

20 Non-Aboriginal heritage

A Technical working paper: Non-Aboriginal heritage (**Appendix R**) has been prepared to assess the potential impact of the project on non-Aboriginal heritage. This chapter provides a summary of the technical report.

Table 20-1 presents the Secretary's Environmental Assessment Requirements (SEARs) as they relate to non-Aboriginal heritage and where in the environmental impact statement (EIS) these have been addressed.

Table 20-1 SEARs – non-Aboriginal heritage

SEAR	Where addressed
Impacts to State and local non-Aboriginal heritage (including conservation areas, built heritage landscapes and archaeology) must be assessed. Where impacts to State or locally significant historic heritage are identified, the assessment must: - outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the guidelines in the NSW Heritage Manual (Heritage Office and Department of Urban Affairs and Planning 1996), - be undertaken by a suitably qualified heritage consultant(s) with relevant heritage expertise (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria), - include a statement of heritage impact for all heritage items / conservation areas to be impacted (including significance assessment). This must include detailed mapping of all heritage items and how they are affected by the proposal, - include details of any proposed mitigation measures (architectural and landscape), - consider the impacts from vibration, demolition, archaeological disturbance, altered historical arrangements and access, increased traffic, landscape and vistas, and architectural noise treatment, and - develop an appropriate archaeological assessment methodology, including research design, in consultation with the Department and the Heritage Council of New South Wales, to guide physical archaeological test excavations and include the results of these excavations.	Impacts to non-Aboriginal heritage have been assessed in Section 20.3 and in Sections 7.0 and 9.0 of Appendix R. Proposed mitigation and management measures are presented in Section 20.4 and in Section 8.0 of Appendix R. The assessment has been undertaken by a qualified heritage consultant. Qualifications are presented in Section 1.6 of Appendix R. A statement of heritage impact is provided in Section 9.0 of Appendix R and summarised in Section 20.3.1. The potential impacts of the project have been considered in Section 20.3, including impacts that may arise as a result of vibration, demolition, archaeological disturbance, altered historical arrangements and access, increased traffic, access, increased traffic, landscape and vistas, as well as architectural noise treatment. Archaeological management measures are proposed for the Alexandra Canal, and palaeontological management measures are proposed for the St Peters Brickpit (refer Table 20-7). The methodology for the non-Aboriginal heritage assessment is presented in Section 20.1. Details of consultation are presented in Section 20.1 and Chapter 7 (Consultation). No further archaeological assessment was considered necessary (refer Section 20.1)

20.1 Assessment methodology

The methodology for the non-Aboriginal heritage assessment included:

- Identifying the study area relevant to non-Aboriginal heritage and the project
- A literature and database review, including a search of relevant heritage registers and schedules to identify properties within the non-Aboriginal heritage study area that may be impacted during construction and operation of the project
- A field survey of the identified properties within the study area
- An assessment of heritage significance for the non-Aboriginal heritage items that may be impacted by the project, including by locating / updating existing statements of heritage impact and preparing new statements of heritage impact where none previously existed
- Assessment of the likely level of impact during construction and operation on the identified properties and non-Aboriginal heritage items, including preparation of statements of heritage impact
- Identification of proposed mitigation and management measures, including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures.

The non-Aboriginal assessment was undertaken in line with following guidelines:

- The Burra Charter (the Australia ICOMOS charter for places of Cultural Significance) (ICOMOS (Australia), 2013)
- Assessing Heritage Significance (NSW Heritage Office, 2001)
- Assessing Significance for Historical Archaeological Sites and Relics (NSW Heritage Branch, 2009)
- *Heritage Curtilages* (NSW Heritage Office and NSW Department of Urban Affairs and Planning, 1996b)
- Levels of Heritage Significance (NSW Heritage Office, 2008).

Apart from the abovementioned guidelines, no further components of the *NSW Heritage Manual* were considered relevant in assessing the potential impacts of the project. Furthermore, as no impacts to the archaeological potential of heritage items would occur as part of the project, it was not considered necessary to prepare a specific archaeological assessment methodology, nor was it considered necessary to prepare for archaeological test excavations in consultation with the Heritage Council of NSW.

20.1.1 Study area

The study area for the non-Aboriginal heritage assessment is shown in **Figure 20-1**, which includes the sub-surface tunnel alignments and all surface works with a 50 metre buffer on both. The 50 metre buffer has been determined as adequate to assess the potential impacts of the project on heritage items.

20.1.2 Literature and database review

A review of archaeological and historical data relevant to the project has been completed, which included heritage registers, databases and schedules, local histories and archaeological reports. This literature and data review was used to identify known non-Aboriginal heritage sites located within the study area.

A search of the relevant heritage databases was conducted on 13 April 2015 and updated on 1 September 2015 to identify non-Aboriginal heritage items within the study area. The following heritage databases have been searched:

- Statutory databases:
 - World Heritage List (World Heritage Committee, UNESCO)
 - The Commonwealth Heritage List (Australian Heritage Council)
 - The National Heritage List (Australian Heritage Council)
 - The State Heritage Register (NSW Heritage Branch, OEH)
 - The State Heritage Inventory (NSW Heritage Branch, OEH)
 - Section 170 Heritage and Conservation Register compiled by Roads and Maritime
 - Section 170 Heritage and Conservation Register compiled by Sydney Trains
 - Section 170 Heritage and Conservation Register compiled by Transport for NSW
 - Section 170 Heritage and Conservation Register compiled by Sydney Water
 - Section 170 Heritage and Conservation Register compiled by Ausgrid
 - Schedule 5 of the Hurstville Local Environmental Plan 2012 (Hurstville LEP)
 - Schedule 5 of the Canterbury Local Environmental Plan 2012 (Canterbury LEP)
 - Schedule 5 of the Rockdale Local Environmental Plan 2011 (Rockdale LEP)
 - Schedule 5 of the Botany Bay Local Environmental Plan 2013 (Botany Bay LEP)
 - Schedule 5 of the Marrickville Local Environmental Plan 2011 (Marrickville LEP)
 - Schedule 5 of the Sydney Local Environmental Plan 2012 (Sydney LEP), including proposed industrial heritage listings currently under consideration for inclusion in Schedule 5 (City of Sydney, 2014).
- Non-statutory:
 - The Register of the National Estate (Australian Heritage Council)
 - The Register of the National Trust of Australia (NSW).

Other literature was also consulted for relevant information about the non-Aboriginal heritage of the study area, including:

- A review of historical materials, such as historical parish maps and plans, to determine the historical context of the study area and identify any potential for archaeological heritage items
- Archives from the:
 - National library of Australia
 - State Library of NSW
 - City of Sydney Archives
 - Land and Property Information's on-line Historical Land Records Viewer
 - Trove digitised newspaper collections
 - Relevant local libraries.

Non-Aboriginal heritage items and areas identified through searches of these databases and registers are summarised in **Table 20-4**, **Section 20.2.2**, and are shown in **Figure 20-1**.

20.1.3 Field survey

Known non-Aboriginal heritage items and areas identified as having the potential to be impacted (either directly or indirectly) by the project were subject to a targeted inspection to determine their current condition. Results from these inspections were used to inform an assessment of potential impacts on non-Aboriginal heritage values. This process comprised:

- Review of mapped non-Aboriginal heritage listings to identify those properties with the potential to be directly or indirectly impacted during construction or operation of the project
- Compilation of available information on potentially impacted non-Aboriginal heritage listings, including past inspection photographs, as a point of comparison
- Field inspections of the identified listings, which involved recording the current condition of each site. Each listed item was photographed and compared to past descriptions / photos. Interior features or the condition of the interior of each site, if relevant to the listing, were based on the details provided within the database
- Field investigation of other potential items of non-Aboriginal heritage additional to those recorded listing locations that may be impacted by the project
- Updates to existing background information with results of field inspections.

Field inspections were carried out from 20 to 23 April 2015 and included a pedestrian and vehicle survey from the public domain within the study area. Sites marked on parish plans or identified as part of the survey were inspected and:

- The structure and / or features identified at each site were recorded
- The structures / features were then assessed for historical significance
- Photographs were taken of the structures / features with details maintained in a photo log.

An additional day of survey was conducted on 21 May 2015 to inspect the interior of the Rudders Bond Store (53-57 Campbell Road, St Peters) and several heritage listed terraces in St Peters (15, 36, 40, 44, and 126 Campbell Street, St Peters).

20.1.4 Significance assessment

Assessments of significance were undertaken to determine why particular sites are important and to enable appropriate site management and curtilage to be determined (refer **Section 20.2.4**). A heritage item may be significant at a local level (ie to the people living in the vicinity of the item), at a State level (ie to all people living within NSW) or to the country as a whole (National / Commonwealth significance). The significance assessment criteria are provided in Section 3.3 of the Technical working paper: non-Aboriginal heritage (**Appendix R**).

Significance assessments were undertaken for all properties identified as listed non-Aboriginal heritage items located within the bounds of, or within 50 metres of, the project area. These listed heritage items were assessed for current condition and compared to photographs from past inspections (where available) and the descriptions contained in heritage listings. Statements of significance were sourced from the published listings for these properties.

20.1.5 Impact assessment

For the purpose of the non-Aboriginal heritage impact assessment, the potential areas of impact were divided into the following components:

- The western surface works and Kingsgrove Road surface works
- The main alignment tunnels
- The Bexley Road surface works
- The Arncliffe surface works
- The St Peters interchange and local road upgrades.

More detailed descriptions of activities proposed at each of the areas listed above are provided in **Chapter 5** (Project description) and **Chapter 6** (Construction work).

Impacts on non-Aboriginal heritage items have been categorised as follows:

- Direct – where the project would be located within the curtilage of the heritage item and / or involve the demolition or modification of the heritage item
- Potentially direct – where the project may impact on the heritage item subject to the condition of the item, more detailed investigation, construction methodologies and / or the implementation of mitigation and management measures. For example, where the project may impact on the item through construction vibration, settlement, or the application of acoustic treatment
- Indirect – where the project would change the visual context and surroundings of a heritage item.

Types of impacts that may result from the construction or operation of the project are identified and described in **Table 20-2**, and are outlined in more detail below.

Table 20-2 Types of impacts to non-Aboriginal heritage items

Impact	Description
Direct	
Demolition	Demolition of structures.
Modification	Modification to a heritage item to cater for the project.
Acquisition	Impacts resulting from the full or partial acquisition (and associated demolition) of properties that contain heritage items. An example of heritage impact arising from acquisition would be a change from original use.
Change in heritage conservation area values	Construction of a new element within a heritage conservation area.
Potentially direct	
Acoustic treatment	Properties, some of which may be listed heritage items, may qualify for at-property acoustic treatment. This may impact on the fabric or the significance of the heritage item.
Vibration, settlement and groundwater drawdown from tunnelling works	The area of potential impact for the main alignment tunnels, on ramp and off ramp tunnels includes a zone on the surface equal to a distance of 50 metres from the outer edge of the underground tunnels. The potential impacts on non-Aboriginal heritage items may be caused by: • Construction vibration from blasting works as the road headers pass underneath properties • The settlement of land if tunnelling activities are conducted underneath or close to heritage features • Impacts on tree roots, in the case of street trees, depending on the depth of the tunnelling activity.
Vibration from surface works	Depending on the setback of buildings from the construction footprint, there is the potential for vibration impacts associated with surface road works, building construction and / or the cut-and-cover sections of the main alignment tunnels, and on and off-ramps.
Dust	Construction activities may result in the generation of dust where construction works are at the surface or during the handling of spoil. Spoil handling would be in part undertaken inside acoustic sheds at compounds. Air quality impacts during construction would be managed by implementing standard and best practice mitigation measures. As such, this potential impact has not been considered further. For further information on dust management, see Section 10.11.1 (Air Quality).

Impact	Description
Indirect	
Visual	There may be temporary and permanent visual impacts as result of the project. These may include: • Construction of new road infrastructure or ancillary facilities • Alterations to surface roads • New noise walls or modifications to existing noise walls, including changes to the height of noise walls • Removal of vegetation • Establishment and use of construction compounds. For more information see Sections 14.3.1 and 14.3.2 (Visual impact and urban design).

The degree to which the impacts listed above would affect the heritage value or significance of identified non-Aboriginal heritage items would vary. In order to undertake a comparative assessment, a set of impact ratings were established and used to rank the degree of impact. These impact ratings are described in **Table 20-3** below.

Table 20-3 Non-Aboriginal heritage impact criteria

Impact assessment	Criteria
Negligible	• Impacts to the heritage item in question would be negligible and would not affect the overall heritage significance of the item.
Minor impact	• Minor impacts may occur to the listed item, typically with respect to its reported curtilage as opposed to the listed item itself • These impacts would be minimal and would not affect the overall heritage significance of the item • Impacts that can be mitigated through remediation and repairs.
Significant impact	• Impacts to the heritage item are unavoidable with the current project design • The heritage value of the item would be impacted.

