ARUP

City of Parramatta Council (CoPC)

Riverside Theatres

Geotechnical Report (SSDA submission)

Reference: GE-RP-0001

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Executive Summary

This report has been prepared in response to the relevant requirements outlined within the project specific Secretary's Environmental Assessments Requirements (SEARs) for the Riverside Theatres Redevelopment.

Table 1 addresses the SEARs requirements relevant to this report and provides the project responses.

Table 1 SEARs requirements relevant to this report

Issue and Assessment Requirements	Project Responses and Relevant Report Sections
Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site, including soil erosion, salinity and acid sulphate soils.	The proposed development is not expected to adversely impact the soil resources, related infrastructure or riparian lands (e.g. interface with parameters river) on and near the site with implementing appropriate measures. Refer to sections below for further details: - Soil erosion (Section 6.7) - Soil Salinity/Acid Sulphate Soils (A high level desktop review of the soil salinity and acid sulphate soils was completed as part of this report – Section 3.2 and 6.6). For more details, refer to the Preliminary Acid Sulphate Soil and Salinity Assessment, and Acid Sulphate Management Plan prepared by JK Environmental for this project. - Impact on the Riverbank Wall (Section 6.10)
Provide a Surface and Groundwater Impact Assessment that assesses potential impacts on: • surface water resources (quality and quantity) including related infrastructure, hydrology, dependent ecosystems, drainage lines, downstream assets and watercourses. • groundwater resources in accordance with the Groundwater Guidelines	For the surface water resources, refer to the project civil study (separate report). This application covers the redevelopment of the existing Riverside Theatres, which has been in operation since 1988. The proposed redevelopment does not involve any new basements or major excavation works, and as such, it does not encroach on the aquifer. No dewatering or groundwater extraction is expected. Therefore, the impact of the proposed redevelopment on the groundwater regime is considered to be minimal subject to detailed assessment of hydrogeological impact. Refer to Section 4 for the site groundwater assessment. Refer to Water Management Plan (separate submission) for further details on surface water and groundwater impact assessment.

This report presents the findings of the geotechnical desktop study for the proposed redevelopment. It discusses the geological and geotechnical aspects, anticipated ground conditions, hydrogeology desktop study, potential geotechnical constraints and issues, and provides recommendations for design and further site investigation.

Some of the main findings of this study are as follows:

- The project site is generally underlain by fill, alluvial soils, residual soils/extremely weathered material and bedrock consisting of shale and sandstone.
- Based on the recently installed monitoring wells by JK Environmental (2025), the observed groundwater level at the northern boundary of the site, adjacent to Market Street, is approximately +6.2m AHD (~2.6–3.0 m bgl). The groundwater level declines to approximately +2.0 m AHD (~1.7-2.0 m bgl), following the site's topography as it slopes down toward the Parramatta River.

- The proposed redevelopment does not involve any new basements or major excavation works, and as such, it does not encroach on the aquifer.
- There are no nearby groundwater dependent ecosystems and any potential dewatering at the Site. The adopted piling method should aim to minimise the ground water extraction. This is considered to be a low-risk item in relation to impacting the groundwater levels.
- The main buildings and the elevated walkway are anticipated to be supported by pile foundations that will be founded on bedrock. Pad foundations on the competent soil layers may be feasible for lightly loaded ancillary structures or the small retaining structures at the casuarina clearing area.
- The developed engineering solution must avoid applying any additional surcharge loading behind (within the influence zone of) the existing Riverbank Wall in its current condition and without further assessment. This includes both construction and design loadings throughout the project's lifetime. Refer to Section 6.10.

Some residual geotechnical risks remain, and we have provided the following recommendations (refer to Section 8 for more details):

- Additional geotechnical investigations through the soil and rock layers to inform the design,
- Detailed impact assessment of the proposed development on the existing assets,
- Development and implementation of an instrumentation and monitoring plan to protect existing assets and facilitate management of the works,
- Geotechnical verification during construction (construction phase support) by a qualified and experienced geotechnical engineer.

In conclusion, the proposed development is deemed feasible from the geotechnical engineering perspective and the commonly used construction methods are generally considered suitable for this redevelopment.

Table of Abbreviations

Table 2 Table of Abbreviations

Abbreviation	Meaning
°C	Degrees Celsius
%	percent
AC	Asphaltic Concrete
AHD	Australian Height Datum
ASS	Acid Sulphate Soil
ASSMP	Acid Sulphate Management Plan
BH	Borehole
BYDA	Before You Dig Australia
CBD	Central Business District
CoPC	City of Parramatta Council
DD	Detailed Design
DEM	Digital Elevation Model
DPE	Department of Planning and Environment
DSI	Detailed Site Investigation (contamination)
dS/m	decisiemens per metre
GDE	Groundwater Dependant Ecosystem
GI	Ground Investigation
HGL	Hydrogeological Landscape
I&M	Instrumentation and Monitoring
km	kilometre
kPa	kilopascal
LiDAR	Light Detection and Ranging
m	metre
mAHD	metre Australian Height Datum
m bgl	metre below ground level
PASS	Potential Acid Sulphate Soil
PLR1	Parramatta Light Rail Stage 1
PMF	Probable Maximum Flood
PSI	Preliminary Site Investigation (contamination)

Abbreviation	Meaning
RAP	Remedial Action Plan
RL	Reduced Level
SPT	Standard Penetration Test
SSDA	State Significant Development Application
St	Street
SWL	Standing Water Level

Important Note about This Report

There are inherent uncertainties in geotechnical and environmental engineering. The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical and environmental engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground and groundwater on a particular site under certain conditions.

Arup may report such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground and groundwater at the place where, and the time when, the investigation was carried out and are believed to be reported accurately.

Any interpretation or recommendation given by Arup shall be understood to be based on judgement and experience and not on greater knowledge of the facts than the report investigations would imply. The information contained within this report shall be considered as for reference only.

This report has been prepared for the use of our Client in connection with the aforementioned project and considers particular requirements and instructions. It is not intended for use by any third party and no responsibility is undertaken to any third party.

1. Introduction

City of Parramatta Council (CoPC, the "Client") has commissioned Arup to undertake State Significant Development Application (SSDA) services for the redevelopment of the Riverside Theatres.

This document covers the geotechnical and groundwater desktop study for the proposed redevelopment.

1.1 Project Site

The Site is situated in the local government area of Parramatta City Council, NSW. It is bounded by Marsden Street and Marist Place to the West, Market Street to the North, Church Street to the East, and Parramatta River foreshore to the South.

A location plan of the Site is shown in Figure 1.

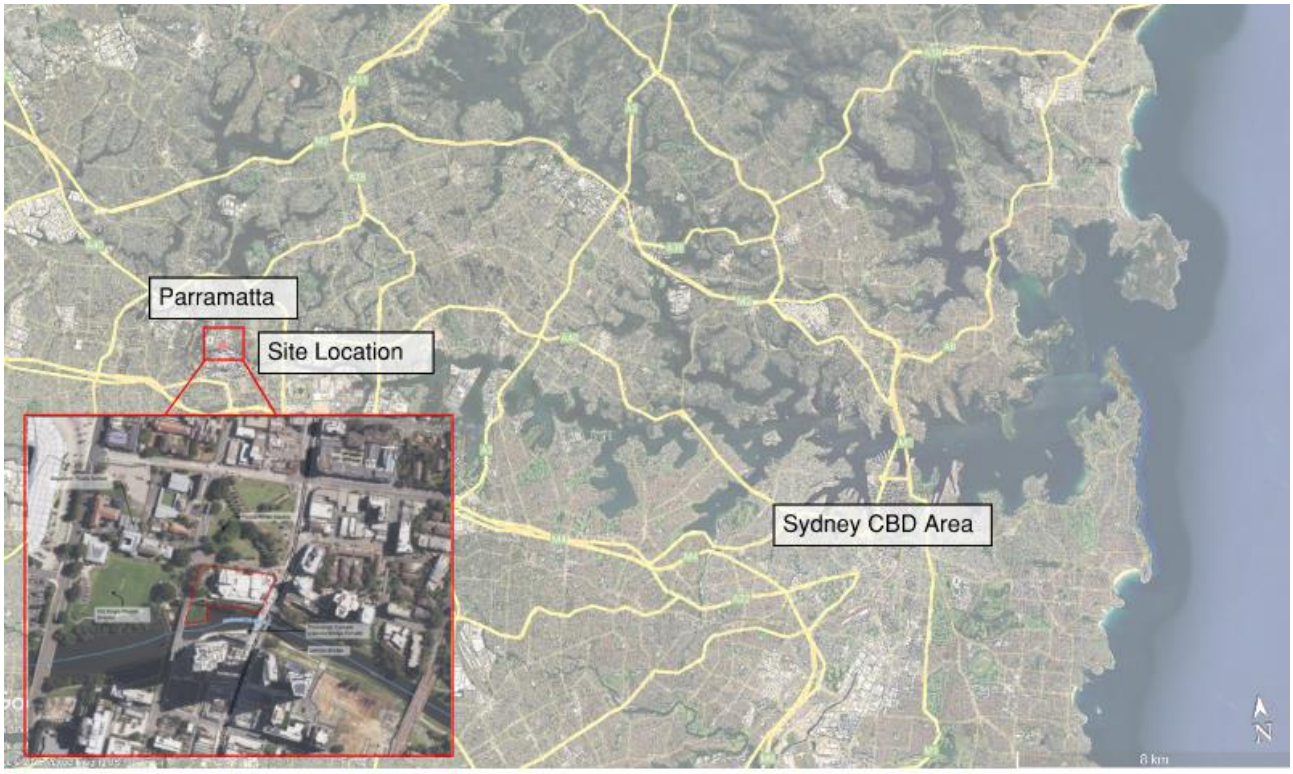


Figure 1 Site Location Plan

1.2 Proposed Development

At the time of writing this report and referring to the Architectural drawings set for SSDA submission (Cox, 3XN and Turf, 2024), the Riverside Theatres redevelopment is understood to comprise of the following components:

- The retention of the existing Riverside Playhouse (the blue section in Figure 2).
- Demolishing of the remaining structures and replacement with three new theatres.
- The three new theatres base RL's are within existing building or structure footprints. No new basements are proposed.
- An elevated shared walkway/cycleway where there are two sections that will cantilever over the existing Parramatta Riverbank Wall.
- Ramped access in the form of a piled walkway connecting to the Level 1 of the building at ~RL9.0m and river foreshore at ~RL4.5m.

