with a hammerstone. There may also be a tiny distal cone on flakes, from the force rebounding off the anvil.
Core Fragment	Broken off a core, and still retaining technological attributes such as negative flake scars or core platform.
Core Tool	A core that also has evidence of tool use on its margins or ridges such as striations, edge rounding or polish.
Cortex	The natural outer weathering rind or surface of rock. This may be remnant on the dorsal surfaces of an artefact and is recorded as a percentage of the dorsal surface area.
Crazing	The surface of a heat affected rock which resembles cracked ceramic.
Crenate Fracture (CF)	Debitage with crenate fracture. This could be from heat shatter but may be from chemical weathering, particularly in chert or tuff artefacts
Culturally Modified Tree (as defined in the NPW Regulation)	A tree that, before or concurrent with (or both) the occupation of the area in which the tree is located by persons of non-Aboriginal extraction, has been scarred, carved or modified by an Aboriginal person by: • The deliberate removal, by traditional methods, of bark or wood from the tree, or • The deliberate modification, by traditional methods, of the wood of the tree.
Debitage	Material from the stone knapping process with no signs of subsequent modification.
Distal End	The termination of a flake opposite the bulb of percussion or point of applied force.
Distal Flake Fragment	A fragment of a flake that has been broken but distal termination (also termed distal fragment or distal flake). It does not have a distal termination.
Dorsal	The outside or back of a flake when removed from a core. The dorsal surface may have negative flake scars from previous flake removals and/or cortex
Fine Grained Siliceous (FGS)	Fine grained siliceous rocks which could not be positively identified without detailed mineralogical investigation.
Flake	A stone artefact that has been removed from a core. A flake has a proximal striking platform, point of force application (pfa), bulb of percussion and distal termination. Also may have a bulbar (éraillure) scar, ripple marks and fracture lines
Flaked Piece	An artefact that has evidence of flaking but no characteristics of a flake, broken flake, flake fragment, retouched flake or core can be discerned. Also referred to as an angular fragment.
Geometric Microlith	A type of backed artefact which is symmetrical in shape. They are often made from flakes with backing along truncated proximal and or distal ends.
Grinding Grooves	Oval shaped indentations on rock surfaces, such as sandstone outcrops which occurred as the result of the shaping and sharpening of ground stone artefacts.
Grindstone	A portable stone with linear striations and/or polish which shows that it has ground. Often made from fine grained sandstone or quartzite. May retain evidence of multipurpose use such as grinding of seeds, ochre.
Ground Stone Artefact	A stone artefact with an edge or surface that had been modified by grinding on another piece of stone. See Grindstone and Hatchet

Hammerstone	A stone used to strike a core for removal of flakes. Often spherical pebbles or cobbles with evidence of percussion pitting or spall scars on ends or margins.
Hatchet	A ground edged hatchet head or fragment. Should have evidence of intentional grinding e.g. linear striations/polish from shaping or resharpening the cutting edge. Hatchets were multipurpose tools and may also have evidence of hammer percussion or anvil use.
Heat Shatter (HS) Debitage	Debitage caused by heat shatter. May have evidence of potlidding from excessive heat stress and/or irregular heat fractured surfaces.
Hornfels	A medium to fine grained metamorphic rock. Includes a variety known as spotted pelitic hornfels with tiny dark clasts or grains.
Igneous	A range of rocks of mixed mineral composition formed after cooling of molten subterranean materials. Occur as intrusions into older rocks such as dykes, diatremes, or spread onto the land surface from volcanic activity. Includes varieties such as basalt, dolerite.
Knapping Floor	An area where a core was flaked/knapped to produce flakes and tools.
Length	A measurement of the distance between the platform and the termination of a flake.
Lustre	A subjective record of lustre of stone artefact, also relating to heat treatment.
Manuport	An unmodified piece of stone out of natural context and considered to have been brought to the site by humans.
Medial Flake Fragment (Med Frag)	A fragment of the mid-section of a flake with no platform or termination.
Medium Grained	A medium grained Siliceous rock of unknown type.
Midden	Also called shell midden. An area with the remains of edible shellfish which were discarded as the result of human procurement/consumption. May included fish and animal bones, stone artefacts and/or charcoal.
Mortar	A large base stone for grinding/pounding.
Modification/Activity Type	Refers to the activity associated with the lithic item e.g. debitage or waste from stone flaking, used as a hammer, anvil, core, bipolar core, retouched artefact, backed artefact.
Pebble	An edge rounded stone less than 6.4 centimetres in size. May have been used as core or small hammerstone.
Petrified Wood	Also called silicified or fossilised wood. Formed when trees were fossilised and their structure replaced by silica. Wood structure and growth rings are still visible as 'bands' within this material.
Platform Type	Records the type of platform on whole flakes or proximal flake fragments for information on flaking patterns and reduction strategies. These include: • Cortical – platform covered in cortex. Unifacial flaking. • Plain – platform is smooth flat surface. Unifacial flaking or unifacial with core rotation. • Ridged – platform has ridge from previous flake removal across core. Unifacial rotated or symmetric alternating (bifacial) flaking. • Scarred – platform has one or more flake scars. Symmetric alternating (bifacial) flaking or asymmetric alternating flaking. May indicate platform preparation. • Faceted – platform has multiple tiny flake scars struck from the dorsal. Indicates careful platform preparation. Asymmetric alternating flaking. • Focal – small platform less than twice the area of ring crack. • Crushed - platform has been crushed from force of flake removal but the rest of the flake is otherwise intact. The platform may have multiple step fractures. Bipolar or unifacial. • Indeterminate – platform is flawed, irregular, or partly collapsed with the remainder of the flake intact.