20.2 Existing environment

20.2.1 Historical context

The literature and data review was used to inform a description of the historical context of the region from pre-European contact until the present day, as follows:

- Aboriginal history - the study area falls within the traditional country of the Darug people, who spoke the Darug (also spelt Dhaŕ-rook, Dharrook, Dhaŕook, Dharruk and Dharug) language. Individual bands of up to around 60 individuals occupied the Cumberland Plain (Attenbrow, 2010), with much larger groups of Aboriginal people, numbering in the hundreds, coming together for events such as corroborees, ritual combats and feasts
- Post-contact history - traditional hunting and camping grounds of the Darug-speaking peoples of the Sydney Region were rapidly claimed and settled by Europeans, and Aboriginal populations decimated by introduced diseases such as tuberculosis and small pox (Attenbrow, 2010). Further details regarding the Aboriginal history and heritage of the region can be found in **Section 23.2**, and Section 4.2 of the Technical working paper: Aboriginal heritage (**Appendix R**)
- European settlement:
 - The Cooks River and Wolli Creek area was one of the last areas close to Sydney to be settled by Europeans. From 1799, the land from what is today Tempe and St Peters to the modern suburb of Kingsgrove was settled as pasture and timbered lands (Wolli Creek Preservation Society, 2011). The area known today as Beverly Hills was settled in 1810. It contained dense forest, small market gardens, dairies, timber getters and charcoal burners (City of Canterbury Library, 2012). Arncliffe was settled in the 1830s and the land was used for farming, including the raising of pigs, poultry, cattle and horses (Rathborne, 1997)

- The first large estate in the area was owned by James Chandler who purchased Sylvester Farm in 1822, around 100 acres (about 40 hectares) to the west of Wolli Creek adjoining Kingsgrove which was added to with a further grant of 1,200 acres (about 485 hectares), covering what is today Bexley, Bexley North, Kogarah and part of Rockdale (Rathborne, 1980)
- The depression of the 1840s plunged many big estate owners into bankruptcy, resulting in subdivision of land along Wolli Creek for smaller farms and market gardens (Wolli Creek Preservation Society, 2011)
- Early 20th century:
 - Many older houses and mansions in the region were subdivided and replaced by working class housing and industries. Bexley remained an elite suburb, Arncliffe accommodated noxious industries such as tanneries, boiling down works and wool washing, and St Peters was famous for its brickworks (Thorp, 1994)
 - The opening of the East Hills railway line in 1931, as well as the break-up of former private lands. Greater access to cars as a means of transport encouraged significant increase in the region's suburbanisation. However, Bexley North, Kingsgrove and Kyeemagh remained sparsely settled until after World War II (Thorp, 1994).
- Post World War II:
 - Small farms, dairies and market gardens closed in the 1960s following pressures of increased urbanisation (Wolli Creek Preservation Society, 2011)
 - Incremental development of Sydney Airport took place over time with the addition of new passenger and military infrastructure. Following WWII, Cooks River was diverted to develop new runways. A third runway was opened in 1994, requiring the Commonwealth government to acquire properties in the area. In 2002 the airport was privatised (Sydney Airport Corporation Limited, 2009)
 - In 2001, the Roads and Traffic Authority (now Roads and Maritime) opened the M5 East Motorway to traffic (Roads and Maritime, 2015c).
- Present day - the study area covers a populous residential and commercial area and supports the main road infrastructure linking the Sydney CBD, Sydney Airport and Port Botany to western Sydney.

20.2.2 Historic heritage items

The review of heritage registers and databases identified 57 individual heritage items within the study area (refer to **Table 20-4** and **Figure 20-1**). Taking in account that seven items are listed on more than one register, a total of 70 listings were identified.

Table 20-4 Historic heritage items identified on heritage registers

Register	Items within study area
Commonwealth	
World Heritage List	No listed items.
National Heritage List	No listed items.
Commonwealth Heritage List	No listed items.
Register of the National Estate (non-statutory) Nine heritage items.	Alexandra Canal (ID No 103889)
	St Peters Brickpit Geological Site on Princes Highway (ID No 162040)
	St Peters Anglican Church and graveyard on Princes Highway 9 ID No 1716)
	Kingsgrove East Urban Conservation Area (ID No 102091)
	Pallamanna Parade Urban Conservation Area (Beverly Hills) (ID No 102089)
	Clemton Park Urban Conservation Area (ID No 102071)
	Bardwell Park Urban Conservation Area (ID No 102101)
	Sydenham Village (ID No 100061)

Register	Items within study area
State	
NSW State Heritage Register	Arncliffe Railway Station Group on Firth Street (ID No 01076)
Five State listed heritage items	Western Outfall Main Sewer Valda Avenue (ID No 01647)
	Timber Slab Cottage on Barden Street (ID No 01412)
	Alexandra Canal 9 ID No 016210
	St Peters Anglican Church and graveyard on Princes Highway (ID No 00032)
Sydney Water Section 170 Heritage And Conservation Register	Western Outfall Main Sewer Valda Avenue (ID No 4572728)
Three State listed heritage items	Alexandra Canal (ID No 4571712)
	Sewerage Pumping Station No. 39 (ID No 4571730)
Sydney Trains Section 170 Heritage And Conservation Register	Arncliffe Railway Station Group on Firth Street (ID No 4801150)
One State listed heritage items, and three listed as having local significance	Arncliffe Overbridge on Forest Road (ID No 4805728)
	Bexley North Railway Station (Register ID No 48101898)
	Wolli Creek Culvert (Register ID No 4305006)
Roads and Maritime Section 170 Heritage And Conservation Register	Terrace group of housing at 28-44 Campbell Street (ID No 4305629)
Two State heritage items	House at 82 Campbell Street (ID No 4305643)
Local	
Canterbury LEP	No listed items.
Hurstville LEP	No listed items.
Marrickville LEP Seventeen local heritage items, including one heritage conservation area	Timber Slab Cottage on Barden Street (I294)
	Moreton Bay Fig at 43 South Street (I303)
	Brick Kerbs and Sandstone Kerb Guttering (George Street, Henry Street, Park Road, Park Lane, Railway Lane, Rowe Lane, Reilly Lane and Stewart Lane) (I284)
	Victorian Filigree Style Sandstone Faced Residence on Railway Road (I288)
	Construction of St Mary / St Mina Coptic Orthodox Church on Railway Road (I289). Note that Marrickville Council have determined to demolish the Church. It will be removed from the Marrickville LEP.
	Alexandra Canal (I270)
	Goodsell Estate Heritage Conservation Area (C16)
	Southern Cross Hotel on Princes Highway (I277)
	A Service Garage at 316 Princes Highway (I312)
	Westpac Stores and Penfolds Wine Cellars on Princes Highway (I299)
	St Peters Anglican Church and graveyard on Princes Highway (I275)
	The Town and Country Hotel on Unwins Bridge Road (I281)
	Narara Terraces on Unwins Bridge Road (I282)
	The Waugh and Josephson Industrial Buildings on Unwins Bridge Road (I280)
	The terrace houses at 105-119 May Street (I273)
	St Peters Public School at 93A Church Street (I271)
	Remaining brick road and footpath paving and stone guttering (I283)

Register	Items within study area
Rockdale LEP Twenty-one local heritage items	House at 148 Wollongong Road (I61)
	Victorian Shop and Dwelling on Firth Street (I21)
	Arncliffe Railway Station Group on Firth Street (I1)
	Street Plantings on Firth Street (Figs) (I18)
	Glenevie Lane (I20)
	Arncliffe Post Office and residence on Firth Street (I19)
	Victorian Houses and Semi-Detached Dwelling on Stanley Street (16-26) (I48)
	Victorian Houses and Semi-Detached Dwelling on Stanley Street (16-26) (I49)
	Victorian Houses and Semi-Detached Dwelling on Stanley Street (16-26) (I50)
	Victorian Houses and Semi-Detached Dwelling on Stanley Street (16-26) (I51)
	Rosslyn Hospital on Forest Road (I24)
	St Francis Xavier Church Group on Forest Road (I22)
	St Francis Xavier Catholic Presbytery on Forest Road (I23)
	Victorian house at 73 West Botany Street (I56)
	Californian Bungalow at 21 Fairview Street (I16)
	Californian Bungalow at 7 Fairview Street (I15)
	Bard of Avon Terrace at 39 Eden Street (I13)
	Victorian house at 31 Kyle Street (I35)
	Wolli Creek Valley (I237)
	Stotts Reserve on Slade Road (I165)
	Stone Federation House at 15 East Street (I81)
Sydney LEP Eight local heritage items, including two items listed under proposed amendments to Sydney LEP (industrial and warehouse buildings)	Alexandra Canal (I13)
	Warehouse "Rudders Bond Store" on Campbell Street (I405)
	The Terrace Group at 2-34 Campbell Road (I12)
	Sewerage Pumping Station No. 39 (I18)
	Industrial Building "Frank G Spurway" on Maddox Street (I20)
	The Cooper Estate Conservation Area (C2)
	Macdonaldtown stormwater channel on Euston Road (proposed amendment ID No 3)
	Former Alexandria Spinning Mills on Maddox Street (proposed amendment ID No and 14)
Botany Bay LEP One local listed heritage item	Alexandra Canal (I1)
Total	70 listings of a total of 57 individual heritage items (including seven heritage items which are listed on two or more registers)

Seven items were found to be listed on more than one heritage register (refer to Table 4 of Technical working paper: Non-Aboriginal heritage in **Appendix R**). In the case of those heritage items with multiple listings, each heritage item has only been counted once.

The following areas are broad, landscape based heritage listings:

- Pallamanna Parade Urban Conservation Area
- Kingsgrove East Urban Conservation Area
- Clemton Park Urban Conservation Area
- Bardwell Park Urban Conservation Area

- Goodsell Estate Heritage Conservation Area
- Cooper Estate Conservation Area
- Sydenham Village.

The significance of these areas is discussed further in Section 6.0 of Technical working paper: Non-Aboriginal heritage (**Appendix R**).

While the Former Bedford Brickworks group within Sydney Park is locally listed under the Sydney LEP (I27), it sits outside the 50 metre study area delineated in **Section 20.1.1**. Furthermore, while not listed under the Sydney LEP or any other heritage register, Sydney Park itself does contain areas of archaeological potential pertaining to the former brickworks (refer Sections 5.2.6 and 6.12.2 of **Appendix R**). Due to the prominence of these items, they have been considered for potential visual impacts as a result of the project (refer Section 7.2.4 of **Appendix R**).

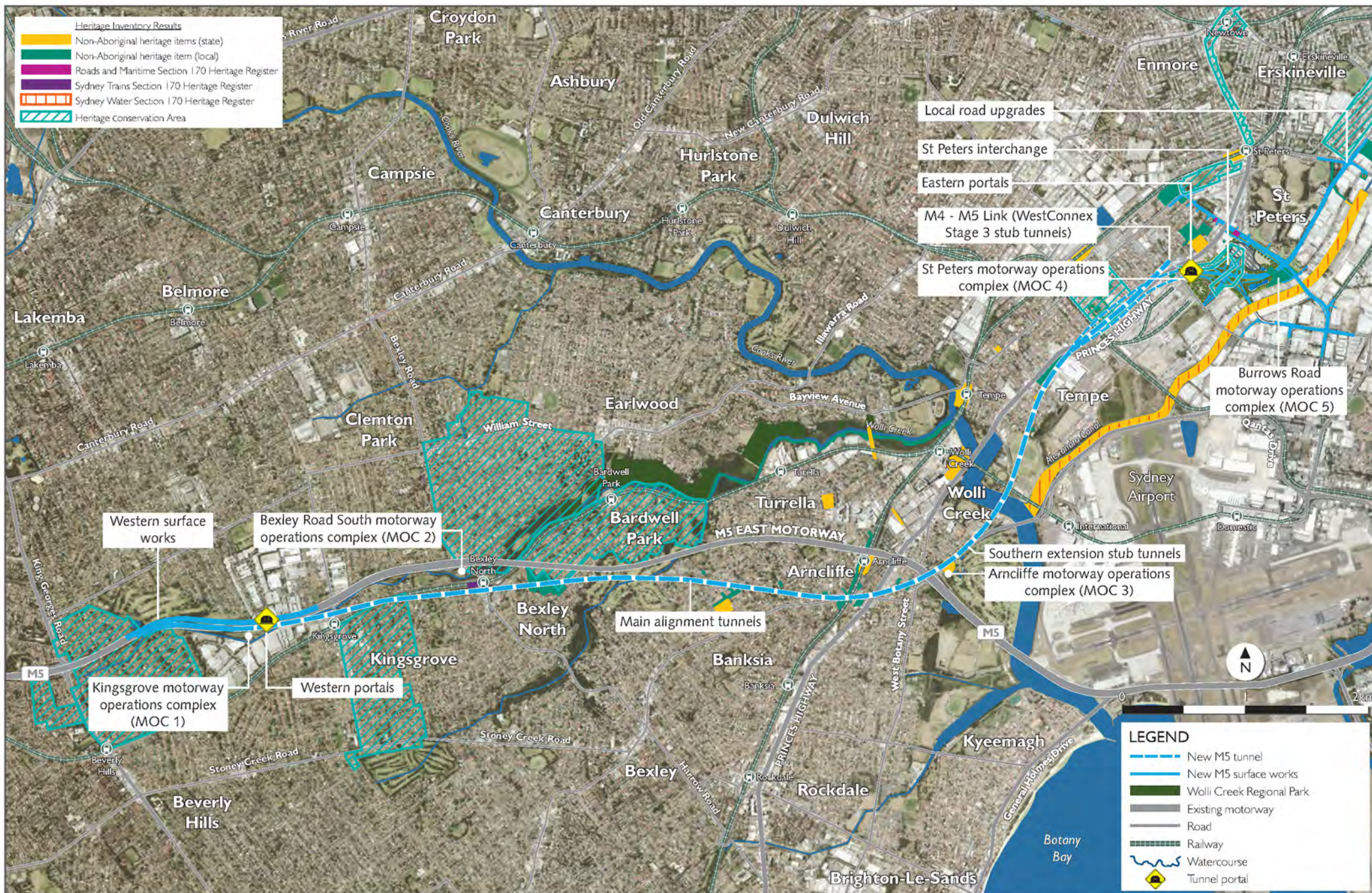


Figure 20-1 Non-Aboriginal heritage inventory results within the study area and surrounds

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20.2.3 Surface disturbance areas

The review of historical maps, plans and images focused on areas where surface disturbance is proposed. Archaeological relics or deposits located in the vicinity of the tunnel alignments are unlikely to be impacted by the project, except in areas of surface disturbance as part of the western surface works, the St Peters interchange surface works and intervening construction compound sites.