- An outdoor landscaped area (Casuarina Clearing) with seating and landscaped retaining walls. This is situated between the Marsden Street Weir concrete channel and the existing shared pathway.

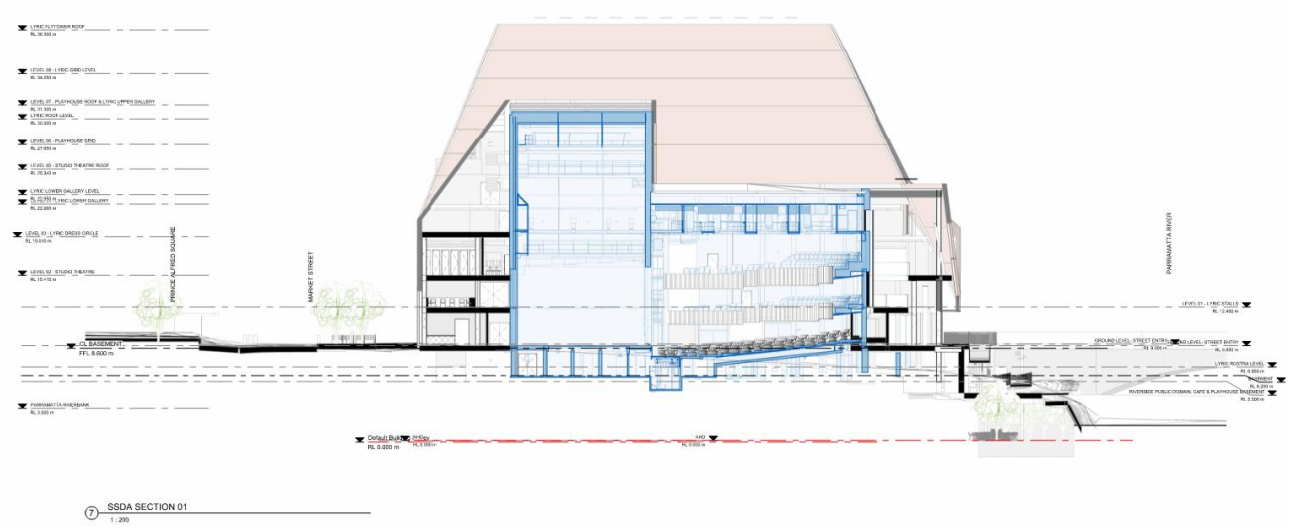


Figure 2 Riverside Theatres redevelopment (Cox, 3XN and Turf, 2024)

The entire site area is approximately 39,000 square metres. It consists of the main building area (highlighted yellow) and external structures (highlighted purple) – see Figure 3.

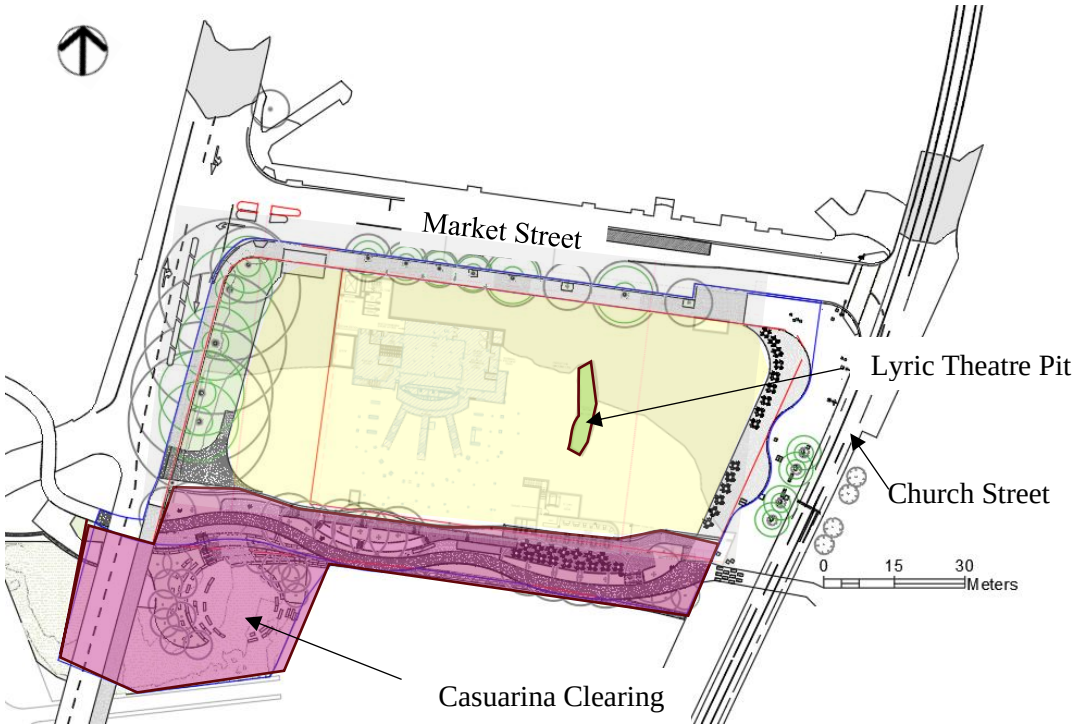


Figure 3 The proposed redevelopment plan (Cox, 3XN and Turf, 2024)

1.3 Scope of Report

This report presents the findings of the geotechnical desktop study for the proposed redevelopment. It discusses the geological and geotechnical aspects, anticipated ground conditions, potential geotechnical constraints and issues, and provides recommendations for design and further site investigation.

The desktop study includes a review of published mapping and reports and available site investigation data.

1.4 Reference Documents

In preparing this document, the following reference documents/drawings are utilised:

- Cox, 3NX and Turf (2024), Architectural Drawings, Riverside Theatres Drawings AR-DA-2000,2028, 4001,4002, Turf Design Studios, November 2024.

1.5 Sources of information

The following historical geotechnical reports were provided by the Client (see Table 3).

Table 3 Historical geotechnical reports provided by the Client

Company	Year	Report Name	Details
JK Geotechnics	2018	Preliminary Geotechnical Investigation for Proposed Riverside Theatres Project	Two boreholes, within the building footprint, were drilled to refusal depths of 5.4m One BH was made into a groundwater monitoring well. SPTs and 3x rock chip samples were tested for moisture readings. 3x soil samples were taken for aggressivity testing.
JK Geotechnics	1984-2018	Geotechnical Desktop Study – Proposed Riverside Theatres Redevelopment	Desktop study review of previous boreholes that were drilled for the original Riverside Theatres development. Altogether, there are 12 boreholes, excluding the two above. Some of them have surface RL's. SPTs, hand penetrometer readings were recorded. No testing was completed or provided.

Arup has also sourced the publicly available archives of geotechnical investigations or data in the area to help inform this study. A summary of the relevant reports and collected historical GI locations are provided in Section 3.3.

2. Site Background and Geology

2.1 Site location

The Site is surrounded by notable heritage-listed landmarks with Lennox Bridge and the pedestrian tunnel immediately southeast, Prince Alfred Square to the North and Old King's Parade Ground and Bayanami Public School to the West.

Low-rise mixed commercial and residential structures are located along the eastern side of Church Street. This is shown below in Figure 4.

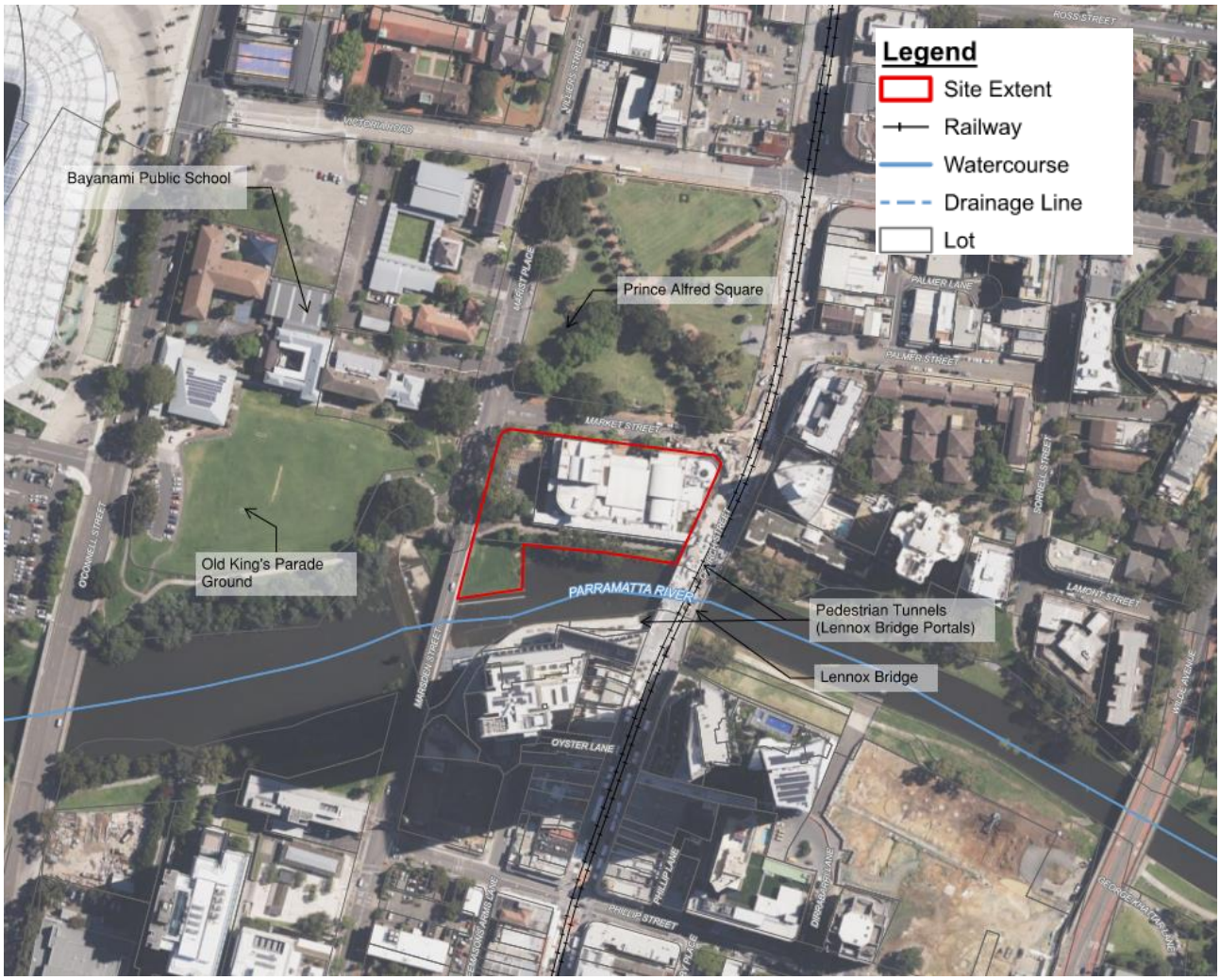


Figure 4 Key Historic Structures near the Site

2.2 Topography

Topographical maps were obtained from 2019 LiDAR data (Spatial Services, 2019) and show the main Site area (footprint of the existing building) is located on gently undulating to flat topography and then slopes down to the South at the southern boundary of the building from RL+5.4m to RL+2m at the Parramatta River foreshore.