Potential Archaeological Deposit (PAD)	An area where no surface archaeological remains are present that has been assessed as having the potential to contain subsurface archaeological deposits on the basis of indicators which may include landform, distance to water and visible surface disturbance.
Proximal End	The striking end of a flake opposite the distal end or termination.
Proximal Flake Fragment (Prox Frag)	A fragment of a flake that has been broken but retains its proximal striking platform (also termed proximal fragment or proximal flake). It does not have a distal termination.
Quality	A record of the flaking quality of the stone. This is a subjective measurement based on how well the material flakes and the presence of flaws. Poor quality material may have large grains or internal flaws which may inhibit controlled reduction of the material. Certain fine grained material lacking in flaws or inclusions may have been preferred for its good flaking properties and selected for particular tasks or implement types e.g. precision cutting/slicing.
Quartz	A hexagonal crystalline form of silicon dioxide (SiO2). May occur as clear, white or coloured from mineral impurities. Can occur as single crystals, veins or geodes. Often has internal fractures or flaws.
Quartzite	Sandstone that had been metamorphosed by volcanic activity or recemented with silica in solution.
Raw Material	The type of stone out of which the artefacts have been made. See Chert, Silcrete and Quartz
Reduction Type	Refers to the technological aspects of reducing stone. For definitions on fracture mechanics and flake characteristics refer to work by Cotterell and Kamminga (1987) and Holdaway and Stern (2004). For non-debitage items it is used to describe the form of that item before it was modified or fractured e.g. a large flake may have been reflaked and used as a core to produce further useable flakes.
Retouched Artefact	A stone artefact with negative flake scars along its margins from intentional retouch after it was removed from the core. More recent scars show that the flakes removed were too small to have been used as tools. It could not always be determined whether these were intended for use as tools or were for core preparation.
Shape	Recorded for whole flakes and includes the following: • Wider than long (W>L) • Longer than wide (L>W) • Length equals width (L=W) • Elongate - length more than twice the width.
Silcrete	An indurated rock comprised of quartz grains cemented in a siliceous matrix.
Silicified Tuff	Also variously termed indurated mudstone, tuff or ryolitic tuff. A fine grained rock of volcanic ash or other fine sediments metamorphosed and consolidated with silica. Sometimes distinguished from chert by having a lack of lustre (Corkill 1999:45), although heat treatment may result in lustrous flaked surfaces (Flenniken & White 1983:43).
Site	An area where Aboriginal objects have been identified.
Size	The maximum or longest dimension of each item was recorded and entered as individual size classes of 5 millimetres (0-4mm, 5-9mm, 10-14mm, 15-19mm etc.).
Termination	Records the type of termination on whole flakes or distal flake fragments. Termination variation depends on the amount of force used, nature of the raw material and core morphology. These include: • Feather – A distal end which has a gradual thinning towards the termination • Hinge – A rounded termination • Plunging – A distal end containing the bottom surface of the core it was removed from • Step – A squared off termination
Thickness	A measurement of the distance between the dorsal and ventral faces of a flake at point where length and width measurements meet.

