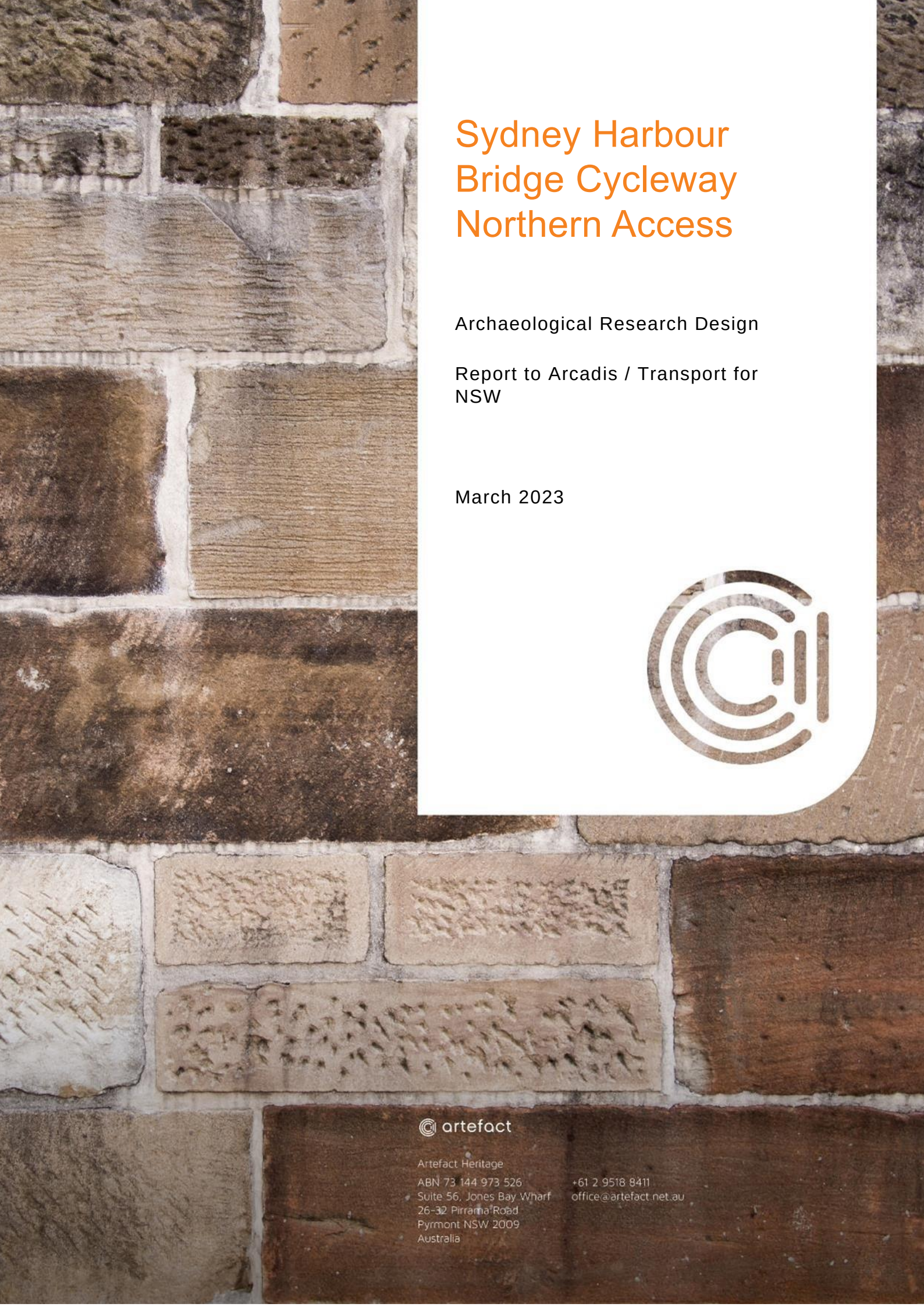
Appendix B: Archaeological Research Design



Sydney Harbour Bridge Cycleway Northern Access

Archaeological Research Design

Report to Arcadis / Transport for NSW

March 2023

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1	9 March 2023	Sandra Wallace	Sandra Wallace	9 March 2023	First draft
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1.0 INTRODUCTION

1.1 Proposal background

The NSW Government is committed to cycling as a key mode of city-serving, sustainable infrastructure. Active transport infrastructure provides positive community health, amenity and environmental outcomes. Active transport involves walking, cycling and other physical modes of travel. The NSW Government is looking to address continued access and safety constraints, and find ways to encourage more people to cycle, to develop active, healthy and carbon neutral ways to move across the metropolis.

The Sydney Harbour Bridge cycleway route is a critical link in the metropolitan Sydney regional bike network connecting the proposed North Shore cycleway on the Pacific Highway with the existing Kent Street cycleway in the Sydney Central Business District (CBD). Over the last decade, a rolling average of just under 2,000 cyclist trips have been completed each weekday on the Sydney Harbour Bridge cycleway making it one of the busiest links in the Metro Sydney Bike Network. However, the current step access to the heavily used Sydney Harbour Bridge cycleway is not easily accessible and prevents many customer groups from using the facility, and its usage has decreased over time despite a significant growth in bike purchases and uptake in the recent years. The step access and safety barriers create a bottleneck that would prevent the cycleway from meeting projected demand.

The proposal is required to not only improve safety and accessibility for cyclists and pedestrians, but also to support the future growth in the number of cyclists travelling between the Lower North Shore, North Sydney CBD and Sydney's CBD. The proposal would provide a linear ramp for cyclists to access the Sydney Harbour Bridge cycleway more easily; and a safer, separated connection on Alfred Street South from Burton Street to the existing bike network on Middlemiss Street. The proposal is part of a suite of projects that aim to make it easier for people to access and use the Sydney Harbour Bridge. Other proposals include upgrades of the Sydney Harbour Bridge's southern cycleway access and the recently completed pedestrian access lift on the northern and southern sides of the Sydney Harbour Bridge pedestrian pathway.

Following extensive consultation and design development, Transport for NSW is upgrading the existing cycleway connection between the Sydney Harbour Bridge northern cycleway and the bike network at Milsons Point. Artefact Heritage has been engaged by Arcadis on behalf of Transport for NSW to prepare a Statement of Heritage Impacts (SoHI) for the submission of an application for Section 60 (S60) approval under the NSW *Heritage Act 1977* (Heritage Act).

The SoHI identified that the proposal footprint has the potential to contain the following significant archaeological resources:

- High potential for locally significant archaeological remains associated with the residential and commercial development of North Sydney prior to the construction of the Sydney Harbour Bridge.

This report provides an historical archaeological research design (ARD) and methodology for managing potential archaeological remains during excavation works associated with the proposal.

1.2 Study area, proposal footprint and description

The proposal is located on Cammeraygal land and is in Milsons Point, within the North Sydney Local Government Area (LGA). The proposal is bounded by Middlemiss Street to the north, the Sydney Harbour Bridge to the east, Fitzroy Street to the south and Alfred Street South to the west.

Key features of the proposal would include:

- A design-led approach to the integration of new cycling infrastructure with its existing significant open space and heritage setting
- A new elevated linear bike ramp, with deck about three metres wide and about 200 metres in length between the Sydney Harbour Bridge Cycleway and Bradfield Park North including:
    - Steel ramp structure with deck incorporating Designing with Country motifs, and balustrade with integrated lighting
    - Precast columns carefully sited within Bradfield Park North and Central
    - Provision of a bike riders rest area next to the Sydney Harbour Bridge Cycleway connection
    - A gathering space , lighting and cycle path within Bradfield Park North connecting the elevated linear bike ramp and the proposed Alfred Street South cycle path
- Alfred Street South pedestrian and cycle path upgrade including:
    - New 2.5-metre-wide two-way cycle path on Alfred Street South from the ramp landing, linking to the existing bike network in Middlemiss Street. The cycle path would be located on the east side of Alfred Street South between the ramp landing and the new street crossing at 110 Alfred Street South. On the west side of Alfred Street South the cycle path would be located between the new crossing and Lavender Street
    - Replacement of the existing pedestrian refuge crossing at the north end of Alfred Street South with a pedestrian and bike rider crossing located near 110 Alfred Street South and an upgrade to the pedestrian crossing at Lavender Street
    - Low speed shared path and verge widening on the north side of Lavender Street
    - Adjustments to the Lavender Street roundabout
    - New street tree planting, shrub planting and footpath paving
    - Relocation of the existing bus stop on Alfred Street South near Lavender Street about 60 metres to the south of its current location
    - Permanent removal of up to 15 parking spaces along Alfred Street South.

The proposal, would also include, but not be limited to:

- Kerb and pavement work, and line marking
- Drainage and utility adjustments
- Street furniture adjustments
- Changes to street parking, parking meter locations and regulatory signage
- Minor lighting upgrades to Bradfield Park North and in other locations where required to meet safe lighting standards.

Construction of the proposal would take around 18 months and, subject to planning approval, is expected to commence late 2023.

Key terms used in this ARD are defined in the REF and include:

- Proposal footprint: includes the area of direct impact and a 10-metre buffer from the design, as well as the proposed temporary ancillary facility located the Bradfield Park Bowling Green at Alfred Street South.
- Study area: generally includes an area of 50 metres either side of the centre of the proposal footprint; and includes the maximum possible extent of a potential ancillary facility site (Refer to Figure 1).

The proposal footprint and study area are shown in Figure 2.

Figure 1: Overview of the proposed elevated bike ramp (Courtesy: Aspect, 2022)

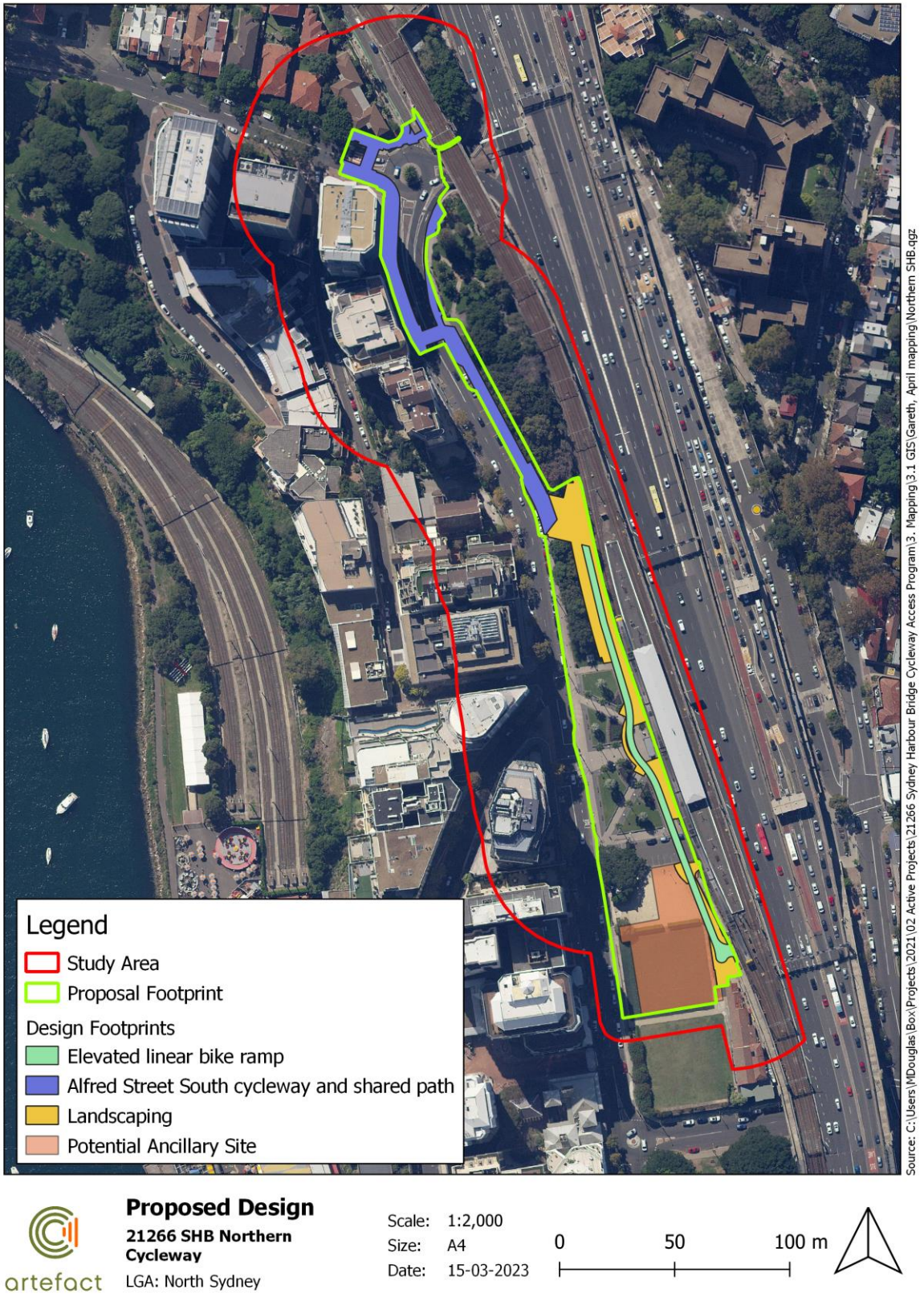


Figure 2: Overview of the proposal footprint and the study area

1.3 Limitations

This ARD has been prepared based on the detailed design developed for the Sydney Harbour Bridge Cycleway finalised in February 2023. This design does not include project staging for work, or outline demolition or constructability methodologies.

Methodologies for works have been inferred where possible, and the proposed excavation methodology provides a broad series of management methodologies that would be adapted to specific scopes of construction work once the construction scope and timing has been determined.

Proposed cores into the existing cycleway slab at the bridge deck level for the new connection are not considered to have the potential to result in archaeological impact and have not been assessed in this document.

The following key reports were used to inform this SOHI:

- *Sydney Harbour Bridge Northern Cycleway Access Urban Design and Heritage Framework* (Cox Architecture, 2021)
- *Sydney Harbour Bridge Geotechnical Studies SOHI* (Artefact, 2018)
- *Scoping Design Report for Cycleway Options* (TZG, SMM and Aurecon, 2021)
- *Sydney Harbour Bridge Cycleway Access Project – North: Supplementary Detailed Heritage Framework* (TZG, 2021)
- *Sydney Harbour Bridge Cycleway Access Program Stage 1: Northern Access Final Business Case* (Transport for NSW, 2021)
- *Sydney Harbour Bridge Cycleway Northern Access Planning Pathway and Environmental Risk Assessment Memo* (Transport for NSW, 2019)
- *Sydney Harbour Bridge Conservation Management Plan* (GML Heritage, 2021).
- *Sydney Harbour Bridge Cycleway Design Report* (Aspect, 2023)

1.4 Report authorship and acknowledgments

This report was prepared by Stephanie Moore (Senior Associate) and Jenny Winnett (Principal) and with input from Dr Iain Stuart (Excavation Director) and Josh Symons (Technical Director). Management input and review was undertaken by Josh Symons (Technical Director) and Dr Iain Stuart (Excavation Director).

2.0 STATUTORY CONTEXT

2.1 Introduction

This section discusses the heritage management framework, notably legislative and policy context, applicable to archaeological management of the proposal footprint and study area.

2.2 NSW Heritage Act 1977

The NSW Heritage Act provides protection for items of 'environmental heritage' in NSW. 'Environmental heritage' includes places, buildings, works, relics, movable objects or precincts considered significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. Items considered to be significant to the State are listed on the SHR and cannot be demolished, altered, moved or damaged, or their significance altered without approval from the Heritage Council of NSW.

2.2.1 State Heritage Register

The SHR was established under Section 22 of the Heritage Act and is a list of places and objects of particular importance to the people of NSW, including archaeological sites. The SHR is administered by Heritage NSW, and includes a diverse range of over 1,500 items, in both private and public ownership. To be listed, an item must be deemed to be of heritage significance for the whole of NSW.

For works to an SHR item, a Section 60 application must be prepared for works that are not exempt under Section 57(2) of the Heritage Act.

The following State significant sites listed on the SHR are located within the study area (see Figure 3):

- Sydney Harbour Bridge, approaches and viaducts (road and rail) (SHR #00781)
- Milsons Point Railway Station Group (SHR #01194).

2.2.2 'Relics' provisions

The Heritage Act also provides protection for 'relics', which includes archaeological material or deposits. Section 4 (1) of the Heritage Act (as amended in 2009) defines a relic as:

> *"...any deposit, artefact, object or material evidence that:*
>
> *a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and*
>
> *b) is of State or local heritage significance"*

Sections 139 to 145 of the Heritage Act prevent the excavation or disturbance of land known or likely to contain relics, unless under an excavation permit. Section 139 (1) states:

> *A person must not disturb or excavate any land knowingly or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a*

relic being discovered, exposed, damaged or destroyed unless the disturbance is carried out in accordance with an excavation permit.

However, note that Section 139 (3) does not states “This section does not apply to a relic that is subject to an interim heritage order made by the Minister or a listing on the State Heritage Register”.

Therefore some parts of the project area will require a permit under Section 139 whereas other area being listed on the State Heritage Register require a different permit.

Excavation permits are issued by the Heritage Council of NSW, or its Delegate, under Section 140 of the Heritage Act An application for an excavation permit must be supported by an ARD and Archaeological Assessment prepared in accordance with the NSW Heritage Division archaeological guidelines. Minor works that would have a minimal impact on archaeological relics may be granted an exception under Section 139 (4) (applicable to non-SHR listed sites) or an exemption under Section 57 (2) of the Heritage Act (applicable to SHR listed sites).

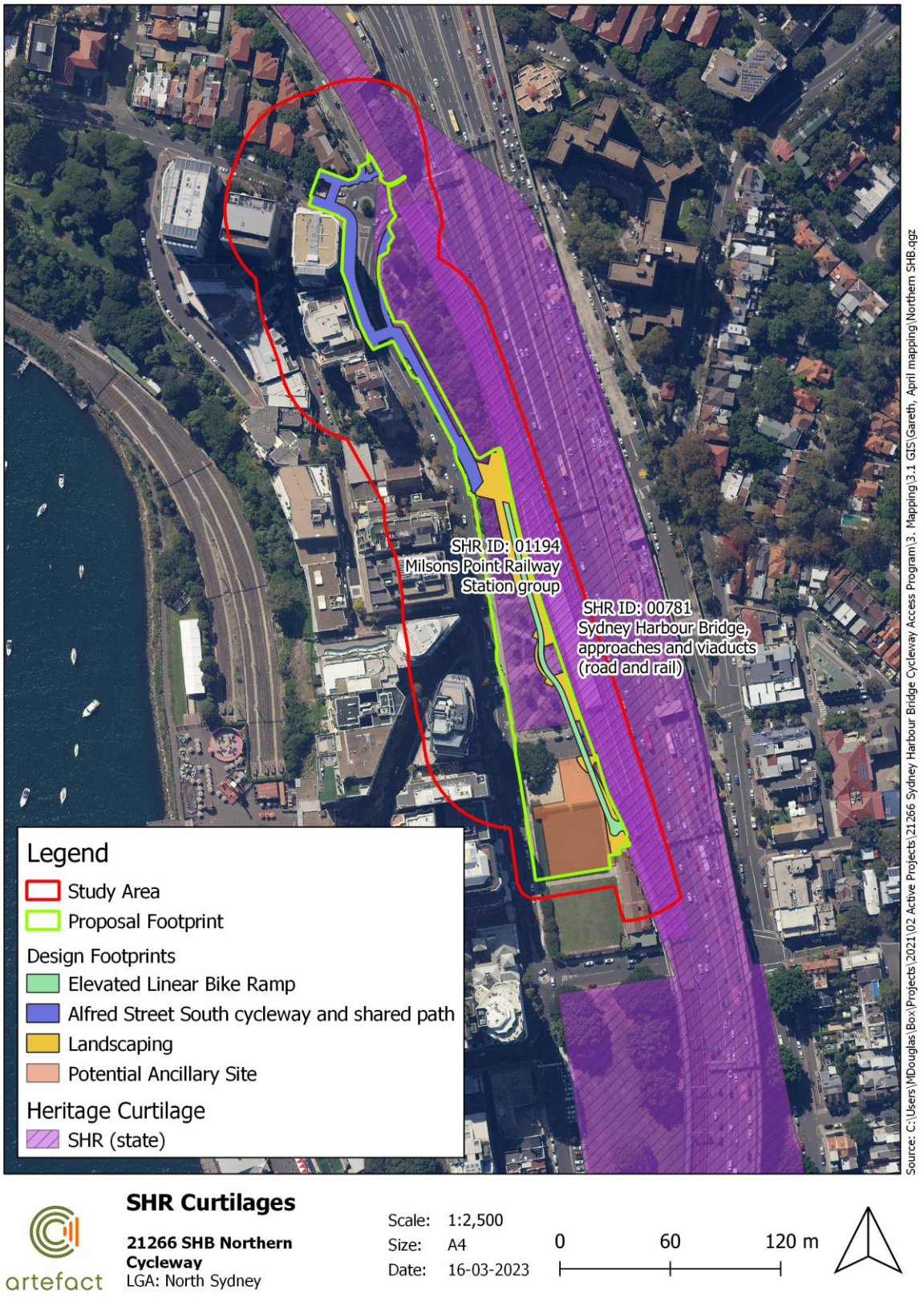


Figure 3: Overview SHR curtilage with the study area and proposal footprint

3.0 ARCHAEOLOGICAL CONTEXT

3.1 Introduction

This section discusses the proposal footprint potential to contain historical archaeological resources. The potential for the survival of archaeological remains is significantly affected by activities which may have caused ground disturbance. This assessment is therefore based on consideration of current ground conditions, and analysis of the historical development of the proposal footprint .