This section is divided into an examination of the non-Aboriginal archaeological potential of the western surface works, Bexley surface works, Arncliffe surface works area, St Peters interchange and local roads upgrades, which are shown on **Figure 20-2** to **Figure 20-6**.

It is also relevant to note the potential for historical tram tracks to be intercepted by ground breaking works throughout these areas. Historically, tram tracks extended throughout the Sydney area, including tracks running from the central business district toward Newtown, Alexandria, Enmore, St Peters, Marrickville, Tempe and Cooks River. As the historical retention of tram tracks and associated infrastructure beneath later developments was ad hoc, there is therefore potential to encounter tram tracks wherever those tracks were historically located.

Western surface works

This area is shown in **Figure 20-2** and **Figure 20-3**. Historical parish plans and the 1943 aerial photography of Sydney provide evidence of land grants, subdivisions and later residential development in this area. The western surface works would take place within the existing M5 East Motorway road reserve. There is no indication that potential archaeological relics or deposits remain in situ at this location.

Kingsgrove Road surface works

This area is shown in **Figure 20-3**. The Kingsgrove Road surface works would be undertaken within the current road reserve of the M5 East Motorway. There are no identified areas of archaeological potential within the areas likely to be disturbed by the Kingsgrove Road surface works.

Bexley Road surface works

This area is shown in **Figure 20-3**. The Bexley Road surface works (which would include construction and operational ancillary facilities) are located within three discrete locations on the eastern and western side of Bexley Road, north of the Bexley North Railway Station. Parish plans and the 1943 aerial photograph indicate that two of the three locations of the Bexley Road surface works remained undeveloped in 1943 (refer to Figure 8 of **Appendix R**). Any relics found at these locations would therefore post-date the early 1940s. The Bexley Road east construction compound has been historically occupied by buildings, as shown on Figure 15 of **Appendix R**. As the site is currently occupied by the M5 East Motorway trial filtration plant, the potential for remnant relics or deposits is considered to be low.

Arncliffe surface works area

This area is shown in **Figure 20-4**. Parish records show that the area around the Arncliffe surface works area was probably still Crown land before the 1830s. The 1943 aerial photographs show that the surrounding area was used for market gardening, and indicate a number of small structures within the extent of the works. However it is anticipated that relics and deposits associated with those structures would have been removed during the subsequent construction of the golf course and associated reclamation activities.

St Peters interchange

This area is shown in **Figure 20-5** and **Figure 20-6**. It was initially subject to an early colonial land grant. However the land was swampy and so remained undeveloped for a period. The 1890s parish plan shows Barwon Park, which, according to the 1951 aerial photograph became the Central Brick and Tile Company kilns. Aerial photographs between 1951 and 1997 indicate that the area containing the kilns was used to manage and stockpile wastes and was later disturbed, and that the kilns and associated structures were later demolished. It is unlikely that relics or deposits associated with the Central Brick and Tile Company remain in situ as any remains are likely to have been disturbed by subsequent waste facility related activities.

The Austral Brick Company also established and operated separate kilns and a brickpit in this area in 1975. It is unlikely that relics associated with the Austral Brick Company will remain in these areas, apart from a section on the corner of Princes Highway and Canal Road.

No substantial ground disturbance works are planned for this area as it contains the Service Garage at 316 Princes Highway, St Peters (a heritage item that is being retained). The footprint of the heritage item closely mirrors that of an historical building from the Austral operation and it is therefore unlikely that landscaping works or similar around the heritage item would encounter relics.

Local road upgrades

These areas are shown in **Figure 20-5** and **Figure 20-6**. The local roads upgrades would be largely undertaken within current road reserves and associated footpaths or in industrial areas that have been developed recently. However, some local road upgrade works would encroach onto numerous areas containing non-Aboriginal heritage items, including the following:

- Goodsell Estate Heritage Conservation Area, corner of Bedwin Road and May Street, St Peters
- Roads and Maritime owned terrace housing, Campbell Street, St Peters
- Roads and Maritime owned house, Campbell Street, St Peters
- Alexandra Canal
- Cooper Estate Heritage Conservation Area, bounded by Fountain Street, Lawrence Street, Hartley Street, Lawrence Lane, Huntley Street and Mitchell Road, Alexandria
- St Peters Brickpit Geological site, corner of Princes Highway and Canal Road.



Figure 20-2 Non-Aboriginal heritage inventory results - map 1 (Western surface works)

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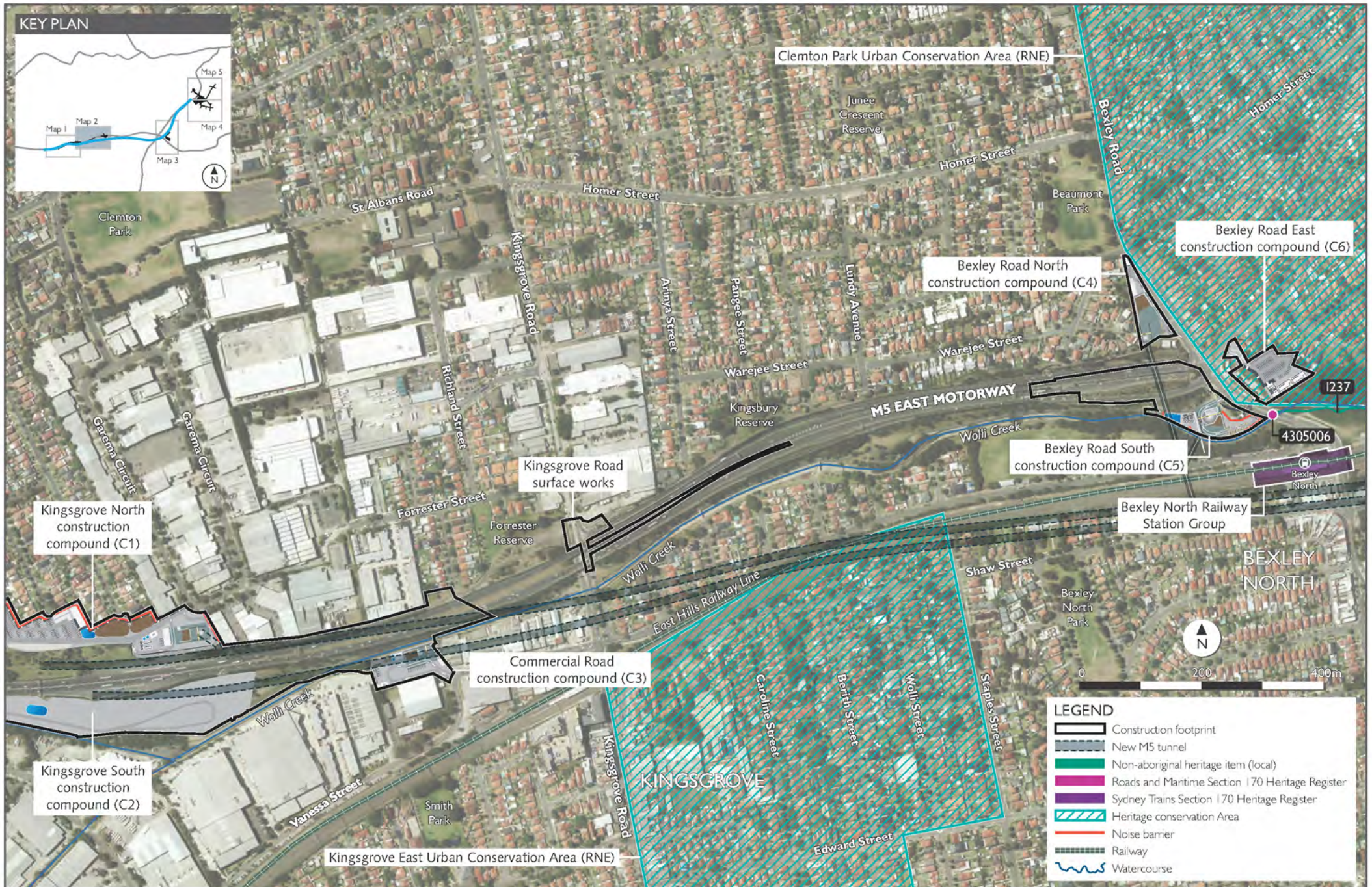


Figure 20-3 Non-Aboriginal heritage inventory results - map 2 (Kingsgrove and Bexley Road surface works)

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Figure 20-4 Non-Aboriginal heritage inventory results - map 3 (Arncliffe surface works)

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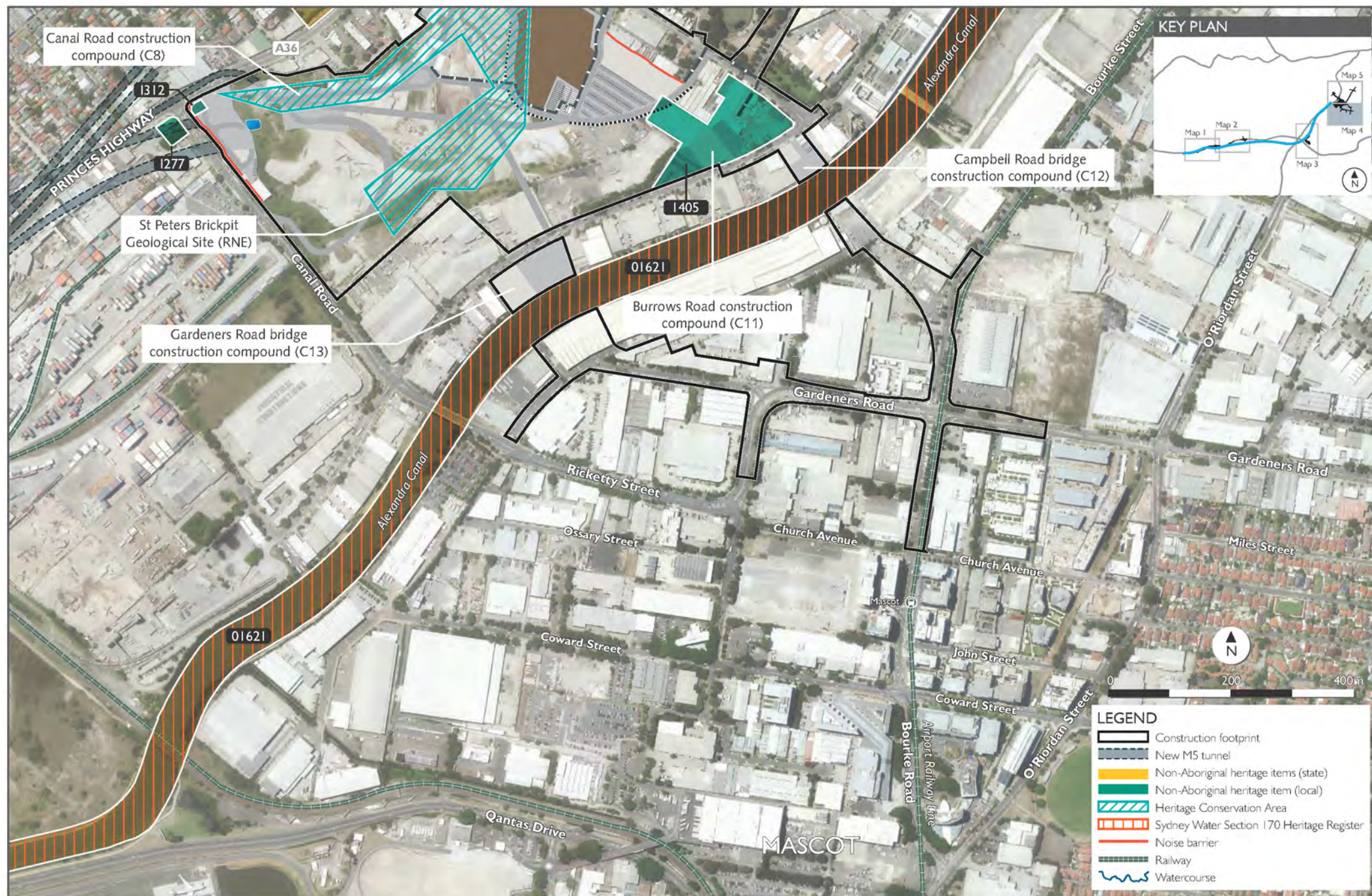