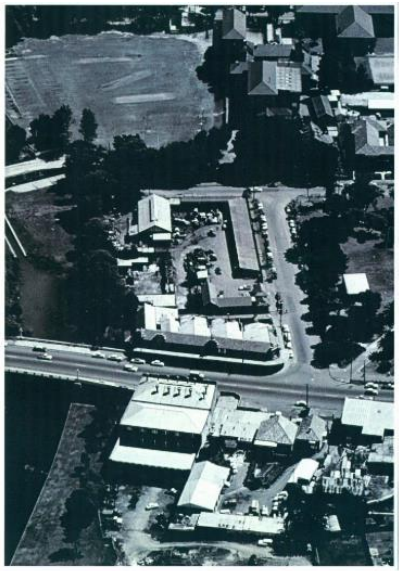
These maps are provided in Appendix A Figure GEO-A-2 and GEO-A-3, respectively.

2.3 Site History

2.3.1 Historical Land Use

A summary of the historical land use of the Site is provided below in Table 4. Aerial images used to infer the historical land use are provided in Appendix B (Spatial Services, 2019). Historical images were also obtained from the City of Parramatta Research and Collections.

Table 4 Historical Land Use

Year	Description
1796-1807	Northern section of the Site was home to the First Parramatta Gaol
1807-1920's	Site was home to the Market Reserve and Public Baths Reserve which consisted of a multi-level brick clad building. The Public Baths were closed in the 1920s. (Pollon, 1983)  The baths building to the left of Lennox Bridge – c, late -1800s. Source: City of Parramatta Research Library Vertical Files VF0779
1934	Public Baths Reserve was substantially refurbished and opened as repurposed retail premises with the car park converted into a Parramatta City Council Vehicle Depot.
1950's	 Aerial view of Parramatta, showing shops and the Council Depot on the old Baths Site. It can be seen in the image that the weir and concrete channel has been constructed. This is likely part of the embankment and channelling works (completed in 1912) that were required after the 1890 flood. Source: (City of Parramatta Research & Collections, 1950)

Year	Description
1986	Old Baths Building was demolished to make way for the Parramatta Culture Centre (renamed Riverside Theatres in 1989). The carpark to the West is left intact.
1988	All construction works completed for the Riverside Theatres.
2004	Roof added to the courtyard of the Riverside Theatres

2.3.2 Current land use

The Site is home to the Riverside Theatres. The building contains three separate theatres capable of housing 1062 seats and has above-ground parking to the West of the building, on the corner of Market and Marist Place.

A sloped pathway that takes the pedestrian foot traffic from Church Street at Lennox Bridge along the Parramatta River foreshore up to Marist Place/Market Street at Bernie Banton Bridge follows the southern boundary of the Site.

2.4 Adjacent Structures and Third-party Interfaces

The design will need to consider the impact of the development on adjacent structures and infrastructure. Asset owners and stakeholders of existing structures and infrastructure around the Site may need to be consulted due to potential impact from the proposed development.

The main historical structures, existing structures and future developments near the Site identified in this desktop study are as follows and as shown in Figure 4.

2.4.1 Parramatta River Wall

Based on the available information, the initial construction of the Parramatta Riverbank Wall was likely to commence around 1934, when the old Baths and arcade buildings were substantially refurbished and opened as repurposed retail premises. Since then, there have been various repair and modification works on the structure. The wall is approximately 10-15m offset from the edge of the Riverside Theatres and has a height up to ~4m above the river level. The wall face consists of sandstone blocks.

Refer to Section 6.10 for further discussion on the potential impacts of the proposed works on the river wall.

2.4.2 Marsden Street Weir/Bernie Banton Bridge

Marsden Street Weir, originally constructed as a raised ironbark, sandstone, earth, and clay dam in 1818, was commissioned by Governor Macquarie as a barrier to separate the saltwater spring tides from the freshwater coming downstream. This was eventually converted into a concrete dam in 1912 after severe flooding events damaged the structure in 1864, and again in 1888. This involved the construction of a concrete channel and apron with a fish ladder which can still be seen today. The weir also acted as a river crossing until the 1970s. (City of Parramatta Research & Collections, 1970)

This concrete channel will directly interface with the proposed development Casuarina Clearing.

2.4.3 Parramatta Light Rail Stage 1

Once open, the Parramatta Light Rail Stage 1 (PLR1) will cross the Lennox Bridge. It will also travel pass the Riverside Theatres along Church Street to the Prince Alfred Square stop. This is approximately 20m from the main development.

The proposed redevelopment does not involve any basement excavation or similar within the influence zone of PLR1, as such the geotechnical impacts are expected to be minor. The impact assessments related to other engineering disciplines are covered in separate reports.

2.4.4 Lennox Bridge/Pedestrian Tunnel Bridge

The Lennox Bridge is a heritage-listed sandstone single arch bridge built in 1930s and located at the east side of the Site. In 2015, two pedestrian tunnels were constructed that connected the Parramatta Riverwalk on both sides of the riverbanks. The southern tunnel was closed off to assist with the construction of the Parramatta Light Rail. The northern tunnel walkway will connect to the elevated walkways proposed as part of the Parramatta Riverside Redevelopment.

2.4.5 Utilities

The existing Riverside building plans as provided by CoPC are reviewed together with the Before You Dig Australia (BYDA, 2024) plans of utilities present near the Site. The eastern side of the Site along Church St is notably congested with gas, electricity and communication services. A sewer main and streetlight poles run along the Parramatta River Walk and communication assets are present along Marist Place. A summary of the asset owners contacted through this search and utilities indicated as present within or adjacent to the Site is presented in Table 5.

Table 5 Summary of utilities present near the Site

Type	Owners	Location
Southern Site Boundary (along Parramatta River Foreshore)		
Sewer	Sydney Water	Sewer running along Parramatta River Walk
Electricity	Endeavour Energy	6 Street light columns with one electrical cable connecting them along Parramatta River Walk
Electricity	Unknown	Two electrical lines run through the sand backfill – and terminate at the Marsden Street concrete channel. One of the electrical lines appears to start inside the wall and runs parallel to the wall to the west.
Stormwater	Sydney Water	Exposed concrete-reinforced 675 diameter stormwater pipe that connects to a manhole under the Bernie Banton Bridge and discharges to the Marsden Street concrete channel. This has an 800mm invert level.
North/East and Western Boundaries		
Electricity	Endeavour Energy	Proposed underground duct (across Church St)
Gas	Jemena	210 kPa (Medium Pressure) along Church St Medium Pressure main running along Market St
Sewer	Sydney Water	Sewer main running along Marsden Street/Marist Place
Sewer	Sydney Water	One main sewer main that crosses from North to South underneath the Riverside Theatres and connects to a manhole on the Parramatta Riverwalk
Potable Water	SWC	Potable water pipe running across Market St
Fibre Optic	Aarnet	Running along Marsden St
Communication	NBN	2 cables in asbestos cement conduit running along Church Street and Market St Cables in asbestos conduit
Communication	Optus	Optus cable in other utility conduit running along Marsden St/Marist Place
Communication	Uecomm	Asset running along Church St
Communication	Telstra	2x50-pair MAIN CABLE running along Market St and connecting to the Site
Fibre Optic	Vocus	Conduit running along Church St and connecting to the Site

2.5 Site Walkover Observations

A site walkover was conducted on 09 August 2024 with the Client, Riverside Theatres representatives and Cox (Lead Architect of the Project).

A second site walkover was also conducted on 07 November 2024, focused on the Riverbank Wall and to plan for Stage 1 of Geotechnical Investigations.

Selected site photos from the walkovers are provided in Appendix C-2.

CoPC drained the section of a Parramatta River between Marsden Street Weir to Charles Street Weir in early November 2024 as part of maintenance required by CoPC. This was to allow CoPC to access and assess the condition of the bridges, weirs, embankments and concrete aprons along a section of the Parramatta River foreshore.

The main observations from the site walkovers are as follows:

2.5.1 Parramatta Riverbank Wall

The wall is approximately 10-15m offset from the edge of the Riverside Theatres and of varying heights of 3-4m. There are visible signs of wear on the wall with vegetation growing out of the gaps in between the masonry blocks. Lower sections, normally submerged due to the river level, appear to have little to no mortar left. There also appears to be tree roots that have grown into the wall. In upper sections of the wall, mulch and algae cover the sandstone blocks. From the visual inspection the maintenance of the wall visual condition appears to be infrequent, particularly on the western end of the wall.

A piled platform also sits in the middle of the southern boundary of the Site overlooking onto the river, over the wall. Some longitudinal cracks were observed on the wall in this area. There also appears to be sandstone blocks dislodged, likely during the initial construction process of the piled platform.

Large pipes that discharge onto the Parramatta River are visible on the wall. These pipes are not present on the BYDA plans and portions of the pipe appear dilapidated. Two plastic pipes have also been installed on the western end of the wall. It is unclear if they are in use or decommissioned.

2.5.2 Parramatta Riverbed between Marsden Street Weir and Lennox Bridge

Riverbed levels at the time of the second site walkover, where the river was drained for access, varied between ~RL+0.5m at the toe of the Parramatta Riverbank Wall to ~ RL-1.0m at the middle of the riverbed.