'Archaeological potential' refers to the likelihood that an area contains physical remains associated with an earlier phase of occupation, activity or development of that area. This is distinct from 'archaeological significance' and 'archaeological research potential'. These designations refer to the cultural value of potential archaeological remains and are the primary basis of the recommended management actions included in this document.

3.2 Historical phases for the site and potential

There are four identifiable phases of development for the proposal footprint , which may be present in the archaeological record:

- Phase 1: Early land grants (1800 – 1861)
- Phase 2: Residential and commercial development (1861 – 1920s)
- Phase 3: Resumption and major construction (Sydney Harbour Bridge) (1920s – 1932).
- Phase 4: Minor Changes to Bradfield Park Area (SHB) (1940s – 2016).

3.2.1 Phase 1: Early land grants (1800 – 1861)

Phase 1 relates to the earliest European developments in the area, and the early period of settlement at Milsons Point. The proposal footprint was originally part of a land grant of 120 acres to Robert Ryan. The ownership of the land passed through multiple landowners before being acquired by Robert Campbell. The land to the north beyond the line of Willoughby Street was granted to John Milson by Governor Bourke on the 10th August 1824. Milson also leased part of the 120 acres from Campbell. Milson's residence was located outside the study.

The northern portion of the study area likely to have been used for grazing prior to subdivision, as indicates by a plan of the area dating to 1840-49 (Figure 5) showing a barn, yards and calf pens (outside the study area). A new road appears to have been formed within the proposal footprint leading from Lane Cove and St Leonards to a new steam punt wharf. The central portion of land within the proposal footprint is labelled as having been a quarry.

Archaeological remains from this period are likely to consist of ephemeral evidence of land clearing and pastoral activities, such as tree boles, burnt stumps, furrows and irrigation channels, post holes from fence lines, and charcoal patches and isolated artefact scatters from informal camps. There is potential for evidence of earlier road alignments. However, any road during this phase would have likely been an informal dirt or gravel track, which are poorly visible within the archaeological record.

Subdivision of this land is likely to have occurred from the mid 1850s (Figure 4). A plan dating to c.1840 (see Figure 6) illustrates the following within the proposal footprint:

- Informal roads and paths

- Lane Cove Road in a state of disrepair, perhaps in the process of being formalised. Substantial holes and a 'swans groove' (i.e. narrow water channel) are labelled
- A tank in the northern portion of the cycleway footprint
- Quarry workings
- Residence on land owned by Samuel Truman (west of cycleway footprint)
- Residence on land belong to Samuel Howard and Francis Howson
- A 'small structure' on land owned by an individual called 'Landers' (see Figure 6)

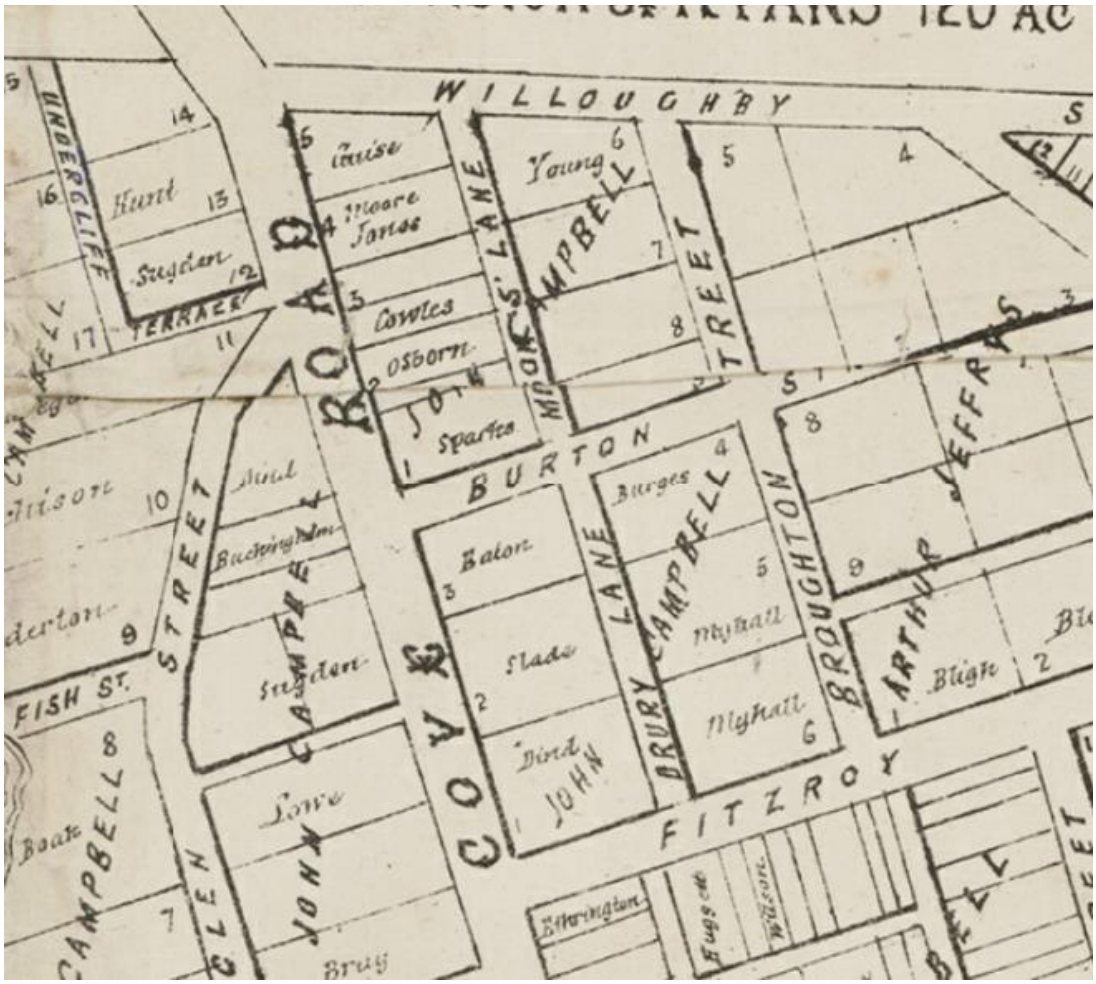


Figure 4: Detail from 1859 subdivision plan of the North Shore c. 1859 showing land ownership within the study area. Source: SLNSW M3 811.14/1859/1

3.2.2 Phase 2: Residential and commercial development (1861 – 1920s)

Development in the area increased after the establishment of the North Shore Steam Ferry Company in 1861. This facilitated the construction of a formalised road network and services, including the establishment of Alfred Street (originally called Lane Cove Road) in 1861. During this time the land to the north on Milsons grant underwent a difference process of development to the land south of Willoughby Street which was held under different ownership.

A plan of Milsons Point in 1868 shows that by this time there were several dwellings located within the proposal footprint with several cottages and residences along the eastern side of Alfred Street. The road network within the proposal footprint is seen to comprise Alfred Street and Milson Street to

the east, both running along a north-east axis, intersected by Willoughby Street to the north, Burton Street and Fitzroy Street to the south.

By 1891, a Water Board plan of the area indicates the east side of Alfred Street had been considerably developed, featuring cottages, terraces and freestanding residences. Sources from this period indicate that these structures within the proposal footprint were largely associated with the working-class community of Milsons Point, and comprised a combination of commercial and residential dwellings (Sands Directory 1886). Historical photographs illustrate that numerous structures within the proposal footprint were raised on stone foundations due to the sloped topography leading south along Alfred Street towards the harbour. A tramline is seen to have been established along Alfred Street.

Archaeological remains from this phase are likely to consist of stone or brick footings, yard surfaces, evidence of lot boundaries, and occupation-related deposits. Archaeological remains of properties established prior to the provision of reticulated water and municipal garbage collection in the late nineteenth century could possibly include cesspits, privies, wells or cisterns. Due to the presence of municipally provided waste management towards the end of the nineteenth century, deposits containing artefacts would be less likely in archaeological remains dating from this time onwards. Potential archaeological remains from Phase 2 could also include the remains of roads demolished to make way for the Sydney Harbour Bridge including the section of Willoughby Street between Alfred Street and Broughton Street, and Milson Street which was located between Alfred Street and Broughton Street. Remains associated with these roads could include evidence of the road surfaces, kerbing, drainage and associated deposits.

A plans dating to 1868 (Figure 7) illustrate the following within the proposal footprint :

- Structures on allotments on the eastern side of Lane Cove Road owned by John Guise, Samuel Truman and William Eaton. All allotments are granted, not all are shown as containing structures.

A Water Board plan dated c.1891 (Figure 8) indicates that the proposal footprint has undergone substantial alteration in the previous 20 years. Many of the former buildings have been subdivided and some lots contain semi-detached dwellings with narrow backyards. The proposal footprint included the following:

- The cycleway passes through the rear yards of several properties, including the footprint of what are likely to be privies, external kitchens and outbuildings.
- Burton and Willoughby Streets are still present, although many of the informal paths and roadways present on earlier plans are no longer depicted.

3.2.3 Phase 3: Resumption and major construction (Sydney Harbour Bridge) (1920s – 1932)

There appears to have been no further developments within the proposal footprint until construction started for the Sydney Harbour Bridge. At this time the proposal footprint was resumed by the government, the workers terraces and cottages were demolished, and the immediate area was excavated for the construction of the retaining wall of the Sydney Harbour Bridge northern approaches. Historical photographs and drawings indicate there was a natural slope towards the southern end of the proposal footprint , and that many of the buildings within the proposal footprint were elevated on stone foundations and in some cases constructed on levelled sites.

Since the construction of the Sydney Harbour Bridge approaches, the main notable developments within the proposal footprint involve the upgrade of landscaping in Bradfield Park.

Archaeological remains in the area would primarily consist of the backfill deposits associated with the Sydney Harbour Bridge. The installation of the services and landscaping works at Bradfield Park may have resulted in localised impacts to accumulated archaeological deposits and artefacts.

3.2.4 Phase 4: Minor Changes to Bradfield Park Area (SHB) (1940s – 2016)

After the Bridge opened in 1932 the facilities such as sheds connected to the construction of the Bridge were removed. This presented North Sydney Council with an opportunity to address the needs of the local community for recreational facilities on the now-vacant land. In 1935, following much public discussion and pressure exerted by various influential public figures including Alderman Primrose, an area of nearly 14 acres from the Harbour Bridge residues at Milsons Point was vested in the North Sydney Council for the purpose of parks and recreation. Council named the park Bradfield Park after J J C Bradfield, Chief Engineer of the Harbour Bridge construction. This causes some confusion with the similarly named Bradfield Park in Lane Cove.

A comprehensive plan for the layout of the proposed park was developed by Council's engineers and adopted in 1934. Some of the features constructed under the Plan including pathways and various tree plantings still apparent today.

In 1950 a group of North Sydney bowlers belonging to the Gallipoli Legion Memorial Bowling Club in Loftus Street, Sydney, received permission from North Sydney Council to clear the central area of Bradfield Park and establish bowling greens and a clubhouse. In 1994, Kirribilli Ex-Service Club amalgamated with Gallipoli Legion Memorial Bowling Club and the 20-year lease, commenced in 1981, was transferred to the Kirribilli Ex-Service Community and Bowling Club Limited. The Club did not seek a new lease when the lease expired in 2001.

The construction of the Sydney Harbour Tunnel 1988 – 1992 resulted in the lower section of Bradfield Park being partitioned off and used as a construction depot.

Improvements and upgrading work carried out in the Park have been in accordance with the Bradfield Park and Kirribilli Foreshore Master Plan. The upgrading of Bradfield Park North and enhancement of the adjacent Burton Street Tunnel was undertaken in 2003. Bradfield Plaza was created in 2006, and a new children's playground was completed in 2007. Also in 2007, the interpretive 'Bradfield Park Heritage Walk' was created based on the results of archaeological monitoring of the landscaping work in 2003.[1]

The majority of elements associated with this phase remain extant. The proposal footprint therefore has nil to low potential to contain archaeological remains associated with Phase 4.

[1] The preceding paragraphs are edited from the history of Bradfield Park in North Sydney Council. Bradfield Park Plan of Management. North Sydney Council (North Sydney: 2014), p8-9.

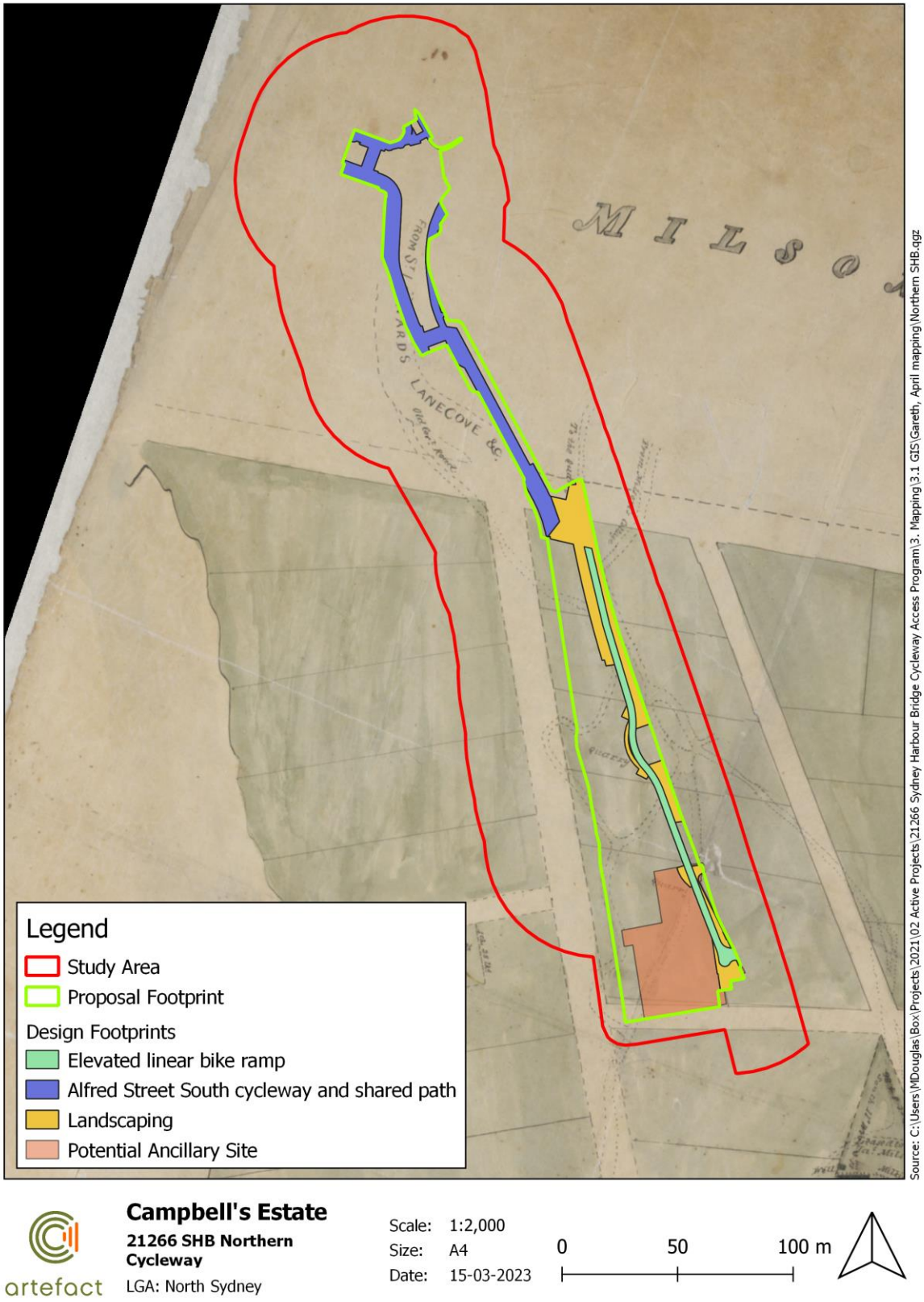


Figure 5:Detail from plan of Robert Campbells Estate, c. 1840. Source: NLA Map F 903

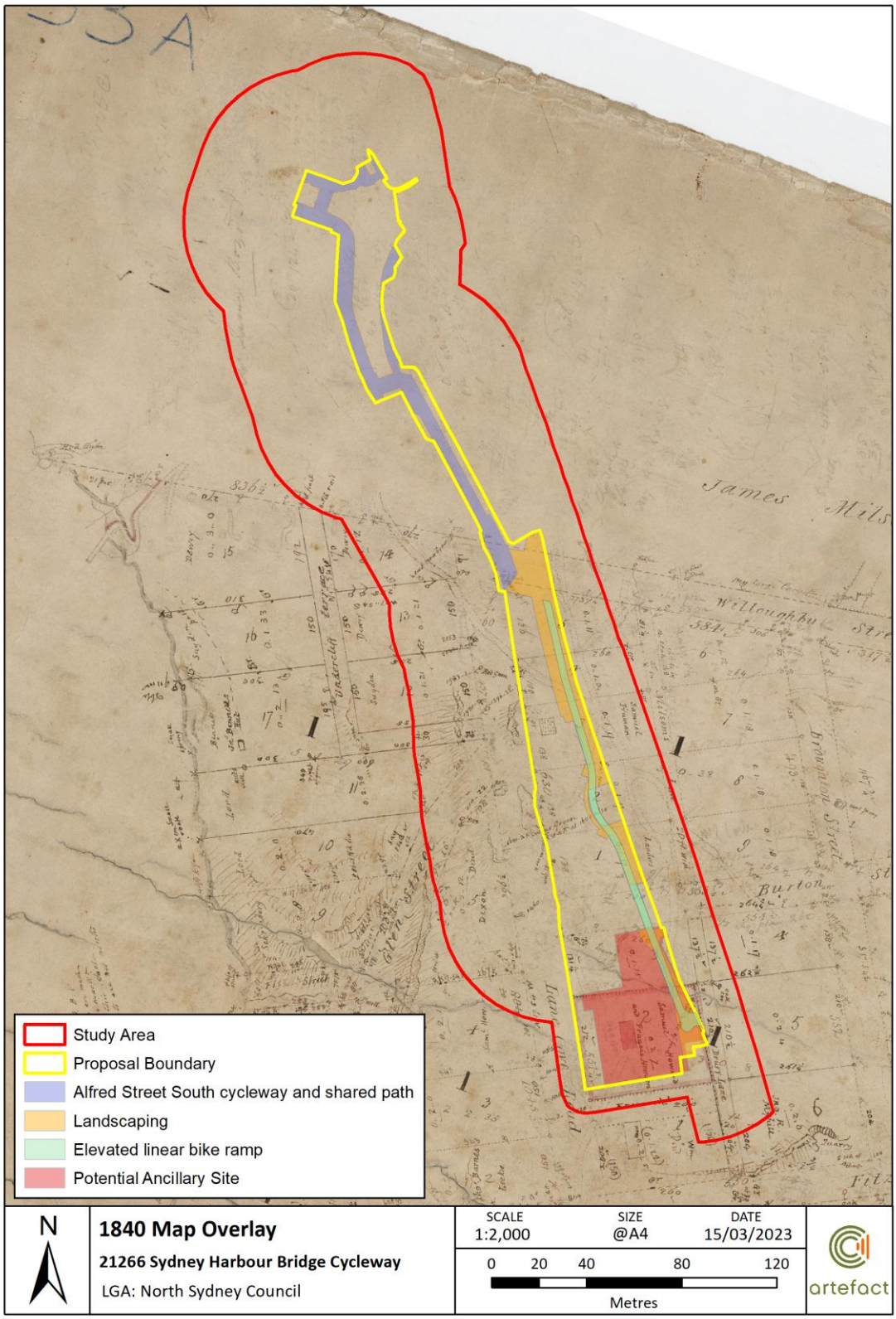


Figure 6: Detail from cadastral manuscript map of allotments and land grants in Milson's Point and Kirribilli, Sydney prepared by John Armstrong, c. 1840. Source: SLNSW Maps/0219