Figure 20-5 Non-Aboriginal heritage inventory results - map 4 (St Peters interchange and local roads)

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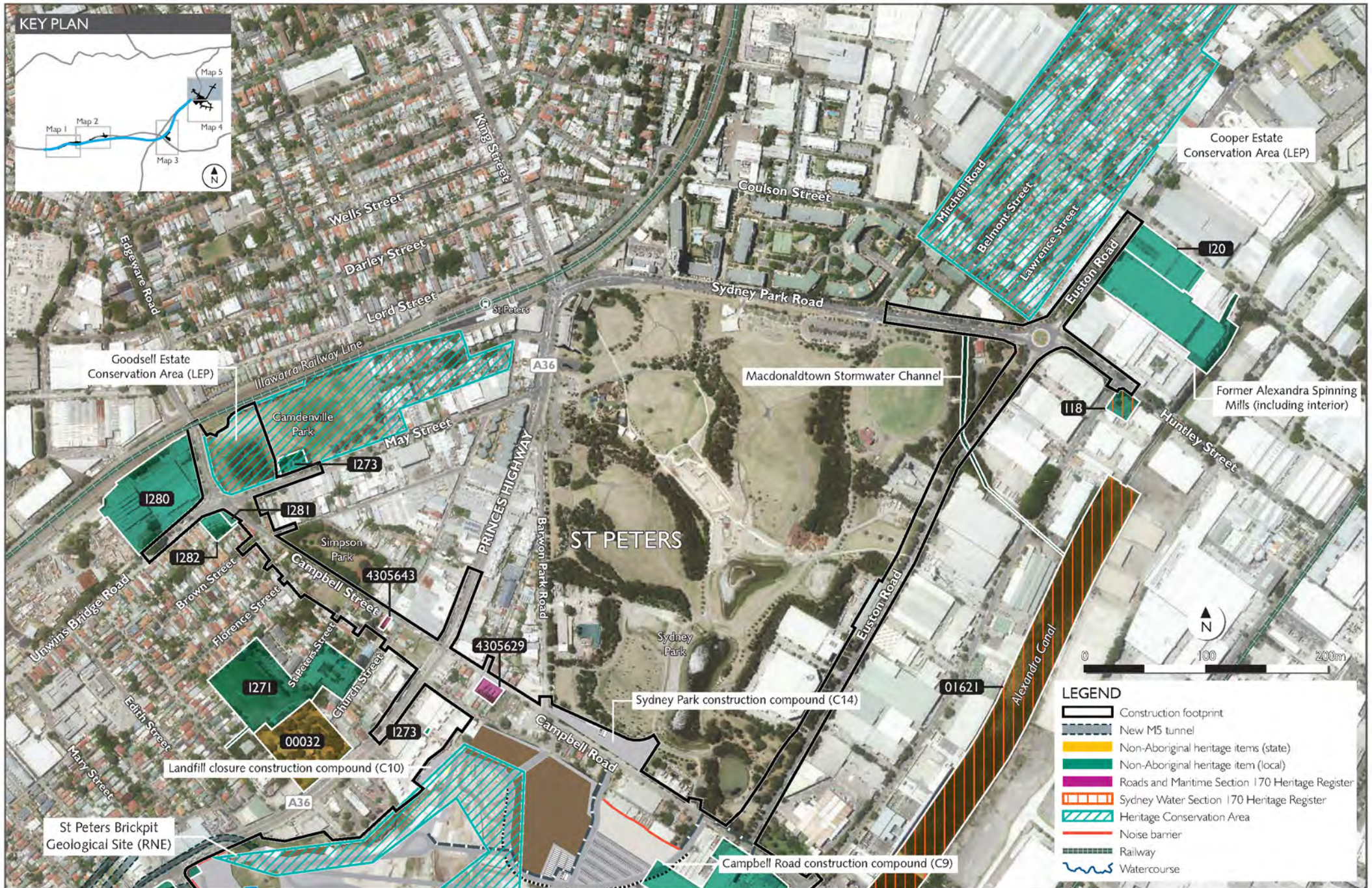


Figure 20-6 Non-Aboriginal heritage inventory results - map 5 (St Peters interchange and local roads)

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20.2.4 Significance assessment

To understand how the project would impact on non-Aboriginal heritage items within the study area it is necessary to first understand why each non-Aboriginal heritage item is significant. Assessments of significance explain why a particular heritage item is important. They also enable the boundary of the heritage site to be properly identified, and allow appropriate site management measures to be selected. For many of the non-Aboriginal heritage items within the study area, statements of heritage significance already exist and are available in the public domain. Where necessary, and based on the site inspection and historical research carried out, significance assessments were revised to ensure they were up to date.

Non-Aboriginal heritage items may be classified as having either a local or State level of heritage significance, in accordance with the guideline *Assessing Heritage Significance* (NSW Heritage Office, 2001) and the *Heritage Act 1977*. Full details of the methodology used to assess non-Aboriginal heritage significance are provided in Section 3.0 of the Technical working paper: Non-Aboriginal heritage (**Appendix R**). The resulting statements of significance for each non-Aboriginal heritage item within the study area are provided in Section 6.0 of the Technical working paper: Non-Aboriginal heritage (**Appendix R**).

Table 20-5 summarises the significance of individual non-Aboriginal heritage items found within each suburb of the study area. The locations of these non-Aboriginal heritage items along the study area are shown in **Figure 20-1**.

The Register of the National Estate no longer has a statutory purpose. Indicative places were identified as potentially being eligible for listing on the Register, but their boundaries and heritage significance were not subject to further refinement.

Table 20-5 Significance listing and reasons for heritage significance

Significance / listing	Summary of heritage significance
Kingsgrove / Beverly Hills / Clemton Park	
Register of the National Estate ID No 102091	The Kingsgrove East Urban Conservation Area (Kingsgrove) is identified on the Register of the National Estate as an area of 1930s Californian bungalows, with some 1940s and 1950s houses. Its status is as an indicative place.
Register of the National Estate ID No 102089	The Pallamanna Parade Urban Conservation Area (Beverly Hills) is identified on the Register of the National Estate as an area of 1930s Californian bungalows, with some 1940s and 1950s houses. Its status is as an indicative place.
Register of the National Estate ID No 102071	The Clemton Park Urban Conservation Area (Clemton Park) is identified on the Register of the National Estate as an area of 1930s Californian bungalows, with some 1940s and 1950s houses. Its status is as an indicative place.
Bexley North	
Local significance - Sydney Trains Section 170 Heritage and Conservation Register ID No 48101898	While not rare, the Bexley North Railway Station is part of the East Hills line, a major Great Depression period piece of public works infrastructure. It provides examples of experimentations with railway architectural styles adaptation to depression period economic conditions.
Local significance – Rockdale LEP I165	Stotts Reserve on Slade Road is a sandstone vegetation and forested area containing remnant bushland.
Bardwell Park	
Local significance – Rockdale LEP I81	Stone Federation House at 15 East Street is a federation rusticated sandstone cottage from the 1910 Maylands Estate subdivision.
Register of the National Estate ID No 102101	Bardwell Park Urban Conservation Area is an area of 1930s Californian bungalows, with some 1940s and 1950s houses.
Earlwood	
Roads and Maritime Section 170 Heritage and Conservation Register ID No 4305006	Wolli Creek Culvert on Bexley Road was a key component of upgrade works bringing Bexley Road up to standard as a newly classified Main Road serving fast growing Canterbury.
Arncliffe	
Local significance - Rockdale LEP I61	House at 148 Wollongong Road is a single storey federation arts and crafts style.
Local significance - Rockdale LEP I21	Victorian Shop and Dwelling on Firth Street evidences the district's economic growth in the mid-late 19th century (ie used as a grocery shop servicing growing population accompanying improved railway access). It also evidences strip commercial development in the Rockdale local government area in the early 20th century.
State significance – State Heritage Register ID No 01076, Sydney Trains Section 170 Heritage and Conservation Register ID No 4801150, and Rockdale LEP I1	Arncliffe Railway Station Group on Firth Street demonstrates the Illawarra Line's development from 1884 to 1925.

Significance / listing	Summary of heritage significance
Local significance - Rockdale LEP I18	Street Plantings on Firth Street (Figs) evidence the public streets beautification program in the early 20th century.
Local significance - Rockdale LEP I20	Glenevie Lane connects an urban network of streets between Firth Street and the Arncliffe Railway Station.
Local significance – Register of the National Estate ID No 19170, and Rockdale LEP I19	Arncliffe Post Office and residence on Firth Street are of rare federation style.
Local significance - Rockdale LEP I48	Victorian Houses and Semi-Detached Dwelling on Stanley Street (16-26) are part of rare group from the early development of Bardens Estate in 1895.
Local significance - Rockdale LEP I49	Victorian Houses and Semi-Detached Dwelling on Stanley Street (16-26) are part of rare group from the early development of Bardens Estate in 1895.
Local significance - Rockdale LEP I50	Victorian Houses and Semi-Detached Dwelling on Stanley Street (16-26) are part of rare group from the early development of Bardens Estate in 1895.
Local significance - Rockdale LEP I51	Victorian Houses and Semi-Detached Dwelling on Stanley Street (16-26) are part of rare group from the early development of Bardens Estate in 1895.
Local significance - Sydney Trains Section 170 Heritage and Conservation Register ID No 4805728	Arncliffe Overbridge on Forest Road is the largest single span brick arch road bridge on the NSW railway network.
Local significance - Rockdale LEP I24	Rosslyn Hospital on Forest Road is a prominent Victorian style villa. Its later conversion to a hospital was a significant contribution to health services development in Arncliffe.
Local significance - Rockdale LEP I22	St Francis Xavier Church Group on Forest Road shows ecclesiastical design from the interwar period, and is historically significant to the early 20th century development of Arncliffe.
Local significance - Rockdale LEP I23	St Francis Xavier Catholic Presbytery on Forest Road is a late Victorian villa.
Local significance - Rockdale LEP I56	Victorian house at 73 West Botany Street is part of the original village of West Botany.
Local significance – Rockdale LEP I16	Californian Bungalow at 21 Fairview Street is part of the original Gibbini Dappeto Estate subdivision in 1918, as Rockdale developed into a commuter suburb.
Local significance - Rockdale LEP I15	Californian Bungalow at 7 Fairview Street demonstrates the expansion of Arncliffe during the 1920s-1930s.
State significance – State Heritage Register ID No 01647, Sydney Water Section 170 Heritage and Conservation Register ID No 4572728	Western Outfall Main Sewer continues in use as part of an original system built in the 1890s to end sewage discharge to Sydney Harbour.
Local significance – Rockdale LEP I13	Bard of Avon Terrace at 39 Eden Street is early evidence of the Wincanton Estate and the late 19th century development of Arncliffe.
Local significance - Rockdale LEP I35	Victorian house at 31 Kyle Street was one of the first houses built on the Innesdale Estate.

