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Jane Street and Mulgoa Road Infrastructure Upgrade

Review of Environmental Factors

Appendix G – Aboriginal Archaeological Test Excavation Results

October 2016

JANE STREET AND MULGOA ROAD INFRASTRUCTURE UPGRADE

Aboriginal Archaeological Test Excavation Results

Prepared for Roads and Maritime Services

Penrith Local Government Area

August 2016

Ref. 1536

KELLEHER NIGHTINGALE CONSULTING PTY LTD
Archaeological and Heritage Management
ACN 120 187 671

Level 10
25 Bligh Street
SYDNEY NSW 2000
Phone 02 9232 5373

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Prepared by	Dr Matthew Kelleher; Mark Rawson; Cristany Milicich; Ben Anderson
Approved by	Dr Matthew Kelleher; Alison Nightingale

Contents

Figures

Tables

1 Introduction

Roads and Maritime Services (Roads and Maritime) propose to undertake upgrade works at Jane Street and Mulgoa Road at Penrith, NSW ('the project'). The project addresses several of the transport challenges identified in the NSW Long Term Transport Masterplan (Transport for NSW 2012) for the City of Penrith over the next 20 years. The Australian and NSW governments have each committed $35 million ($70 million in total) to fund this project. Initial stakeholder consultation, design and traffic modelling identified a number of options to reduce congestion within the project area.

Preliminary technical and environmental investigations were carried out in late 2013 and the first half of 2014 to inform the options development process. These investigations have been reported in a Preliminary Environmental Investigation (PEI) (NGH Environmental 2014), Jane Street Extension Options Modelling and Analysis report (Hyder 2014) and Flooding Investigation Volumes 1 and 2 (Lyall and Associates 2014). A preferred option report was subsequently prepared in November 2014 (Roads and Maritime 2014).

Following selection of the preferred option, Roads and Maritime engaged Arup to prepare a Review of Environmental Factors (REF) for the project. The REF included assessment of Roads and Maritime Aboriginal cultural heritage in accordance with Stage 2 of the Roads and Maritime *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Roads and Maritime 2011). No Aboriginal objects were identified within the project area but the potential for subsurface archaeological deposit was considered to be high and large portions of the project area were designated as Potential Archaeological Deposit (PAD) (Artefact Heritage 2016) [see section 4 of this report]. It was recommended that a program of subsurface archaeological test excavation be undertaken to determine the existence and, if present, the nature and extent of any subsurface archaeological deposit within the proposed impact areas (Artefact Heritage 2016).

Roads and Maritime engaged Kelleher Nightingale Consulting Pty Ltd (KNC) to undertake the archaeological test excavation in accordance with the Office of Environment and Heritage (OEH) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH 2010) and Stage 3 of the Roads and Maritime PACHCI. This report documents the findings of the test excavation program.

2 Investigators and contributors

This report has been prepared by the personnel in the following table:

Table 1. Investigators and contributors

Contributor	Organisation	Role
Dr Matthew Kelleher	KNC	Project Director, Reporting
Alison Nightingale	KNC	Advisor, Review
Mark Rawson	KNC	Site Supervisor, Reporting
Cristany Milicich	KNC	Reporting
Ben Anderson	KNC	Mapping, GIS

3 Location and scope of activity

The 'study area' for this report generally comprises the portion of the Jane Street and Mulgoa Road Infrastructure Upgrade extending south along Castlereagh Road/Mulgoa Road from Museum Drive to Union Road. The study area extends to the east and west along the Main Western Railway line, Jane Street and High Street/Great Western Highway. The study area is shown in Figure 1.

This proposed upgrade works involve:

- An additional lane both north and south bound on Mulgoa Road / Castlereagh Road between Museum Drive and Union Road, increasing capacity for through traffic, while providing capacity for vehicles turning left onto Mulgoa Road from Jane Street and right onto the Great Western Highway
- A longer left-turn lane along Mulgoa Road for vehicles turning onto the Great Western Highway
- Upgrading the Mulgoa Road and High Street intersection to provide increased capacity
- Upgrading the T-intersection of Jane Street and Castlereagh Road / Mulgoa Road to provide increased capacity
- Widening the existing rail underpass to allow three lanes of traffic in each direction on Castlereagh Road and a left turn lane into Jane Street

The location of proposed ancillary facilities including site compounds, stockpiles and plant storage areas have also been considered during this assessment.

Figure 1. Study area location

4 Previous archaeological investigations

Previous archaeological investigation of the study area has taken place under Stages 1 and 2 of the Roads and Maritime PACHCI during preliminary environmental investigation, options analysis and preparation of the REF for the project.

Stage 1 investigation for the preliminary environmental investigation (NGH Environmental 2014) included a search of the OEH Aboriginal Heritage Information Management System (AHIMS) database to identify registered Aboriginal archaeological sites within the project area. The extensive search of the AHIMS database identified one potential archaeological deposit (PAD) located near the border of the study area on Peach Tree Creek, north of the rail line. A second heritage item (open camp site) was located about 600 metres south of the study area. Archaeological potential in the study area was considered to be slightly higher along Peach Tree Creek to the west but overall it was considered that the majority of the study area was disturbed and Aboriginal heritage items were unlikely to be found.