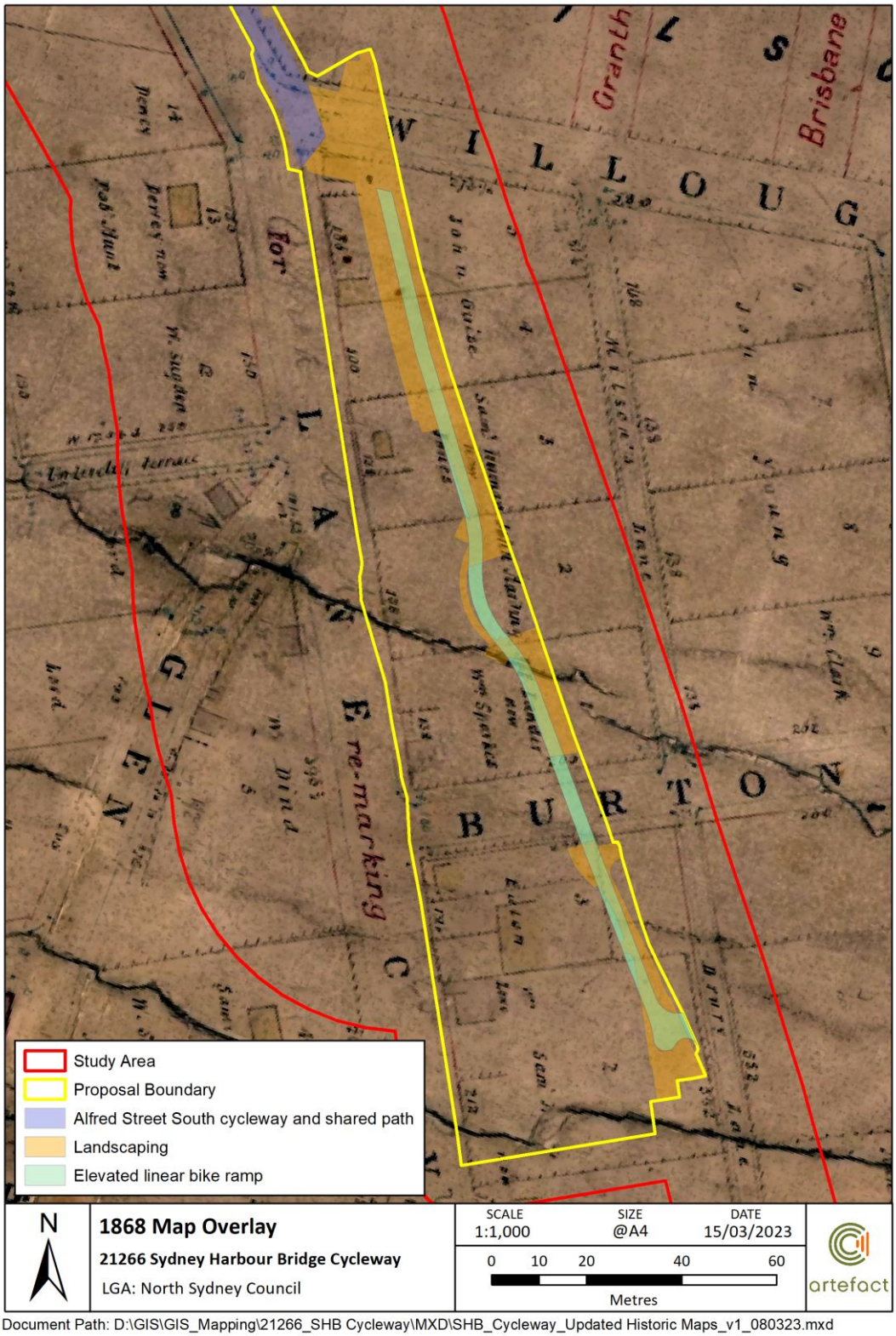


Figure 7: Detail from Plan of Streets in the East St. Leonards from 1868 showing extent of development. within proposal footprint. Source: NSW Land and Property Information, Historical Lands Records Viewer

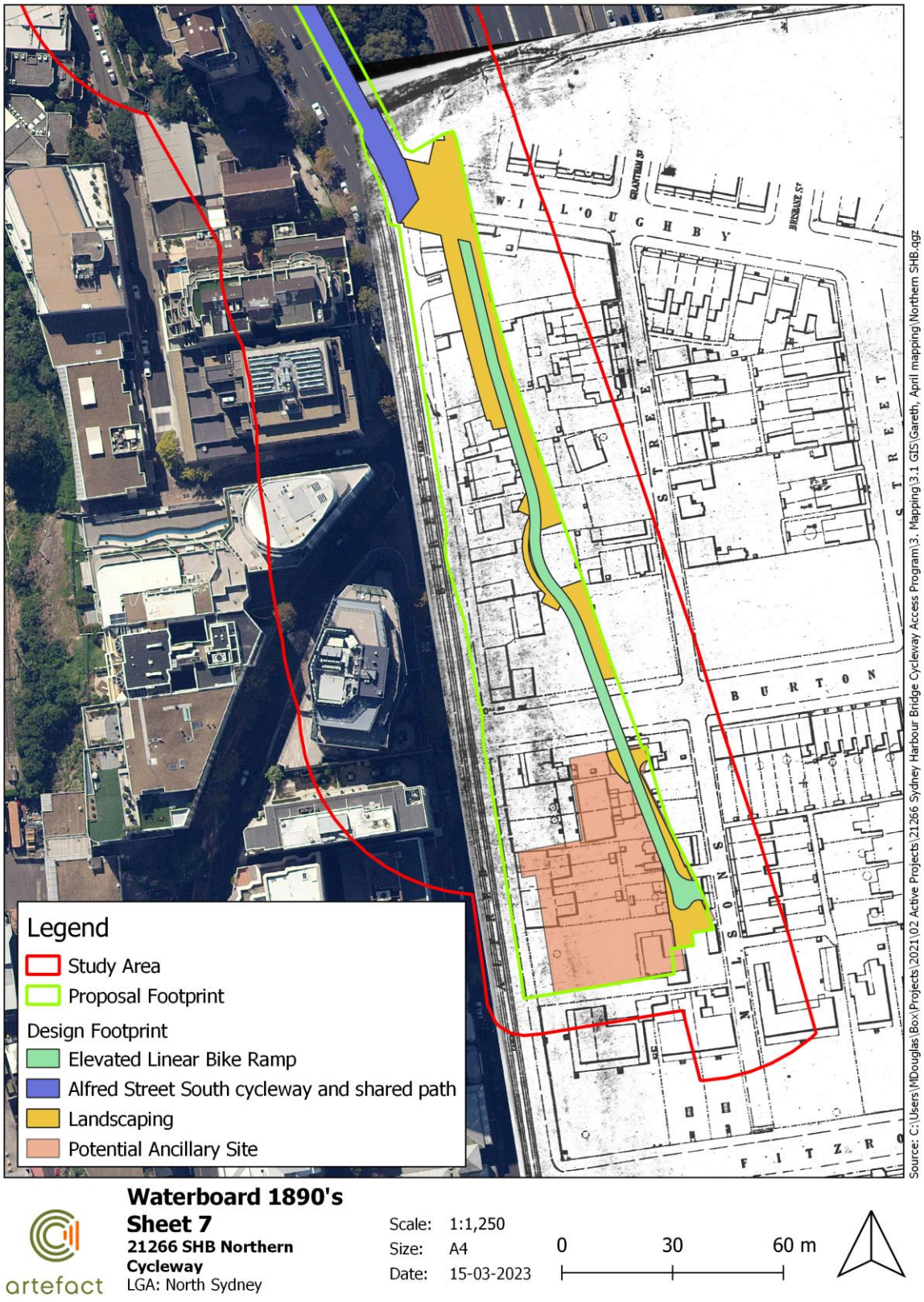


Figure 8: Detail from the Water Board block plan; North Sydney Sheet No 7, c. 1891. Source: Stanton Library

3.3 Guiding investigations and documents

In 2001 landscaping work was proposed in Bradfield Park and following preliminary reporting by HLA-Envirosciences (Di Fazio 2001) landscaping proceeded until archaeological remains were encountered which triggered and archaeological response. Dr Iain Stuart from HLA-Envirosciences was the Excavation Director. The reports generated by these works are discussed below.[2]

3.3.1 Di Fazio, 2001: Bradfield Park North, Milsons Point Archaeological Assessment

An archaeological assessment was completed by Di Fazio from HLA-Envirosciences in 2001 as part of an Assessment of Heritage Impact for the proposed landscaping upgrades to Bradfield Park North. The assessment concluded that due to the evidence of demolition and subsequent use of the site for construction works, which involved heavy disturbance combined with levelling and dumping of soil from outside the site, archaeological material was likely to have been removed or damaged. The assessment identified that some structural remains of the residential buildings, such as basements and foundations, may remain intact.

3.3.2 HLA Envirosciences 2003: Statement of Heritage Impact – Sandstone Walls: Bradfield Park North, Milsons Point

During landscaping works carried out in Bradfield Park in 2003, the remains of sandstone walls were identified and recorded by HLA Envirosciences. The SOHI was prepared to allow works to proceed within the curtilage of the Sydney Harbour Bridge. The sandstone walls were determined to date to the late 1800s and were an intact part of the original boundaries surrounding the residence located at 115-117 Alfred Street. The SoHI found the remains met the following criteria:

> Criterion (a)The archaeological remains are demonstrative of an earlier phase of urban development within Milsons Point and the wider North Sydney precinct. The walls are physical evidence that a number of 19th century residences existed on the site which were resumed and demolished as part of the Sydney Harbour Bridge construction.
>
> Criterion (e)The archaeological remains have some potential to yield information about the previous residential and commercial occupation of Milsons Point prior to the construction of the Sydney Harbour Bridge transport link.

The SoHI identified the sandstone walls as having “moderate” heritage significance at a local level in the context of the overall established significance of Bradfield Park. The following conclusions were made:

- The sandstone walls date to the late 1800s, an early period of occupation in Milsons Point.
- The walls are an intact part of the original boundaries surrounding the residence located at 115-117 Alfred Street.
- The walls are surviving elements of North Sydney’s history.
- The walls are part of the original layout associated with the early structures of Alfred Street, Milsons Point and are indicative of an initial phase of use of Bradfield Park.

The following statement of significance was provided for the sandstone walls: *The surviving stone walls are significant through their ability to demonstrate that the construction of the bridge had both a*

[2] Dr Iain Stuart pers com 2023

positive and negative impact on the North Shore community. The walls demonstrate that the Bridge resulted in the destruction of established houses and other buildings at Milsons Point.

3.3.3 HLA Envirosciences 2003: Section 65a Research Design Cesspit or Well, Bradfield Park North, Milsons Point

During landscaping works carried out in Bradfield Park, the remains of a cesspit or well were exposed in July 2003. Following uncovering of these remains, a Section 65a was provided as an amendment to the original Section 60 approval for the project, with a research design accompanying the application prepared by HLA Envirosciences. The cesspit or well was located approximately 60 metres to the north of the Milsons Point Station entrance, positioned between the two previously identified sandstone walls. The cesspit or well was assessed as being associated with the existing established significance of Bradfield Park, being reflective of the occupation and use of Bradfield Park, and as having local significance under Criterion E.[3]

The features were investigated to a total depth of 50cm. Glass bottles and other artefacts were identified in the removed fill (Figure 9). The remainder of the cesspit/well deposit was retained in situ.

Figure 9: Surface of the cesspit or well, with bottles removed from uppermost fill layer

3.3.4 AHMS 2006, Archaeological Excavation, Bradfield Park Plaza, Bradfield Park South at Milsons Point, NSW

In 2005 construction works approximately 80m to the south of the current study area exposed archaeological remains. These were investigated and assessed by AHMS, who identified brick footings and overlying full deposits associated with late 19th century domestic structures. These were interpreted as being the remains of two of the terrace houses shown lining Lewington Lane on the

[3] HLA Envirosciences 2003 Section 65a Research Design: 'Cesspit or Well, Bradfield Park North, Milsons Point' pp5-6.

1891 “Sydney Water Block Plan.”[4] (see Figure 10). Following the completion of archaeological recording, works proceeded. It is unclear if the remains have been retained in situ.

Figure 10: View west across the excavated area, the buildings identified during the excavation are indicated by a blue (the building that was fully cleaned and recorded) and a red arrow (the partially cleaned and recorded building). These footings are made from white dry pressed bricks and bonded by cement mortar. Source: AHMS 2006

3.3.5 Conclusions

Previous archaeological investigations within the proposal footprint have been undertaken in response to planned landscaping within Bradfield Park. This work has been limited to discrete areas being impacted. No overarching salvage excavation has been undertaken, and Reduced Levels (RL’s) on exposed archaeological remains were unable to be identified during preparation of this report. These investigations demonstrate that archaeological deposits and structural remains are likely to exist within the uppermost c. 1m within Bradfield Park. Archaeological remains uncovered by HLA Enviroscience have been retained in situ (uppermost 50cm of the well/cesspit has been removed).

3.4 Assessment of archaeological potential

Based on historic plans and aerials, and after analysis of potential archaeological features within the landscape, it is evident that the proposal footprint originally contained numerous structures associated with the residential development of North Sydney prior to the changes in street layout that occurred in preparation for and during construction of the Sydney Harbour Bridge.

The results of previous archaeological investigations in the proposal footprint, primarily those undertaken by HLA Enviroscience in Bradfield Park North, demonstrates that the proposal footprint has high potential to contain substantially intact archaeological resources associated with Phase 2. The integrity of exposed remains suggests that archaeological resources associate with Phase 1 are

[4] AHMS, letter report prepared for Hamish McLachlan ‘Re. Archaeological Excavation, Bradfield Park Plaza, Bradfield Park South at Milsons Point, NSW.’ 9 January 2006

also likely to be retained within Bradfield Park. A subdivision plan from c1859 (Figure 4) indicates that residential subdivision and development was relatively advanced by the mid-19th century (see Figure 6). The plan does not include details showing the location of cesspits, wells or outbuildings that would almost certainly have been associated with the main structures depicted. As the study area passes through the former rear yards of this early subdivision, the project has moderate potential to encounter archaeological evidence associated with structures/features of this type associated with Phase 1.

Table 1 provides a summary of the potential for identifying intact, legible archaeological remains related to former structures and historical land use described in the previous section.

Table 1: Historical phasing for the proposal footprint

Phase	Potential archaeological remains	Potential
Phase 1 (1800 – 1861)	Evidence of low impact pastoral activities, early road construction and quarry activity i.e. tree boles, burnt stumps, furrows and irrigation channels, post holes from fence lines, evidence of early road construction, backfilled depressions associated with quarrying activity. Evidence of early residential development including: • Cesspits, wells • Undocumented outbuildings, external kitchens. Evidence of early utilities: • Tank illustrated on the 1840s plan • Swan groove/evidence of water management in Lane Cove Road	**Moderate**
Phase 2 (1861 – 1920s)	Evidence of the residential and commercial development of the proposal footprint including: • Brick and/or stone footings • Postholes associated with fence lines, house stumps • Brick pads showing the location of posts • Areas of beaten earth, remnant tile, stone or brick paved flooring, evidence of timber flooring in the form of remnant joists and/or bearer impressions • Brick chimney bases and hearths • Paved areas showing the location of former verandahs • Wells, cisterns, privies and/or cesspits associated with artefact bearing backfill and accumulated deposits • Rubbish pits • Artefact bearing garden soils • Early road surfaces, drainage and kerbing associated with Burton and Willoughby Streets. Remains of residences along Alfred Street may also be present and are known to have been excavated in the north of the park (HLA 2003).	**High**
Phase 3 (1920s – 1932)	Backfill deposits from the SHB construction.	**High** (nil for relics (outside SHR curtilage))
Phase 4 (1940s – 2016)	Minor development works on Bradfield Park	**Nil – low** (extant)

3.5 Assessment of archaeological significance

Heritage or 'cultural' significance is defined in the Burra Charter' as: 'Aesthetic, historic, scientific, social or spiritual value for past, present and future generations'.[5]

Delineating the cultural significance of a place or an item assists in identifying what aspects of the place contribute to that significance. An understanding of the significance of the place is crucial to its management in providing guidance for future work and to ensure the significance is retained.

The Heritage Office (now Heritage NSW) developed a set of seven criteria detailed in the NSW Heritage Manual to provide the basis for an assessment of heritage significance of an item or place.[6]

If an item meets one of the seven heritage criteria, and retains the integrity of its key attributes, it can be considered to have heritage significance. The significance of an item or potential archaeological site can then be assessed as being of local or state significance. If a potential archaeological resource does not reach the local or state significance threshold, then it is not classified as a relic under the Heritage Act.

'*State heritage significance'*, in relation to a place, building, work, relic, moveable object or precinct, means significance to the State in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.

'*Local heritage significance'*, in relation to a place, building, work, relic, moveable object or precinct, means significance to an area in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.

The specific nature of archaeological resources necessitates that they be assessed independently from aboveground and other heritage elements because of the challenges associated with the often-unknown nature and extent of buried archaeological remains. A significance assessment is usually formulated based on anticipated attributes. Consideration of archaeological research potential is required when undertaking a significance assessment of a historical archaeological site. To facilitate assessment of archaeological significance, the former Heritage Office arranged the seven heritage criteria into four groups and provide further directions and guidelines in Assessing Significance for Historical Archaeological Sites and 'Relics'.[7] The following assessment has been prepared using the 2009 guidelines.

3.5.1 Assessment against the NSW heritage assessment guidelines

The assessment of the significance of the potential archaeological resource contained within the proposal footprint against the NSW heritage assessment criteria is outlined below.

Table 3: Consideration against NSW heritage assessment criteria

Criterion	Discussion
A) an item is important in the course, or pattern, of NSW's cultural or natural history (or the local area)	Phase 1 dates to the earliest European settlement of the North Shore. As historical research suggests that there was little development on the Campbell and Milson grant and that it was primarily used for agricultural pursuits, it is unlikely that this phase would have produced any substantial archaeological remains. Archaeological remains associated

[5] Australia ICOMOS 2013, 'Australia ICOMOS Charter for Places of Cultural Significance (The Burra Charter).
[6] Heritage NSW 2001, NSW Heritage Manual 'Assessing Heritage Significance' p.9
[7] Heritage NSW 2009, Assessing Significance for Historical Archaeological Sites and Relics.

Criterion	Discussion
	with land clearance, quarrying and grazing activities would be ephemeral in nature. The potential for archaeological evidence from this phase is nil-low. Any intact remains would be locally significant for their ability to contribute to our knowledge of the early development and occupation of Sydney's North Shore. Archaeological remains from Phase 2 are primarily associated with the residential development of the proposal footprint during the mid to late nineteenth century. Substantial remains from this phase may have research potential associated with the development of the North Shore during this period, analysis of which may provide insight into the preferences and ways of life of the working-class community of Milsons Point at this time. Archaeological remains may also provide information on the material expressions of the relative isolation of the north shore prior to construction of the bridge, and differences compared to the CBD. The relatively short occupation of the site between the 1860s and the 1920s could offer a 'snapshot' of life prior to the easy access to the city and the acceleration of development. If intact archaeological remains are located, they would be locally significant. Phase 3 is associated the SHB construction. Whilst this was a momentous event in the course of Sydney's history, archaeological remains of this phase would primarily consist of backfill deposits and would not hold any notable historical importance. As such, potential archaeological remains within the proposal footprint would meet the threshold for listing under this criterion at a local level.
B) an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the local area)	The proposal footprint was part of the grant provided to Robert Campbell and then to James Milson, both well-known local figures. However, the ephemeral nature of the remains from Phase 1 means it would be difficult to directly associate them with the lives of Campbell or Milson. Archaeological remains associated with Phase 2 would be unlikely to hold strong or special association with any individuals or groups of historical importance. Phase 3 is associated with the SHB construction. Whilst this was a momentous event in the course of Sydney's history, archaeological remains of this phase would primarily consist of backfill deposits. These deposits do not hold any research potential and would not be of any significance. As such, potential archaeological remains within the proposal footprint would not meet the threshold for listing under this criterion at a local or State level.
C) an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area)	Research indicates that potential archaeological remains within the proposal footprint would not possess any notable aesthetic or technical significance. As such, potential archaeological remains within the proposal footprint would not meet the threshold for listing under this criterion at a local or State level.

Criterion	Discussion
D) an item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons (or the local area)	Archaeological remains associated with Phase 1, Phase 2 and Phase 3 may be of interest to members of the local Milsons Point and broader Sydney community. However, it is unlikely that this association would be considered as particularly strong or special. As such, potential archaeological remains within the proposal footprint would not meet the threshold for listing under this criterion at a local of State level**.**
E) an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the local area)	Phase 1 dates to the earliest European settlement of the North Shore. As historical research suggests that there was little development on the Campbell and Milson grant and that it was primarily used for agricultural pursuits, it is unlikely that this phase would have produced any substantial archaeological remains. Archaeological remains associated with land clearance, quarrying and grazing activities would be ephemeral in nature. The potential for archaeological evidence from this phase is nil-low. Any intact remains would be locally significant for their ability to contribute to our knowledge of the early development and occupation of Sydney's North Shore. Archaeological remains from Phase 2 are primarily associated with the residential development of the proposal footprint during the mid to late nineteenth century. Substantial remains from this phase may have research potential associated with the development of the North Shore during this period, analysis of which may provide insight into the preferences and ways of life of the working-class community of Milsons Points at this time. Archaeological remains may also provide information on the material expressions of the relative isolation of the north shore prior to construction of the bridge, and difference with the CBD. The relatively short occupation of the site between the 1860s and the 1920s could offer a 'snapshot' of life prior to the easy access to the city and the acceleration of development. If intact archaeological remains are located, they would be locally significant. Phase 3 is associated the SHB construction. Archaeological remains of this phase would primarily consist of backfill deposits. These deposits do not hold any research potential and would not be of any significance. As such, potential Phase 3 archaeological remains within the proposal footprint would meet the threshold for listing under this criterion at a local level.
F) an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the local area)	Archaeological remains from Phase 1 and Phase 2 are associated with the early development of European settlement of Sydney's North Shore. Whilst historically significant, these remains would not be uncommon or particularly rare as similar sites exists within Milsons Point. As such, potential archaeological remains within the proposal footprint would not meet the threshold for listing under this criterion at a local or State level.