Significance / listing		Summary of heritage significance
Wolli Creek		
Local significance - Rockdale LEP I237		Wolli Creek Valley is a rare example of native vegetation and landscape in the inner Sydney urban area, containing several rare and significant fauna and flora species. It is significant for its role in the decision to begin settlement in the area by providing water and promised good soils for crops. It was integral to the protection of the riparian corridor of Wolli Creek and acts as an essential green recreation corridor buffering densely urban surrounding areas.
Tempe		
State significance – State Heritage Register ID No 01412, and Marrickville LEP I294		Timber Slab Cottage on Barden Street was constructed around 1840, and is a rare surviving example of rudimentary timber buildings in early Sydney.
Local significance – Marrickville LEP I303		Moreton Bay Fig at 43 South Street was planted after the Tempe Estate subdivision, in either late 19th or early 20th century.
Sydenham		
Local significance - Marrickville LEP I284		Brick Kerbs and Sandstone Kerb Guttering (George Street, Henry Street, Park Road, Park Lane, Railway Lane, Rowe Lane, Reilly Lane and Stewart Lane) demonstrate the development of Sydenham. These are rare heritage features, given that the majority of guttering is now impacted / replaced by upgrade works.
Local significance - Marrickville LEP I288		Victorian Filigree Style Sandstone Faced Residence on Railway Road has an unusual stone front façade reflecting proximity to stone quarries.
Local Significance - Marrickville LEP I289		Construction of St Mary / St Mina Coptic Orthodox Church on Railway Road demonstrated the district's growing Methodist congregation. It is noted that Marrickville Council has determined to demolish the Church as no suitable use for the structure has been found.
Register of the National Estate ID No 100061		Sydenham Village is listed on the Register of the National Estate as an indicative place. It was an area of workers' cottages, built with bricks from the local brickworks. The central portion of the village was demolished as noise mitigation related to the construction of the third runway at Sydney Airport.
St Peters		
State significance – Register of the National Estate ID No 103889, State Heritage Register ID No 01621, Sydney Water Section 170 Heritage and Conservation Register ID No 4571712, Sydney LEP I13, Marrickville LEP I270 and Botany Bay LEP I1		Alexandra Canal was built on the historic Sheas Creek, which was first dredged in 1887, and was an unemployment relief scheme. The original canal extended between Sydenham to Botany Railway Bridge to the Canal Road Bridge. In 1894 plans were made to extend the Canal to Redfern. However, only part of this was constructed and the Canal halted just to the south of Huntley Street, Alexandria in 1900. During the expansion of Sydney Airport between 1947 and 1970, the Canal underwent major alterations. However the Canal was never fully utilised, being subject to silting, tidal factors and limitations on the draft of vessels that could use the passage. The closure of the Canal to shipping traffic began in the 1930s when two lifting span bridges were replaced with fixed span bridges. In the early 1940s the wharves that had serviced the Alexandra Canal were demolished as the declining use of the Canal did not warrant their maintenance.

Significance / listing	Summary of heritage significance
Local significance - Marrickville LEP C16	Goodsell Estate Heritage Conservation Area demonstrates principles and patterns of Marrickville's development, including brick and pottery industries.
Local significance – Roads and Maritime Section 170 Heritage and Conservation Register ID No 4305629	Terrace group of housing at 28-44 Campbell Street is part of rare group housing for this part of Sydney prior to the 1890s. These properties housed brickworkers after the 1870s.
Local significance – Roads and Maritime Section 170 Heritage and Conservation Register ID No 4305643	House at 82 Campbell Street is part of rare group housing for this part of Sydney prior to the 1890s. These properties houses brickworkers after the 1870s.
State significance - Sydney LEP I405	Warehouse “Rudders Bond Store” on Campbell Street is of State historical significance through its associations with Ralph Symonds Pty Ltd. The Symonds company were instrumental in the development and wide-spread use of glued structural laminated timber and laminated timber more generally, particularly during the materials shortages of World War Two and the following years.
Local significance - Sydney LEP I12	The Terrace Group at 2-34 Campbell Road was constructed around 1886 and leased to families working in nearby brickpits and factories.
Register of the National Estate ID No 162040	St Peters Brickpit Geological Site on Princes Highway has palaeontological value, and has been used for tertiary Palaeontological / geological educational purposes.
Local significance - Marrickville LEP I277	Southern Cross Hotel on Princes Highway has been a hotel site since 1906. The existing 1936 hotel shows interwar free classical style.
Local significance - Marrickville LEP I312	A Service Garage at 316 Princes Highway has detailing and architectural style unusual as applied to a mechanical workshop.
Local significance - Marrickville LEP I299	Westpac Stores and Penfolds Wine Cellars on Princes Highway were constructed in 1956, and constitute a modern industrial precinct of better quality than many of the other recent industrial developments in the area.
State significance – State Heritage Register ID No 00032, the Marrickville LEP 2011 I275, and Register of the National Estate ID No 1716.	St Peters Anglican Church and graveyard on Princes Highway is one of the earliest churches constructed as a result of the <i>Church Building Act 1836</i> and with the use of free labour in NSW. The graveyard contains many colonial settlers.
Local significance - Marrickville LEP I281	The Town and Country Hotel on Unwins Bridge Road is unusual for its close historical association with the Narara Terraces, and by together forming a unifying corner treatment of Unwins Bridge Road.
Local significance - Marrickville LEP I282	Narara Terraces on Unwins Bridge Road are unusual for their close historical association with the Town and Country Hotel, and by together forming a unifying corner treatment of Unwins Bridge Road.
Local significance - Marrickville LEP I280	The Waugh and Josephson Industrial Buildings on Unwins Bridge Road show the interwar functionalist style of the area.
Local significance - Marrickville LEP I273	The terrace houses at 105-119 May Street provided accommodation for brick and other industrial workers.
Local significance - Marrickville LEP I271	St Peters Public School at 93A Church Street is a late 19th century school building showing the development of St Peters.

Significance / listing	Summary of heritage significance
Local significance – Marrickville LEP I283	Remaining brick road and footpath paving and stone guttering.
Alexandria	
Local significance – Sydney Water Section 170 Heritage and Conservation Register ID No 4571730 Local significance - Sydney LEP I18	Sewerage Pumping Station No. 39 has multiple heritage listings. It and Water Board Pump House on Huntley Street were constructed in 1925 to combat the increasing pollution caused by Sydney's growing population.
Local significance - Sydney LEP I20	Industrial Building "Frank G Spurway" on Maddox Street shows mid-20th century industrial / commercial development.
Local significance – Sydney LEP C2	The Cooper Estate Conservation Area was subdivided in the 1880s to provide housing for industrial workers.
Local significance - proposed amendment to Sydney LEP 2012 (Industrial and warehouse buildings) ID No 3	Macdonaldtown stormwater channel on Euston Road is proposed to be included in amendments to Sydney LEP.
Local significance - proposed amendment to Sydney LEP 2012 (Industrial and warehouse buildings) ID No and 14	Former Alexandria Spinning Mills on Maddox Street is proposed to be included in amendments to Sydney LEP.

20.3 Assessment of potential impacts

Fifty seven non-Aboriginal heritage items are expected to be directly or indirectly impacted by the project. In some instances, an item would be both directly and indirectly impacted by the project. The early identification of non-Aboriginal heritage items and conservation areas during the design phase informed the project design and enabled the avoidance of heritage items where practicable.

Impacts to heritage items are discussed below. Statements of heritage impact are included in Section 9.0 of the Technical working paper: Non-Aboriginal heritage (**Appendix R**). The assessment considered the following types of impacts:

- Primary direct impacts, where the project would be located within the curtilage of the heritage item and / or involve the demolition or modification of the heritage item or its heritage significance
- Secondary direct impacts to heritage items, where the project may impact on the heritage item or its significance subject to the condition of the item, more detailed investigation, construction methodologies and / or the implementation of mitigation and management measures
- Indirect impacts to heritage items, where the project would change the visual context and surroundings of a heritage item with the potential to affect its heritage significance.

The assessment considered the degree of impact the project would have on heritage items (being negligible, minor or significant) (refer **Section 20.1.1**). The outcomes of this assessment are presented in Sections 7.0 and 9.0 of the Technical working paper: Non-Aboriginal heritage (**Appendix R**). Items where the degree of impacts has been determined as minor or significant are provided in **Table 20-6**.

As an outcome of this assessment, statements of heritage impact have been prepared for the following items which would be considered to be significantly or physically impacted by acquisition by the project following mitigation and management:

- Rudders Bond Store
- Terraces and houses on Campbell Street
- Alexandra Canal
- St Peters Brickpit Geological Site
- Service garage
- Goodsell Heritage Conservation Area.

These statements of heritage impact are summarised in **Section 20.3.1** below. Impacts to the remaining items consist primarily of potential negligible direct impacts as a result of tunnelling works. Further information regarding impacts to non-Aboriginal heritage items is provided in Sections 7.0 and 9.0 of the Technical working paper: non-Aboriginal heritage (**Appendix R**), including descriptions of impacts specific to each heritage item. Those heritage items which would be significantly impacted have been assessed further in Section 9.0 of the Technical working paper: Non-Aboriginal heritage (**Appendix R**), and are depicted in **Figure 20-7**.

Table 20-6 Summary of impact assessment

LEP and / or other register	Item	Impact type	Comment	Degree of impact
Section 170 - Roads and Maritime	Wolli Creek Culvert #4305006	Vibration from surface works	This item is located within ten to 20 metres of the construction footprint and has the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Minor secondary direct impact – vibration (surface works)
State Heritage Register	Alexandra Canal SHR #01621	Modification	Three new bridges would be constructed across Alexandra Canal. This has the potential to generate the following impacts on the heritage values of the Canal:	Significant direct impact – modification
Sydney LEP 2012	I3 (Sydney LEP)	Visual	Visual, due to the introduction of three new bridges, including two road bridges and one dedicated pedestrian / cyclist bridge	Significant indirect impact – visual
Marrickville LEP	I270 (Marrickville LEP)	Vibration (surface works)	- Changes to the navigability of the Canal - Direct modification to the embankment, to enable new surface water discharge points and scour protection - Vibration, due to surface works occurring in close proximity to the embankments of the Canal. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Significant direct impact – vibration (surface works)
Botany Bay LEP	I1 (Botany LEP)			
Register of National Estate	RNE # 4571712			
Section 170 Sydney				
Water Heritage and Conservation Register				

LEP and / or other register	Item	Impact type	Comment	Degree of impact
Marrickville LEP 2011	St Peters Public School, including interiors I271	Vibration (surface works) At-property acoustic treatment	The eastern curtilage of the heritage item is located around 50 metres from the construction footprint and has the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item. The properties have also been identified for consideration of at property acoustic treatment, which would be confirmed during detailed design.	Negligible secondary direct impact – Vibration (surface works) Minor direct impacts – At-property acoustic treatment
Marrickville LEP 2011	Terrace housing, including interiors I273	Vibration (surface works) Visual	The item would be directly located to surface works associated with the local road works, and would have minor impacts to the visual setting of the heritage item. The item also has the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and a program of monitoring would be undertaken to identify early potential risks to the heritage item.	Potential minor direct impact – vibration (surface works) Minor indirect impact – visual
Marrickville LEP 2011	Waugh and Josephson industrial buildings, former, showroom, offices and workshops, including interiors I280	Visual Vibration (surface works)	The item would be directly located at surface works associated with the local road works. However, at this location, the Campbell Road / Unwins Bridge Road and May Street intersection would be realigned to provide greater setback from the heritage curtilage from its eastern boundary. Widening of Unwins Bridge Road at the intersection, however, would result in a minor reduction in setback from its southern boundary. However, the building would retain its landmark qualities, as no part of it would be obscured by the works. Construction works also have the potential to directly impact due to vibration associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Potential minor direct impact – vibration (surface works) Minor indirect impact – visual

LEP and / or other register	Item	Impact type	Comment	Degree of impact
Marrickville LEP 2011	Town and Country Hotel, including interiors I281	Visual Vibration (surface works)	Surface works associated with the local road works would be undertaken directly adjacent to the heritage item. However, at this location, the realignment of the Campbell Road / Unwins Bridge Road / Bedwin Road / May Street intersection would be realigned to provide greater setback of the building from the road carriageways. As such, the project would not have a significant impact on the visual context of the heritage item in terms of its landmark qualities. Construction works also have the potential to directly impact due to vibration associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Potential minor direct impact – vibration (surface works) Minor indirect impact – visual
Marrickville LEP 2011	Group of Victorian Filigree and Victorian Italianate terrace houses – Narara, including interiors. I282	Vibration (surface works) Visual	The item would be directly located at surface works associated with local road works, and would have minor impacts due to the visual setting. Construction works also have the potential to directly impact due to vibration associated with surface construction. However surface works would adhere to safe working distances. An existing survey condition report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Potential minor direct impact – vibration (surface works) Minor indirect impact – visual

LEP and / or other register	Item	Impact type	Comment	Degree of impact
Marrickville LEP 2011	Service Garage I312	Vibration and settlement (tunnelling) Vibration (surface works) Visual impacts Acquisition	The heritage item would be located within the construction footprint, and directly above the eastern portal. Potential impacts may include: • Settlement during and after construction. However this would be less than ten millimetres, which is considered to be cosmetic only • Vibration impacts during tunnelling • Change in use and visual impacts associated within the integration of this item within the urban design of the interchange. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Secondary direct minor impact – vibration and settlement (tunnelling) and vibration (surface works) Significant direct impact –acquisition Minor indirect impact – visual impacts