The higher archaeological potential ascribed to the area along Peach Tree Creek was based on the findings of a previous Stage 2 PACHCI assessment for the Nepean River Green Bridge, around 500 metres west of the current study area (Artefact Heritage 2012). That assessment considered that the local area would have been extensively used by Aboriginal people since the Pleistocene, being located in close proximity to the major resource zone of the Nepean River. Previous archaeological excavation in the area located Aboriginal objects below the 1:100 year flood level, albeit in highly disturbed contexts (Silcox 1987 in Artefact Heritage 2012). The likelihood of intact archaeological deposits was tied to the extent and severity (energy) of flooding, historical disturbance and modern land use practices.

A Stage 2 PACHCI assessment related to the current project was subsequently undertaken by Artefact Heritage in February 2016 (Artefact Heritage 2016). The assessment included a review of background information and an archaeological field survey of the study area. The Artefact Heritage study area was inclusive of an extensive buffer around the existing road and rail corridors. The review of background information included an updated AHIMS search (October 2015) and analysis of previous archaeological investigations in the region. The AHIMS search did not identify any registered Aboriginal archaeological sites or Aboriginal places within the study area. The review of previous archaeological investigations is partially reproduced below (Artefact Heritage 2016:19-20):

Penrith Rugby League Club (Silcox 1987)
Archaeological test excavations were conducted at locations on the margins of Peach Tree Creek, on the eastern side of the Nepean, approximately 840m south-west of the study area. The test excavations were conducted at sites RP3 (45-5-0539) and RP4 (45-5-0540). Artefacts were recovered from excavation at both sites, however the archaeological deposit was identified as heavily disturbed, with historical material mixed through the deposit to a depth of 25cm. Both sites were located below the 1:100 year flood level, and it was suggested that the high levels of disturbance evident were due to both the effects of flood events and farming activities.

Site 45-5-2491, North Penrith (Jo McDonald Cultural Heritage Management (JMCHM) 2010)
This report was part of a series of Aboriginal and non-Indigenous heritage assessments undertaken prior to the redevelopment of the former Defence land at North Penrith, located on the north side of the railway line about 300m east of the study area. An assessment of the north eastern section of the land was undertaken prior to proposed redevelopment, in order to prepare a management plan for a known Aboriginal site, AHIMS 45-5-2491. The site consisted of 25-50 artefacts located on the ground surface; and most of the site was assessed as having no to low archaeological potential although part had moderate potential. The site is located on Bringelly shale geology, but in relation to the adjacent Cranebrook Terrace, it was noted that this is a 'significant pluvial deposit which has good potential for early human occupation'.

164 Station Street, Penrith (Archaeological & Heritage Management Solutions (AHMS) 2012)
This assessment addressed the property known as 164 Station Street, Penrith, approximately 650m south of the current study area. The southern part of the subject area was identified as a potential archaeological deposit, as it appeared that the upper part of the soil profile in this location remained relatively undisturbed. Although the subject area was located on the Cranebrook Formation, it was considered likely that it was within the older Penrith Unit, due to the distance from the Nepean. It was therefore considered that there was low archaeological potential in the deeper subsoil. Subsequent test excavation indicated that this subject area was located on the transition between the Richmond and Penrith Units of the Cranebrook Formation (AHMS Aug 2014: 18)

Peach Tree Creek (AHMS August 2014)
Archaeological test and salvage excavation was undertaken prior to stabilisation works along the western side of Peach Tree Creek in Penrith, approximately 80m north of the current study area. The results indicated that the subject area was within the Richmond Unit of the Cranebrook Formation. In this location, it consisted of compact silty clay loam, over 5m in depth, overlying a deposit of weakly cemented gravels. The excavation resulted in the recovery of seven artefacts. One was from the disturbed topsoil horizon. The remaining six were found at a depth of 3.5-3.7m

below the ground surface, at 20.55-20.65m AHD. A tentative age for the occupation represented by the artefacts was suggested to be in the terminal Pleistocene, c20-9ka.

Nepean Green Bridge (Artefact Heritage 2014)
An Aboriginal archaeological assessment was undertaken to inform planning for the proposed Nepean River Green Bridge project. It was found that most of the subject area was below the 1:100 year flood level, and had been subject to erosion and re-deposition. This area was assessed as having low archaeological potential. However, an area of potential archaeological deposit was identified in Tench Reserve, on the eastern bank of the Nepean. This was a slightly raised landform located at the top of the bank, above the 1:100 year flood level.

Landscape assessment for the current study area identified flooding and ground disturbance as key factors for the survivability of archaeological deposit. It was considered that few surface objects would be identified due to modern land use practices and development. Artefact Heritage considered that subsurface deposits were more likely, based on their interpretation of geotechnical borehole and test pit data previously undertaken for the project. Artefact Heritage (2016) interpreted the geotechnical data as indicative of intact deep alluvial deposits associated with the Richmond Unit of the Cranebrook Formation. The Richmond Unit comprises an upper overburden of fine alluvial sediments dated to 20,000 – 15,000 years old atop older gravel deposits and (where intact) has the potential to contain buried archaeological deposits. These deposits are vulnerable to erosion and re-working during major flood events. Geotechnical data was also used to estimate the nature and extent of disturbance in the study area with regards to road construction and development.