Criterion	Discussion
G) an item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places or cultural or natural environments (or the local area)	Research indicates that potential archaeological remains within the proposal footprint would not possess any notable representative significance. As such, potential archaeological remains within the proposal footprint would not meet the threshold for listing under this criterion at a local or State level.

Consideration of archaeological research potential is also required when undertaking a significance assessment of an historical archaeological site. In *Assessing the Research Significance of Historic Sites* (1984), Bickford and Sullivan developed three questions to gauge significance:[1]

The following responses answer the questions posed by Bickford and Sullivan regarding the proposal footprint overall.

- Can the site contribute knowledge that no other site can?
    - The potential archaeological resource may contribute to our knowledge of the early development and occupation of North Sydney
- Can the site contribute knowledge that no other resource can?
    - Similar sites have been subject to considerable archaeological analysis in recent years. However, in terms of a comparison between the historical archaeology of the Southern Bridge abutments in The Rocks vs. the archaeology preserved in Bradfield Park there is the potential for the proposal footprint to contribute information that no other resource can do.
- Is this knowledge relevant to general questions about human history or other substantive questions relating to Australian history, or does it contribute to other major research questions?
    - This archaeological resource is likely to contribute insight or data that would provide insight into Australian history, and respond to research questions relevant to the local area.

3.6 Statement of archaeological significance

The proposal footprint has the potential to contain an archaeological resource associated with early agricultural land use and the residential development of the suburb of Milsons Point. Intact archaeological remains may provide information regarding domestic life, agricultural development, living conditions and the growth of the local economy from the late nineteenth century to the early twentieth century.

Archaeological remains are likely to consist of footings associated with former structures. As previously identified by HLA, the proposal footprint also has potential to contain archaeological relics

[1] Bickford, A. & S. Sullivan, 1984. Assessing the Research Significance of Historic Sites. In: Sullivan S. & S. Bowdler (eds.) *Site Surveys and Significance Assessment in Australian Archaeology* (Proceedings of the 1981 Springwood Conference on Australian Prehistory), Department of Prehistory, Research School of Pacific Studies, The Australian National University, Canberra, p. 23–24.

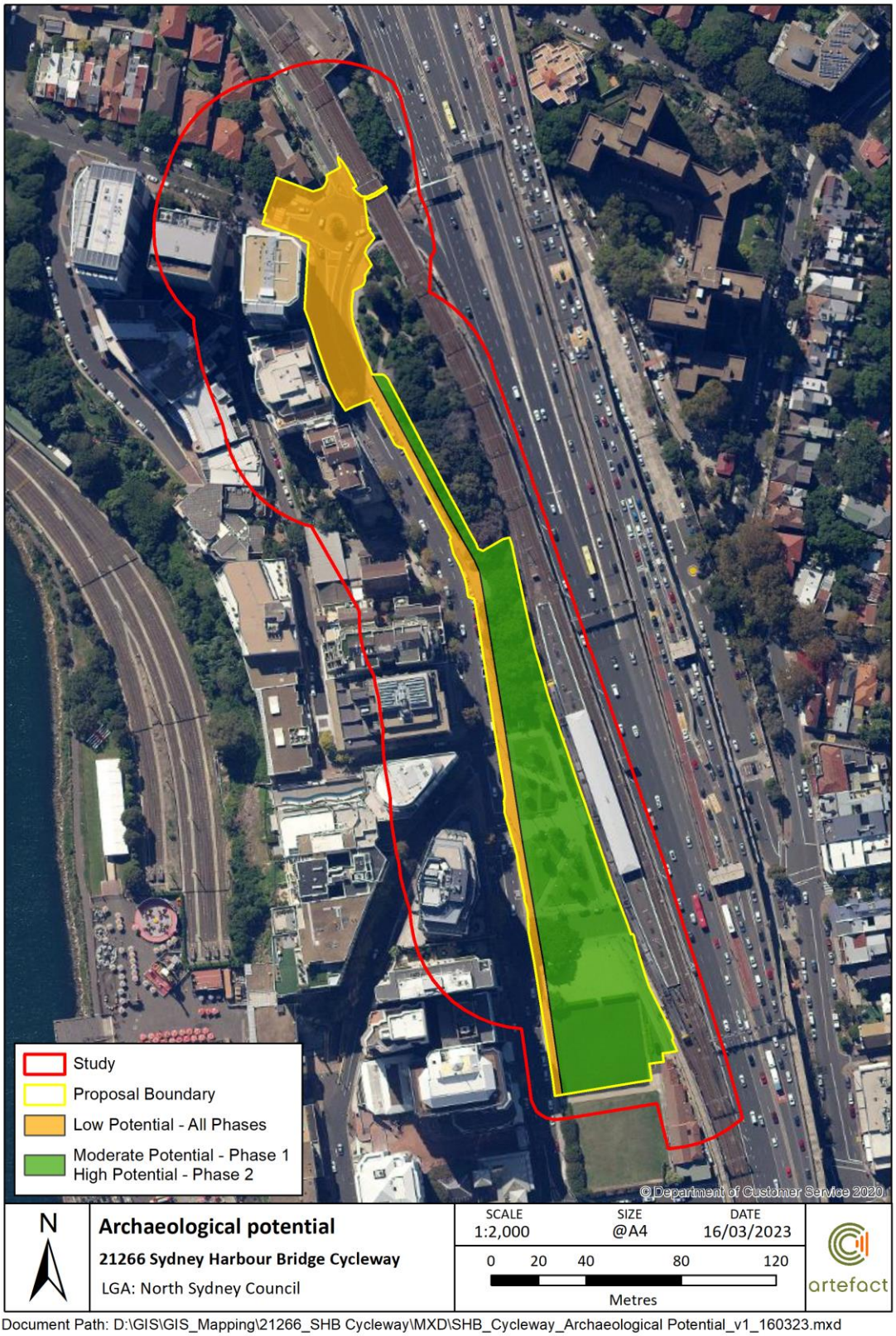
in the form of backfilled artefact-bearing deposits within decommissioned wells and former garden soils.

If any intact remains of this type are located, they may reach the threshold for local significance under criteria A and E.

A summary of the potential archaeological resource is summarised below and in Figure 11.

Table 2: Archaeological potential summary for the proposal footprint

Phase	Potential	Significance
Phase 1 (1788 – 1860s)	Moderate	Local
Phase 2 (1860s – 1920s)	High	Local
Phase 3 (1920s – 1930s)	High	Unlikely to reach the threshold of local significance
Phase 4 (1940s – 2016)	Nil/low	None (extant)



Document Path: D:\GIS\GIS_Mapping\21266_SHB Cycleway\MXD\SHB_Cycleway_Archaeological Potential_v1_160323.mxd

Figure 11: Overview of archaeological potential

4.0 ARCHAEOLOGICAL RESEARCH DESIGN

4.1 Introduction

Contextual analysis is undertaken to place the history of a particular site within relevant historical contexts, in order to gauge how typical or unique the history of a particular site actually is. This is usually ascertained by gaining an understanding of the history of a site in relation to the broad historical themes characterising Australia at the time. Such themes have been established by the Australian Heritage Commission and the NSW Heritage Office and are outlined in synoptic form in New South Wales Historical Themes, issued by the NSW Heritage Office.

The Statement of Significance in Section 3.6 in combination with the NSW Historical Themes below,[8] provide the basis for the following research design framework. The development of a robust research design is fundamental to the practise of historical archaeology. As valuable archaeological resources become increasingly scarce, the results of fieldwork should contribute insight into the processes that have shaped an area.

4.1.1 Summary of relevant themes

After considering the history of the proposal footprint , three relevant historical themes were identified. Each theme will be discussed in turn to contextualise the site history and identify potential archaeological evidence.

Table 3: Historic themes for the potential archaeological resource

Australian Theme	NSW Theme	Comments
Building settlements, towns and cities	Utilities	The area of proposed impact may include undocumented privies, water tank, wells, cistern or decommissioned stormwater services.
Building settlements, towns and cities	Accommodation	The area of proposed impact has the potential to contain archaeological evidence associated with former residences and outbuildings in the form of building footings, artefacts within rubbish pits and wells/cesspits and/or yard deposits.
Developing Australia's cultural life	Domestic life	The area of proposed impact has the potential to contain archaeological evidence associated with life within the former residences in the form of artefacts scatters and/or building footings.

4.2 Research questions

The significance of a potential archaeological resource lies in its ability to respond to research agendas in a meaningful way, rather than duplicating known information, or information that might be more readily available from other sources such as documentary records or oral history. Therefore, the aim of the following research questions is to ensure that the proposed archaeological investigation is focused on genuine research needs and will contribute meaningfully to the project and archaeological practise more broadly.

[8] Heritage Council of NSW 2001

The overarching research aim of the proposed archaeological program is to be able to interpret the archaeological results in terms of broader research themes. The intention is to compare the results of the program, wherever possible, to results from other relevant sites, projects and current research agendas, and therefore into broader research frameworks.

General research questions regarding the integrity of the potential archaeological resource include:

- What physical evidence of former structures, landscape modifications and features survive in the area?
- If present, where do these lie within the stratigraphic context?
- At what depth below the current ground level do these remains exist?
- What is the integrity of these remains? Have they been truncated by later development or agricultural practises and if so, to what extent?
- What contexts, phases and imported/redeposited fill layers are evident (within the constraints of the test excavation)? Do these support evidence obtained from cartographic resources?
- Does the site contain in situ artefact bearing deposits that may be considered to be 'relics'?
- Is there evidence for land use or occupation other than that identified within the historical record?

Early plans indicate that the proposal footprint contained several residences associated with the mid to late 19th century development of the proposal footprint. The proposal footprint has the potential to contain unrecorded structures typically found within rear yards such as cisterns, cess pits, privies and wells.

Any drainage features, cisterns, outbuildings (including cesspits) and water infrastructure identified have the potential to contribute to our understanding of the types of amenities available in the early to late 19th century, as well as the adaptation of infrastructure to the local landscape.

Artefact deposits may be found in rubbish pits, decommissioned cesspits and wells, or within yard deposits.

Evidence of domestic occupation and identity would relate to the NSW Historic Theme of 'Domestic life', 'Accommodation' and 'Utilities'.

Potential research questions relating to the lifeways of these individuals include the following:

- Is there evidence that the residents were engaged in recreational activities? (gaming, smoking, sewing, etc)
- What food were the residents of the buildings consuming? Is there evidence of the cooking methods, brand or food preferences?
- What evidence is there of gardens, and the layout and use of the yard areas?
- How do the archaeological remains compare to other sites excavated in the Sydney CBD, the Rocks and the inner suburbs of Sydney? Is the site typical of an early to mid 19th century residential site, or do the remains provide information that is rare in the regional context?
- Can we compare the archaeology of the Rocks with Milsons Point and if so what is the result? Can we see two different urban forma and cultures reflected in the built form or archaeological remains of material culture.

- Does the archaeological resource provide insight into activities split along gender or age lines? Is there evidence for the presence of women and children? Does the resource provide information about family dynamics in early north Sydney?
- Does the archaeological resource provide evidence of social standing and status? Does this support the notion that the area was working class? Is there evidence that former inhabitants of the site displayed their social standing or ethnicity through items of personal adornment or preferences for certain consumables?

5.0 MANAGEMENT OF ARCHAEOLOGICAL IMPACTS

5.1 Proposed works and potential impact

The following discussion of impacts is based on information provided in the Detailed Design Report[1] and Structural Design Report[2] provided for Preliminary Design Review (PDR). The location of excavation works are shown on Figure 16 to Figure 19

5.1.1 Equipment and Plant

The Structural Design Report[3] provides a list of plant and equipment that will be utilised during the construction phases of the project. Portions of this list have been replicated below, to inform the impact assessment.

- Foundation/Piling
    - Hand Tools;
    - Track mounted drilling rig (for rock anchor);
    - Service crawler crane;
    - Excavator;
    - Dump Truck and/or Trucks and Dog Trailer;
    - Pumps (dewatering/ ERSED);
    - Concrete pumps;
    - Agitator Trucks;
    - Tremie Pipe including Rack and Hopper;
    - Temporary Hoarding;
    - PIT testing equipment; and
    - Welding Unit.
- Earthworks
    - Excavator;
    - Backhoe;
    - Front End Loader;
    - Dump Trucks;
    - Trucks and Dog Trailers; and

[1] Aurecon 2023a
[2] Aurecon 2023b
[3] Aurecon 2023b, p. 62-63

- Testing equipment (DCP, compression etc.).

5.1.2 Early works

Bore hole and contamination investigation

- Geotechnical boreholes numbered 5-8. The precise location of the BH's may need to be adjusted to allow for existing utilities and/or other in-ground constraints. A 5m buffer around each BH location has therefore been considered in this assessment
- 4 x boreholes 120mm diameter drilled up to an approximate depth of 10m (note that BH6 may not be required)
- Installation of standpipe within BH8 only, with gattic cover for groundwater monitoring. One completion of monitoring the standpipe would be removed, backfilled and the area reinstated
- Obtaining and testing of sample site soil for contamination and standard penetration testing
- Reinstatement of all borehole locations to existing conditions, flush to the surrounding ground surface level.

Utilities investigation (slot trench)

- 16 x slot trenching locations by Non-destructive digging (NDD) with vacuum truck
- Saw cut and excavate any hard surface (if required)
- Slot trench dimensions would range in length from 1 to 12 metres, with a width of 0.5 to 1.5 metres, and all to a maximum depth of approximately 1.5 metres. Note: locations included 5m onsite buffer in assessment.
- Pick up of any exposed services, and drill and tap of unknown services (if required)
- Obtaining and testing of sample site soil for contamination and standard penetration testing
- Backfill and reinstatement of trench to existing ground conditions.

Tree root mapping (Arborist scope)

- Tree root surveying of mature trees in Bradfield Park North (involving targeted root potholing and investigations to arborists specifications).
- The purpose of tree root mapping is to identify all tree roots that may interfere with the proposed cycleway construction. Three NDD slot trenches of width 0.3m to 0.5m at a depth between 0.4m to 1.5m will be excavated around the perimeter of the proposed footpath and stormwater pit located within close vicinity of maintained trees, to an approximate total length of 80m. The pressure of the NDD would not exceed 2000psi and would be performed under arborist supervision. The trench must be excavated to a continuous length to account for any critical roots.
- Backfill and reinstatement of trench to existing ground conditions.

5.1.3 Excavation for piers

The superstructure of the elevated cycleway will be supported by pier foundations, comprised of reinforced concrete pad footings, founded on Class V rocks or better. Piers 3 to 8 will have 2 x 50 diameter rock anchors, to allow transverse bending actions to be resisted. All eight piers will be prefabricated reinforced concrete, to provide a high-quality finish. Each pier is cylindrical with a slight taper, measuring 550 millimetres at the top and 700 millimetres at the base.

Pier foundations Type 1 will be used for piers 1 and 2. Type 1 footings will be 1600 millimetres square and placed approximately 500 millimetres below the present ground surface. Pier foundations Type 2 will be used for piers 3 to 8. Type 2 footings will be 3400 millimetres by 1300 millimetres.

A minimum over excavation of 50 millimetres on all sides of footings and the piers will be required to ensure sound installation. The construction detail has not been provided at this time. It is assumed construction will require bulk excavation, rock drilling, and backfill.

5.1.4 Drainage

Drainage is required throughout the proposal footprint. This work is shown in Figure 12 to Figure 15. Excavation for drainage pipes and pits would extend to a maximum depth of 1500mm.