In the exposed sections of the riverbed, bedrock outcrop was visible consisting of weathered sandstone interlaminated with shale. An indicative section is provided below.

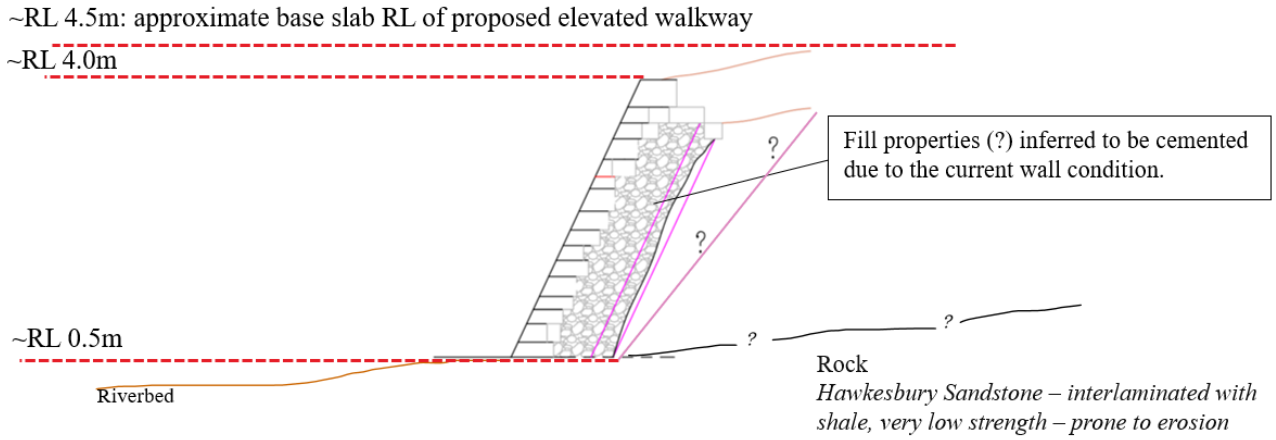


Figure 5 Indicative Section of the Parramatta Riverbed and Riverbank Wall

2.5.3 Pedestrian Pathway

The pedestrian/cycleway pathway stretches along the southern site boundary and is accessible from stairs at both Lennox Bridge and Bernie Banton Bridge connecting Church Street and Marist Place respectively.

There are light poles approximately every 25m along the pathway. There are two large and elevated manholes (approximately 1.0-1.5m above the eastern ground surface level) on the eastern end of the pathway connecting to two pits, with signs of other utilities sprayed on the surface of the pathway.

Continuing west towards the Bernie Banton Bridge, the pathway slopes upwards towards the Riverside Theatres carpark where a cluster of trees are planted to the south. The pathway continues downwards, towards the sandbank.

2.5.4 Sand bank next to the Marsden Street Weir

The sand bank next to the Marsden Street Weir and directly below Bernie Banton Bridge appears to be a dumping ground for different materials. Concrete blocks with steel reinforcements, bricks, fragments of concrete piping, backfill sand and rubbish were visible. A reinforced concrete pipe connected to another manhole can be seen. Access to the sandbank is through an old pathway that appears to be retained by a deteriorating sandstone wall.

2.5.5 Riverside Theatres

Riverside Theatres is a brick clad two-level building with street access from Church Street to the East and Market Street to the North. It has a car park to the West that is accessible from Marsden Street/Marist Place. The Theatres itself has a central courtyard that is completely enclosed and has a basement accessible from ground level (first floor being street access level). Remnants of a flood gate can be seen on the first floor, and this reaches 1.8m above the first floor.

The basement of the Riverside Playhouse has excavation fill batter exposed to the North. There are shale fragments in the fill and signs of water ingress. A concrete plinth with a column extending from it was observed in the centre of the basement. This matches with the existing column and pile set out drawings provided by the Client. (Public Works Department, 1985)

3. Geotechnical Conditions

3.1 Published Geomorphology and Geology

3.1.1 Geological Mapping

Geological mapping of the Site is presented in Appendix A Figure GEO-A-4 (GSNSW, 2024).

The map shows that the Site is partially underlain by alluvial terrace deposits (QP_at) in the south. These typically comprise of silty/sandy clay with occasional gravels and vary in thickness along the river course and are mapped to the western boundary of the Site. This is underlain by Ashfield Shale formation (Twia) and is mapped across the entire Site. This is normally associated with low energy coastal marine environments. This formation typically comprises of black to dark grey siltstones that grade upwards into coarse grained laminites.

This is underlain by Hawkesbury Sandstone (Tuth) which comprises of medium to coarse grained quartz sandstone and minor laminated mudstone and siltstone lenses.

Anthropogenic Breakwaters, Embankments and Artificial Levees (Q_hl)

Anthropogenic levee deposits (Q_hl) are also mapped on the Southern edge of the Site boundary. These deposits are typically large concrete blocks and/or very large, quarried boulders; unconsolidated conglomerate of either quarried or local cobbles to boulders with a clay to sandy matrix; sporadic sandy loam capping layers. This is likely associated with the Marsden Street Weir on the Western boundary of the Site.

It should be noted that the NSW 1:500 000 Seamless Geological map has been produced at a 1:100,000 scale, therefore unit boundary positions may not be representative of the Site conditions.

3.1.2 Soil Landscapes

A map of the Soil Landscapes at the Site is presented in Appendix A Figure GEO-A-5 (DPE, 1989) (DPE, 1990).

The map shows the Site is underlain by the fluvial Birrong landscape which typically consists of silt and clayey soils. This landscape typically has high soil erosion hazard, moderately to slightly reactive surface movement potential, saline subsoil, seasonal water logging and very low soil fertility.

3.2 Soil Salinity and Potential Acid Sulphate Soils (PASS)

A map of the Salinity Potential at the Site is presented in Appendix A Figure GEO-A-6 (DPE, 2002), where the salinity potential is shown to be Moderate.

A map of the Acid Sulphate Soil (ASS) risk at the Site is provided in Appendix A Figure GEO-A-7 and Figure GEO-A-8 (DCCEEW, 2022). Site soils are shown to have high probability of occurrence of ASS. This is likely associated with Parramatta River to the south of the Site.

In addition, the Site is located within a Class 5 Acid Sulphate Soil (ASS) area and borders Class 1 ASS. Class 5 is defined within the Parramatta Local Environment Plan (City of Parramatta Council , 2023) as requiring consideration of ASS when development works are “within 500metres of adjacent Class 1,2,3 or 4 land that is below 5m Australian Height Datum (mAHD). The entire section along the Parramatta Riverwalk falls under this classification.

The most recent study (JK Environments, 2025) indicates that no PASS was identified, and investigations did not identify acidic conditions exceeding the action criteria for ASS. The results suggest that PASS is unlikely to be disturbed.

Furthermore, JK Environments (2025) study concluded that the Site poses a low risk of salinity, and a detailed salinity management plan (SMP) is not required.

Refer to JK Environments (2025) for more details.

3.3 Existing Field Investigation Data

The location of the collected historical Ground Investigations (GIs) available at or adjacent to the site location are shown in Appendix C.

A summary of the available information is presented below.

It is important to note that only the JK boreholes were completed within our Site, hence the greater relevance to the proposed works. Other reports are provided for reference as they are also near the Site.

3.3.1 JK Geotechnical Boreholes (1984-2018)

A summary of the encountered stratigraphy within the JK Geotechnical boreholes is included in Table 6. A map with the JK Geotechnical boreholes is provided in Appendix C. Details of each report provided to Arup by the Client are presented below.

3.3.1.1 JK Geotechnics (1984-1993) – Geotechnical Desktop Study for Proposed Riverside Theatres Project

This report presents the factual data from boreholes completed by JK Geotechnics between 1984 to 1993. This is likely to have informed the design and construction of the current Riverside Theatres. It included twelve (12) boreholes of depths ranging between ~5.0m to ~8.0m below original surface levels.

The investigation includes SPTs (standard penetration tests) every 1.0m and pocket penetrometer tests within residual soils. In some of the boreholes, soil samples were taken; however, no testing results were provided within the report.

Groundwater was encountered in earlier boreholes (1984 – 1985). However, no groundwater was encountered after 1993.

3.3.1.2 JK Geotechnics (2018) - Preliminary Geotechnical Investigation for Proposed Riverside Theatres Project

This report presents the results of a geotechnical investigation undertaken at the Site in 2018. The investigation was completed to target depths of 5.4m bgl.

The investigation comprised of two (2) rock cored boreholes in the Riverside Theatres courtyard and parking. The investigation includes SPTs (standard penetration tests) every 0.5m and pocket penetrometer readings within residual soils. In addition, three moisture content tests were completed and used to correlate to the field-assessed rock strengths.

Chemical test results completed within the sampled soils (fill, alluvial and residual) are generally slightly acidic to neutral, with relatively low sulphate and chloride contents and relatively high resistivities.

No groundwater was encountered within the depths investigated. BH1 was converted into a groundwater monitoring well yet no readings were made.

3.3.2 Geotechnical and Geophysical Investigations of an Old Stone Heritage Bridge at Parramatta, Greater Western Sydney, Coffey (2018)

Geotechnical and geophysical investigations were completed to assess the depth of the abutment foundations of the Lennox Bridge. This included one borehole on the Western side of the Lennox Bridge (within our Site boundaries). These suggest that the Southern boundary of the site is underlain by:

- Fill consisting of silty clay to a depth of ~3.6 m bgl
- Hawkesbury Sandstone with very low to low strength that increases in strength with depth from ~RL0.5m.

Groundwater was intersected at the depth of ~3.0 m bgl (RL+1.2m) and water pockets were observed within fill layers.

3.3.3 Old Kings School Geotechnical Investigation, NSW Department of Public Work and Services (2000)

Two boreholes were completed to depths of 4.7m and 5.15m below ground surface level on the Old Kings School site for a proposed refurbishment. The site is situated ~40m west of the Site at the junction of Marsden Street and Marist Place.

The scope of work involved assessing sub-surface conditions and the foundation conditions of the main building of the Old Kings School Site. Note this site is Heritage-Listed.