Site predictions for the study area were based on the archaeological and landscape factors as outlined above. Namely, it was considered that stone artefacts would be the most likely site type and would most likely be present in subsurface deposits given the extent of previous disturbance within the study area. It was considered that the Richmond Unit 'alluvium' would contain deeper archaeological deposits related to Pleistocene occupation. The western part of the study area was considered likely to have been more severely affected by flooding than the more elevated eastern portion. It was predicted that surface sites would be rare or non-existent. The aim of the subsequent archaeological survey was therefore to assess the extent of ground disturbance.

The main aim of the field survey was to confirm levels of disturbance through the study area, especially with regard to the likely effect on the predicted subsurface deposits. Effective survey coverage was low due to thick grass cover and ground-obscuring development and infrastructure including roads, paving and the rail corridor. No Aboriginal objects of archaeological sites were identified during the field survey.

Despite the lack of surface archaeology and the confirmed high levels of disturbance, a large Potential Archaeological Deposit (PAD) was identified within the study area during the Stage 2 PACHCI assessment. The rationale for the identification of PAD was that Aboriginal objects could be present within the 'alluvium' identified during the geotechnical investigations, at a depth beneath any existing disturbance. The assessment concluded it was likely that Aboriginal objects would be present within the study area despite disturbances and truncation of the upper part of the soil profile by infrastructure and development activities: "These remains are likely to consist largely, or entirely, of stone artefacts. Densities are likely to be lower, and the context more disturbed, in the western part of the study area. The evidence could date back to the late Pleistocene period. Evidence from the later Holocene occupation of the study area is likely to have been subject to greater levels of historical disturbance, being higher in the profile" (Artefact Heritage 2016:33). The PAD was assessed as having moderate archaeological potential and significance (Artefact Heritage 2016:41).

It was recommended that archaeological test excavation of the PAD be undertaken as part of the subsequent Stage 3 PACHCI assessment, to confirm the presence/absence of the PAD and the nature and extent of any identified archaeology. Test excavation would also allow for a more precise assessment of the extent of subsurface disturbance within the study area. A test excavation under the *Code of practice for archaeological investigation of Aboriginal objects in NSW* (OEH 2010) was therefore recommended.