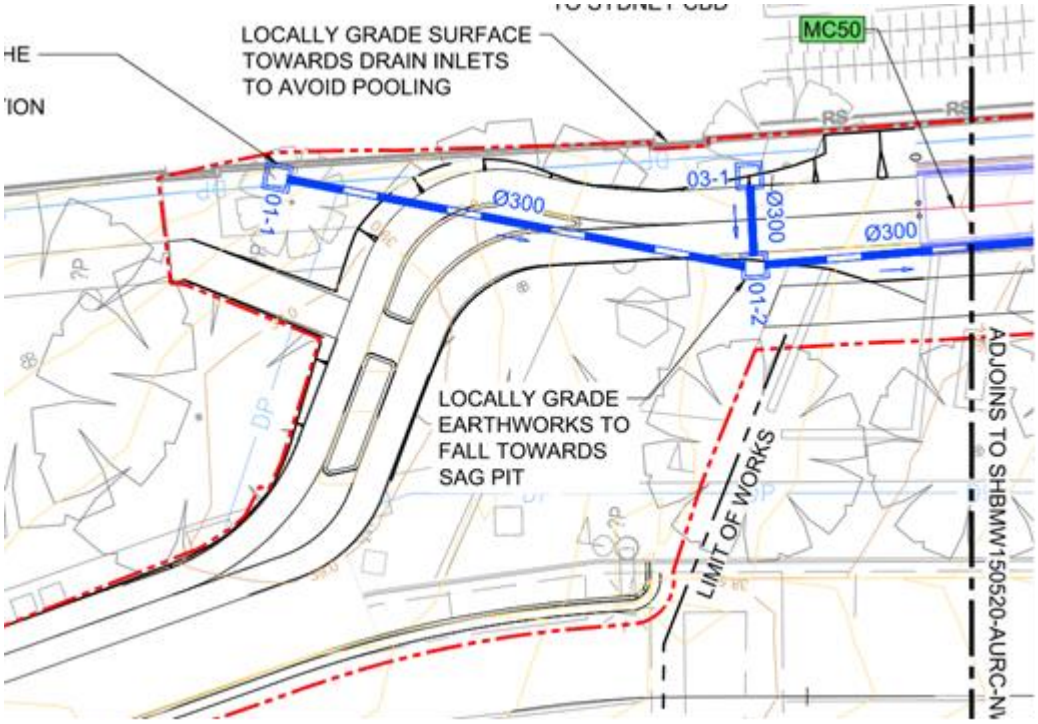


Figure 12: Proposed drainage works. Source: Aurecon

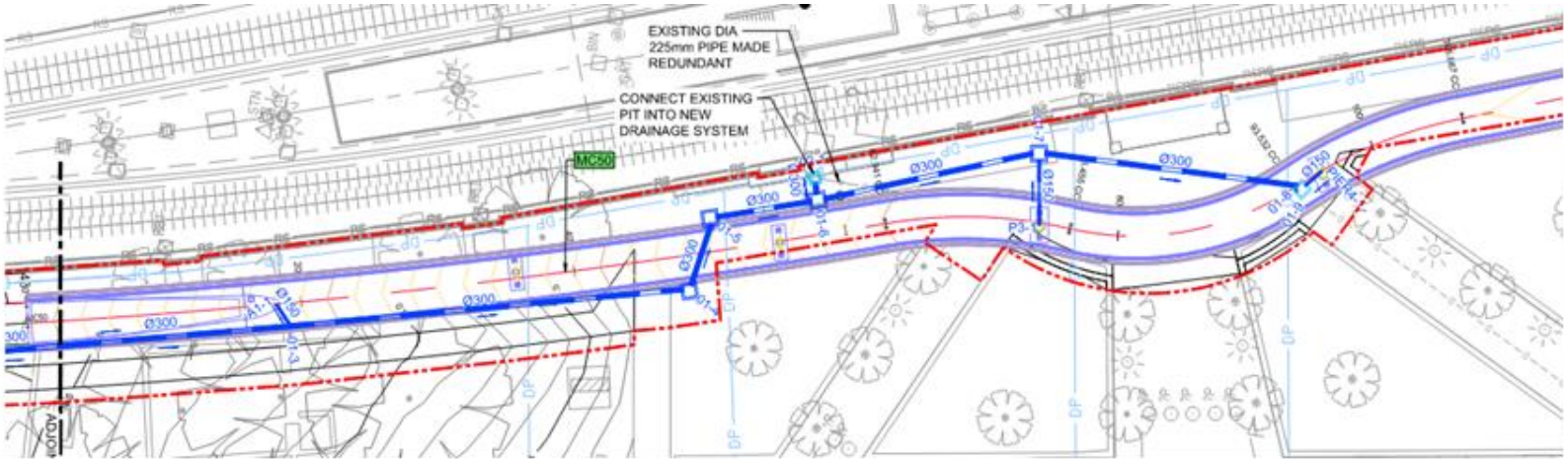


Figure 13: Proposed drainage works. Source: Aurecon

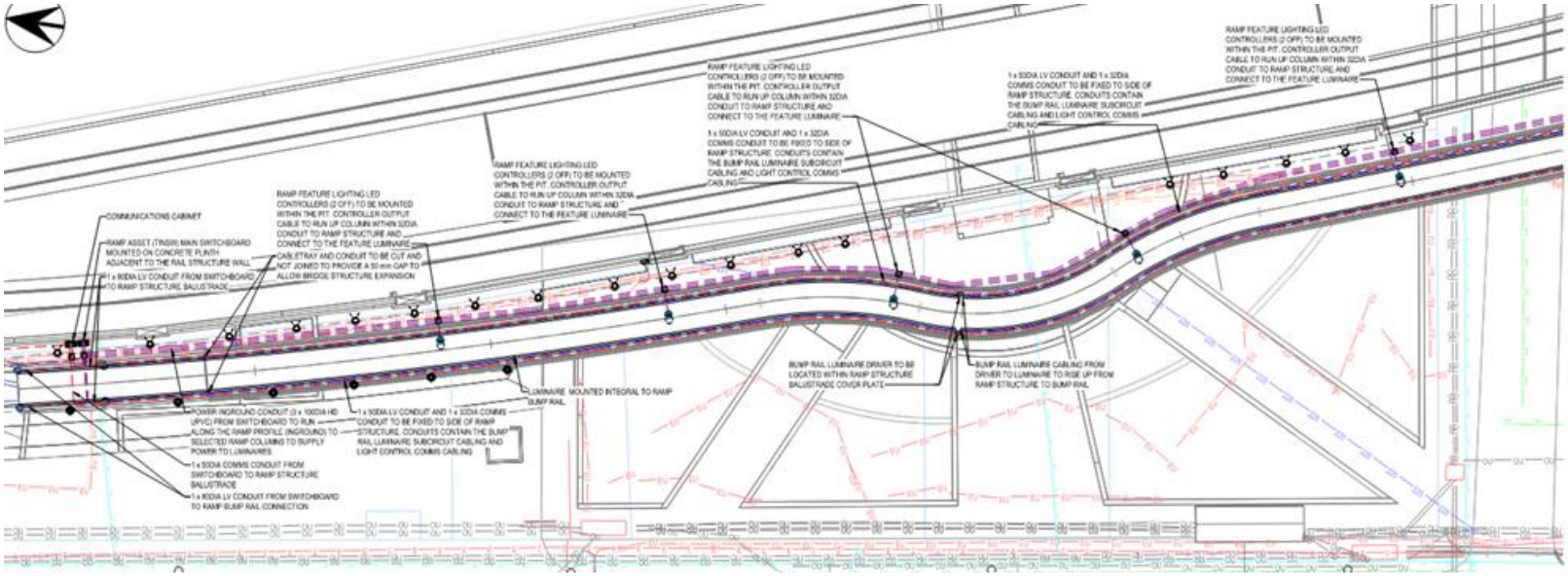


Figure 14: Proposed drainage works. Source: Aurecon

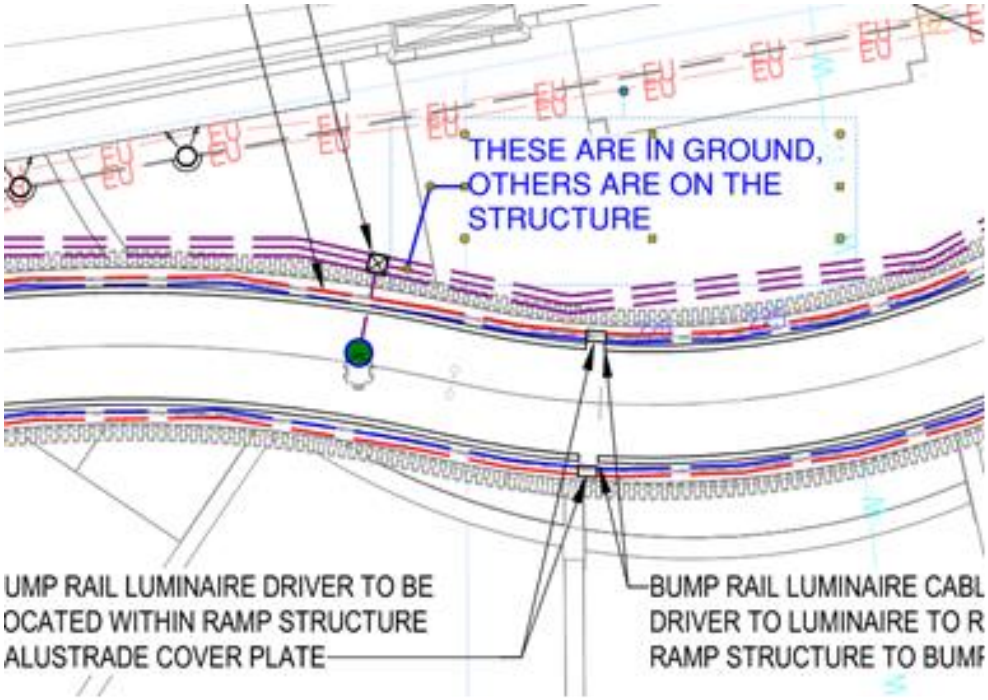


Figure 15: Proposed drainage works. Source: Aurecon

5.1.5 Construction of Alfred Street cycleway and shared path

Construction of the Alfred Street cycleway and shared path will involve installation of new paths, reinstatement/resurfacing of existing roadways and paths, and installation of new kerbing. Pavements for footpath, median, shared path and cycleway surfaces have been design in accordance with the North Sydney Council specifications and design guidelines.[9] The nominated pavement profiles are provided in Table 4 below.

The following outlines the proposed pavement types and their nominated purpose:

- Pavement type R1 is nominated for pedestrian paths and footpaths, with concrete finishing.
- Pavement type R2 is nominated for island medians, shared path, cycleway and pedestrian paths with pavers. The concrete type and thickness of pavement type R2 are based on North Sydney Council standard drawing S107 and Public Domain Style Manual & Design Codes by North Sydney Council. Unit pavers with concrete pavement is adopted to be consistent with existing island medians.
- Pavement type R3 is nominated for roundabout centre island which is located at the intersection of Lavender Street and Alfred Street.
- Pavement type R4 is adopted for the concrete driveway located at Burton's Street near Milson's Point Station.

[9] Aurecon 2023a, p. 14

Table 4: Nominated pavement profiles (Aurecon 2023a, p. 14)

Pavement Tag	Nominated Area	Pavement Details
R1	Pedestrian path/ footpath	100mm N32 Concrete with SL72 mesh 100mm Class 2 DGB (Traffic Category D) Compacted Subgrade
R2	Concrete median, footpath, shared path and cycleway with pavers (based on NS council standard drawing S107 and Public Domain Style Manual & Design Codes by North Sydney Council)	50mm Unit pavers (refer to urban design drawings) 30mm Laticrete 3701 thick mortar bed with Laticrete slurry bond coat top and bottom (or similar approved) 130mm N32 Concrete with SL82 mesh 150mm Class 2 DGB (Traffic Category D) or Existing pavement Compacted Subgrade
R3	Roundabout centre island	200mm Min. N32 Concrete with SL82 mesh 150mm Class 2 DGB (Traffic Category D) Compacted Subgrade
R4	Driveway	130mm N32 Concrete with SL82 mesh 150mm Class 2 DGB (Traffic Category D) Compacted Subgrade
P1	Cycleway (asphalt)	35mm AC10 (C450 Binder) Tact coat Existing pavement
S1	Resurfacing	50mm AC14 (A15E Binder) Tackcoat / Emulprime Existing pavement
S2	Resurfacing with Corrective course	50mm AC14 (A15E Binder) AC10/14/20 Corrective course (C450) Tackcoat / Emulprime Existing pavement

5.1.6 Installation of signage and signposting

Additional street signage will need to be placed to provide instruction to drivers, cyclists and pedestrians. The detail of the proposed signage, including location and method of installation is not clear at this time.

If required within Bradfield Park North, where archaeological resources are known to be at shallow depths, then proposed signage has the potential to result in negligible to minor impacts to archaeological features and relics.

5.1.7 Landscaping works

Landscaping is required throughout the proposal footprint. Detail of excavation required is illustrated in Figure 20 to Figure 26. Depth of excavation would generally not exceed 500mm, with deeper excavation up to 1500mm required in localised areas for tree planting.

5.1.8 Works unlikely to result in impact to archaeology

- It is assumed that construction of the elevated cycleway will require the movement of plant and equipment. This activity is not expected to result in impacts to known archaeological features.
- Reinstatement of disturbed areas are unlikely to result in impact to archaeological remains.
- The use of the former bowling greens as an ancillary site for laydown of material and equipment is unlikely to result in impact to archaeological resources. It is assumed that no in-ground excavation will be required in the astonishment of the facility, and that any surviving underlying archaeological remains would be protected from compaction and vibration by the ballast introduced during construction of the greens.

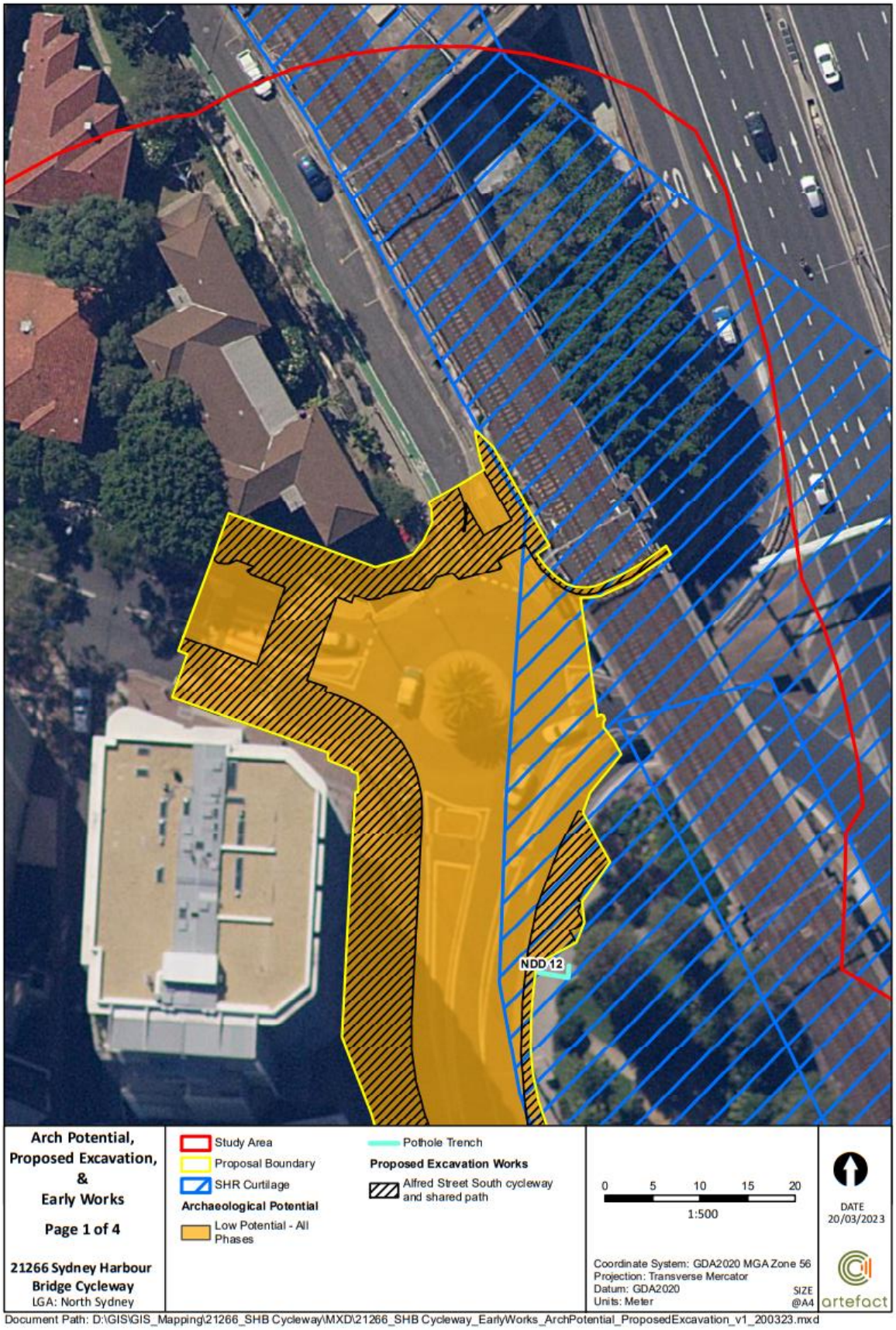


Figure 16: Intersection of proposed excavation works with areas of archaeological potential

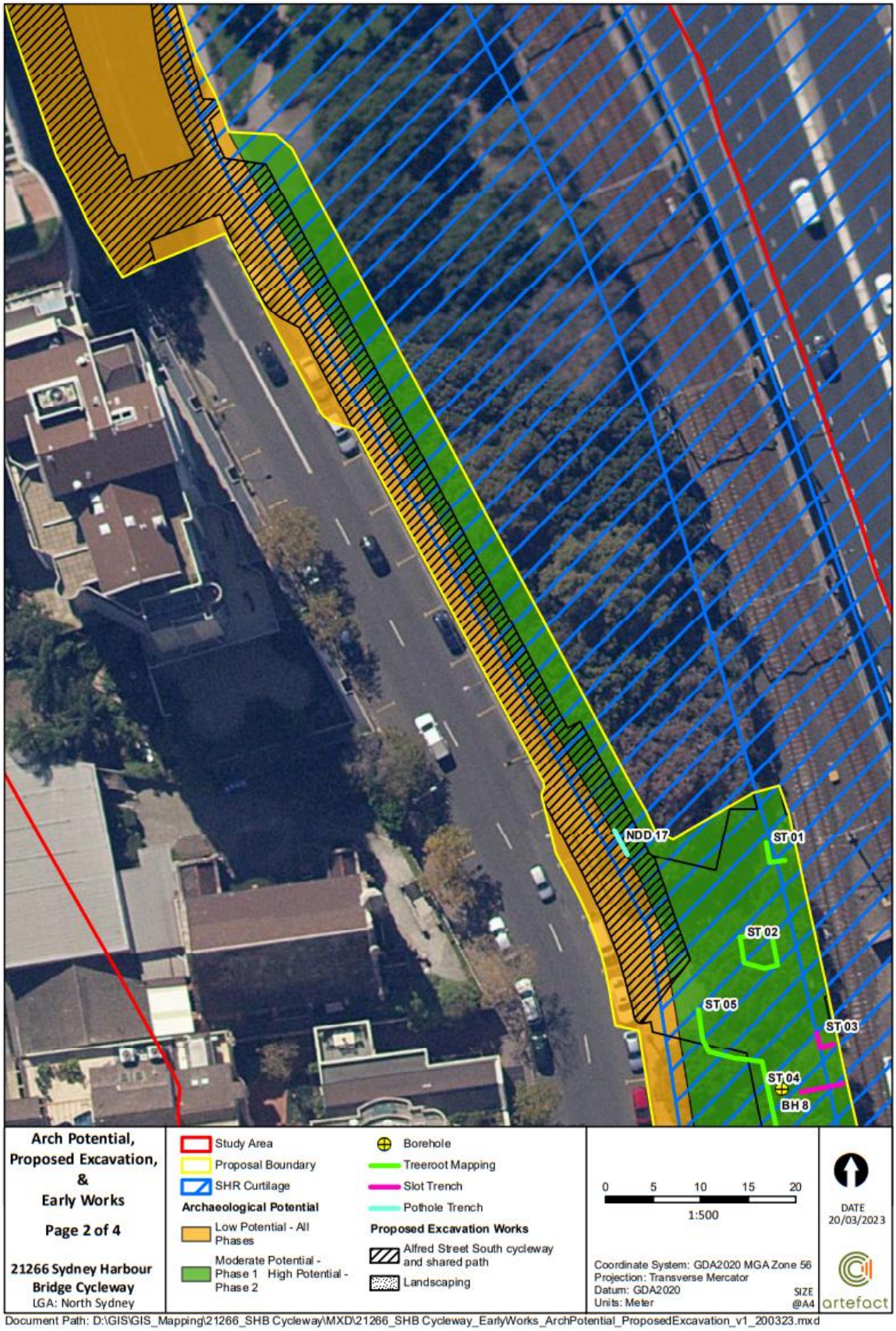


Figure 17: Intersection of proposed excavation works with areas of archaeological potential

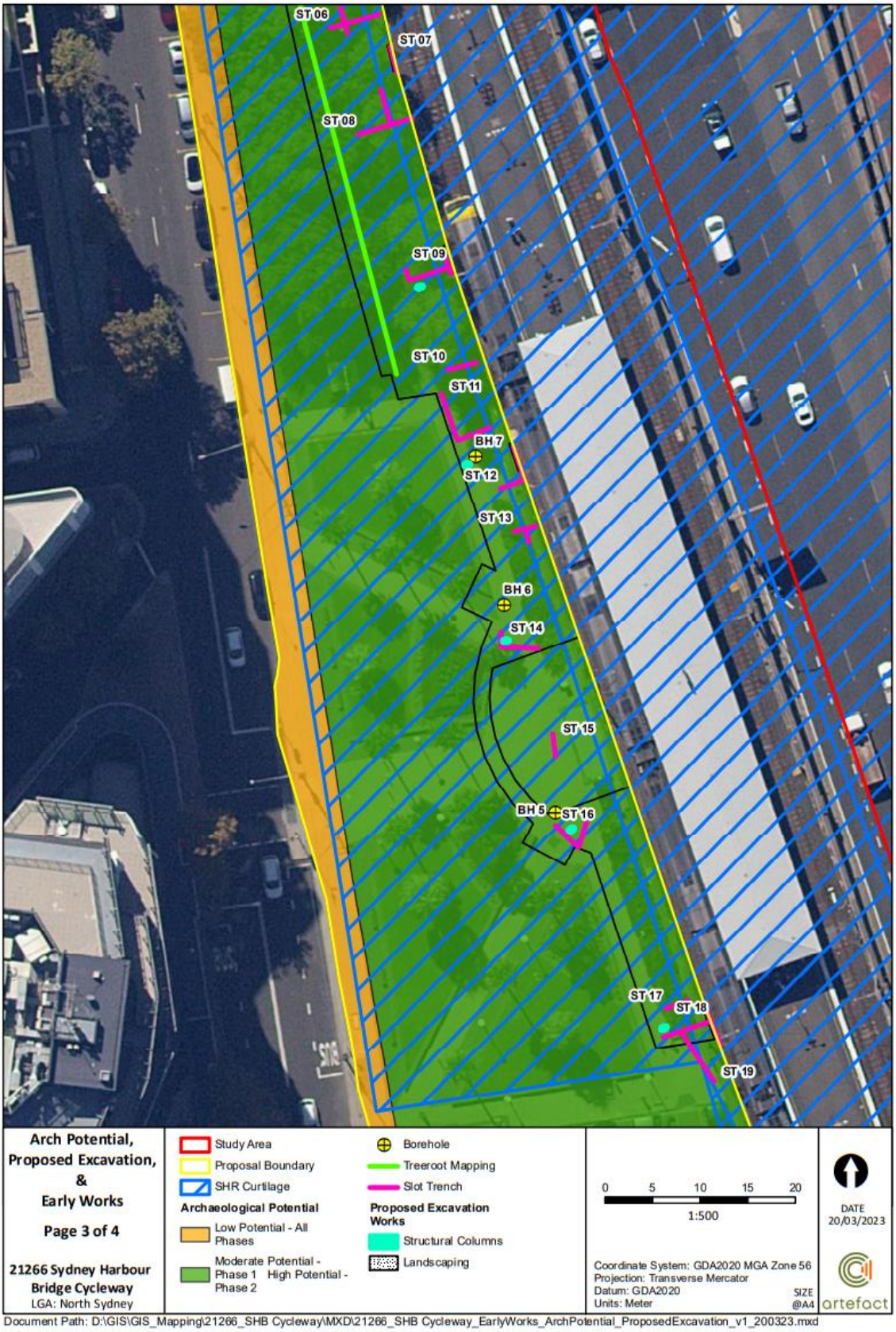


Figure 18: Intersection of proposed excavation works with areas of archaeological potential

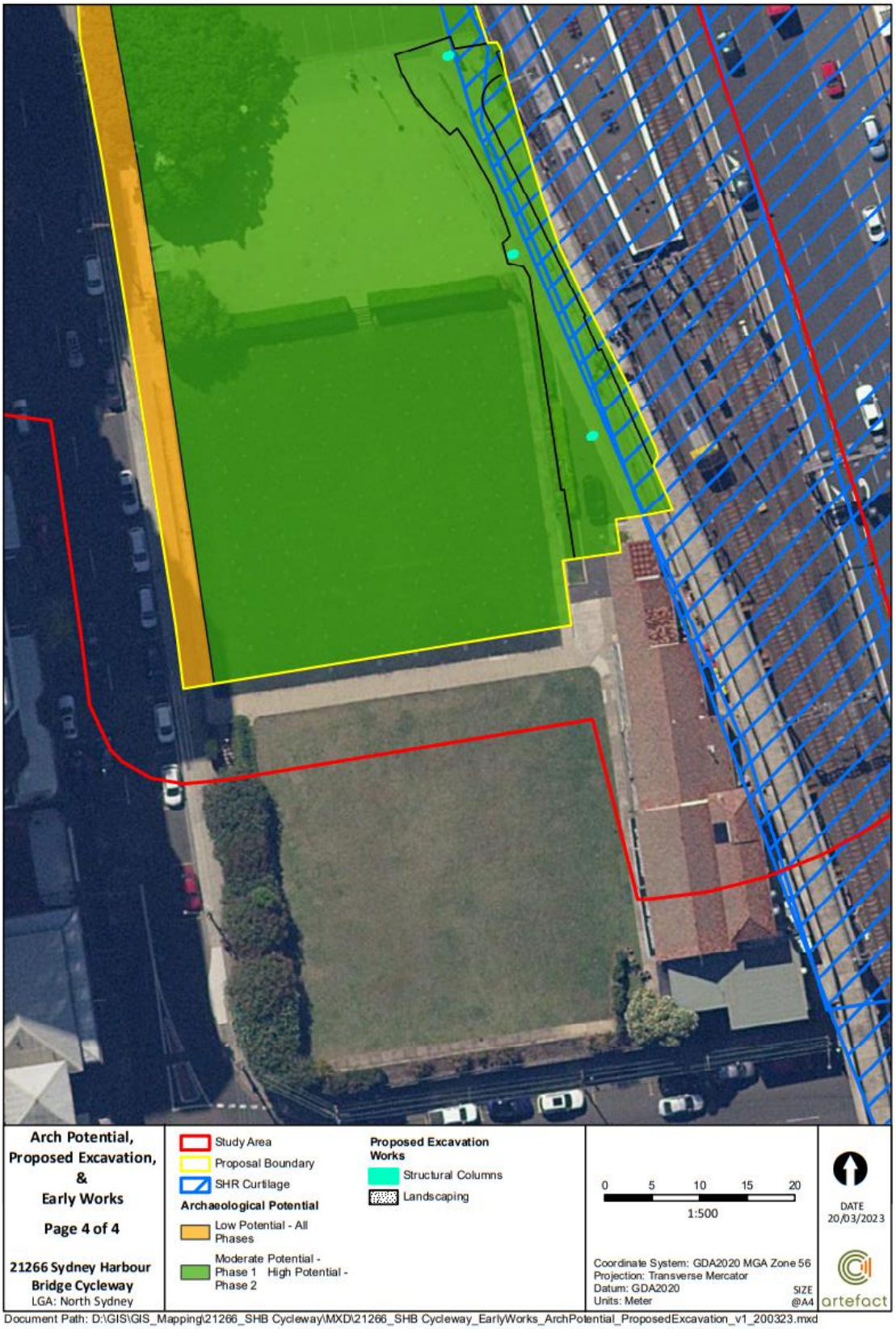


Figure 19: Intersection of proposed excavation works with areas of archaeological potential