The field work indicated that the site has:

- A thin layer of fill consisting of gravelly/clayey sand with occasional building rubble, concrete, brick, render, timber, steel, boulders to a depth of ~0.55-0.80 m bgl underlain by,
- Sandstone blocks or possible sandstone boulders (likely original foundation) to a depth of ~1.0 m bgl underlain by,
- Residual silty clay/clayey silt of soft to firm consistency, becoming stiff to very stiff with depth, to a depth of ~2.8 m bgl underlain by,
- Weathered Ashfield Shale to a depth of ~4.6 m bgl underlain by,
- Weathered, extremely weak Hawkesbury Sandstone.

Groundwater was intersected at a depth of ~4.6 m bgl and water pockets were observed within fill layers.

3.3.4 GW108611, WaterNSW Groundwater telemetered database (2005)

A domestic groundwater well was drilled at the Roman Catholic Church site, approximately 100m Northwest of the Site. This is situated ~50m North of the JK Geotechnics (2018) investigation (Section 1) and was reported to be used as a supply bore.

During drilling, the following was logged, however the boreholes were not provided for review:

- Fill to a depth of ~1.0 m bgl is underlain by,
- Residual clay to a depth of ~3.0 m bgl is underlain by,
- Shale to a depth of ~5.50 m bgl is underlain by,
- Bedrock from ~RL60.50.

The depth of the borehole is ~56.5m below ground surface level. Surface water level was recorded at ~6.20mbgl . Groundwater salinity was recorded to be between 4650-5300mg/L.

3.3.5 355 and 375 Church Street, Parramatta Preliminary Site Investigation (2014)

A Preliminary Site Investigation was completed by SGA Environmental for a potential redevelopment at 355 and 375 Church Street, approximately 160m north of the Site.

This involved a collation of previous geotechnical investigations in the area and completion of environmental testing. Note borehole logs were not provided. The report found:

- Fill, with a fragment of fibre cement sheeting containing chrysotile asbestos at a depth of 0-0.2 below ground surface level.
- Low permeability residual clays underlain by,
- Shale underlain by,
- Sandstone.

The groundwater level was not intersected, and boreholes were completed to ~4.4 metres below ground surface level.

Table 6 Summary of Encountered Stratigraphy in Historical JK BH's within the Site boundary.

	Below Ground Surface Levels (m)													
	JK 1984/1985							*JK 1993*					*JK 2018*	
	BH1	*BH2*	*BH3*	*BH4*	*BH5*	*BH6*	*BH7*	*BH1*	*BH2*	*BH3B*	*BH3C*	*BH4*	*BH1*	*BH2*
RL	8.6	8.1	7.4	6.2	8.2	7.7	8.9							
Encountered Stratigraphy														
FILL: Pavement/AC, with reinforcement	0-0.1	0-0.1	0-0.15	0-0.1	0-0.5	0-0.2	0-0.1	0-0.16	0-0.15	0-0.14	0-0.13	0-0.125	0-0.05	0-0.365
FILL: Sandy GRAVEL/CLAY, with crushed sandstone (parts of the old pool in BH3B – 1993*)			0.15-3.2	0.1-1.9		0.2-0.6	0.1-3	0.16-2.8	0.15-2.1	0.14-0.8	0.13-0.8	0.125-1.4	0.05-1.4	0.365-1.5
Alluvial Materials: stiff Silty CLAY or SAND		0.1-0.6		1.9-2.8	0.5-2.1	0.6-2.2							1.4-4.4	1.5-3.1
Residual Soil/ Extremely Weathered Material - stiff to very stiff Sandy CLAY	0.1-4.1	0.6-4.6	3.2-4.7	2.8-3.8	2.1-4	2.2-4.3	3-5.53	2.8-7.0	2.1-3.6			1.4-4.3	4.4-4.5	3.1-4.5
Low strength, highly weathered sandstone interlaminated with shale	4.1-5.5	4.6-6.0	4.7-6.1	3.8-5		4.3-5.2	5.53-7.9	7.0-7.9	3.6-5.2			4.3-5.0	4.5-5.4	4.5-5.4
Moderately weathered sandstone					4-7.23	5.2-7.42	7.9-8							
Groundwater encountered	3.8	3.8					3.1							
* The concrete structure found in this borehole has been documented as part of the old Bath pool but this has not been verified.														

4. Hydrogeology

4.1 Hydrostratigraphy

A map of the hydrogeological landscapes and registered groundwater bores are presented in Appendix A Figure GEO-A-10 (DPE, 2020). This shows that there are three hydrostratigraphies within a 1km radius of the Site. These are the Bankstown, Parramatta/Georges River and Hawkesbury Sandstone Hydrogeological Landscapes (HGL). These are described in further detail in Sections 4.1.1, 4.1.2 and 4.1.3.

A summary of the hydrostratigraphy underlying the site is presented in Table 7, based on the mapped geology of the Site. The inferred hydraulic conductivity characteristics for each unit are qualitatively based on lithology descriptions. A map of the groundwater salinity hazards is also presented in Appendix A Figure GEO-A-11 (DPE, 2020).

Table 7 Summary of the hydrostratigraphy underlying the Site

Stratum	Inferred hydrogeology landscape	Thickness	Characteristics
Fill	Groundwater Source	0.5 to 3.6m	Sandy clay with shale fragments
Alluvium		0.5 to 3m	Sandy clay, silty clay and clay Groundwater levels are likely to be highly influenced by the stage level of Parramatta River Associated with Parramatta/Georges River HGL Brackish to saline groundwater salinity Low to high hydraulic conductivity
Residual Soil	Aquitard	0.1 to 3m	Silty Clay Low to high hydraulic conductivity Derived from Ashfield Shale Brackish to saline groundwater salinity
Ashfield Shale		Thickness not proved	Associated with the Bankstown HGL High groundwater salinity Inferred low to moderate hydraulic conductivity
Hawkesbury Sandstone	Groundwater source	Thickness not proved	Inferred intermediate hydraulic conductivity Associated with the Hawkesbury Sandstone HGL

Note that a 1km radius from the Site has been defined as the study area to understand the impact of the construction works as these are not limited to the Site boundaries.

4.1.1 Parramatta/Georges River Hydrogeological Landscape (HGL)

The Parramatta/Georges River HGL is associated with alluvial deposits along Parramatta River, and the Parramatta CBD area south of the site. The Parramatta/Georges River HGL is underlain by the Bankstown HGL. The groundwater salinity hazard associated with the Parramatta/Georges River HGL is classified as very high or severe.

The following hydrogeological parameters are associated with this HGL (DPE, 2011):

- Hydraulic conductivity: greater than 10m/day (high)
- Specific Yield: 10 to 20% (moderate to high)

- Groundwater salinity: 1.6 to greater than 4.8 dS/m (brackish to saline)
- Depth to water table: 0 to 8 m bgl

4.1.2 Bankstown Hydrogeological Landscape

Bankstown HGL is typically characterised by low rolling hills and gently undulating rises and plains, long colluvial/alluvial footslopes and broad flat plains and floodplains with often eroded and incised channels. It is an area with moderate to high rainfall (>800mm) and consists of sodic and high levels of salinity (1.6 to 4.8 dS ECw) in the soil material within its drainage lines.

It comprises of sedimentary rocks from the Triassic Wianamatta Group (major Bringelly Shale with minor Ashfield Shale and Minchinbury Sandstone). Alluvial sands and gravels derived from the surrounding rocks are present along the river streams. Residual soils from this HGL from part of the Blacktown and Birrong Soil Landscape.

The groundwater in this landscape predominantly moves laterally through the shale layers and vertically through inter-bedded sandstone and sandstone fracturing.

This landscape typically has the following parameters:

- Hydraulic conductivity: less than 10^{-2} to 10m/day (low to moderate)
- Specific Yield: less than 5 to 15% (low to moderate)
- Groundwater salinity:1.6 to greater than 4.8dS/m (brackish to saline)
- Depth to water table: 2 to 6m

4.1.3 Hawkesbury Sandstone HGL

The Hawkesbury Sandstone HGL is associated with plateau, scarps, benches and hills on sandstone, which is present north of the site, and likely underlies the Bankstown HGL. It comprises of sedimentary rocks from the Triassic Hawkesbury Sandstone and Narrabeen Group in majority. The groundwater table is deep, typically more than 8m below ground level. It presents high hydraulic conductivity due to structures like bedding, joints, and faults in fractured bedrock. Transmissivity is moderate to high.

The following hydrogeological parameters are associated with this HGL (DPE, 2011):

- Hydraulic conductivity: greater than 10m/day (high)
- Specific yield: 5% to greater than 15% (moderate to high)
- Groundwater salinity: less than 0.8 dS/m (fresh)
- Depth to water table: 0 to 8m

4.2 Groundwater Levels

Groundwater level records are available for registered groundwater bores located within 1 km from the Site boundary. Standing water levels (SWL) recorded in the bore installation logs are between 5 to 7m bgl and are summarised in Table 8.

Table 8 Summary of groundwater bore information

Bore ID	Purpose	Location from the Site	Date	Total depth (m bgl)	SWL (m bgl)	Screen Depth (m)	Screened Formation
GW108611	Water Supply	150m North	20/04/2005	60.5	6.2	Unknown	Unknown
GW110914	Monitoring	700m East	20/01/2010	6	5	2.5 – 6.0	Loam/ Siltstone
GW110912	Monitoring	700m East	20/01/2010	10	7	3.0 – 10.0	Loam/ Shale/ Sandstone

Bore ID	Purpose	Location from the Site	Date	Total depth (m bgl)	SWL (m bgl)	Screen Depth (m)	Screened Formation
GW110913	Monitoring	700m East	20/01/2010	10	7	6.0 – 10.0	Sandstone

4.3 Groundwater Receptors

4.3.1 Registered Groundwater Bores

Four registered groundwater wells are present within 1km to the Site, three bores were registered for monitoring purposes and one bore for water supply (BOM, 2024). One registered bore for water supply (GW108611) is present near the Site, located approximately 130 m away from the Site (BOM, 2024). Installation record from this bore indicates a yield of 0.2L/s. Groundwater wells registered for monitoring purposes are not considered to be groundwater receptors in this desk study.

4.3.2 Groundwater Dependent Ecosystem (GDE)

Groundwater dependent ecosystems are ecosystems which require access to groundwater on a permanent or intermittent basis. As the construction of this development may require dewatering, the BOM GDE Atlas has been reviewed and the map presented in Appendix A Figure GEO-A-10 (DPE, 2020).