LEP and / or other register	Item	Impact type	Comment	Degree of impact
Marrickville LEP 2011	Goodsell Estate Heritage Conservation area C16	Acquisition Modification Change in heritage conservation area values Visual	An area of Camdenville Park, which is located within the Godsell Conservation Area would be directly impacted by the project as a result of: - The realignment of the Campbell Road / Unwins Bridge Road / Bedwin Road / May Street intersection. This would result in the permanent loss of an area along the western extent of the conservation area - Construction activities associated with the augmentation of the stormwater detention basin for additional flood storage and surface water treatment These have the potential to generate the following impacts on the heritage values of the conservation area: - Impacts to heritage values within the conservation area, which would be localised to the western curtilage of the conservation area - Visual, due to the realignment and widening of roads, and alterations to the existing stormwater detention basin which is vegetated. However, proposed landscaping would minimise the potential for adverse impacts - Direct acquisition of land within the curtilage of the conservation area, resulting in the permanent loss of this portion of land - Modification to areas within the conservation area associated with the upgrade of the stormwater detention basin. This would result in excavation of the basin of around two metres from the current level. Surface road works would also occur within or adjacent to the conservation area, which have the potential to cause vibration impacts on structures within the conservation area. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area and within 50 metres of the main alignment tunnels.	Minor secondary direct impact – vibration (surface works) Minor direct impact – acquisition and modification Minor indirect impact – visual Minor indirect impact – conservation area values

LEP and / or other register	Item	Impact type	Comment	Degree of impact
Register of National Estate	St Peters Brickpit Geological Site RNE #16240	Modification Visual impacts Vibration (surface works)	The heritage item would be directly impacted as a result of the St Peters interchange and the construction of a shared pathway along the northern boundary of the St Peters interchange.	Significant direct impact – modification Significant indirect impact – visual Significant secondary direct impact – vibration (surface works)
Roads and Maritime Heritage and Conservation Register	Terrace group – 28-44 Campbell Street #4305629	Demolition	The project would involve the demolition of this item to enable the widening of Campbell Street. This impact cannot be avoided.	Significant direct impact –demolition
Roads and Maritime Heritage and Conservation Register	House #4305643	Demolition	The project would involve the demolition of this item to enable the widening of Campbell Road. This impact cannot be avoided.	Significant direct impact – demolition

LEP and / or other register	Item	Impact type	Comment	Degree of impact
Sydney LEP 2012	Terrace group I12	Visual Vibration (surface works) At-property acoustic treatment	The item is located directly adjacent to the surface works associated with the widening of Campbell Road and opposite the St Peters interchange. A new pedestrian bridge would also be constructed to the north-west of the heritage curtilage. Construction compounds would be located in the vicinity of the heritage item. Permanent structures and the road widening would change the visual setting of this heritage item. Construction works also have the potential to directly impact due to vibration associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item. The properties have also been identified for consideration of at property acoustic treatment, which would be confirmed during detailed design.	Minor secondary direct impact – vibration (surface works) Minor indirect impact –visual Minor direct – At-property acoustic treatment
Sydney LEP 2012 Sydney Water Section 170	Water Board pump house, including Interior and substructure I18 #4571730	Visual Vibration (surface works)	Surface works associated with the local road works would occur in proximity to the heritage item. However, works associated with the project would be within an existing road corridor. As such, there would be no significant change to the visual setting of the heritage item. There is the potential for the item to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Minor secondary direct impact – vibration (surface works) Minor indirect impact – visual

LEP and / or other register	Item	Impact type	Comment	Degree of impact
Sydney LEP 2012	Industrial Building, 'Frank G Spurway' I20	Visual Vibration (surface works)	Surface works associated with the local road works would occur in proximity to the heritage item. However, works associated with the project would be within an existing road corridor. As such, there would be no significant change to the visual setting of the heritage item. There is the potential for the item to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Minor secondary direct impact – vibration (surface works) Minor indirect impact – visual
Sydney LEP 2012	Warehouse 'Rudders Bond Store' I1405	Demolition	The project would involve the demolition of this item. This impact cannot be avoided.	Significant direct impact –demolition
Proposed amendment to Sydney LEP 2012 (Industrial and warehouse buildings)	Macdonaldtown Stormwater Channel #3	Visual Vibration (surface works)	Surface works associated with the local road works would occur within the curtilage of the stormwater canal, which presently passes under Euston Road. The project would require the widening of Euston Road, which would involve additional sections of the canal being covered. The works would not require a direct modification of the canal structure, but would cause direct impacts as a result of: • Change to the visual setting of the item • Impacts from vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Minor secondary direct impact – vibration (surface works) Minor indirect impact – visual

LEP and / or other register	Item	Impact type	Comment	Degree of impact
Proposed amendment to Sydney LEP 2012 (Industrial and warehouse buildings)	Former Alexandria Spinning Mills #14	Visual Vibration (surface works)	Surface works associated with the local road works would occur in proximity to the heritage item. However, works associated with the project would be within an existing road corridor. As such, there would be no significant change to the visual setting of the heritage item. There is potential for the item to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Minor secondary direct impact – vibration (surface works) Negligible indirect impact – visual

LEP and / or other register	Item	Impact type	Comment	Degree of impact
Register of the National Estate	Clemtan Park Urban Conservation Area #102071	Changes in heritage conservation area values Vibration from surface works Visual	Impacts to heritage values within the conservation area would be localised to specific areas already associated with major transport network infrastructure, or which have been previously disturbed by previous road infrastructure projects (such as the M5 East Motorway, and the M5 East Motorway filtration trial). Visual impacts due to Bexley Road South motorway operations complex would be visible and may affect certain properties. Temporary visual impacts may also occur while the Bexley Road North construction compound (C4), the Bexley Road South construction compound (C5) and the Bexley Road East construction compound (C6) are used during construction. However, there would be no direct impacts in the sense that there would be no demolition of houses or structures in the urban conservation area. The works within the urban conservation area are restricted to the current motorway road reserve, land used to support the M5 East Motorway or vacant land. Buildings that are within 50 metres of the construction footprint have the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area. Landscaping would provide screening of the Bexley Road South motorway operations complex from the Clemtan Park Urban Conservation Area, once established.	Negligible direct impact – change in heritage values Negligible impact – visual Minor secondary direct impact – vibration (surface works)

LEP and / or other register	Item	Impact type	Comment	Degree of impact
Register of the National Estate	Pallamanna Parade Urban Conservation Area #102089	Change in heritage conservation values	The preferred project corridor at this location follows the existing motorway alignment and passes through the conservation area. The curtilage of this urban conservation area was determined prior to the construction of the M5 East Motorway and has not been updated since.	Negligible direct impact – change in heritage values
		Vibration from surface works	Impacts to heritage values within the conservation area would be localised to specific areas already associated with major transport network infrastructure.	Low to negligible indirect impact – visual
		Visual	The M5 East Motorway would be widened to cater for the western portal and associated ancillary facilities. This would extend into the heritage conservation area. Visual impacts due to changes from new noise walls and the Kingsgrove motorway operations complex which would be visible above the noise walls may affect certain properties. However, there would be no direct impacts in the sense that there would be no demolition of houses or structures in the urban conservation area. Landscaping would provide screening of the project from the heritage conservation area, once established. For these reasons, visual impacts would be low to negligible. Buildings that are within 50 metres of the construction footprint have the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the heritage conservation area that are within safe working distances. Temporary visual impacts may also occur when the Kingsgrove North construction compound (C1), the Kingsgrove South construction compound (C2) and the Commercial Road construction compound (C3) are used during construction.	Negligible secondary direct impact – vibration (surface works)

20.3.1 Direct impacts

There are 57 non-Aboriginal heritage items outlined in **Table 20-5** which would be directly or indirectly impacted by the project. Of these:

- Three items would be demolished as a result of the project:
 - Warehouse ‘Rudders Bond Store’ (ID No I1405 under the Sydney LEP)
 - Terrace group – 28-44 Campbell Street, St Peters (ID No 4305629 under the Roads and Maritime Section 170 Heritage and Conservation Register)
 - House – 82 Campbell Street, St Peters (ID No 4305643 under the Roads and Maritime Section 170 Heritage and Conservation Register)
- Modifications ranging from a minor to significant level would be required at four items, being:
 - Alexandra Canal (ID No 103889 under the Register of the National Estate, ID No 01621 under the State Heritage Register, ID No 4571712 under the Sydney Water Section 170 Heritage and Conservation Register, ID No I13 under the Sydney LEP, ID No I1 under the Botany LEP 2013, ID No I270 under the Marrickville LEP 2011)
 - St Peters Brickpit Geological Site (RNE #16240)
 - Service Garage – 316 Princes Highway (Marrickville LEP 2011 I312) (the modification includes change of use, as a result of acquisition of the property)
 - Goodsell Estate Conservation Area (Marrickville LEP 2011 C16).
- Eight heritage conservation areas would be partially and directly impacted, with the majority of heritage conservation areas being exposed to negligible impacts only. Landscaping of the project within these areas would minimise the potential impacts. Some of these conservation areas may be impacted by secondary direct impacts (as the tunnel passes under these heritage conservation areas). The overall heritage value of the heritage conservation areas would not be significantly impacted by the project. The three heritage conservation areas that would be partially and directly impacted within the minor to low range of impact are:
 - Pallamanna Parade Urban Conservation Area (ID No 102089 under the Register of the National Estate)
 - Clemton Park Urban Conservation Area (ID No 102071 under the Register of the National Estate)
 - Goodsell Conservation Area (ID No C16 under the Marrickville LEP).

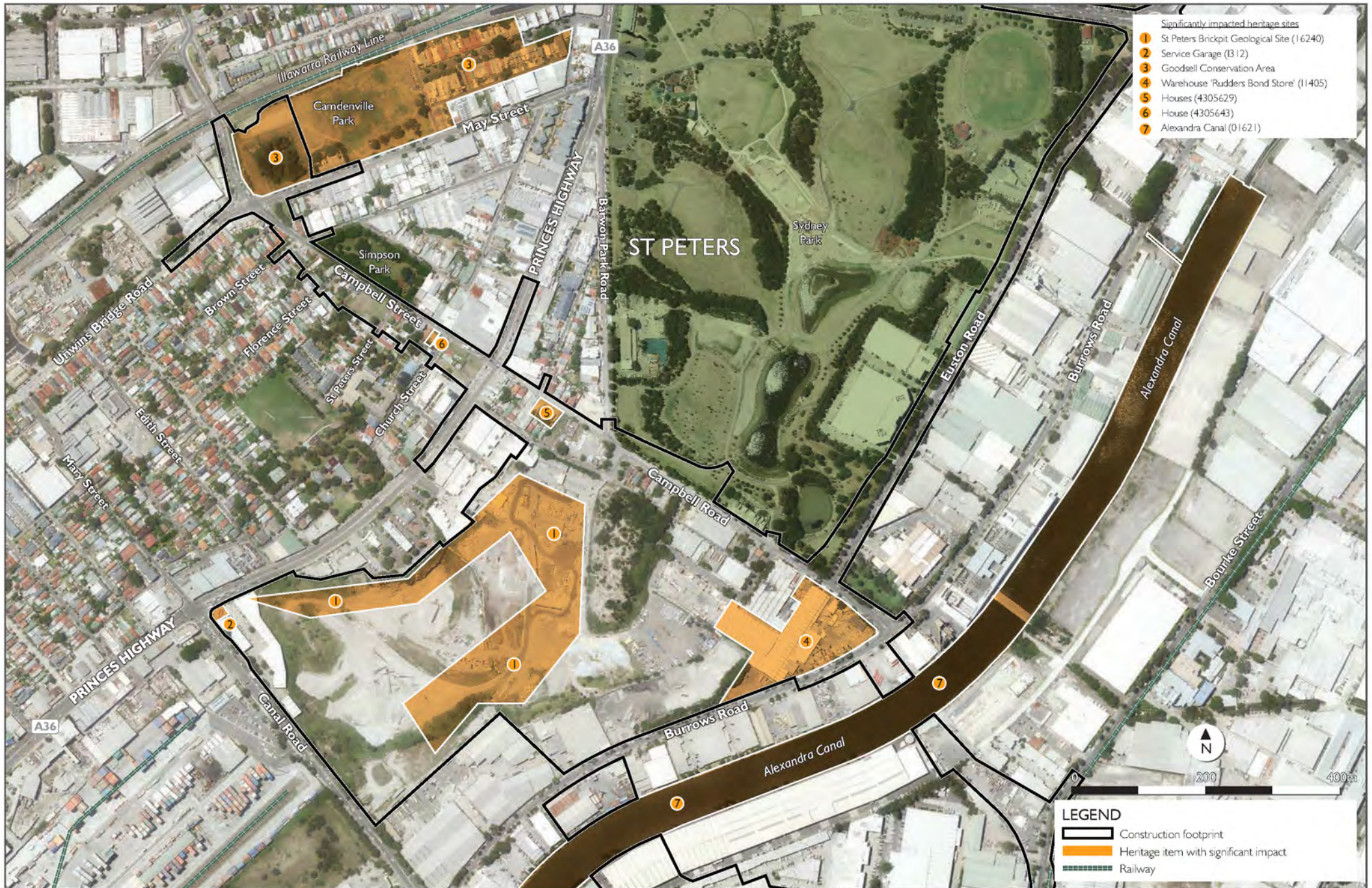
Relevant mitigation measures for these three heritage conservation areas are contained in **Table 20-7**.