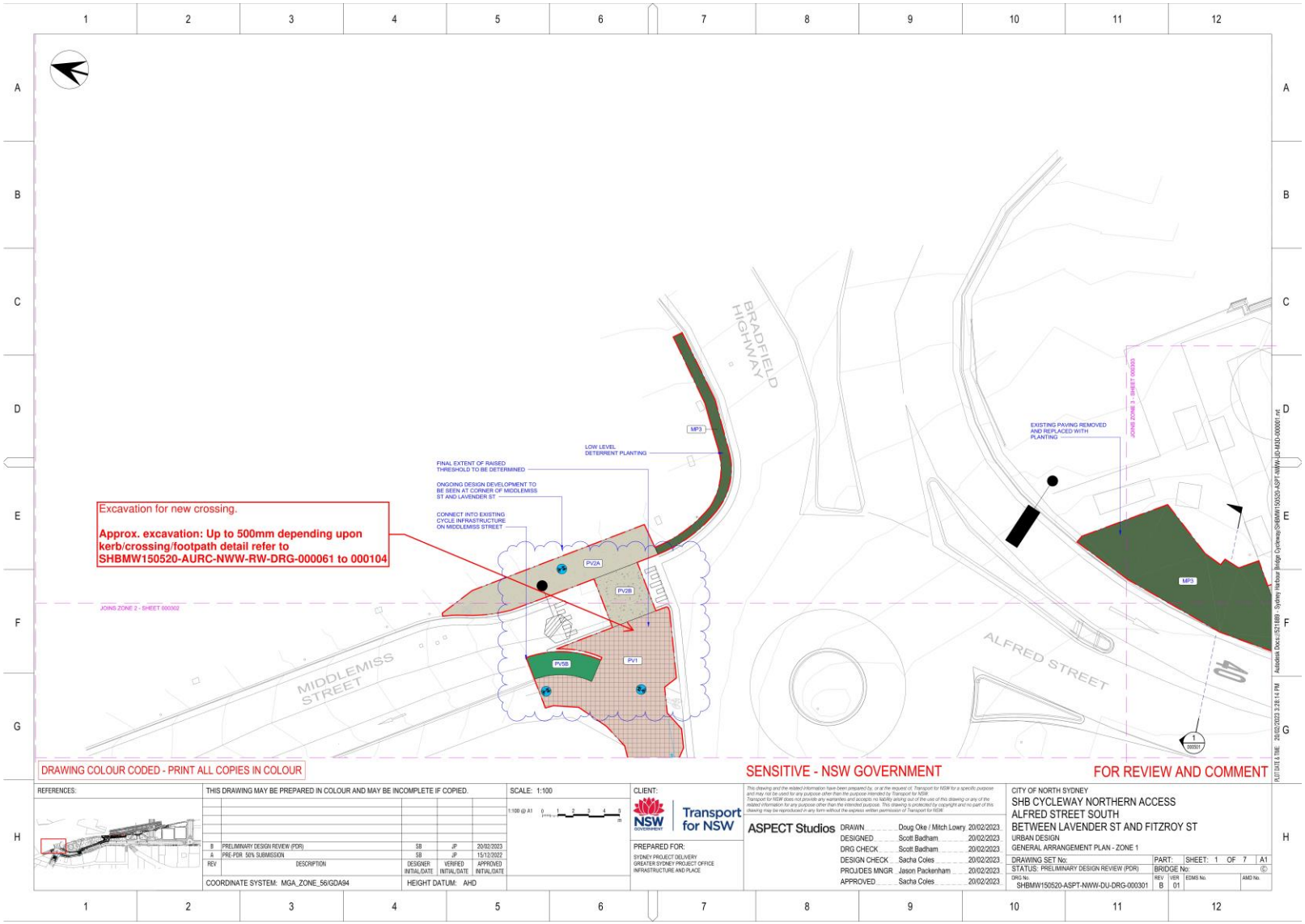


Figure 20: Landscaping works and excavation extents. Source: Aurecon

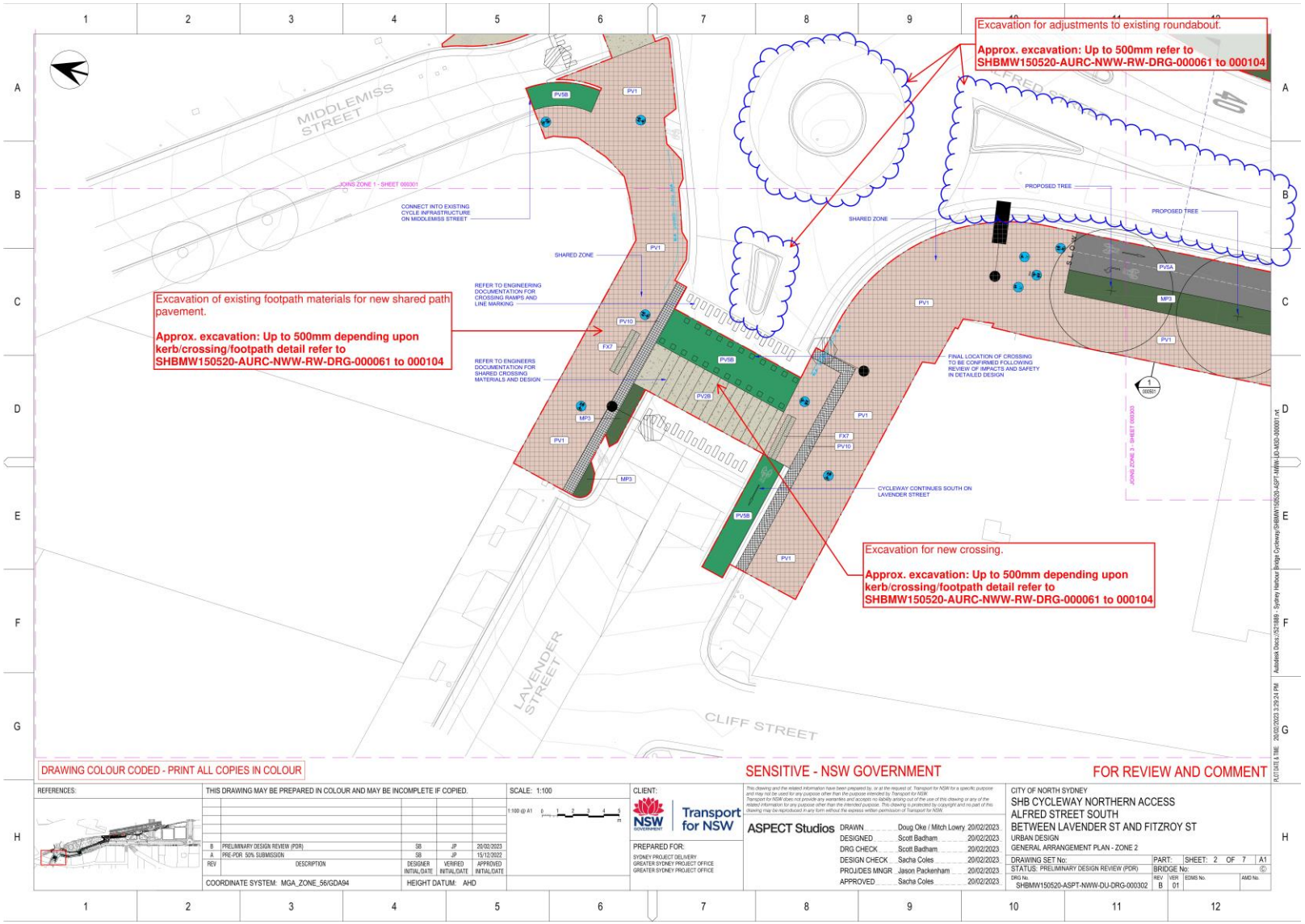


Figure 21: Landscaping works and excavation extents. Source: Aurecon

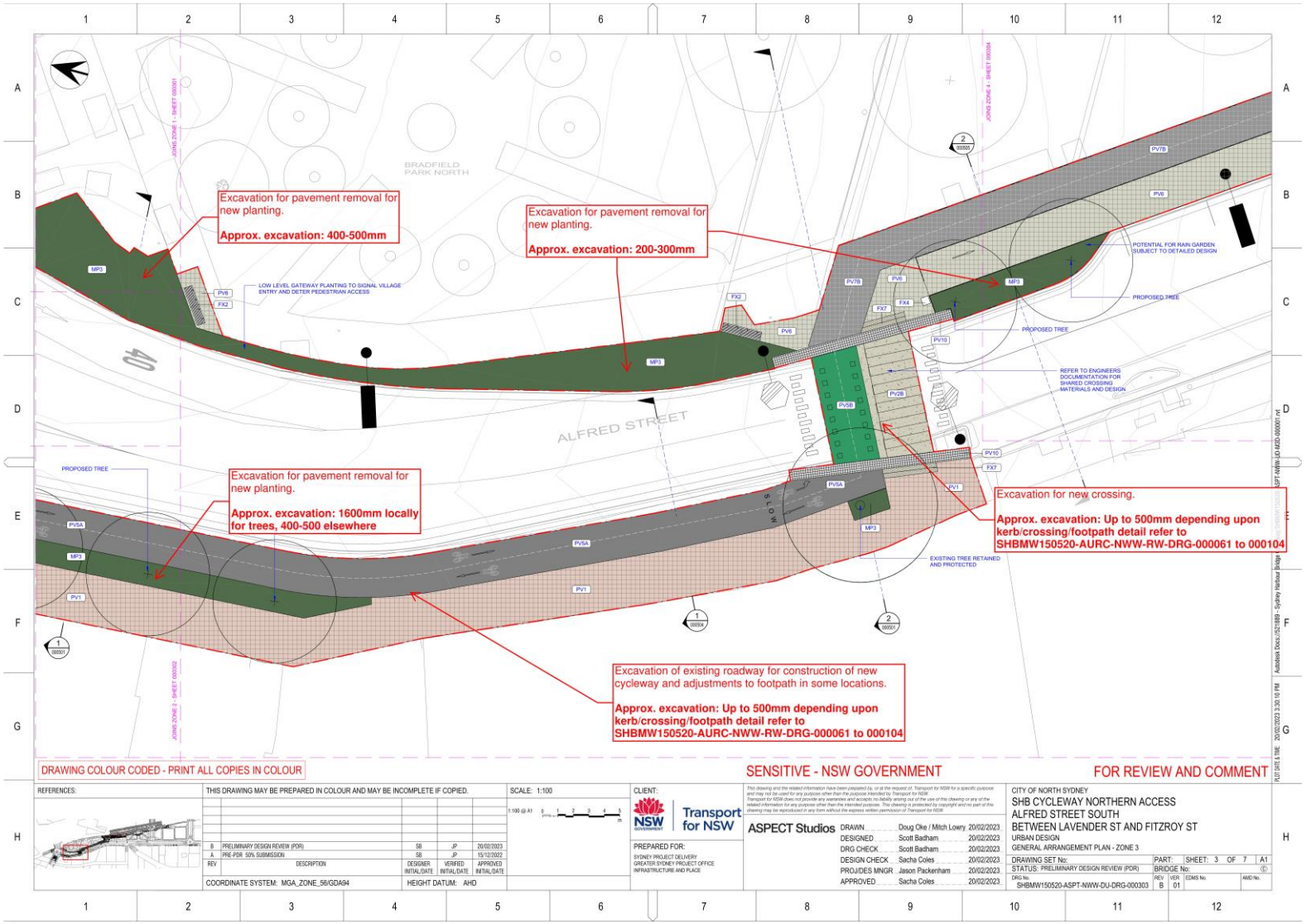


Figure 22: Landscaping works and excavation extents. Source: Aurecon

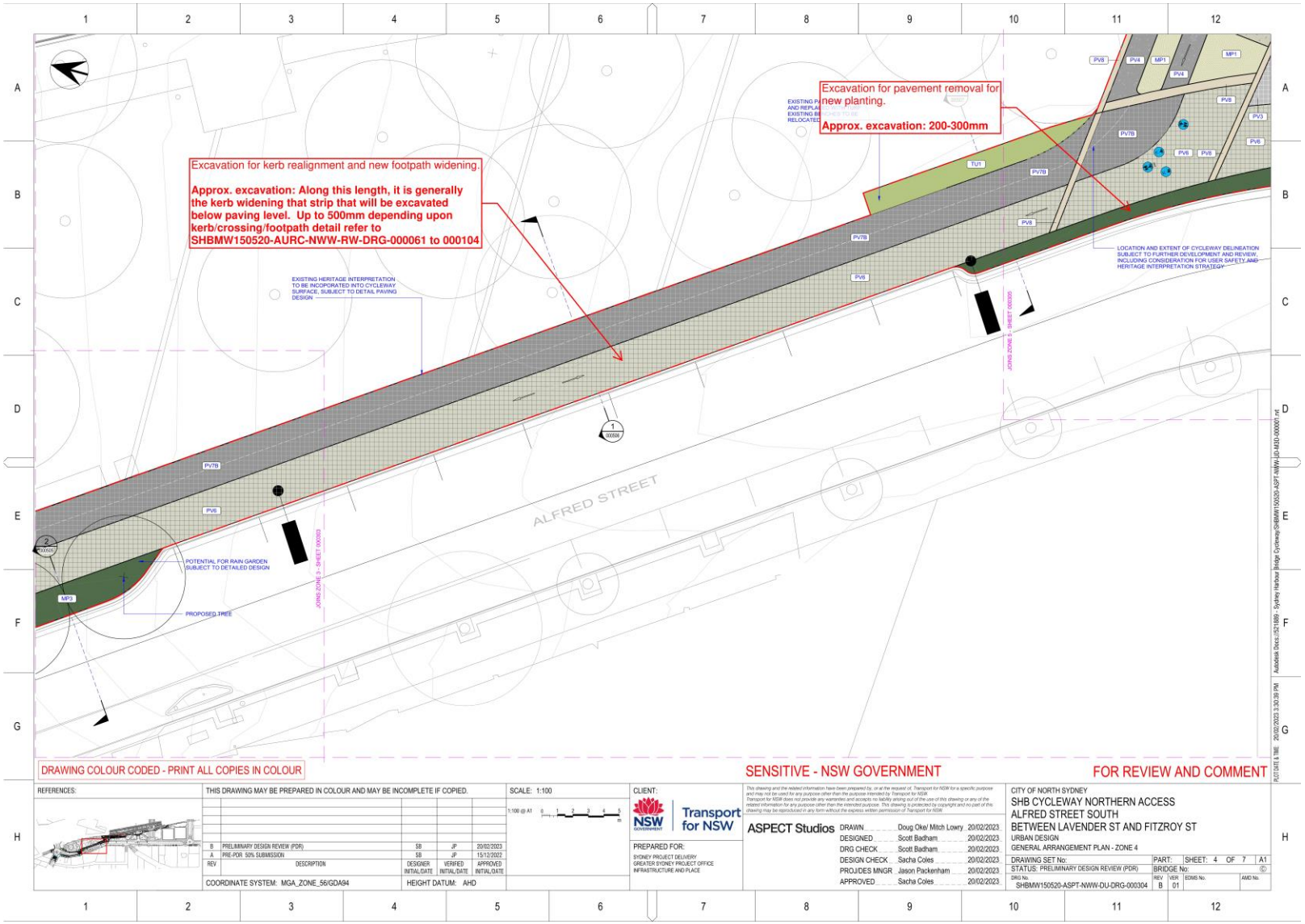


Figure 23: Landscaping works and excavation extents. Source: Aurecon

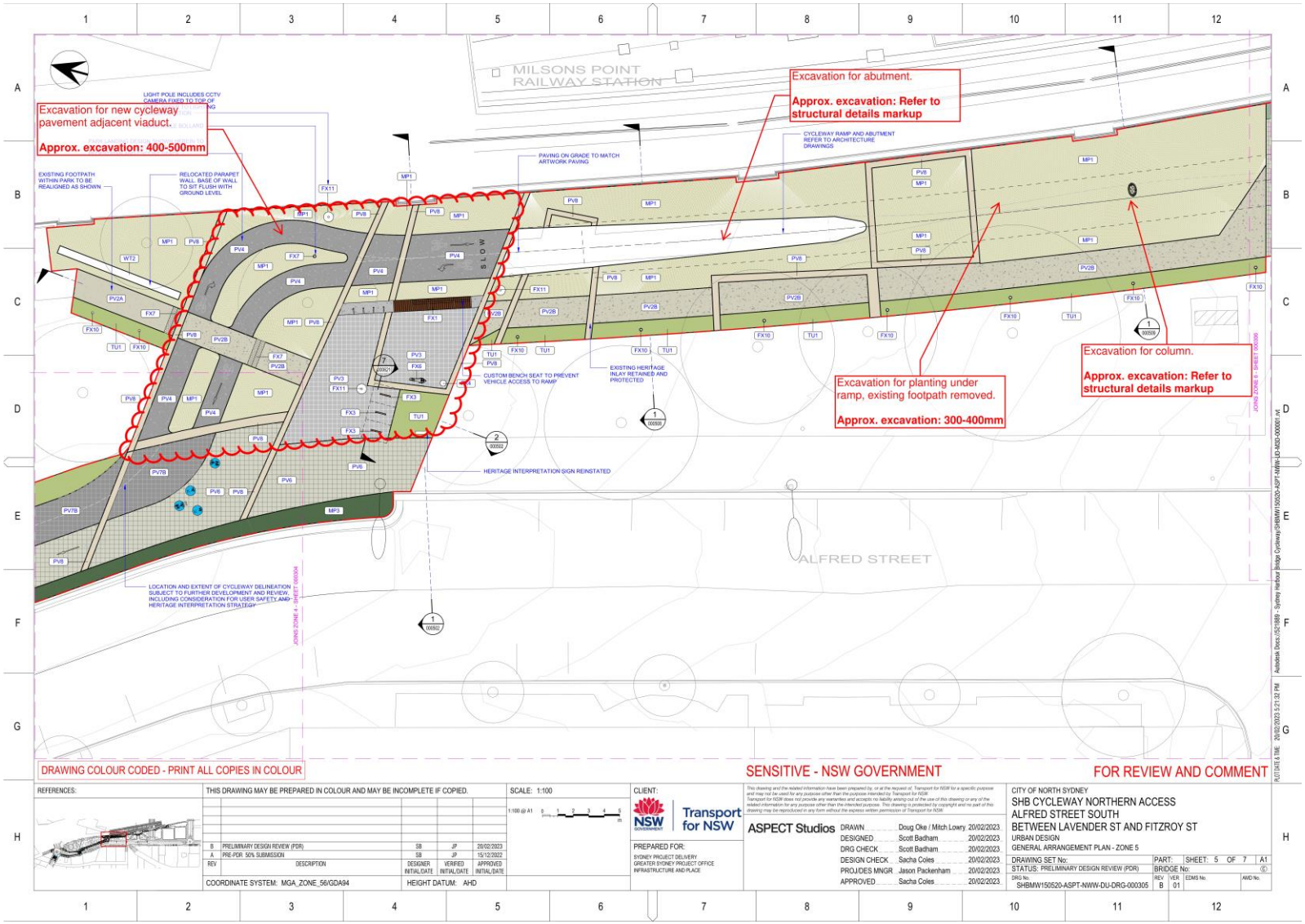


Figure 24: Landscaping works and excavation extents. Source: Aurecon

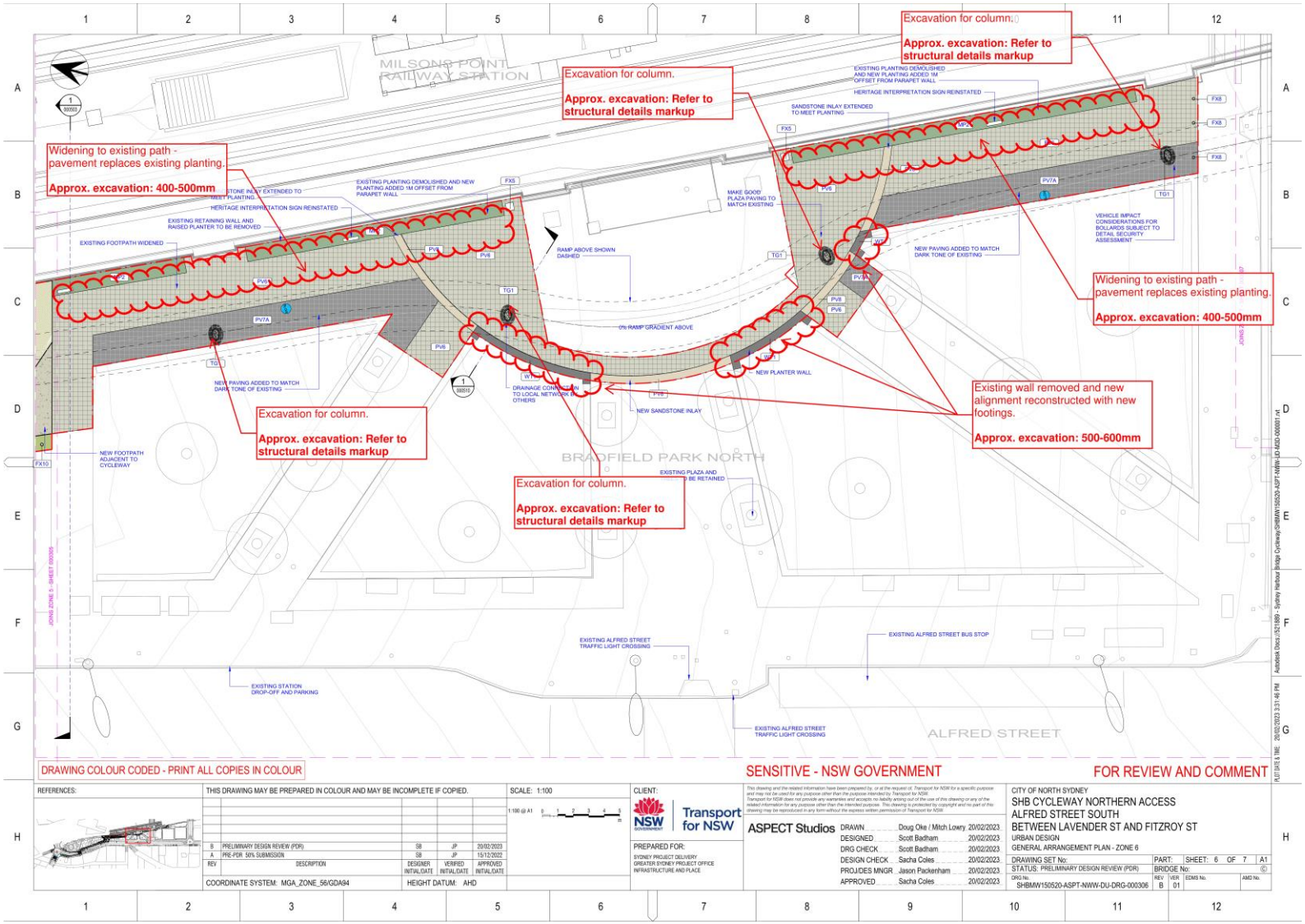


Figure 25: Landscaping works and excavation extents. Source: Aurecon

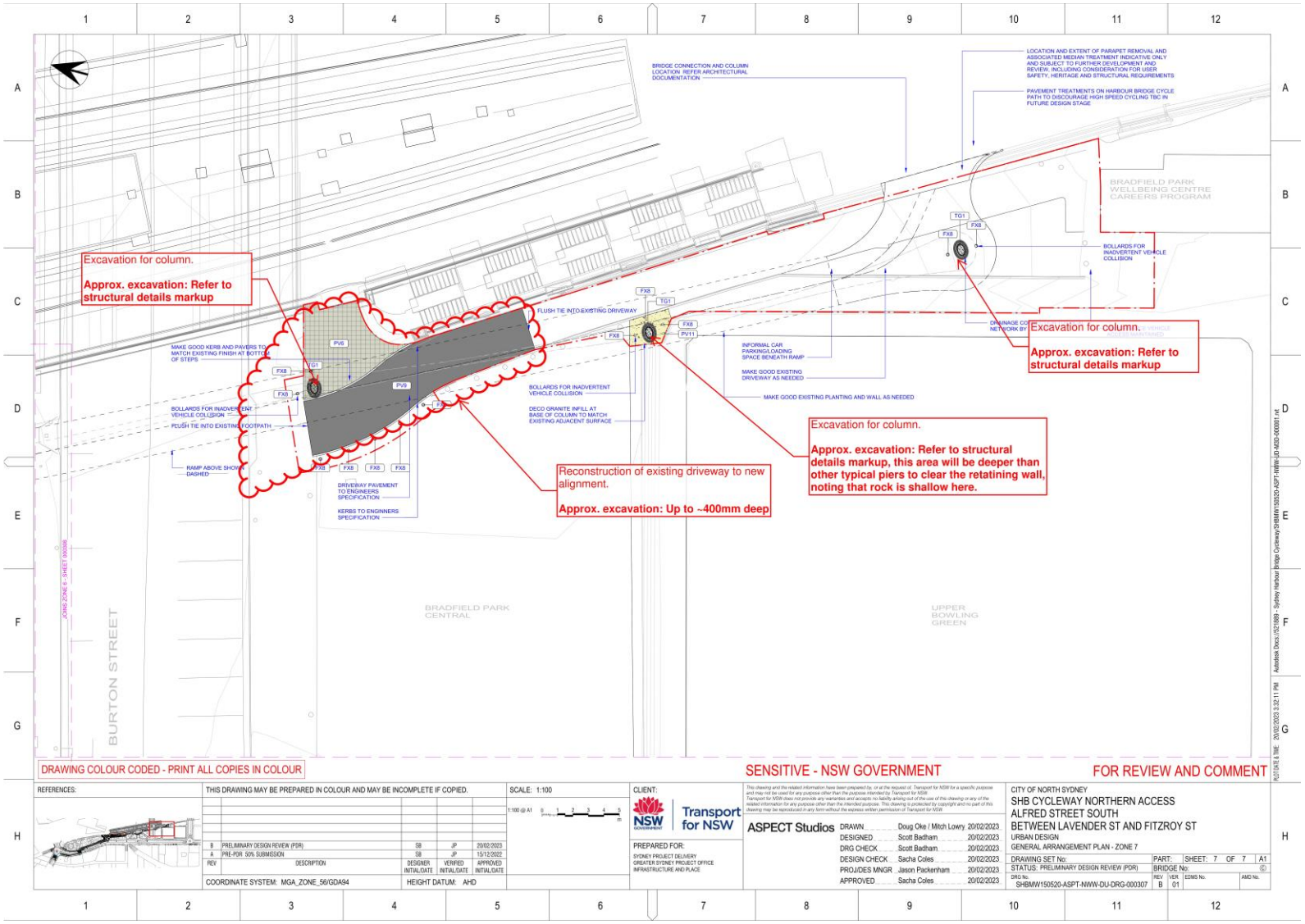


Figure 26: Landscaping works and excavation extents. Source: Aurecon

5.2 Assessment of archaeological impacts

It is anticipated that locally significant archaeology would be impacted by the proposed works.

Bradfield Park has high potential to contain substantially intact locally significant archaeological resources associated with Phase 2 (1861-1920s). The intersection of proposed excavation works with Phase 2 buildings footings (as detailed from the 1891 Sydney Water Board plans) are illustrated in Figure 27 to Figure 30.

Bradfield Park has moderate potential to contain intact archaeological resources associated with Phase 1 (1788 – 1860s).

The remainder of the study area has low potential to contain intact archaeological resources (Figure 11).

Excavation impacts within areas of high archaeological potential would be associated with the following project works:

- Deep excavation for piers
- Excavation for landscaping
- Excavation for drainage and utilities
- Excavation for installation of signage
- Early works investigations (boreholes, tree root mapping and NDD slot trenches).