Within the study area, there are no aquatic or subterranean GDEs mapped (BOM, 2019). However, there is a terrestrial GDE associated with Cumberland River Flat Forest which is approximately 850m northwest of the Site. Any potential dewatering at the Site is unlikely to have a significant impact, given its proximity to the Parramatta River, which likely provides groundwater recharge to the GDE.

4.4 Observations from the Recent Site Investigation by JK Environmental (2025)

Three groundwater monitoring wells were installed as part of the contamination detailed site investigation (JK Environmental, 2025). The observed groundwater level at the northern boundary of the site, adjacent to Market Street, is approximately 6.2 m AHD (~2.6–3.0 m bgl). The groundwater level declines to approximately 2.0 m AHD (~1.7-2.0 m bgl), following the site's topography as it slopes down toward the Parramatta River.

5. Ground Conditions

5.1 Geotechnical Units

The following subsurface conditions have been inferred based on the review of the available historical geotechnical investigation data and informed by Arup ground investigations (Stage 1) in front of the Parramatta Riverbank Wall.

Note that the developed preliminary geological model is based on the available geotechnical information at the SSDA stage, which should be verified by additional geotechnical investigations for implementing in the design and managing the associated ground risks.

5.1.1 Unit 1 – Fill

Three different types of fills were identified in previous investigations. A summary of the units is provided below.

Table 9 Geotechnical Fill Units

Unit	Origin	Description
Unit 1A	Pavement Materials	Bituminous Concrete/Asphaltic Concrete Layer: This unit is very thin – approximately 100-150mm in thickness within the main Site. This increases to approximately 400mm in the parking area.
Unit 1B	Mixed Materials	Sandy GRAVEL, clayey/gravelly/silty SAND, fine to medium grained, pale brown, with timber, steel, brick and crushed sandstone gravels, appears well compacted. Layer thickness varies between one to three metres across the Site. This layer is present at the river foreshore but is relatively thin (~100mm in thickness).
Unit 1C	Backfill SAND	SAND, fine grained, pale brown, appears to be loosely compacted This layer is present at the interface between the Marsden Street Weir Channel and the existing River Wall, which is estimated to be about 400-650mm thick.

5.1.2 Unit 2 – Alluvial Materials

From the available borehole logs, this layer is found to typically range between 1.0 to 1.5m in thickness. This layer consists of Silty SAND or SAND that are fine to medium grained, light brown to grey, low to medium plasticity, and are typically medium dense sands. These layers are generally thinner in the south (~0.3m) as compared to north potentially due to river erosion. However, DCP results next to HA-09 at the front of the Riverbank Wall suggests that there may be localised pockets of thicker and very soft deposits between RL1.00m to RL2.00m.

5.1.3 Unit 3 – Residual Soil/Extremely Weathered Materials

Residual soils and extremely weathered materials were encountered directly below fill or the alluvial materials. This unit consists of Sandy/Silty CLAY that are low to medium plasticity, orange mottled red brown and typically increases in consistency with depth and gravel content from the underlying bedrock. The thickness of this layer varies between 1.0 to 2.0m and is generally of a stiff to very hard consistency.

5.1.4 Unit 4 – Bedrock

From the available investigations, the inferred top of rock surface in the North varies between ~3.5-4.5m below ground surface (estimated to be about RL3.5m). This then gradually dips downwards to ~RL2.2m at the main building southern boundary and ~RL0.5m at the Parramatta riverbed.

Investigations typically encountered Hawkesbury Sandstone that is very low to low strength (likely due to the presence of extremely weathered clay seams) for approximately one to two metres, and medium strength, slightly weathered rock directly underneath.

5.2 Groundwater

Preliminary groundwater observations and a nearby monitoring well indicate that the groundwater levels around the Site are likely around RL6.5m. This is consistent with historical groundwater levels recorded by JK Geotechnics boreholes in 1984.

However, a more recent monitoring well completed in 2018 was dry on completion and after 4.5 hours. This suggests that the original building development has redirected groundwater flow away from the area and excavations within the initial building footprint should be dry. However, if excavations are required outside of the original building footprint, groundwater levels could be encountered.

5.3 Soil Aggressivity

The soil aggressivity results available for this Site are summarised in Table 10 below.

Table 10 Available Soil Aggressivity Results

Sample	Description	pH 1:5 soil: water	Chloride (mg/kg)	Sulphate (mg/kg)	Resistivity in Soil (ohm.cm)	Table 6.4.2 (c) – Concrete Piles (1)	Table 6.5.2 (c) – Steel Piles (1)
BH1 (JK,2018)	1.50-1.95	6.6	26	200	6,800	Mild	Non-Aggressive
BH1 (JK,2018)	3.0-3.45	7.0	<10	10	69,000	Mild	Non-Aggressive
BH2 (JK,2018)	3.1-3.45	6.9	20	60	18,000	Mild	Non-Aggressive
Note: (1) – Assuming Soil Conditions A – high permeability soils (e.g., sands and gravels) which are in groundwater							

6. Geotechnical Considerations

The main geotechnical considerations of the project are as follows. These are provided with reference to SSDA plans (Cox, 3XN and Turf, 2024), should the design change, the following considerations or recommendations must be reviewed for appropriateness.

Note that these considerations are based on the available geotechnical information at the SSDA stage only and needs to be reviewed and verified by additional geotechnical investigations to inform the detailed design. As such, the considerations and parameters are preliminary and not suitable for detailed design without further review.

6.1 Foundations

6.1.1 Pile Foundations

The main buildings and the elevated walkway are anticipated to be supported by pile foundations that will be founded on bedrock. The founding layer characteristics must be verified by future investigations with boreholes that terminate below the proposed founding level. Targeted boreholes may be required at locations where higher structural loads are expected (Lyric Theatre Pit).

The proposed pile foundation design should be undertaken in accordance with AS 2159 (2009).

The recommended parameters for preliminary design are given in Table 11. The parameters are selected based on rock class, assuming rock socket roughness of R2 or better (Pells et al., 2019) and a clean socket base. These values have been determined to limit foundation settlement to a maximum of 1% of minimum footing dimension. Nonetheless, these values should only be used as a guide for preliminary design.

The geotechnical strength reduction factor should be taken as per AS 2159 (2009) based on the proposed pile testing schedule by the designer. In absence of pile load testing, the geotechnical reduction factor of 0.4 as per AS2159 (2009) should be adopted.

Table 11 Preliminary design parameters for bored piles within the Site (as per Pells, 2019)

Material	Allowable end-bearing pressure (MPa)	Ultimate shaft adhesion (kPa)
Class IV Sandstone	1 – 3.5	250
Class III Sandstone	3.5 – 6.0	800
Class II or better Sandstone	6.0 – 12.0	1,500

Notes:

1. Bearing capacities are based on minimum embedment of 0.5m (or 1D of piles) into the relevant material.
2. Ensure adequate base cleanliness prior to installation of reinforcing steel and concreting.
3. Classification of material shall be in accordance with the classification system as per Pells et. al. (2019).
4. Lower bound allowable end-bearing pressure is suggested to be adopted for preliminary design in the absence of additional GI and load testing results on rock samples.
5. 70% of ultimate shaft adhesion can be applied for uplift loads. Cone pull-out failure should be checked for uplift loadings

6.1.2 Shallow Foundations

Pad foundations on the competent soil layers may be feasible for lightly loaded ancillary structures or the small retaining structures at the Casuarina Clearing. This can be further assessed during the design stage based on the loading magnitude, acceptable settlement limits and informed by the additional ground investigations.

The founding material shall be verified by a competent Geotechnical Engineer prior to placing the foundation.

6.2 Retaining Walls

It is understood, based on the available SSDA plans, that landscaped retaining walls are required at the river foreshore. These retaining walls are expected to be relatively short. Concrete gravity walls or concrete blocks might be considered pending further GI and detailed design and assessment.

The retaining walls in this area will interact with groundwater at the surface as the Casuarina Clearing will interface with the Parramatta River. Therefore, buoyancy forces will need to be considered in the design.

6.3 Excavation

Based on the current SSDA plans, no basement excavation is anticipated. Temporary or localized excavations may be required for the redevelopment.

General safety during excavation in sandstone should be followed. This includes wet cutting methods to suppress any dust or silica particles and having local exhaust ventilation. All workers should comply with the SafeWork NSW guidelines for excavations and earthmoving plant in construction regarding silica risk.

6.3.1 Excavatability

Within the main building footprint, this is likely to excavate through Units 1, 2 and 3. This is readily excavatable using conventional earthmoving equipment such as hydraulic excavators with bucket attachments. Sandstone boulders or bricks may be encountered within the fill which may require a hydraulic impact rock hammer.

For structures external to the building footprint, (i.e. elevated walkway, casuarina clearing area and river foreshore structures), low to medium strength shale and sandstone are expected within the top ~1.5m, below that medium to high strength sandstone likely to be encountered which may require rock breakers or very hard ripping which will generate noise and vibrations during construction. This may impact nearby critical structures such as the Marsden Street Weir, the existing Parramatta Riverbank Wall and existing utilities and therefore a vibration monitoring plan is recommended.

An impact assessment or dilapidation reports of the nearby utilities is also recommended prior to construction to determine the appropriate excavation technique.

A waste classification will be required to inform any disposal requirements.

6.3.2 Seepage

As discussed in Section 5.2, all boreholes completed at the Site after the Parramatta Riverbank Wall and the construction of Riverside Theatres in 1985, have not encountered groundwater.

For deeper excavation or any excavation outside the footprint of the existing building, temporary dewatering measures might be required during construction. Further geotechnical and hydrogeological testing will be required to provide a more accurate assessment of potential groundwater inflow rates.

Flood levels may also be encountered which will need to be factored into the design and construction.

6.4 Hydrogeological Conditions

6.4.1 Impact on Nearby Stakeholders

There is one water supply groundwater well around 100m North of the Site. Reviewing the records of this groundwater well, the screen depth of this well is unknown and may require further information/coordination with the bore owner prior to construction.