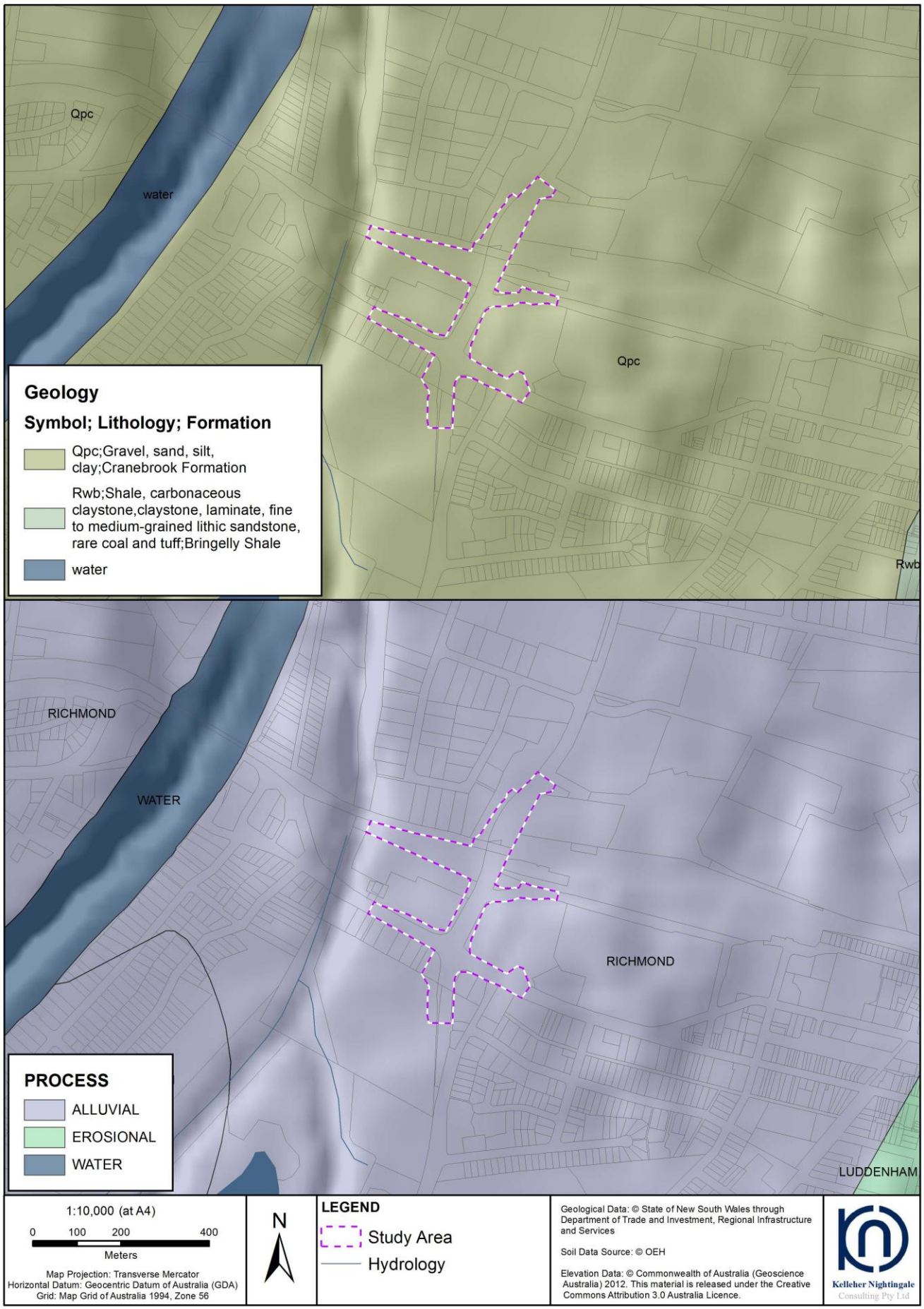

Figure 2. Geology and soil landscapes of the study area

5 Landscape context

The study area is located on the western margin of the Cumberland Plain at Penrith in Sydney's west. The Cumberland Plain is a large, low-lying and gently undulating physiographic region of the Sydney Basin. The Sydney Basin is a large geological feature stretching from Batemans Bay in the south to Newcastle in the north and Lithgow in the west. The formation of the basin began between 250 to 300 million years ago when river deltas gradually replaced the ocean that had extended as far west as Lithgow (Clark and Jones 1991).

Topography in the study area has been influenced by the formation and development of the Hawkesbury-Nepean River system, with the Nepean River located approximately 400 metres west of the study area. Repeated episodes of flooding, erosion, channel migration and deposition have created abroad higher level terrace on which the study area is located. This river terrace was formed by deposition and accumulation of sediments known as the Cranebrook Formation (Clark and Jones 1991). The Cranebrook Formation forms a broad terrace 14-16 metres above the level of the river and consists of basal clast-supported gravels overlain by sand, silt and clay (Clark and Jones 1991:44). The basal gravel consists of clasts of pebbles and cobbles of quartz, quartzite, chert, porphyry, granite, sandstone, hornfels and silcrete, likely derived from the Lachlan Fold Belt to the west. Red-brown to yellow sand and silt deposits up to 5 metres thick overlie the basal gravels.

The Cranebrook formation is often divided into two units: the older Penrith Unit east of Cranebrook Creek (50,000 – 110,000 years old) and the younger Richmond Unit to the west (15,000 – 50,000 years old). Both Units comprise the same material but were laid down in different depositional events. The landscape assessment completed for the Stage 2 PACHCI report (Artefact Heritage 2016) considered it likely that the study area fell within the Richmond Unit. Given the more recent age of the Richmond Unit it was considered that the upper levels of the alluvial sands/silts could contain buried Aboriginal archaeological sites relating to Aboriginal land use as early as the Pleistocene. The alluvium logged in the geotechnical borehole and test pit data was interpreted as representing these sand/silt deposits.

An additional review of the geotechnical data was undertaken for the current Stage 3 PACHCI investigation. The alluvium referred to in the Stage 2 report does not consist of such alluvial sands/silts, instead being characterised by heavily plasticised clay to sandy clay. Overlying sands and developed soils were found to be relatively shallow and in most cases heavily disturbed. It is therefore considered unlikely that the presence of alluvium in the geotechnical logs is indicative of archaeological potential, being composed in this case of materials more common to the archaeologically sterile B horizon of the overlying fluvial Richmond Soil Landscape.

The Richmond Soil Landscape consists of poorly structured orange to red clay loams, clays and sands (Bannerman and Hazleton 1990). Soil distribution is related to landform, with loose reddish brown loamy sands overlying brown sandy clay loams forming deeper topsoils (A horizon) near terrace edges. Terrace flats and backs more commonly display brown sandy clay loam directly over brown mottled light clay to brown mottled stiff medium-heavy clay. Where drainage lines incise or abut the terrace, flooding often mixes stratigraphy causing interspersing of the layers along the channel and across the associated floodplain. Surface soils are moderately erodible due to high sand content and are prone to waterlogging and flooding, being generally associated with the margins of an active major floodplain along the Nepean. Flooding is a major factor in the development and evolution of the landscape in the local area. Repeated episodes of flooding and deposition strip, re-work and re-deposit sediments from the upper layers of the soil profile. Flooding also homogenises deposits and may remove Aboriginal objects from both surface and subsurface deposits depending on extent, duration and flood energy.