Tool	A stone artefact which has been modified into a formal type or used (expedient tool).
Usewear	An artefact with evidence of use such as striations, rounding or tiny edge fracture scars
Ventral Surface	The face of a flake which can be joined back to the core the flake was removed from. The ventral surface of a flake may exhibit the bulb of percussion, the ringcrack, ripple marks or fissures
Weight	Weight for each artefact was recorded using an electronic balance to the nearest 0.1g.
Width	A measurement at right angles to the length measurement of a flake, at the midpoint of the length

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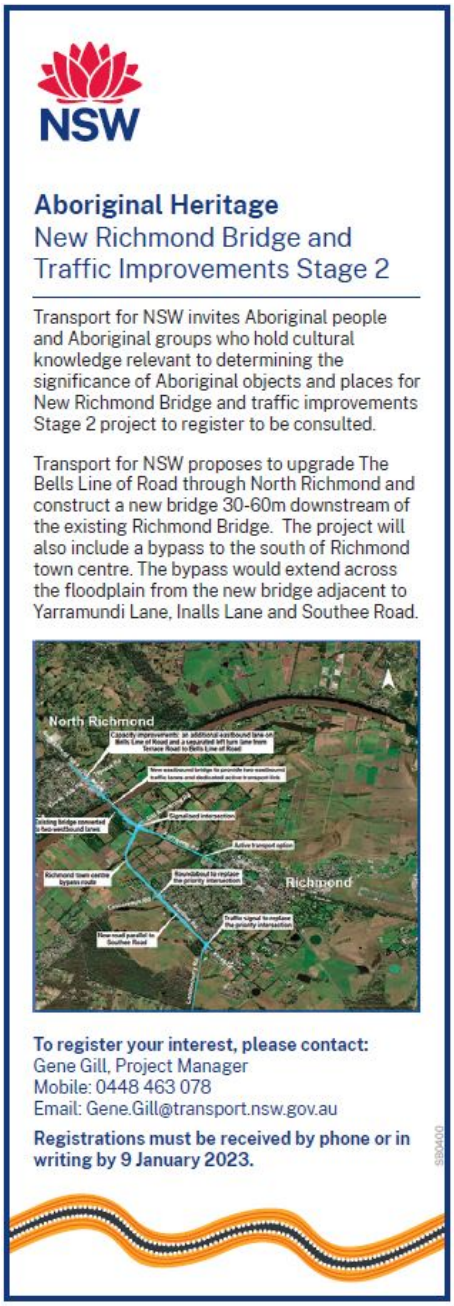
Appendix A Advertisement



NSW

Aboriginal Heritage
New Richmond Bridge and Traffic Improvements Stage 2

Transport for NSW invites Aboriginal people and Aboriginal groups who hold cultural knowledge relevant to determining the significance of Aboriginal objects and places for New Richmond Bridge and traffic improvements Stage 2 project to register to be consulted.

Transport for NSW proposes to upgrade The Bells Line of Road through North Richmond and construct a new bridge 30-60m downstream of the existing Richmond Bridge. The project will also include a bypass to the south of Richmond town centre. The bypass would extend across the floodplain from the new bridge adjacent to Yarramundi Lane, Inalls Lane and Southee Road.

To register your interest, please contact:
Gene Gill, Project Manager
Mobile: 0448 463 078
Email: Gene.Gill@transport.nsw.gov.au

Registrations must be received by phone or in writing by 9 January 2023.

Appeared in: *Hawkesbury Gazette* and *The Koori Mail*

Publication dates: Wednesday, 21 December 2022 and Wednesday, 11 January 2023

Appendix B Aboriginal Community Comments on Draft ACHAR

Contact

From: [redacted]
Sent: Tuesday, 23 April 2024 4:13 PM
To: Contact
Subject: Re: Draft CHAR Review and Invitation to AFG meeting - 2227 New Richmond Bridge - Baiyan CS

Hi

Bariyan Cultural Connections have read and reviewed the draft report for the Aboriginal Cultural Heritage Assessment Report for the proposed New bridge over the Hawkesbury River between Richmond and North Richmond NSW and we have no comments at this time.

We would like to attend the virtual AFG meeting on the 2nd may 2024 at 3pm.

Contact

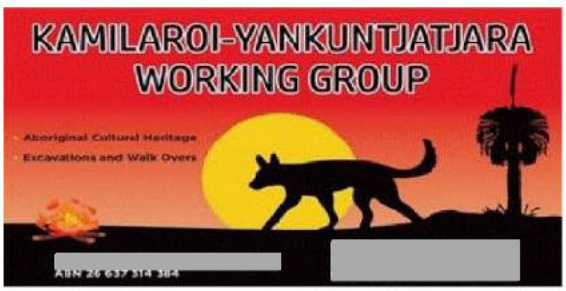
From: [redacted]
Sent: Tuesday, 7 May 2024 1:09 PM
To: Contact
Subject: RE: Draft CHAR Review and Invitation to AFG meeting - 2227 New Richmond Bridge - KYWG

Hi Zac,

Corrine from Transport call wanting a response so I emailed her the following response,

Thank you for your CHAR for New Richmond Bridge & Traffic Improvements, we would like to agree and support your recommendations. We look forward to working alongside you on this project.