6.4.2 Understanding Influencing Factors of the Groundwater Level

Four groundwater wells were identified within 1km of our Site. These generally indicate that groundwater levels around the Site are 5.5 to 7m (approximately RL2.10) below ground surface level. It is also likely that groundwater levels are hydraulically connected to the river levels. As the river levels in front of the development are controlled between two weirs – Marsden Street Weir at approximately RL 4.3m and

Charles Street Weir downstream at approximately RL2.5m, it is likely that the groundwater level is controlled by this downgradient RL.

Furthermore, groundwater level monitoring data is restricted to the northern side of the Site. To be able to inform on the need for dewatering (if required), the groundwater level and how the weirs upstream and downstream affect it should be better understood.

It is also likely that the groundwater levels are highly responsive to rainfall and flooding events. Therefore, additional groundwater monitoring with a data logger installed and sampling across the Site should be considered.

6.4.3 Climate Change

It is expected that with climate change, the intensity of rainfalls will increase which will increase the likelihood of flooding events. This will influence the groundwater levels and so the design should factor this into the final design groundwater level.

6.5 Durability

6.5.1 Soil

Aggressivity

The available laboratory test results in the alluvial soils are summarised in Section 5.3.

An exposure classification of A2 is applicable for buried concrete structures according to AS3600.

Referring to Table 6.5.2 (C) AS2159 and for soil condition A, the exposure classification for concrete piles is Mild, while the exposure classification for steel piles appears to be non-aggressive.

This classification is in line with testing and results completed as part of the Preliminary Acid Sulphate Soil and Salinity Assessment prepared by JK Environmental (JK Environments, 2025).

Salinity

Assessment of salinity in the soil is assessed separately in the Preliminary Acid Sulphate Soil and Salinity Assessment, and Acid Sulphate Management Plan report. The EC_e results for most of the samples generally ranged from <2dS/m to 3.5dS/m which is non-saline. There were three slightly saline samples and two of them were in fill. Therefore, in alluvial soils, the salinity is considered very low at the Site. (JK Environments, 2025)

6.5.2 Groundwater

According to the published hydro stratigraphy of the Site, the Bankstown HGL is typically characterised by sodic and saline soils. This is problematic as sodic soils tend to swell and disperse depending on the salinity content in the water. This can cause problems to the foundations stability and serviceability.

However, three groundwater samples taken across the Site indicate that the groundwater is slightly saline and within the “freshwater rivers” to “brackish water” (EC of 570 to 1700µS/cm). Therefore, the risk is considered low. In addition, the proposed redevelopment does not include salinity risk activities as defined in the Salinity Code of Practice such as high levels of irrigation, major landscape re-shaping. (JK Environments, 2025).

6.6 Acid Sulphate Soils

As the Site is located within a Class 5 Acid Sulphate Soil (ASS) area and borders Class 1 ASS as discussed in Section 3.2. An Acid Sulphate Soil Management Plan (ASSMP) has been prepared by an external consultant and should be referred to for guidelines in the event ASS is identified during construction (JK Environments, 2025). Treatment with lime or similar might be required prior to disposal.

6.7 Soil Erosion

Appropriate erosion and sediment control measures should be implemented during construction to mitigate soil erosion and prevent sediment runoff, complying with the Blue Book – Managing Urban Stormwater: Soils and Construction. The control measures may include practices such as silt fencing, sediment basins, and staged vegetation to stabilize exposed surfaces, as appropriate. This is detailed in the Parramatta Riverside Theatres Mott MacDonald Civil Design Report.

6.8 Seismicity

In accordance with AS1170.4 (2024) Section 4, the site sub-soil class can be assessed as "Class Ce – Shallow Soil" where the depths of the soil on Site do not exceed the maximum depths in Table 4.1 of the code.

A more detailed geo-seismic assessment can be conducted to refine the design if seismic loadings are found to govern the design.

6.9 Dilapidation Surveys of Existing Utilities

Several assets have been identified using the BYDA service and during site investigations within the Site boundaries. Therefore, prior to commencing work, dilapidation surveys and coordination with relevant stakeholders are suggested to survey and document the current condition of the assets.

Table 12 summarises the identified utilities that may be impacted due to the proposed redevelopment.

Table 12 Summary of Nearby Utilities

Type	Owners	Location
Southern Site Boundary (along Parramatta River Foreshore)		
Sewer	Sydney Water	Sewer running along Parramatta River Walk
Sewer	Sydney Water	A north-south sewer connection and connecting manhole at the Parramatta River Walk
Electricity	Endeavour Energy	6 Street light columns and electrical cable along Parramatta River Walk
Electricity	Unknown	Two electrical lines run through the sand backfill – and terminate at the Marsden Street concrete channel. One of the electrical lines appears to start inside the wall and runs parallel to the wall to the west.
Stormwater	Sydney Water	Exposed concrete-reinforced 675 diameter stormwater pipe that connects to a manhole under the Bernie Banton Bridge and discharges to the Marsden Street concrete channel. This has an 800mm invert level.

6.10 Adjacent Structures: Parramatta Riverbank Wall

Referring to the current SSDA plans (Cox, 3XN and Turf, 2024) an elevated walkway along the river which cantilevers partly over the Parramatta Riverbank Wall is proposed. This can potentially impact the surcharge loading behind the wall and thus has potential to impact on the wall.

Arup site investigations indicate that the existing Parramatta Riverbank Wall is a revetment wall (not a gravity wall) consisting of one to two layers of sandstone blocks at the wall face. The revetment is relatively steep (up to ~66 degrees) and seats on shallow bedrock (e.g. weathered sandstone interlaminated with shale) or possibly large sandstone boulders (where the bedrock is deeper).

Therefore, the existing Riverbank Wall revetment is unlikely to have any reliable reserve capacity to support any additional surcharge loading behind it (within the influence zone), without posing the risk of damage. This includes both construction and design loadings throughout the project's lifetime.

The engineering solution developed must account for this constraint. The proposed elevated walkway along the river can be supported by pile foundations within the influence zone, including sleeving (as required). The finished ground levels within the influence zone must not exceed the existing ground levels.

Additionally, a clear exclusion zone should be defined behind the wall as part of the site construction management plan.

An instrumentation and monitoring (I&M) of the Riverbank Wall movement during construction is required.

7. Key Geotechnical Residual Risks

A summary of geotechnical and hydrogeological hazards, constraints and risks regarding constructability and design considerations for the proposed redevelopment are outlined in Table 13. Mitigation strategies and requirements are also provided which should be considered and undertaken during future planning and design stages.

These risks are considered manageable from a ground engineering perspective by adopting appropriate measures during the design and construction stages.

Table 13 Key Geotechnical and Hydrogeology Hazards and constraints

Potential Risk	Description of Risk	Recommendation
Geotechnical		
Limitations in the geotechnical investigations undertaken at the Site	Uncertainty in Site Specific ground conditions. Existing geotechnical investigations did not terminate deep enough to adequately inform design of the proposed foundations. There is also limited information on groundwater conditions. The ground design parameters need to be verified by additional investigations.	Undertake further geotechnical investigations to inform design and construction planning Complete in-situ testing and associated laboratory testing
Existing fill	Potential difficulties during construction. Piling through existing fill known to contain boulders/asphaltic concrete and reinforcement can be difficult and slow down progress. The selected piling approach should consider the stability of hole within the existing fill. Risk of contamination or presence of asbestos (to be investigated and assessed in a separate report). A waste classification might be required to inform disposal requirements (refer to the contamination report by others).	Pre-drilling might be required for piling in areas identified with thicker uncontrolled fill materials During piling works, temporary casing likely required as a stability measure.
	Potential remnants of historical structures/infrastructures on Site. This includes the Old Baths and any undisturbed old, abandoned foundations.	This may impact the construction schedule (e.g. piling works) and should be taken into consideration.

Potential Risk	Description of Risk	Recommendation
Alluvial Soils	Uncertain depth and presence within the site boundaries Potential soft and compressible material prone to shrink/swell. There is a risk of excessive/differential settlements for shallow foundation founding on this material. These soils are also prone to erosion so this needs to be understood and managed through design and construction controls.	Undertake geotechnical investigations with associated laboratory testing to preclude/confirm the presence of alluvial soils
Potential aggressive soils/groundwater	Durability of exposed structural elements needs to be assessed but limited test data to confirm the exposure classification across the site. Risk of impacting the long-term behaviour.	Undertake additional geotechnical investigations with suitable laboratory testing, including aggressivity suite of testing on both groundwater and soil samples.
Ground lateral stability	Based on the topography at the Site and the current ground surface levels, various slopes have been identified. There are slopes against the existing Riverbank Wall and backfilled slopes underneath the existing theatre building. Vibrations and surcharge loading from machinery during construction can affect the stability of these slopes.	The ground lateral stability should be checked for both temporary and permanent conditions.
Hydrogeological		
Limited understanding of the groundwater conditions across the site	Impact on the proposed redevelopment and drainage needs to be assessed but the available groundwater data is limited and appears to be no reliable groundwater monitoring at the site.	Undertake groundwater level monitoring over extended time periods. Consider the effect of rainfall events and required level of drainage during construction. Further hydrogeology assessments might be required.
Impact on Third Party Assets		
Construction and demolition of the existing building is required through an existing sewer man-hole connection.	Manhole and sewer connections need to be considered if left in place during construction. Settlement due to vibration or additional loading during construction may cause damage to the asset.	If the sewer and manhole connections are left as-is and remain serviceable, dilapidation surveys should be completed. An impact assessment is also required
Riverbank Wall	Vibrations and surcharge loading from machinery during construction can affect the stability of the existing Riverbank Wall.	Impact assessment for the Riverbank wall is required.

8. Conclusion and Recommendations

Based on the information reviewed, it is considered that commonly used construction methods are applicable for this redevelopment and that pending further geotechnical investigations, the concept design is feasible.

The following are some recommendations to address the identified residual geotechnical risks.

8.1 Additional Field Investigation

The following geotechnical investigations are recommemded to fill in existing gaps of understanding at the Site:

- Boreholes drilled to a minimum depth of 3m of competent rock to confirm top of rock levels and quality of rock to inform design of foundations and retention systems. This should extend below the depth of the proposed substructure.
- Continuous groundwater monitoring to develop a hydrogeological model of the Site and to inform the need of a hydrogeological impact assessment. Coordination with WaterNSW required to understand requirements as part of SSDA and later stage design. Note that WaterNSW requires 3 monitoring wells in the periphery of the Site and 6 months of monitoring data.
- Collection and laboratory testing of appropriate samples of the alluvial soils and the rock to understand the material characteristics for design.