Landforms within the study area are generally flat to gently sloping with low relief. Terrace tops, terrace edges and levees provide the low relief (<3 metres) present across the Cranebrook terrace. The study area is slightly higher in the east tending downwards towards Peach Tree Creek, a higher order tributary of the Nepean River to the west. A minor drainage channel crosses the study area in the south and may represent a heavily modified natural watercourse. The majority of the study area is located along existing road corridors, some of which have been elevated during construction. The Main Western Railway line crosses the study area from west to east and runs along the top of an artificial embankment. The roads within the study area are typically flanked with grass verges and landscaping. Surrounding land uses include commercial, light industrial, infrastructure and recreation. Previous assessments and the review of background information suggest that the majority of the study area has been highly disturbed by modern land use, including excavation related to subsurface utilities, road construction and the construction of the rail line underpass along Castlereagh Road.

In particular, analysis of the geotechnical test pit and borehole logs indicates that ground disturbance in the study area is both widespread and extensive in depth. Test excavation aimed to sample locations complementary to the geotechnical investigations, in order to augment the previously established data relating to the nature of subsurface deposits in the study area (see sections 7.1 and 7.2). The location of the previous geotechnical investigations is shown in Figure 3.

Figure 3. Location of previous geotechnical investigations (Roads and Maritime 2015)

6 Regional character and predictions

Previous archaeological field surveys and excavations across the Cumberland Plain have provided data on artefact distribution, site typology and lithic raw material use that assist in the development of site predictions within the study area. Many of the discussions regarding the distribution of archaeological material focus on a combination of artefact density and landform context.

One finding has been the relationship between high artefact density and high order waterways, with lower artefact densities consistently recorded at excavated sites in upper slopes and ridge crest contexts away from high order drainage lines. The study area is located in close proximity to the Nepean River, the major watercourse of the Cumberland Plain. The river would have been a key focus of past Aboriginal landscape use in the region due to the rich economic resource zone associated with the watercourse. As well as a permanent source of fresh water and varied plant and animal resources, the Nepean River gravels and exposed terrace gravels of the Cranebrook formation offered a suitable source of raw materials for artefact manufacture. The Nepean/Hawkesbury system may also have acted as a 'refuge' for Aboriginal people during the harsher climate of the Last Glacial Maximum.

In assessing the potential for material traces of Aboriginal occupation within this complex landscape, the nature of geomorphic and site formation processes that occur over time and the likely implications of these factors on site composition, preservation and detectability must also be considered. Erosion, flooding and the movement of soil are significant factors to artefact survivability. Flooding in particular is a key consideration. The proximity to the Nepean River to the west means at least portions of the study area are likely to have been affected by major flood events, while flooding along smaller tributaries including Peach Tree Creek and the unnamed modified drainage line to the south will also have affected deposits to some degree.

Ground disturbance within the study area is extensive. The majority of the study is located along existing road corridors which have been highly disturbed by excavation and construction, while buried services run beneath the grass verges. Large portions of the study area have been landscaped, including the extensive earthworks undertaken to build the rail embankment and rail line underpass along Castlereagh Road. These works are likely to have removed any archaeological deposit that may have been present within the upper soil profiles. Archaeological deposit in the deeper 'alluvium' is also considered unlikely due to the B horizon nature of these sandy clay deposits.

Any remnant deposit within the study area will likely consist of isolated stone artefacts in disturbed context.

7 Test excavation program

Previous archaeological assessment during the Stage 2 PACHCI recommended that the study area required further investigation prior to any impact. A large area of PAD was identified across the majority of the study area. Portions of the study area with known extensive ground disturbance were not included in the PAD: the rail underpass, around the Penrith Civic Centre, the drainage basin north of the rail line and areas where underground surfaces have been installed. It was noted that "the nature of the PAD has been assessed based on documentary evidence only, as no surface expressions of the PAD were observed and no subsurface investigation was undertaken" (Artefact Heritage 2016:33).

The study area for the Stage 3 PACHCI is smaller than the original Stage 2 study area, which included a substantial buffer around the proposed construction impact areas. Test excavation intended to determine the nature of subsurface deposits and identify any Aboriginal objects or archaeology within the road upgrade areas.

Test excavation was carried out by KNC in July 2016 in accordance with the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. Aims, methodology and results of the test excavation program are presented below.

7.1 Aims

The study area is located within a highly modified landscape. The aim of the test excavation program was to determine the presence/absence of the PAD as identified during the Stage 2 PACHCI assessment. Test excavation aimed to identify whether subsurface archaeological deposit was present within the study area, and, if so, to adequately characterise the nature and extent of that deposit by excavating a sample of the subsurface archaeology. Information from the testing program would then be used to assist with detailed planning and management for the infrastructure upgrade program.

7.2 Methodology

The test excavation methodology was designed to focus on those parts of the PAD within the development footprint that had been subject to lower apparent levels of historical disturbance and where no geotechnical data was available to characterise the nature of subsurface deposits. Three general test areas were selected based on lower levels of visible disturbance.

The test areas had no surface archaeology and were vegetated with introduced grass species with areas of native and introduced trees. All test excavation areas were restricted to ensure an adequate sample of the study area without having significant impact on any archaeological value.