Kind Regards
Phil Khan – Director
[redacted]
ABN 26 637 314 384



Sent from Mail for Windows

Contact

From: [redacted]
Sent: Friday, 3 May 2024 10:36 AM
To: Contact; Corrine Quinlan
Subject: Re: Draft CHAR Review and Invitation to AFG meeting - 2227 New Richmond Bridge - MBMAC
Attachments: New Richmond Bridge and Traffic Improvements_ACHAR_v0.3.pdf; Agenda - Aboriginal Focus Group - New Richmond Bridge and traffic improvements Stage 2.pdf; 4.4_MBMAC_180424.pdf

Hi Corrine
I have read the project information and draft char for the above project, I endorse the recommendations made.
Thanks
Darleen
[redacted]

Appendix C Salvage Excavation Methodology

Salvage Excavation Area
Salvage excavation would be undertaken at the following Aboriginal archaeological sites to mitigate the impacts of the proposed works:

- Terrace Road Redbank Creek AFT 1
- Norfolk Place Hawkesbury River AFT 1

Salvage Excavation Aims
The main aims of the proposed salvage excavation program are:

- To salvage a representative sample of the cultural deposit from the identified archaeological site prior to impact from the proposed works using established techniques (see Field Methods below).
- To analyse the salvaged archaeological material to gain and conserve knowledge and understanding of the scientific and cultural information exhibited by the site.
- To use the excavation results to gain insight into the subsurface archaeology of the adjacent areas not being impacted by the proposal. This would increase future educational opportunities and allow more informed management of Aboriginal heritage.

The further scientific aim of the salvage excavation program would be to determine the following characteristics of the subsurface cultural deposit:

- Subsurface integrity. Determining the integrity of the deposit involves assessing the degree of disturbance which is present.
- Statistical extent of the sites and/or activity areas. Determining the statistical extent of sites and/or activity areas involves identifying the boundaries associated with the identified archaeological deposit.
- Spatial distribution of the cultural deposit. Assessing the spatial distribution involves identifying the presence/absence of archaeological material across archaeological sites.
- Nature of the cultural deposit. The nature of the cultural deposit/archaeological site refers to the type of activities indicated by the artefactual material (e.g. primary production, domestic knapping, hunting camps). The goal would be to retrieve entire assemblages from specific activities if such activities are present.

Research Questions
The results of the proposed salvage excavation would increase our understanding of subsurface archaeology of the study area. In particular, research would focus on the archaeologically identifiable cultural activities that took place on landforms within the Redbank Creek and Hawkesbury River catchment area.

Question 1: Are cultural activities archaeologically identifiable at Aboriginal archaeological site Terrace Road Redbank Creek AFT 1 and Norfolk Place Hawkesbury River AFT 1?

Question 2: Do the artefacts recovered during the archaeological salvage excavation at Terrace Road Redbank Creek AFT 1 and Norfolk Place Hawkesbury River AFT 1 differ in raw material or artefact type to those recovered from other Aboriginal archaeological sites in the region and in particular, the Redbank Creek and Hawkesbury River catchment area? If so, are these differences likely reflective of a true dissimilarity in cultural activities between the landforms/sites? (Bearing in mind the different taphonomic and geomorphological processes operating on each site).

Question 3: What do the results indicate about the archaeology of similar landforms along the lower reaches of Redbank Creek and bordering the Hawkesbury floodplain? Do the sites display generalised or unique geomorphological or taphonomic features?

Question 4: Do the sites display any unique or distinguishing traits that may be the result of their location in a transitional shale/sandstone landscape?

In this context, taphonomic indicators are generalised to include biospherical process such as bioturbation and geomorphic features such as soil lenses and soil laminates as indicators of post-depositional factors affecting site formation.

METHODOLOGY

The salvage excavation would focus on the extraction of collections of artefacts related to activity areas and geomorphic information in order to address the research aims and questions specified on the preceding page. In this regard interpretation would not precede data collection.

The proposed archaeological program would systematically sample the identified salvage excavation areas using standard techniques with the outcome being a viable, robust and comparable sample. Analysis of the sample would follow, and interpretations would be made distinctly separate from the results.

It is anticipated that the salvage excavation program would be undertaken in two phases (Phases 1 and 2) as described in the following sections. It is anticipated that a maximum of 15 Phase 1 squares and a minimum of 25 Phase 2 squares (if warranted by the results of the Phase 1 excavation) would be excavated during the salvage excavation program for each site.