The proposed columns pass through both the frontages and yards of former 1890s properties. Yards are more likely to contain archaeological ‘relics’ within backfilled wells and cesspits. The presence of artefact deposits associated with structural remains and wells/tanks containing artefactual material has been previously demonstrated through archaeological excavation in the vicinity.

Overall, there is potential for the works to impact locally significant archaeological resources. It is assumed that these impacts can be partially mitigated through archaeological management and the implementation of heritage interpretation strategies where appropriate.

5.3 Approval pathways

5.3.1 Works within the SHR curtilage

A Section 60 approval is required for all excavation works within the SHR curtilage of the SHB.

5.3.2 Works outside the SHR curtilage

Areas outside the SHR curtilage have the potential to contain locally significant archaeological ‘relics’ associated with residential occupation of the proposal footprint from the early to late 19th century (historical phases 1 and 2). It is therefore recommended that a Section 140 approval is obtained from HNSW prior to works commencing.

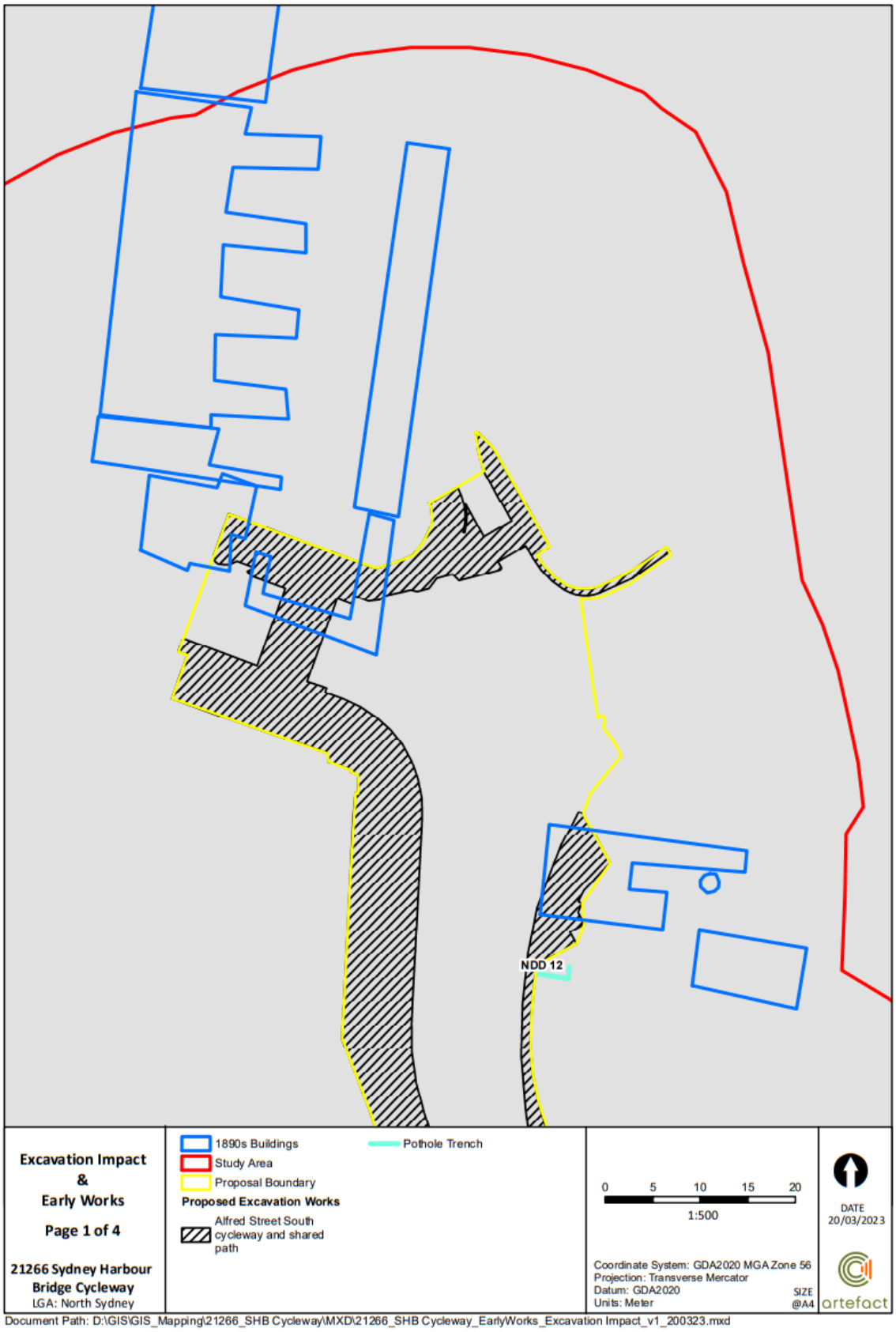


Figure 27: Proposed excavation impacts and intersection with potential Phase 2 archaeological remains (as detailed from 1891 Sydney Water Board plans)

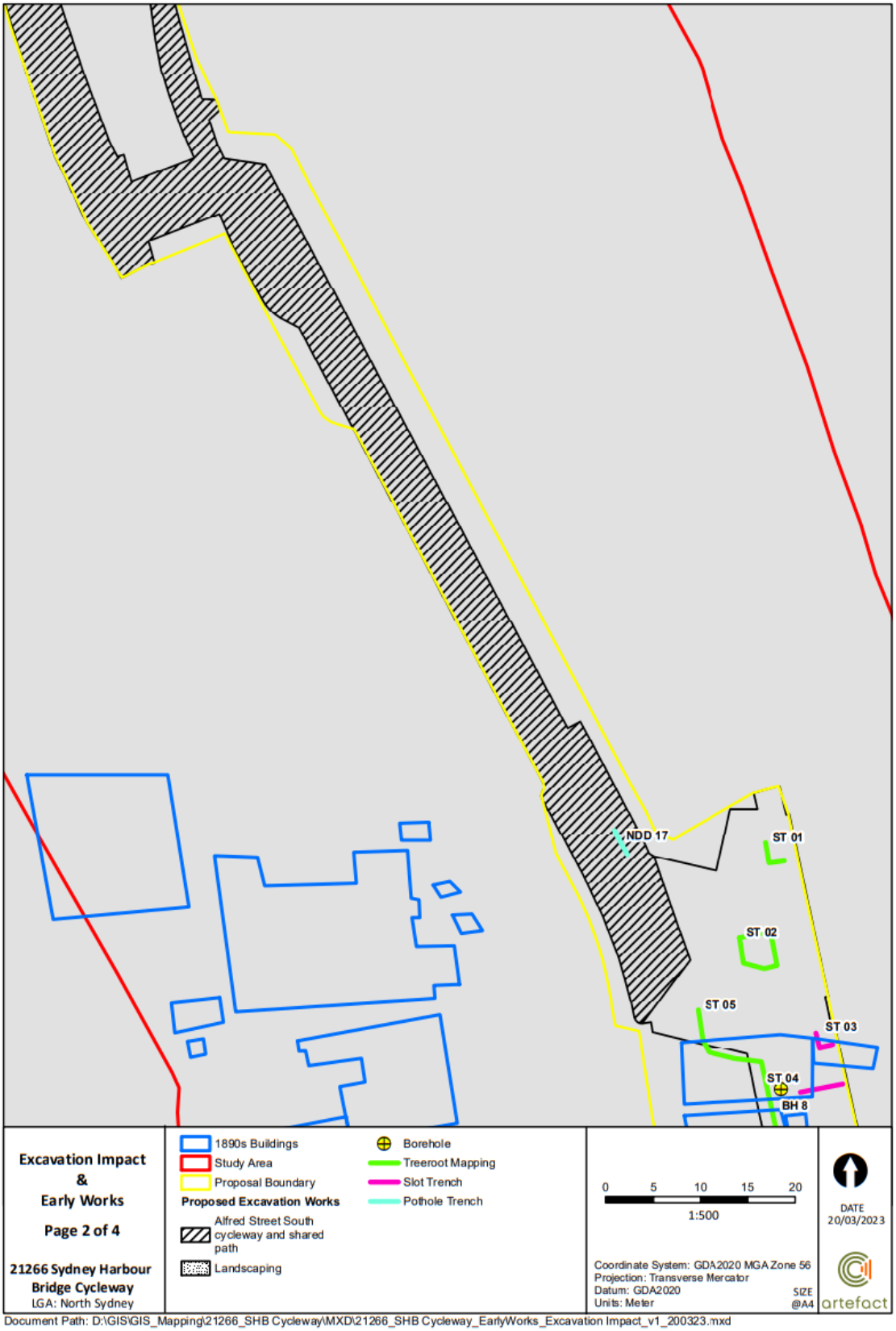


Figure 28: Proposed excavation impacts and intersection with potential Phase 2 archaeological remains (as detailed from 1891 Sydney Water Board plans)

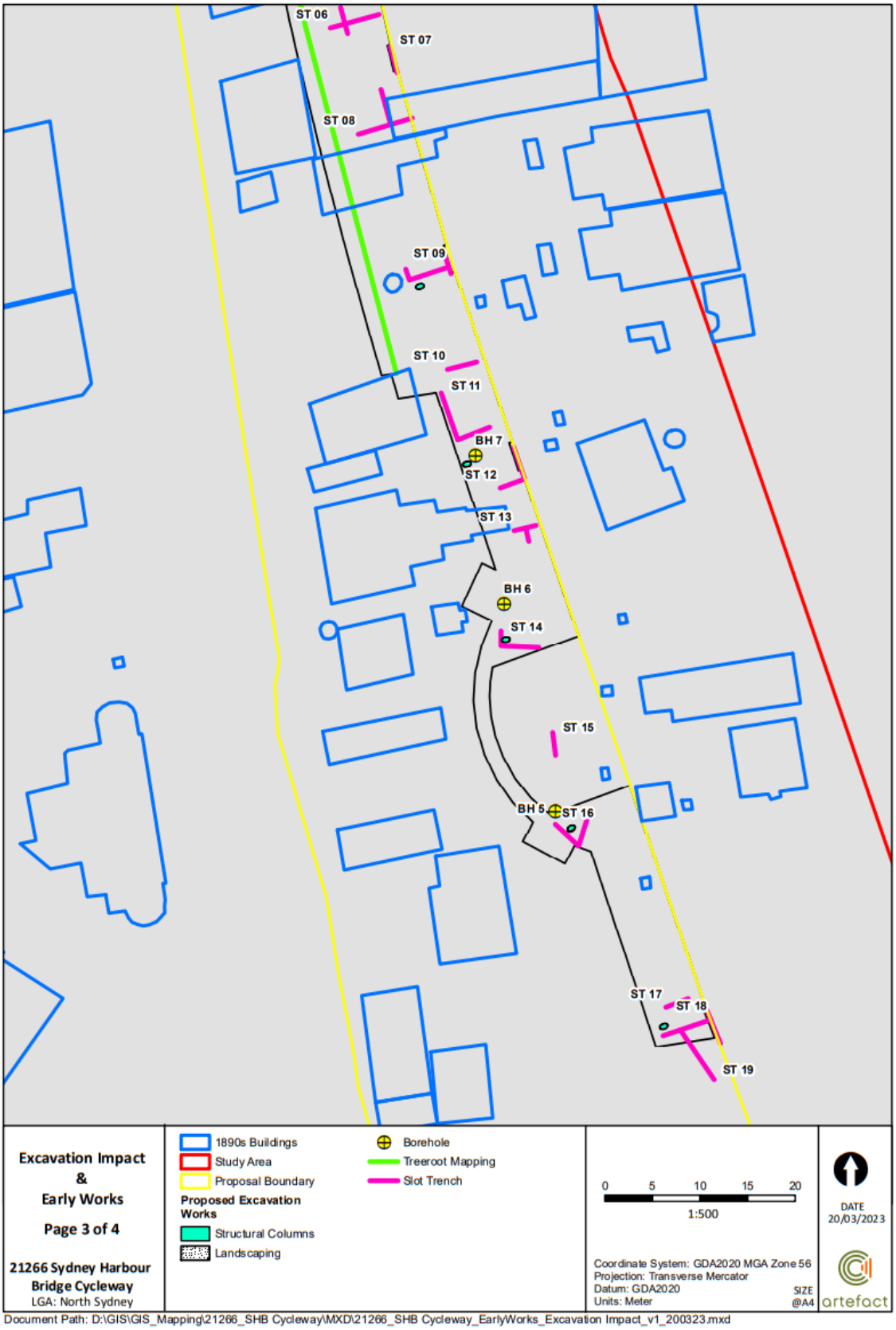


Figure 29: Proposed excavation impacts and intersection with potential Phase 2 archaeological remains (as detailed from 1891 Sydney Water Board plans)