Field methodology was developed and carried out in accordance with requirement 16a of the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales.* In accordance with the Code of Practice, where test excavation units (where possible) were placed along transects at 15m intervals. The majority of excavation units measured 100 cm x 50 cm comprising two adjoining 50cm x 50cm squares, giving a total of 0.5m^2 for each unit. One excavation unit was excavated as a single 50cm x 50cm square, totalling 0.25m^2. Easting/northing GPS coordinates (GDA 94) were taken at the north west corner of each excavation unit. The test units were then given an arbitrary identifying number (e.g. TS 1, TS 2,TS 3). A total of six 100cm x 50cm units and one 50cm x 50cm unit were excavated, giving a total sample of 3.25m^2 excavated across the testing area. It was determined that sufficient information was recovered from the seven test pits and additional excavation was deemed unnecessary. The location of the test squares is shown on Figure 4.

Following OEH guidelines, the first excavation unit was excavated in 5cm spits onto a culturally sterile deposit to determine the nature of the subsurface deposit and the presence or absence of artefactual material. Based on the results of the first excavation square, subsequent squares were excavated in 10cm spits until culturally sterile soils were reached.

The information from each test excavation square, including a detailed deposit description, any excavated features and unit depths, was recorded onto standardised excavation forms. Detailed descriptions of disturbance to the soil profile were recorded. At the end of the excavation program, all squares were photographed and soil section profiles were recorded. Completed test squares were demarcated and protected with star pickets and high-visibility mesh bunting. Test squares were backfilled with spoil as soon as possible.

All excavation was undertaken using hand tools. All excavated material was placed in buckets and transported to the adjacent sieving area and either dry sieved or wet sieved using a combination of nested 5mm and 2.5mm wire mesh screens.

Figure 4. Distribution of test squares and location of geotechnical test pit

Plate 1. TS 1 being excavated and sieved. Drainage line and Mulgoa Rd to rear.

Plate 2. TS1 plan view at base of spit 3 (15cm depth).

Plate 3. Hand excavation of TS 3. Rail line embankment visible in background.

Plate 4. TS 1 completed. TS 6 location marked at left.

Plate 5. Hand excavation of TS 7 south of Jane St.

Plate 6. View south towards Mulgoa Rd. TS 1 being excavated and sieved.

Personnel

Project Director: Dr Matthew Kelleher (KNC)
Site Supervisor: Mark Rawson (KNC)
Archaeologists: Tyler Beebe (KNC), Owen Barrett (KNC), Tristram Miller (KNC), Sam Richards (KNC)
Registered Aboriginal Stakeholder Representatives: Darleen Johnson (Murra Bidgee Mullangari Aboriginal Corporation); Chris Jones (DLALC); Steven Knight (DLALC); Rivers McEwen (DLALC).

7.3 Results

No Aboriginal objects were recovered by the test excavation. Subsurface deposits were found to suffer from moderate to extreme levels of disturbance. In short, no archaeological deposit or intact artefact-bearing soil substructure was identified and the study area exhibits no archaeological potential.

7.3.1 Soils and disturbance

The southern test excavation area was located in a grassed lot on the south western corner of the High Street – Mulgoa/Castlereagh Road intersection. The area was bounded by High Street to the north, Mulgoa Road to the east, the modified drainage line to the south and private property to the west. Four test excavation units measuring 1m x 50cm were excavated in this area. TS 1, TS 2 and TS6 were aligned on a north-east to south-west running transect and were spaced 15 metres apart. TS 5 was offset 15 metres to the east but excavation of this unit was abandoned due to the presence of asbestos within the upper layers of the soil. A total of 2m^2 was excavated in this area.

The three completed test excavation units in this area displayed relatively homogenous sandy to silty loam deposits over heavy clay to sandy clay. All three units were excavated into the sandy clay B horizon with excavation ceased at 80 cm depth. Modern disturbance including broken glass, building rubble and broken ceramics were present in the upper 10 cm while tree root activity was evident in all three units, particularly in TS 2 which had root activity throughout the upper 40 cm of the deposit. The natural soils encountered in this testing area indicate that no substantial ground disturbance/modification works have taken place, however the area is likely to have been affected by periodic flooding and waterlogging. Small (<30mm) sub-rounded (waterborne) gravels were identified in TS 1 while ironstone and ferromanganese nodules appeared from c.35cm depth in all test squares and were well-dispersed throughout the deposit.