Twenty three items would be directly impacted due to construction vibration from surface works. These impacts are anticipated to have a negligible to minor risk of affecting the significance of the heritage items. Structural damage vibration limits for non-Aboriginal heritage properties and recommended safe working distances for vibration intensive plant are provided in Section 7.2.1 of the Technical working paper: non-Aboriginal heritage (**Appendix R**). The overall heritage value of these heritage items would not be significantly impacted by the project.

Thirty four items would be directly impacted due to vibration, settlement and groundwater drawdown as a result of tunnelling works. These items are primarily located within the preferred project corridor and include items consisting of mainly residential houses. Impacts to these items are anticipated to be minor to negligible. Four of these items would also be directly impacted by construction vibration due to surface works. The overall heritage value of the heritage items would not be significantly impacted by the project.

There is also the potential for direct impacts due to potential eligibility for at-property acoustic treatment. Two of the 57 items have also been identified as being potentially eligible for consideration of property acoustic treatment (St Peters Public School, and the terrace group of housing at 2-34 Campbell Road, St Peters). This would be confirmed during detailed design, in consultation with landowners, and with consideration of potential impacts to heritage values. Treatment would be sympathetic to the heritage values of each item and would be undertaken in accordance with the Burra Charter, which stipulates that changes reducing cultural significance should be reversible.

Further information about mitigation measures to manage noise and vibration impacts as a result of the project is provided in **Section 12.5.3**.



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Tunnelling works – settlement and vibration impacts

Section 5.5 of the Technical working paper: Noise and vibration (**Appendix J**) provides an assessment of potential construction vibration impacts as a result of works at surface and below ground (tunnelling). It concludes that, for tunnelling activities, the predicted vibration levels at heritage items are estimated to be around two millimetres per second or less, which is below the recommended maximum level of vibration that would be applicable to heritage structures set within the German Standard DIN 4150 - Part 3 - Structural Vibration in Buildings – Effects on Structures.

The ground settlement as a result of the project, and its potential impacts on heritage structures would be dependent on the geotechnical conditions, the depth of the tunnelling activity, the number of storeys of the building, and the position, condition and masonry of the structure itself. **Section 19.3.9** (Groundwater) provides an assessment of the potential impacts of ground settlement on structures.

The calculated settlement for the project is generally less than 20 millimetres for the majority of the tunnel alignment. Locations of peak settlement are at the portals and at the Y-junction caverns. It is expected that settlement would stabilise within two months of the roadheader passing under a structure.

All heritage structures have a predicted settlement of less than 20 millimetres and are assessed as having a building damage category of “Negligible”. Examples of visible potential impacts would be cosmetic and could include hairline cracks.

It is noted that these results are preliminary and do not take into account the specifics of properties themselves. Further assessments would be undertaken during detailed design to determine the level of potential impact on structures and to identify appropriate mitigation and management measures to minimise these impacts. For some properties, this may involve undertaking an existing condition survey and a program of monitoring (refer **Section 12.4.1** – Noise and vibration).

For the majority of listed street tree groups, potential impacts as a result of the project would be minor and / or negligible due to the depth of the tunnel at these locations.

Surface works – vibration impacts

For surface works, such as at the local road surface works, cosmetic damage to buildings would be unlikely where buildings are distanced from the project by two metres to 25 metres (depending on the vibration-generating equipment being used and the location of that equipment within each construction area). Safe working distances for vibration intensive plant equipment are outlined in Section 7.2.1 of **Appendix R**. Sections 8.5 and 10.0 of **Appendix R**, along with recommended mitigation measures such as condition surveys and monitoring where works within these setbacks cannot be avoided.

Statements of heritage impact

Detailed statements of heritage impacts have been prepared and are provided in full in Section 9.0 of the Technical working paper: Non-Aboriginal heritage (**Appendix R**). Summaries of those statements of heritage impact are provided here for those items that would be directly impacted either through demolition or modification as a result of the project.

Warehouse ‘Rudders Bond Store’

Due to the location of the Rudders Bond Store within the proposed location of the St Peters interchange, there is no potential to retain the store or its associated office. The demolition of this store and office would be a major negative impact, resulting in the irreversible loss of State significance heritage fabric and value. This would be mitigated through the salvage and reuse of at least a section of the store (focusing on the significant laminated timber columns, mitigating the impacts to the item’s aesthetic, technical and rarity significance). Such mitigation measures would be considered further during detailed design to confirm whether they are reasonable and feasible. An archival recording of the store and associated office would also be undertaken prior to demolition / salvage works.

Terraces and houses on Campbell Street

The terraces at 28-44 and 82 Campbell Street, St Peters, are listed on Road and Maritime's Section 170 Heritage and Conservation Register (ID # 4305629 & ID #4305643). The demolition of the terraces and houses would be unavoidable, and is considered to be a moderate level of negative impact. The loss of heritage fabric would be mitigated through archival recordings prior to demolition. The style of the terraces is not rare within the Marrickville and Sydney local government areas. Furthermore, similar examples of such terraces within the project area would not be directly impacted on as part of the project (eg those within the Goodsell Estate Heritage Conservation Area and the Cooper Estate Heritage Conservation Area, as well as the Narara Terraces and others).

Alexandra Canal

As part of the project, three new bridges would be constructed over the Alexandra Canal, including:

- A new bridge over the Alexandra Canal as part of the Campbell Road extension
- A new pedestrian and cycle bridge extending from east of Alexandra Canal, to over the on and off ramps at the St Peters interchange
- A new bridge over the Alexandra Canal as part of the Gardeners Road extension.

Crossings would provide a clear span across the Canal to avoid the construction of piers within the Canal. To achieve this, the abutment piers for the road bridges would be located one metre from the top of the existing sandstone embankment walls. Construction works would be managed to prevent direct impacts to the sandstone embankments on either side of the Canal. The crossings would also result in direct vibration and indirect visual impacts to the Canal.

Stormwater discharge points would also be constructed into the Canal at the Campbell Road bridge. These outlets would require the removal of sections of the embankment walls which have been identified as being of high significance, including State heritage significance.

In terms of major negative impacts to the Alexandra Canal, the stormwater discharge points proposed as part of the project would impact on the Canal's aesthetic significance by requiring the removal of two intact sections of sandstone walls. However, these impacts would be mitigated by reinstating the blocks and reusing them to finish the discharge points. The stormwater design has also been sympathetically considered to enable the necessary discharge via only two points, thereby limiting impacts to this fabric.

The construction of the additional crossings would have a minor impact on the Canal's significance. These crossings would open up further views of the Canal and allow for a greater appreciation of the industrial heritage of the Canal.

Overall, while impacts are proposed to the fabric of the Alexandra Canal, these can be mitigated through increased public access to and interpretation along the Campbell Road pedestrian / cycle bridge, and by reinstating sandstone removed to insert the proposed discharge points.

St Peters Brickpit Geological Site

The St Peters interchange would be located on land that includes the current St Peters Brickpit Geological Site. The construction of the St Peters interchange would therefore result in alterations to this heritage item, including cut and fill. Ultimately the project would result in geological formations in the Brickpit being obscured by landscaping. However the project would not necessarily require the removal of these geological formations. In terms of minor negative impacts, the construction of the St Peters interchange would therefore result in the removal or concealment of the currently exposed cuttings at the St Peters Brickpit Geological Site.

In terms of major positive impacts, the project would result in the potential for improved access and interpretation of this heritage item within the St Peters interchange, including by allowing for greater public knowledge of the site. This improved interpretation would contribute to a greater understanding of the geological and palaeontological history of the Sydney Basin.

Service garage

Whilst no direct impacts are actually proposed to the fabric of the service garage, it would be acquired as part of the project and cease to operate as a service garage. It is proposed to be retained with possible re-use opportunities (eg commercial / retail). The aesthetic and rarity values of this heritage item would therefore not be impacted on. Any potential modifications required for the change of use would be assessed at a future time, once approved. As the service garage has operated in its capacity since at least 1946, there would be some loss of significance associated with a changed use and this is considered to be a minor negative impact.

Goodsell Heritage Conservation Area

Local road upgrades would include the realignment of the intersection of Bedwin Road, Unwins Bridge Road, Campbell Street and May Street. The project would therefore require the acquisition of the south western corner of the Goodsell Heritage Conservation Area. This section proposed for acquisition is currently part of the Camdenville Park and is a fenced area providing a depression for the collection of stormwater runoff. However, the project would nevertheless result in an amendment to the curtilage of the Goodsell Heritage Conservation Area, involving the augmentation of this stormwater basin to cater for the operation of the project.

Ultimately the statement of heritage impact prepared for this heritage conservation area has concluded that the project would not impact on its overall heritage significance.

20.3.2 Indirect impacts

Of the 57 heritage items, 21 items may be indirectly impacted by the project, due to temporary and / or permanent visual impacts. Of the 21 items, 20 would also have the potential to be directly impacted as outlined in **Section 20.3.1**.

Visual character

The introduction of new elements within the study area has the potential to indirectly visually impact heritage items, particularly if the visual characteristics of these elements are unsympathetic with those of the heritage items. In addition, new elements may obstruct significant views to heritage items or places, when viewed from public or private land. It is also the case that the heritage significance of the items in the study area is such that views from an item do not necessarily contribute to its heritage significance. The individual contribution of views into and out from heritage properties and the long-term impact of construction, if any, would be considered in identifying ways to appropriately manage such impacts.

The project aims to use urban design techniques such as architectural design, building materials and colour palettes to merge new infrastructure into the existing visual environment where feasible to do so. In the majority of cases, impacts to the heritage items as a result of visual effects are therefore anticipated to be minor (refer **Sections 14.3.1** and **14.3.2**– Visual impact and urban design). Further, visual impacts to affected heritage items would be reduced in part by distance and the screening effect of surrounding residential developments and proposed landscaping. Existing vistas and view lines from heritage items would be considered during detailed design, and rehabilitation strategies sympathetic to the heritage item would be determined. In these cases, the overall heritage value of the heritage items would not be significantly impacted by the project.

However, the impact to Alexandra Canal is considered to be significant due to the introduction of new crossings of the Canal. For this reason the item was carried forward for further consideration in a statement of heritage impact.

Further information on indirect visual impacts to heritage items, and recommended measures to mitigate these impacts, are provided in **Section 14.4** (Visual impact and urban design).

Noise

There is also the potential for direct impacts due to potential eligibility for at-property acoustic treatment. Two of the 57 items have also been identified as being potentially eligible for consideration of property acoustic treatment. This would be confirmed during detailed design, in consultation with landowners, and with consideration of potential impacts to heritage values.

Traffic and access

Impacts to traffic and access are outlined in more detail in **Section 9.3.1** and **9.3.2** (Traffic and transport). No roads on which heritage listed items are located are anticipated to be permanently closed. Other than those heritage listed properties which are to be acquired, permanent altered access arrangements would not be required for heritage properties as a result of the project.

The nearby temporary closure of Brown Street and Florence Street (refer **Sections 9.3.1** and **9.3.2**) may result in additional traffic using Unwins Bridge Road. While some properties along Euston Road and Gardeners Road would require temporary driveway modifications, this would not impact on heritage listed items.

The Alexandra Canal bridge design, where reasonable and feasible, would be set back from the edge of the Canal to allow unimpeded pedestrian access during operation. The increased number of crossings, and particularly the pedestrian / cycle bridge adjacent to the Campbell Road bridge would increase access to and visibility of the Canal during operation of the project.

For the St Peters Brickpit, the public access created by the St Peters interchange could allow for greater public knowledge of the geological and palaeontological significance of the site and the Sydney basin more generally, through the implementation of interpretive management measures (refer **Table 20-7**).

Whilst it does not lie directly within the project area, a further assessment was undertaken of potential traffic impacts to the King Street / Enmore Road Heritage Conservation Area (listed under both the Sydney LEP 2012 and Marrickville LEP 2011). This heritage conservation area is identified as being of State heritage significance, despite not being listed on the State Heritage Register.

Consultation during the preparation of the EIS identified a concern that the project would impact King Street and its retail function, thereby impacting the heritage significance of the King Street / Enmore Road Heritage Conservation Area. The project would not modify King Street, including by way of speed limits or on-street parking arrangements. Traffic modelling (refer **Section 9.3.2**) has indicated that the future operation of King Street is expected, in most cases, to experience reduced peak hour volumes when compared to a scenario where the project were not to proceed. The exception to this would occur in the 2031 cumulative scenario, where morning peak hour volumes southbound would increase by around 35 per cent compared to the scenario where the project does not proceed. However these predictions are in the opposite direction to the dominant morning peak hour traffic, and they are also within the design carrying capacity of the road. No resulting impacts would occur to the heritage value of the King Street / Enmore Road Heritage Conservation Area. As such, this heritage conservation area has not been carried forward for further assessment in this chapter.