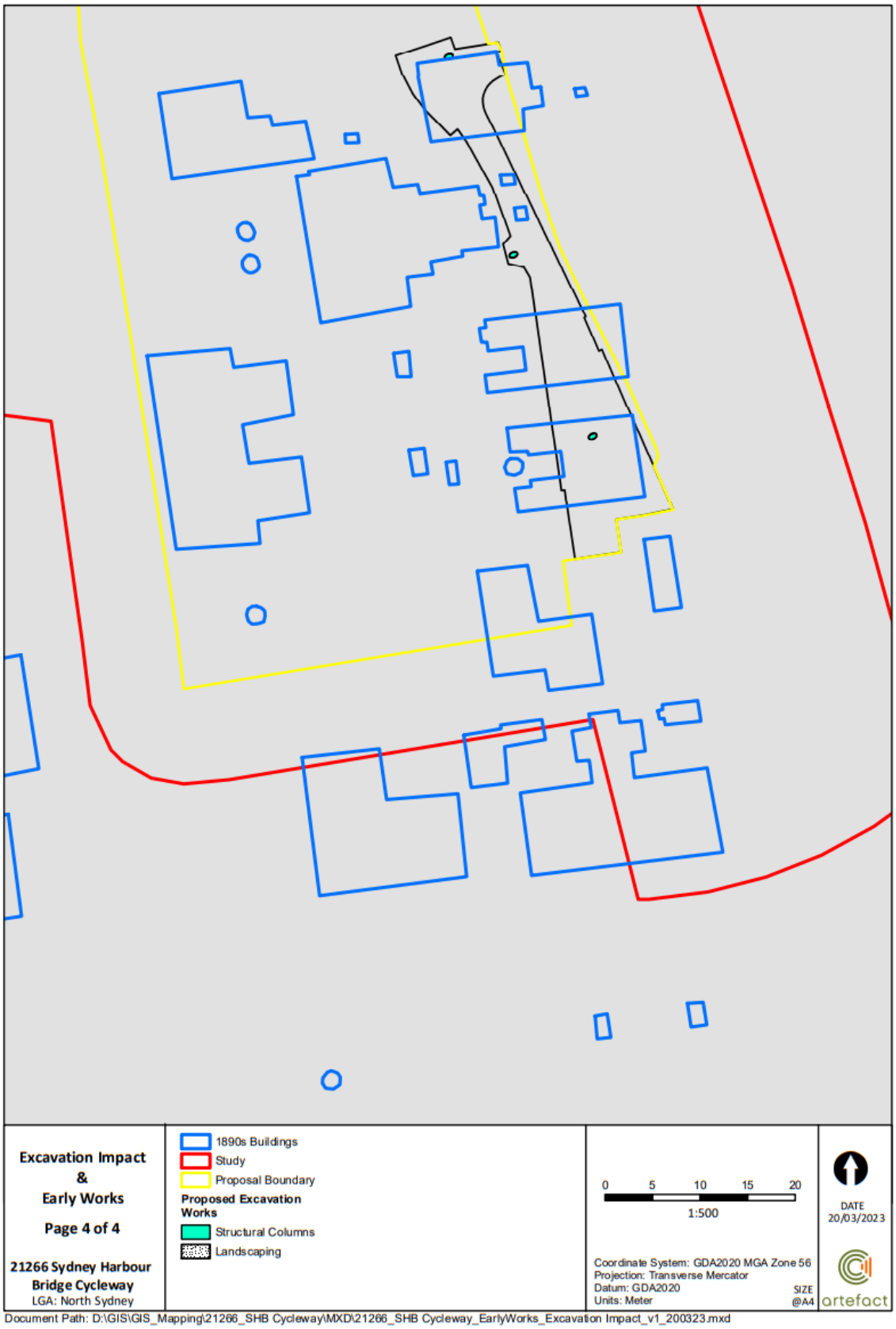


Figure 30: Proposed excavation impacts and intersection with potential Phase 2 archaeological remains (as detailed from 1891 Sydney Water Board plans)

6.0 EXCAVATION METHODOLOGY

6.1 Introduction

The proposal footprint is considered to have high potential to contain archaeological resources of local significance. If structural remains exist within the proposal footprint, their integrity is expected to be high, particularly within Bradfield Park North. Generally, these guiding precepts are followed:

- Manage archaeological resources in accordance with the relics provisions of the Heritage Act with appropriate approval from HNSW in the form of a Section 140 approval (for excavation works outside the SHR curtilage of the SHB), and a Section 60 approval (for works within the SHR curtilage of the SHB).
- Investigate and record archaeological resources in accordance with archaeological best practice, Heritage Council of NSW guidelines and the conditions of any approvals issued under the Heritage Act.

It is proposed that management of potential impacts include the following archaeological processes:

- Testing and targeted salvage - Pier excavation
- Monitoring and recording - NDD early works
- Monitoring and salvage – Utilities excavation, landscaping, signage footings, boreholes, cycleway excavation within areas of high potential
- Unexpected finds procedure - Cycleway within areas of low potential.

A heritage induction must be provided to communicate archaeological requirements prior to project works commencing.

These methodologies have been outlined below and illustrated on Figure 31 to Figure 34.

Figure 31: Archaeological management

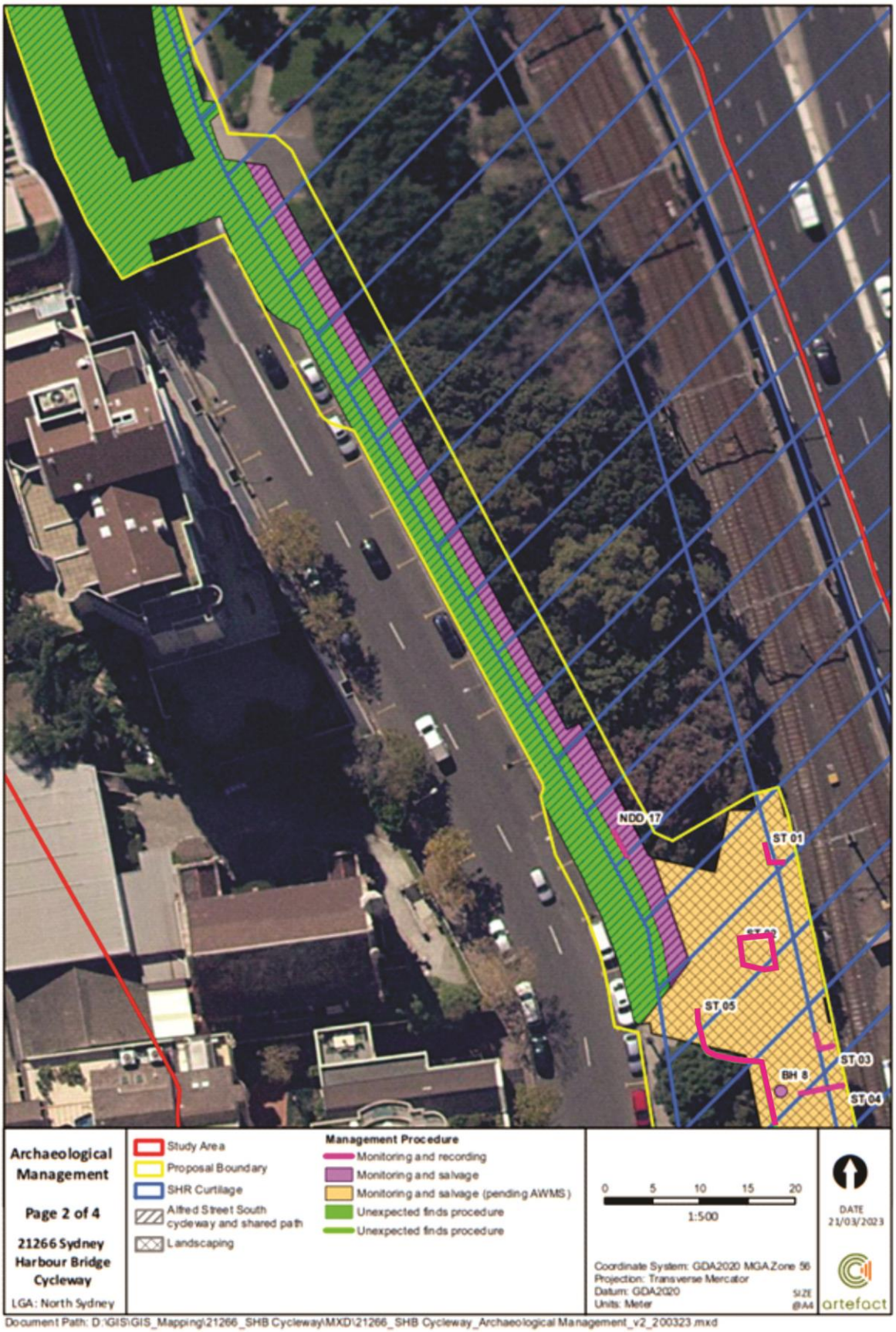


Figure 32: Archaeological management

Figure 33: Archaeological management

Figure 34: Archaeological management

6.2 Heritage induction

Prior to project works commencing, a heritage induction should be carried out with personnel involved in project excavation works. At a minimum, this would include an overview of the project's obligations, the proposed archaeological methodology, required management under the Heritage Act and the role of the archaeological team.

6.3 Targeted Test Excavation

The following works would be subject to targeted test excavation and salvage:

- Pier footing foundation excavation.

It is recommended that each pier footing location be subject to targeted archaeological testing and salvage (if required) prior to project works commencing. This would allow archaeologists to identify, record, salvage and clear each location prior to project works commencing.

Archaeological salvage would likely involve removal of modern fills and disturbance to the top of archaeological layers of interest by machine under archaeological supervision. On the identification of the historical context /archaeological fills specified for archaeological salvage, salvage excavation would commence. This investigation would be undertaken using hand tools, with machines used where required and as permitted in the AWMS, by a qualified archaeological team. The archaeological remains would be cleaned by hand, investigated (excavated) and recorded in detail by the archaeological team.

If unexpectedly intact archaeological remains not identified in the archaeological assessment are encountered during the testing and salvage program, Heritage NSW would be consulted. It is understood that a variation or further approval may be required prior to impact to unexpected archaeological remains be identified.

Construction works would not proceed until the salvage excavation is completed in the relevant location and the Excavation Director has provided clearance for the area in question. It is noted that due to the potentially deep archaeological deposits in some areas, archaeological excavation and Excavation Director clearance would not proceed deeper than the anticipated depth of works, unless otherwise specified in the relevant AWMS.

6.4 Archaeological Monitoring and Recording

The following works would be subject to archaeological monitoring, recording and backfilling:

- Potholing
- Slot trenches
- Tree root mapping.

It is recommended that monitoring and recording is undertaken during NDD potholing and slot trench excavation. It is assumed these works will not require removal of the archaeological resource and therefore recording and backfilling of remains identified would be appropriate.

If archaeological remains are identified during monitoring, they would be recorded and assessed to determine if further investigation is required at a later stage. Localised stoppages in the construction work would be required to facilitate this process. Works would not recommence until the monitoring

archaeologist has completed the recording and the Excavation Director is satisfied that further investigation is not required.

If significant and intact archaeological remains are identified, then further investigation such as salvage would be required prior to construction impacts occurring to the item. This would be explored in the AWMS to be prepared for landscaping work.

All significant archaeological remains which would not be impacted by the proposed works would be backfilled following the completion of the excavation. This would involve providing a protective layer of geofabric of similar over exposed archaeological deposits and then backfilled with either previously excavated spoil or clean imported spoil.

6.5 Archaeological Monitoring and Salvage

The following works within the area designated **high archaeological potential** would be subject to archaeological monitoring, recording and salvage:

- Landscaping works
- Drainage and utilities excavation
- Cycleway excavation
- Borehole excavation
- Excavation for signage footings.

An archaeologist would be present on site supervising the above works. If archaeological remains are identified during archaeological monitoring, they would be recorded and assessed to determine if further investigation is required. Localised stoppages in the construction work would be required to facilitate this process. Works would not recommence until the monitoring archaeologist has completed the recording and the Excavation Director is satisfied that further investigation is not required.

If significant and intact archaeological remains are identified, then further investigation such as salvage would be required prior to construction impacts occurring to the item. Assessments of significance of all finds would be supervised and confirmed by the Excavation Director.

All significant archaeological remains which would not be impacted by the proposed works would be backfilled following the completion of the excavation. This would involve providing a protective layer of geofabric of similar over exposed archaeological deposits and then backfilled with either previously excavated spoil or clean imported spoil.

6.6 Unexpected Finds Procedure

It is recommended that the following works be subject to the Transport for New South Wales *Unexpected heritage items procedure* 2022:

- Cycleway excavation, and all other excavation, **within areas of low archaeological potential**.

6.7 Archaeological recording and documentation procedures

6.7.1 Overview of excavation recording methodology

Significant archaeological remains would be recorded in accordance with the following methodology:

- A site datum would be established
- Levels would be reduced to Australian Height Datum
- Survey and scaled plans of the area, trench locations and any significant archaeological features uncovered in the monitoring, test and salvage program. The plans would include elevations recorded by a surveyor where possible. Should a large amount of archaeological resources be identified during the excavation, the site would be digitally surveyed and recorded
- Scaled section drawings where appropriate
- Photogrammetry where appropriate
- Digital photography, in RAW format, using photographic scales and photo boards where appropriate. A photographic record of all phases of the work on site would be undertaken
- A standard context recording system will be employed: The locations, dimensions and characteristics of all archaeological features and deposits will be recorded on a sequentially numbered context register. This documentation will be supplemented by preparation of a Harris matrix showing the stratigraphic relationships between features and deposits
- Artefact collection by context. Large or redundant artefactual materials from individual contexts would be sample collected as supported by a discard register. Hazardous material would not be collected.
- Registers of contexts, photos, samples and drawings would be kept.

6.7.2 Survey Control

A survey control for the site would be established, tied to the Geocentric Datum of Australia (GDA) 2020. For preference, survey data would be recorded with a DGPS and post-processed to sub 1 centimetre accuracy. Alternatively, a Total Station would be used to establish the survey and record survey data. An automatic level could also be used to record depths and tied to known datum points.

Within an archaeological excavation area, the archaeological team would set out a grid where possible for ease of recording and, where required, and establish main and subsidiary datums based on survey information. Further datums for vertical control will be established to allow all excavation areas to be surveyed into a nearby datum. These will be tied back to Australian Height Datum and the survey grid.

Where electronic surveying equipment is not available to the archaeological team, horizontal measurements and detailed scaled plans of excavation areas and features would be prepared. Vertical relative elevations would be taken with a dumpy level. These plans and levels would be tied to a previously surveyed main or subsidiary datum. Every level taken is assigned a number and is recorded on a level sheet.

Where dateable or otherwise special artefacts are located they would be recorded in three dimensions with surveying equipment if available.

6.7.3 Recording of Contexts

All soil deposits and significant features would be given a unique context number without duplication. Context numbers will be recorded in a register of context numbers to ensure context numbers are not duplicated. Each context is numbered sequentially.

Rubble deposits would be recorded only where it provides specific information regarding masonry and construction (i.e., wall finishes, material etc.). Fills need to be described in detail as there are varying types of fills (e.g., demolition, levelling).

Contexts would be related to each other through the use of a Harris Matrix. The relationships between each of the contexts are recorded on the context sheet and these are also recorded in Stratify, a computer program used for producing Harris Matrices.

6.7.4 Recording of Archaeological Features

Significant archaeological features would be recorded through the preparation of plans and sections. Structural elements, such as brick walls or timber posts, would be recorded in situ to observe phases in construction, and then removed in stratigraphic sequence.

Plans and sections will be labelled with details of what is being recorded, context numbers and details of the recorder. Each plan, map or section will be catalogued and receive a number which is put on the plan and in the catalogue. The plan, map or section will be placed flat in an artist portfolio.

Archaeological remains need to be directly surveyed during works or four control points on each plan that can then be surveyed in to georeference the plan. All records of vertical sections would include elevation data to ensure accurate measurement of stratigraphic layers at the site. Excavation open areas of significant features would include elevation levels throughout site, recorded either with a DGPS or total station, or with a dumpy level measured off surveyed datum control points for the site. The surface level and end of excavation elevation levels for all test excavation trenches, and all salvage excavation areas, would be recorded.

6.7.5 Photography

In photographically recording significant archaeological remains, the AWMS will specify where photography must meet the requirements for photogrammetry, which includes accurate scale bars, overlapping of images and recording with a colour card where required. Photographs would be recorded in a register identifying the shot number, direction and a description of the scene.

Photographic recording of significant archaeological remains would be informed by the standards established in the *Photographic Recording of Heritage Items Using Film or Digital Capture* (Heritage Office 2006), accepting that parts of these guidelines are technically obsolete. Artefact would use a digital SLR camera and shoot in raw format to capture the maximum amount of information from the camera sensors. Photograph numbers will be documented on a photo register, including information such as photo direction and content.

6.7.6 Collection of Artefacts

Artefacts are likely to be uncovered during archaeological investigations. Artefacts from secure or in situ contexts would be collected and recorded (by context). Retrieval of artefacts should focus on

diagnostic pieces and other items whose analysis would contribute to the research questions for this site are retained.

Should diagnostic or significant artefacts be present within the fill layers (out-of-context), a sample would be retained as part of the archaeological record. Any discarded items will be recorded on context or discard sheets (in the case of sieving).

Artefacts would be collected by context and bagged with a label recording their registered context number, site code, date and initials of the collecting individual/s. A record and description of relevant artefacts would be included in their corresponding context sheet and photographed where necessary.

6.7.6.1 Modern deposits

Artefacts from modern (post-1960) deposits would be sample collected to demonstrate the nature and context of the remains.

6.7.6.2 Historic fills and secondary deposits

Similarly, artefacts collected from historic fills and other bulk deposits that lack stratigraphic integrity will be recorded and a representative sample collected.

6.7.6.3 Primary deposits

All artefacts from primary deposits would be collected by context and bagged. Diagnostic or unique/fragile artefacts would be bagged separately under their corresponding context.

6.7.6.4 Building materials

Building and structural materials would be collected by type and sampled. For example, one full brick and one partial brick of the same type, two samples of mortar, stone, timber and plaster (bagged by context). All collected samples would be noted on their corresponding context sheet and recorded in a building material sample register.

6.7.6.5 Organic or fragile materials

Metal and fabric or organic materials such as timber, leather, bone or shell would be stored in paper bags for conservation purposes under their corresponding context. If significant and diagnostic fabric or leather items are found, these would be submitted to a conservation specialist with two months of collection.

6.7.6.6 Hazardous materials

Artefacts manufactured from hazardous material such as asbestos or found within a contaminated deposit would not be collected, although their presence within the context would be recorded in their corresponding context sheet. Such artefacts be disposed of in an appropriate manner according to guidelines for dealing with hazardous waste.

6.7.7 Long term management of recovered artefacts from site

It is recommended that consultation with North Sydney Council is undertaken prior to archaeological management of the site to inform them of the potential for artefacts to be recovered during works.

Opportunities for artefactual material to be incorporated into future interpretive spaces should be considered. Should recovered archaeological remains be considered unstable for long-term storage, conservation handling would be undertaken for long-term preservation of finds. This would involve engagement of a specialist conservator who has experience with the material in question, for example metals or wood. The material would be stabilised and stored securely.

6.8 Contractor responsibilities

The contractor would set up site and then operate under the direction of the archaeologists during archaeological investigation. This would include but not be limited to:

- Provide a heritage site induction to contractors in consultation with the Excavation Director
- Set out and secure the work area for the construction and archaeological team
- Provide machine plant to assist the removal of fill where required under the supervision of the archaeological team
- Provide shoring, if required
- Provide pressurised water and a sieving area, if required.

6.9 Heritage NSW notification

Should state significant historical archaeological 'relics,' or other significant remains not predicted by the SoHI or this ARD be identified during the test excavation program, there may be a requirement to notify the Heritage Council under s146 of the Heritage Act.

6.10 Contaminated materials

Due to the potential for contaminants across the proposal footprint, any archaeological excavation would also be undertaken in accordance with the specified work health and safety protocols established for the site, prior to the commencement of works on site. Information regarding the presence of contaminants, resulting from any preliminary investigations, should be made accessible to the archaeologists prior to the excavation's commencement. Should the discovery of contaminants on site likely result in the potential harm to archaeological staff working on site, there may be a requirement to deviate from the proposed archaeological methodology, in order to ensure the health and safety of onsite staff. This may include the use of protective clothing, face masks, and specified gloves, additional washing protocols, through to the need to cease or limit the amount of archaeological excavation and/or altering excavation and recording techniques.

Should the requirement to employ mechanical excavation rather than hand excavation arise, archival recording of archaeological material would need to be taken in the form of photographic, and possibly 3D scanning, from a safe distance (as specified in the work health and safety requirements of the remediation specialists).

6.11 Site clearance

A written clearance confirmation would be provided by the Excavation Director to the contractor once archaeological management has been completed in an area. Construction would then continue under an the Transport for New South Wales *Unexpected heritage items procedure* 2022.

6.12 Post-excavation analysis and reporting

Following the completion of on-site archaeological works, post-excavation analysis of the findings would be undertaken. This includes artefact analysis, environmental and building material sample analysis, stratigraphic reporting and production of Harris Matrices, production of detailed site survey plans, illustrations and interpretative drawings, generation of catalogues, data records and site registers.

Artefacts would be catalogued and analyse to facilitate inter-site artefactual comparative analysis.[10]

A final excavation report detailing the archaeological program and results would be prepared. It would include the results of the archaeological excavation and analysis, additional historical information if needed, photographs, illustrations and plans, catalogue and analysis of artefacts, and also respond to the research questions in detail. The report would also include a reassessment of archaeological significance based on the investigation results. Opportunities for archaeological interpretation would also be included in the final report.

Final excavation reporting would be prepared within 12 months of the completion of all archaeological investigation at the construction site. This report would be a standalone report. The report would be submitted to the client, Transport for NSW and the relevant Council when it is completed.

[10] Crook and Murray, 2006. *Guide to the EAMC Archaeology Database*. Archaeology of the Modern City Series, Volume 10. Historic Houses Trust of New South Wales.