Soil profiles identified in this area were generally typical of the Richmond soil landscape beneath a superficial layer of disturbance and more recent topsoil. Sandy to silty clay loams were present to 35-40cm depth, grading to sandy clay and heavy sandy clay with high chroma. A general soil description by spit is as follows:

Plate 7. TS 1 plan view of completed square

0-10cm: Surface, low grass; dark brown silty loam (sandy), friable; Munsell 10YR 3/3

10-20cm: Brown, moist sandy loam; increasing compaction and chroma; some silt content apparent in TS 1 but little to none in TS 2 and TS6

20-30cm: Brown moist sandy loam, increasing clay and sand content, low organic content. Clear boundary at 28-30 cm depth to strong brown sandy clay

30-40cm: Strong brown sandy clay; moist; increasing compaction; Munsell 7.5YR 4/6 to 5/6; appearance of fine (<10mm) fe/mn nodules, c.5%

40-50cm: Strong brown sandy clay; negligible organic content; increase to 5-10% fe/mn towards base of spit, gradual change in hue/chroma to:

50-60cm: Yellowish red sandy clay; occasional scattered fe/mn nodules; increasing clay content

60-70cm: Contination of yellowish red sandy clay; clay content increasing with depth; strongly stains fingers, sticky when wet, visible sand grains, coherent plastic bolus, forms ribbon of 4cm+

70-80cm: Yellowish red to strong brown sandy clay to heavy sandy clay, plastic

Base: Yellowish red (in TS 2) to strong brown (in TS 1 and TS 6) sandy clay to heavy sandy clay, plastic, occasional scattered fe/mn nodules; Munsell 5YR 4/6 to 7.5YR 5/6-5/8.

Plate 8. TS 2 northern section

Plate 9. TS 6 northern section

The second excavation area was situated south east of the Jane Street/Castlereagh Road intersection. One test excavation unit (TS 7) measuring 50m x 50cm was located on the landscaped grassed verge adjacent to the paved footpath. The verge along this portion of the study area surrounding the Penrith Civic Centre carpark has been landscaped as an elevated mound and slope with bricked edging and various plantings. The test square location was selected in order to avoid the numerous buried services that run along the road verges.

No natural soil profile was identified in this test area, with the subsurface found to be highly disturbed. It is likely that excavation/construction of Jane Street, the Civic Centre and adjacent carpark facilities, the installation of various services and subsequent landscaping have totally destroyed the original deposit in the area. Historical photographs indicate that the earthworks and excavation associated with the construction of the Civic Centre were extensive (see Artefact Heritage 2016:15-16) and the surrounding verges within the study area retain no natural soils. A soil description by spit for TS 7 is as follows:

0-10cm: Grassed surface; thin topsoil with grass roots throughout overlying dark grey brown fill, sandy, relatively clean; clear and abrupt boundary at 10cm depth to:

10-20cm: Strong brown clay fill, dense redeposited gravels and occasional cobbles >10cm (road base material), bitumen fragments, fibro, ceramic pipe fragments at 13cm depth, highly compact, cement appearing towards base of spit, patches of orange clay, appearance of third distinct sandy mottled grey-brown fill layer in northern half of square towards 20cm depth

Base: Mottled grey-brown sandy fill in northern half of square, strong brown clay fill with gravel, cobbles and bitumen in southern half of square

Plate 10. TS 7 southern section

Plate 11. TS 7, view west towards Jane St/Castlereagh Rd intersection

The remaining test excavation area was located in a vacant lot west of Castlereagh Road and immediately south of the Main Western Rail line. To the south were the tennis courts and facilities of the Nepean District Tennis Association and Woodriff Gardens. Further to the west is Peach Tree Creek. The area contains numerous aboveground and buried services and test excavation squares were positioned to avoid these. Some surface disturbance was evident, with large areas of the lot displaying uneven ground, made particularly evident by accompanying poor drainage, with pooling water after periods of rain. This area was selected for testing on the basis that no obvious above-ground construction or landscaping had taken place (i.e. no built structures). It was intended to investigate whether subsurface deposits in the area retained any integrity. Two test excavation squares measuring 1m x 50cm were excavated in this test area (TS 3 and TS 4), giving a total excavated sample of $1m^2$. Squares were positioned in the centre of the open grassed lot to avoid buried services. No intact soils were identified in this testing area, with both test square locations displaying severe disturbance.

Plate 12. TS 3 southern section

Plate 13. TS 4 northern section

0-6cm: Humic topsoil layer, dark brown, vegetated with kikuyu grass, grass roots throughout

6cm-13/17cm: Compact fill; yellow, brown and white clay; sharp (TS3) to gradual (TS4) boundary to:

13/17-30cm: Dark brown loamy fill with orange clay lumps, small sandstone rubble, glass, metal fragments, occasional cobbles

30-40cm: For TS 3, as above, appearance of heavy railway ballast and rubble. For TS 4, pale grey highly compacted fill, ashy in colour.

40-50cm: Highly compacted fill, dark grey-brown sandy to loamy clay, railway ballast and cobbles throughout up to 15cm diameter, orange clay lumps, glass and sandstone fragments.

Base: Continued fill, excavation halted at maximum depth of 50cm.

Additional geotechnical testing was being undertaken at the time of the archaeological test excavation, and one of the nearby geotechnical test pits (see Figure 4) was examined to ascertain the nature of subsurface deposits beyond the depth to which hand excavation was possible. Plates 14 and 15 show the geotechnical pit, indicating the severity and extensive depth of disturbance to the area. On the basis of the severe disturbance evident in the test squares and the depth to which this was apparent in the geotechnical test pit, excavation in the test area was ceased. It is reasonable to assume that the subsurface is similar across the remainder of the lot given the uneven surface and its close proximity to the rail line.