20.3.3 Cumulative impacts

The cumulative impact of the project to heritage values would be moderate. These potential impacts are to be managed to reduce the risk of actual impacts to the identified items.

20.4 Environmental management measures

The early identification of non-Aboriginal heritage items and conservation areas during the design phase informed the project design and enabled the avoidance of heritage items where practicable.

The mitigation and management measures provided in **Table 20-7** have been developed to avoid, reduce and manage identified potential impacts to non-Aboriginal heritage. These measures would be developed further on a case by case basis during detailed design, with consideration of finalised areas of disturbance. The final suite of mitigation and management measures would be documented within the Construction Environmental Management Plan.

Heritage specialists would work with the construction contractor and design team to ensure that appropriate mitigation measures are implemented and impacts to heritage items minimised. The heritage significance of particular sites and localities would also be interpreted through signage and other means, where reasonable and feasible and as part of the urban landscape strategy.

The level of effectiveness in mitigating the impact to individual items and conservation areas has been ranked in the following manner:

- Highly effective – the measure completely mitigates the impacts to the item's / area's heritage significance
- Moderately effective – the measure largely mitigates the impacts to the item's / area's heritage significance, but the impact is not fully mitigated
- Somewhat effective – the measure only partly mitigates the impacts to the item's / area's heritage significance
- Ineffective – the measure is not effective in mitigating the impacts to the item's / area's heritage significance.

An assessment of the effectiveness of the proposed management measures is contained in Section 8.9 and Appendix A of the Technical working paper: Non-Aboriginal heritage (**Appendix R**). The management measures selected for the project were mostly found to be highly effective, except in the following instances:

- For the Alexandra Canal, where mitigation measures to manage visual and modification impacts would be moderately effective
- For the Service Garage at 316 Princes Highway, where mitigation measures to manage the change of use and acquisition impacts would be somewhat effective
- For the terrace group of housing at 28-44 Campbell Street and the house at 82 Campbell Street, where mitigation measures to manage demolition would be somewhat effective
- For the Warehouse 'Rudders Bond Store,' where mitigation measures to manage demolition would be somewhat effective.

Mitigation and management measures relevant to non-Aboriginal heritage items are also included in other sections of this EIS as follows:

- Construction vibration in **Section 12.5.3** (Noise and vibration)
- Ground settlement in **Sections 19.3.9** and **19.5** (Soils and water quality)
- Dust in **Section 10.11** (Air quality)
- Landscaping in the vicinity of non-Aboriginal heritage items in **Sections 14.4** (Visual impact and urban design)
- Revegetation of the temporary construction footprint in the vicinity of non-Aboriginal heritage items in **Section 14.4** (Visual impact and urban design) and **Section 21.4** (Biodiversity).

Table 20-7 Environmental management measures – non-Aboriginal heritage

Impact	No.	Environmental management measure	Timing
Construction			
General	NAH01	Protocols would be developed for anticipated categories of unexpected non-Aboriginal heritage finds, such as tram infrastructure, late 19th to early 20th refuse, and brick works. In the event of an unexpected cultural heritage find outside of these specific protocols, the <i>Standard Management Procedure – Unexpected Archaeological Finds</i> (Roads and Maritime, 2015a) would be followed. This would include notification to the NSW Heritage Division of OEH (highly effective).	Pre-construction and construction
	NAH02	Construction personnel would be made aware of non-Aboriginal heritage sites as part of the site induction. These sites would be identified on sensitive area plans and in the CEMP (highly effective).	Pre-construction and construction

Impact	No.	Environmental management measure	Timing
	NAH03	As part of the construction heritage management plan, an overarching historical archaeological research design would be prepared prior to commencement of construction in consultation with the NSW Heritage Division of OEH. It would describe clear significance thresholds to possible archaeological items that may be uncovered during works and designate when monitoring, testing and / or salvage and excavation should occur in relation to the project works and timing. Post-excavation reporting, including artefact analysis and additional historical research (where necessary), would be required for any historical archaeological investigations undertaken (moderately effective).	Detailed design
	NAH04	A construction heritage management plan would be prepared prior to construction in consultation with the NSW Heritage Division of OEH. The plan would detail how construction impacts on heritage would be minimised and managed including training and induction processes for construction personnel. Inductions are to cover built heritage, landscape and historical archaeological sites and their management, and provide heritage guidance on how to avoid / manage impacts. The induction would be prepared in consultation with a suitably qualified heritage specialist and historical archaeologist. As a minimum, the plan would include the following: • Induction protocols for staff and project personnel to undertake a cultural heritage induction, to assist them in understanding and complying with their legal obligations under the <i>Heritage Act 1977</i> • A list, plan and GIS layer showing the location of identified heritage items • A significance assessment and statement of significance for each item • Detail the mitigation measures identified and when the measures are to be implemented • Provide protocols and procedures to be enacted during construction to ensure the protection of items of heritage significance • An unexpected finds procedure in the event that further sites are identified during works • The separate procedure for the discovery of skeletal remains (highly effective).	Pre-construction
	NAH05	Impacts to built heritage, heritage landscapes and historical archaeological sites, will to the greatest extent practicable, be avoided and minimised. Where impacts are unavoidable, works shall be undertaken in accordance with the strategy outlined in the construction heritage management plan (moderately effective).	Pre-construction and construction

Impact	No.	Environmental management measure	Timing
Removal of heritage listed structures	NAH06	In relation to the house at 82 Campbell Street and terrace group at 28-44 Campbell Street the following would be undertaken: • The buildings would be subject to a full archival recording following the <i>NSW Heritage Division guidelines How to Prepare an Archival Recording</i> (NSW Heritage Office, 2003) and <i>Photographic recording of heritage items using film or digital capture</i> (NSW Heritage Office, 2006) • Consideration should be given as to whether elements of the houses could be salvaged and used to maintain or restore other properties managed by Roads and Maritime (somewhat effective).	Detailed design
	NAH07	In relation to Rudders Bond Store, the following would be undertaken: • The bond store would be subject to a full archival recording following the <i>NSW Heritage Division guidelines How to Prepare an Archival Recording</i> (NSW Heritage Office, 2003) and <i>Photographic recording of heritage items using film or digital capture</i> (NSW Heritage Office, 2006) • Consideration would be given as to whether the laminated timber columns could be salvaged and re-erected and clad elsewhere within the St Peters interchange or the local area. The cladding and brick walls are not considered to be of heritage significance and are not included within the reuse proposal • Investigate options for documenting the history of the Ralph Symonds company and presenting it to a national audience, in partnership with stakeholders such as the City of Sydney and Powerhouse Museum. The focus would be on their development of innovative timber construction methods during and after World War II (somewhat effective).	Detailed design / pre-construction

Impact	No.	Environmental management measure	Timing
Change of use	NAH08	In relation to the Service Garage at 316 Princes Highway, the following would be undertaken: • An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item • A photographic archival recording is undertaken prior to the current use ceasing. The archival recording should conform to the guidelines provided in <i>How to prepare archival records</i> (NSW Heritage Office, 2003) and <i>Photographic recording of heritage items using film or digital capture</i> (NSW Heritage Office, 2006). The archival recording should be lodged with the relevant local libraries and the State Library of NSW. • The oral history should be prepared, which seeks to contact past and present employees as well as others with memories of the service station. The oral history should be lodged with the relevant local libraries and the State Library of NSW (somewhat effective).	Pre-construction
Potential for direct impacts due to vibration associated with surface construction	NAH09	Detailed mitigation and management measures would be developed for each heritage item directly impacted by the project with regard to vibration (surface and tunnelling) and settlement once final disturbance areas have been identified through detailed design. These mitigation and management measures would be included in the construction environmental management plan(s) for the project (highly effective).	Detailed design
Potential for direct impacts due to vibration associated with surface construction	NAH10	Surface works would adhere to safe working distances, and an existing condition survey report and program of monitoring would be undertaken to identify early potential risks at the following non-Aboriginal heritage items: • Wolli Creek Culvert • St Peters Public School, including interiors • Terrace housing, including interiors (I273) • Waugh and Josephson industrial buildings, former, showroom, offices and workshops, including interiors • Town and Country Hotel, including interiors • Group of Victorian Filigree and Victorian Italianate terrace houses – Narara, including interiors • Terrace group I12 • Water Board pump house, including Interior and substructure • Industrial Building, 'Frank G Spurway' • Former Alexandria Spinning Mills (highly effective).	Pre-construction and construction
Visual impacts, as well as vibration impacts to the Macdonaldtown Stormwater Channel #3	NAH11	An existing condition survey report and program of monitoring would be undertaken to identify early potential risks at the Macdonaldtown Stormwater Channel #3 (highly effective).	Pre-construction and construction

Impact	No.	Environmental management measure	Timing
Acoustic impacts to non-Aboriginal heritage items	NAH12	The following non-Aboriginal heritage properties would be considered for at property acoustic treatment: • St Peters Public School, including interiors • Terrace group I12 (highly effective). Acoustic treatments would be confirmed during detailed design, and would consider the principles of <i>The Burra Charter (the Australia ICOMOS charter for places of Cultural Significance)</i> (ICOMOS (Australia), 2013).	Detailed design
Impacts to the Goodsell Estate Heritage Conservation Area as a result of vibration, acquisition and modification, as well as visual impacts and impacts conservation area values.	NAH13	Management measures for the Goodsell Estate Heritage Conservation Area would include: • Landscaping, to mitigate the impacts of realigning and widening roads, as well as alterations to the existing stormwater detention basin • Surface works would adhere to safe working distances • An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conversation area and within 50 metres of the main alignment tunnels (highly effective).	Pre-construction, construction and post-construction
Impacts to the Clemton Park Urban Conservation Area as a result of vibration, changes in heritage area conservation values, and visual impacts.	NAH14	Management measures for the Clemton Park Urban Conservation Area would include: • Surface works would adhere to safe working distances • An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area • Landscaping would provide screening of the Bexley Road South motorway operations complex from the Clemton Park Urban Conservation Area, once established (highly effective).	Pre-construction, construction and post-construction
Impacts to the Pallamanna Parade urban Conservation Area as a result of vibration, changes in heritage area conservation values, and visual impacts.	NAH15	Management measures for the Pallamanna Parade Urban Conservation Area would include: • Surface works would adhere to safe working distances • An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area • Landscaping would provide screening of the project from the Pallamanna Parade Urban Conservation Area, once established (highly effective).	Pre-construction, construction and post-construction

Impact	No.	Environmental management measure	Timing
Impacts to heritage values due to construction of stormwater discharge points	NAH16	The following management measures would be implemented with respect to Alexandra Canal: - Monitoring during works to ensure vibration is not impacting the Alexandra Canal walls - Preparation of an archival recording of the Canal, involving both scale drawings and photography, prior to the removal of sandstone blocks - Numbering of sandstone blocks so that those displaced by the discharge points can be replaced in their previous locations - Stockpiling displaced sandstone blocks for use in repairs of other sections of the Alexandra Canal - Installation of heritage interpretation regarding the Canal in accordance with an interpretation plan (moderately effective).	Detailed design and construction
Heritage interpretation	NAH17	An interpretation plan would be prepared and implemented for: - Alexandra Canal and the industrial heritage of the area. This shall include installation of a heritage interpretation regarding the Canal in accordance with an interpretation plan - The St Peters Brickpit geological site, including: - Integrate the geological interpretation into the Sydney Park brickworks in consultation with City of Sydney, as the industrial counterpart to the geological history to tell a more complete story of historical land use in the area - Integrate the geological / palaeontological discovery of the <i>Paraclytosaurus davdi</i> - Retain an exposed section of the fresh shales and siltstones, including features associated with deposition of the sedimentary rocks, and later formed fractures such as joints and faults, if safe to do so for both landform stability and ongoing access for interpretation (moderately effective).	Detailed design and construction
Impact to geological and palaeontological values	NAH18	An archival recording of the St Peters brickpit geological site would be undertaken prior to and during the construction (highly effective).	Pre-construction
	NAH19	An assessment and / or consultation with a palaeontologist to determine whether the project impact area has potential to contain further specimens of scientific interest (highly effective).	Pre-construction
Visual	NAH20	Approaches to appropriately manage impacts of the project to the individual contribution of views into and out from heritage properties and the long-term impact of construction would be detailed in a CEMP (highly effective). Individually tailored landscape treatments would be developed during detailed design to mitigate visual impacts at 2-34 Campbell Road, St Peters.	Pre-construction Detailed design
Impacts on archaeology	NAH21	The construction heritage management plan would include detailed procedures / strategies for the conservation and curation of any historical artefacts recovered during works (moderately effective).	Pre-construction and construction

Impact	No.	Environmental management measure	Timing
Urban design and landscaping	NAH22	Urban design and landscaping would be undertaken to manage visual impacts to the following additional non-Aboriginal heritage items: • Terrace housing (I273) • Southern Cross Hotel (I277) • Water Board pump house (I18) (highly effective).	Construction and post-construction

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