Field Methods

The salvage excavation would consist of a number of excavation squares, horizontally measuring one square metre that would be aligned to and positioned within a predetermined grid that encompasses the entire salvage excavation area.

The location of the excavated square would be accurately recorded on a surveyed plan of the archaeological salvage area. The coordinates from the northwest corner of each excavation square located at beginning and end of each Phase 1 transect or containing information bearing deposits (see below) would be recorded using handheld GPS receivers in the projected coordinate system: GDA 94 Zone 56.

Each excavation square would be excavated by hand until the basal layer, or a culturally sterile deposit is reached. The excavation squares would be excavated in stratigraphic units (Unit A, Unit B, etc.) were present or as a single unit (bulk) where stratigraphic units are not present. Soil horizons, disturbance and artefacts identified during the excavation of each square will be recorded on a detailed and standardised recording form.

Soil samples as well as thin section profiles (where feasible) would also be collected. Where possible, carbon samples will be collected and analysed for material relating to both the archaeology and geomorphology. Where appropriate cosmogenic and radiometric dating of soils and rock surfaces will be applied.

The sections of each excavation square will be photographed and contextual photographs showing the excavation square in relation to the overall salvage excavation area will be taken. The sections of excavation squares containing archaeological features will be accurately drawn and photographed.

All excavated deposit would be sieved using nested 5.0 millimetre and 2.5 millimetre sieves. Where potential micro-debitage is recovered 1.0 millimetre sieves will be utilised.

Phase 1

The first phase of the salvage excavation would comprise a series of excavation squares that would be excavated at 15 metre intervals along one or more parallel transects. The Phase 1 transects would be sited to investigate the subsurface deposit in relation to the spatial extent of lithics, geomorphological variations and subsurface disturbance.

The results of the Phase 1 excavation would be used to identify areas where Phase 2 salvage excavation would be appropriate. Statistical salvage following this method is highly beneficial because it creates a robust inter-site sample, sufficiently random, critical for regional comparative analysis.

Phase 2

The second phase of the salvage excavation would be undertaken if information bearing deposits were identified during the Phase 1 salvage excavation. Information bearing deposits are identified by triggers including:

- Significant quantities of artefacts
- Variations in raw material
- Unusual artefacts
- Chronological material. In this context chronologic material is anything that can be used to date artefacts or deposit: charcoal or charcoal bearing deposit (e.g., hearth ash), sandy deposit, gravels (e.g., aluminium feldspar).
- Taphonomic indicators.

Additional excavation squares, constituting an open area, will be excavated around information bearing deposits and aligned to the excavation grid. Phase 2 open area investigation would expand to encompass entire activity areas.

LITHIC ANALYSIS

Field Analysis

A preliminary analysis of recovered artefacts would occur on site during the salvage excavation. The analysis would record basic data, such as material type, number and type of artefacts, number of non-diagnostic fragments, and any significant depositional characteristics, such as conjoining artefacts, artefact fragmentation or heat damage for each excavated unit (stratigraphic or single/bulk unit) for each excavation square.

The purpose of the field analysis would be to establish a basic recording of artefacts retrieved and to allow on-going assessment of the excavation regime (e.g., whether higher stratigraphic resolution is required while digging).

Detailed (Laboratory) Analysis

Artefacts recovered during the excavation program would be further analysed offsite. The analysis would entail the recording a larger number of characteristics for each individual artefact. These details would be recorded in matrices suitable for comparative analysis (e.g., multivariate and univariate) of the excavated assemblage on a local and regional basis. A range of stone artefacts may be present, and the analysis would expand accordingly to account for artefact variability.

Information derived from this analysis; in particular the identification of specific artefact types and their distributions and associations; would be used to put together interpretations about how sites were used, where sites were located across the landscape, the age of sites and to assess cultural heritage values. By comparing different areas, it would be possible to determine whether there were differences in the kinds of activities carried out and if different activities were related to specific topographic features.

All information would be recorded in database form (MS Excel). For consistency, terms and category types would in large part be derived from Holdaway and Stern (2004). Minimum Number of Flake (MNF) calculations would be undertaken where applicable (although past experience indicates MNF calculations would not be required for this excavation program). A detailed explanation and glossary would be provided with the final excavation report.

The analysis of artefacts recovered during the salvage excavation program would be undertaken in a consistent and replicable fashion so as to permit the comparison of the entire excavated assemblage with data from other areas. This would also allow for an interpretation of the study area's archaeological significance.