Plate 14. Geotechnical test pit, severe disturbance

Plate 15. Geotechnical test pit, severe disturbance

Plate 16. View west towards Peach Tree Creek, rail embankment at right. TS 3 in foreground

Plate 17. View north east from TS 4. Note uneven ground surface and poor drainage

7.4 Discussion

Test excavation recovered no Aboriginal objects from the investigated PAD area. The majority of the area previously assessed as PAD during the Stage 2 PACHCI investigation was found to be heavily disturbed with no archaeological potential and no potential for intact deposits. The study area does not contain any potential archaeological deposit.

Landscape and subsurface disturbance was found to be severe in two of the tested areas, with no remnant natural soils identified. Various activities have totally removed the natural soil horizons: at TS 3 and TS 4 the severe disturbance is likely associated with the construction of the Main Western Rail line immediately to the north. Railway ballast was evident throughout the lower levels of the deposit and to a depth of c. 1.5m in the geotechnical test pit. No buried surfaces/soils were evident, with total stripping and replacement with fill evident above heavy clays. At TS 7 no natural soils were encountered, with the entirety of the mound likely to consist of fill associated with construction and landscaping of the Penrith Civic Centre. Earthworks associated with its construction are likely to have stripped away the A horizon and replaced it with fill.

The portion of the study area south west of the Mulgoa/Castlereagh Road and High Street intersection (test squares TS 1, TS 2 and TS 6) displayed more intact soils below a superficial layer of historical disturbance. This portion of the study area does not appear to have been subject to the major ground modifications that have taken place elsewhere in the study area. The stratigraphy and composition of the intact soils was found to be typical of the Richmond Soil Landscape when in close proximity to drainage features, displaying a somewhat homogenised sandy to silty clay loam grading to sandy clay and heavy sandy clay with high chroma. Heavy sandy B horizon clays were apparent from 80cm depth. No Aboriginal objects or archaeological deposit was identified in this area despite the relatively intact (albeit flood-affected) soils.

Past Aboriginal land use in the immediate area is likely to have been more closely focused on the nearby Nepean River and possibly the higher-order Peach Tree Creek; however, much of the archaeological evidence for this landuse will have been lost over time due to high energy flood events and erosion. Specific landscape contexts may allow the preservation of buried (and possibly old) deposits within the Richmond soils and underlying alluvium but the test excavation results indicate that this is unlikely within the study area.

Overall, the study area is likely to have functioned as an intermediate area between the major landscape feature and resource zone of the Nepean and the interior of the Cumberland Plain. More intensive occupation (and consequent archaeological deposit) is likely to have taken place closer to the river to the west. Archaeological evidence in the study area may have been more reflective of transient use of the local area while people passed through; however, a combination of natural and historical disturbance have combined to remove any archaeology relating to this landscape use that may have been present.

8 Significance and impact assessment

No Aboriginal objects were identified within the study area during both the Stage 2 and Stage 3 PACHCI assessments.

Archaeological test excavation in conjunction with an analysis of the available geotechnical data established that the majority of the study area is severely disturbed and does not retain natural subsurface soil structure. Where intact natural soils do exist, these did not contain Aboriginal objects.

The study area does not represent an area of Potential Archaeological Deposit and contains no known Aboriginal objects or sites. The archaeological (scientific) significance of the study area is therefore assessed as low based on widespread disturbance and identified culturally sterile soil profiles.

It is therefore reasonable to assume that the proposed Jane St and Mulgoa Rd Infrastructure Upgrade would not harm any Aboriginal objects as defined under the Act and would have no impact Aboriginal cultural heritage impact.

9 Statutory Requirements

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

Under the Act, an "Aboriginal object" is defined as "any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction and includes Aboriginal remains". As such, Aboriginal objects are confined to physical evidence and are commonly referred to as Aboriginal sites.

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

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

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

Section 87 (2) of the Act provides a defence against prosecution under section 86 (2) if "the defendant exercised due diligence to determine whether the act or omission constituting the alleged offence would harm an Aboriginal object and reasonably determined that no Aboriginal object would be harmed".

Under section 87 (1) it is also a defence if "(a) the harm or desecration concerned was authorised by an Aboriginal heritage impact permit, and (b) the conditions to which that Aboriginal heritage impact permit was subject were not contravened".

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

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

An Aboriginal heritage impact permit (AHIP) is required for an activity which will harm an Aboriginal object.

10 Management and Recommendations

No Aboriginal archaeological objects, sites or potential archaeological deposits were identified by the Stage 3 PACHCI assessment and test excavation program within the study area for the Jane Street and Mulgoa Road Infrastructure Upgrade.

No further Aboriginal archaeological assessment is warranted for the study area.

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www.rms.nsw.gov.au/JaneStreetMulgoaRoad

1800 733 084

Jane Street and Mulgoa Road Upgrade
Roads and Maritime Services
PO Box 973
Parramatta CBD NSW 2124

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