8.2 Instrumentation and Monitoring

Construction will require an instrumentation and monitoring plan to be implemented during the works. Monitoring data will be used to monitor groundwater, potential movement and stability of structures (existing and new) as well as ground movements resulting from the proposed works and the impacts this may have on nearby assets.

Details to be developed in later design stage.

8.3 Geotechnical Verification During Construction

Geotechnical verifications by an appropriately qualified and experienced geotechnical engineer is recommended to verify ground conditions prior to the construction of the foundations, assess temporary excavations/fill batters and review earthworks in line with construction specifications and design requirements.

9. References

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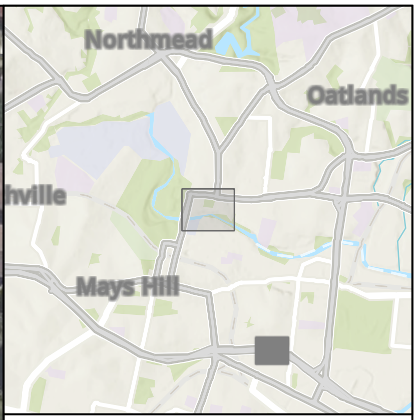
Appendix A

GIS Figures



Legend

- Site Extent
- Railway
- Watercourse
- Drainage Line
- Lot

DRAFT	6/08/2024	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres
0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

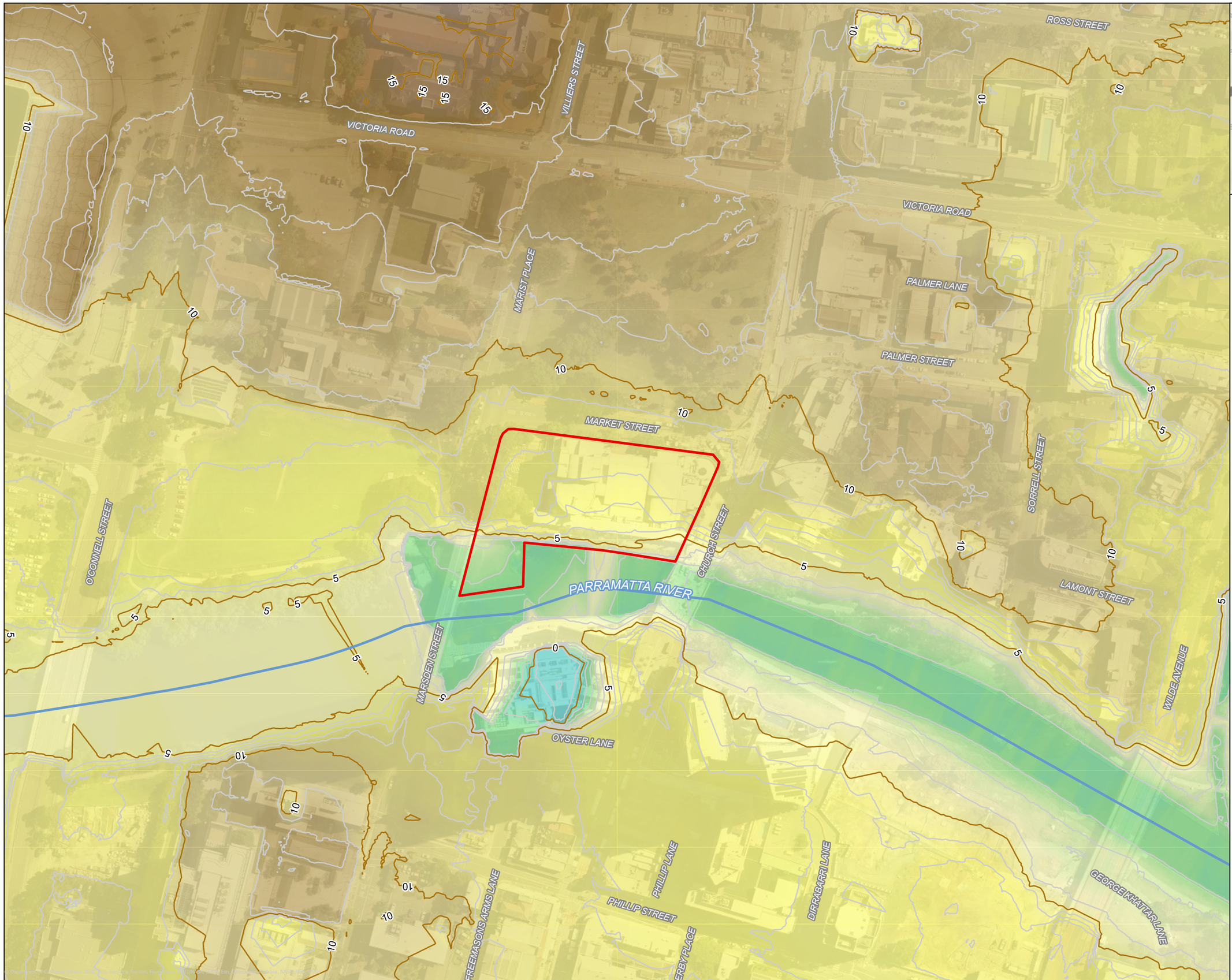
Figure Title
Site Location

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-A-1**

\\global.arup.com\australasia\SYD\Projects\296000\296335-00 Riverside Theatre SSD\Work\Internal\3_SSDA\19_Geotechnical\02 GIS\Riverside_GDS_1.aprx



Legend

- Site Extent
- Watercourse
- Contour (5m interval)
- Contour (1m interval)

Elevation (mAHD)

25

0

DRAFT	6/08/2024	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Job Title
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Figure Title
Topography - Elevation

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-A-2**

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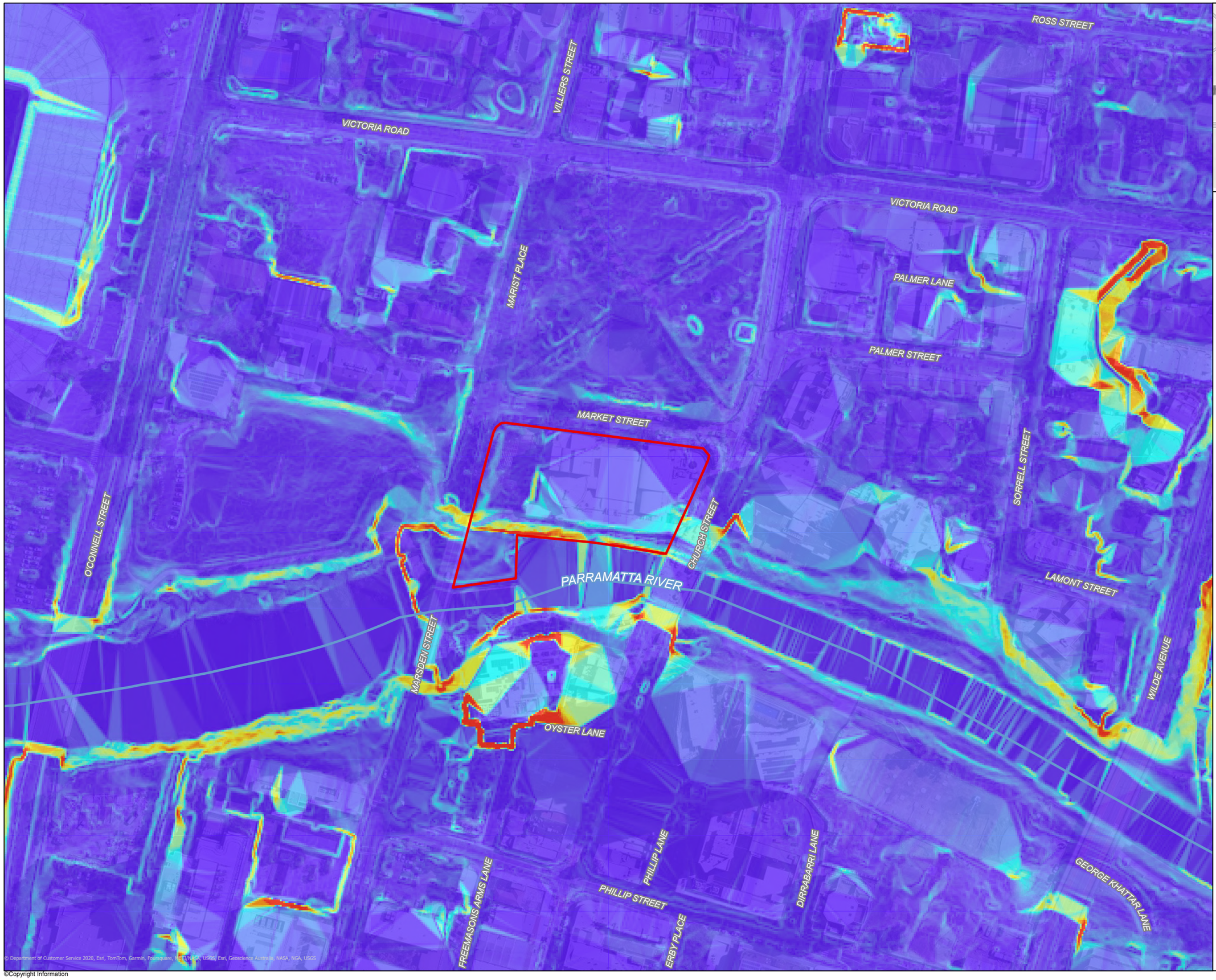

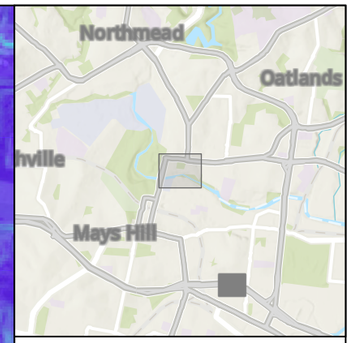

Legend

- Site Extent
- Watercourse

Slope (degrees)

45

0

Rev	Date	By	Chkd	Appd
DRAFT	6/08/2024	MA	DL	AC

Metres

0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Topography - Slope

Scale at A3	Figure Status
1:2,000	DRAFT

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	GEO-A-3

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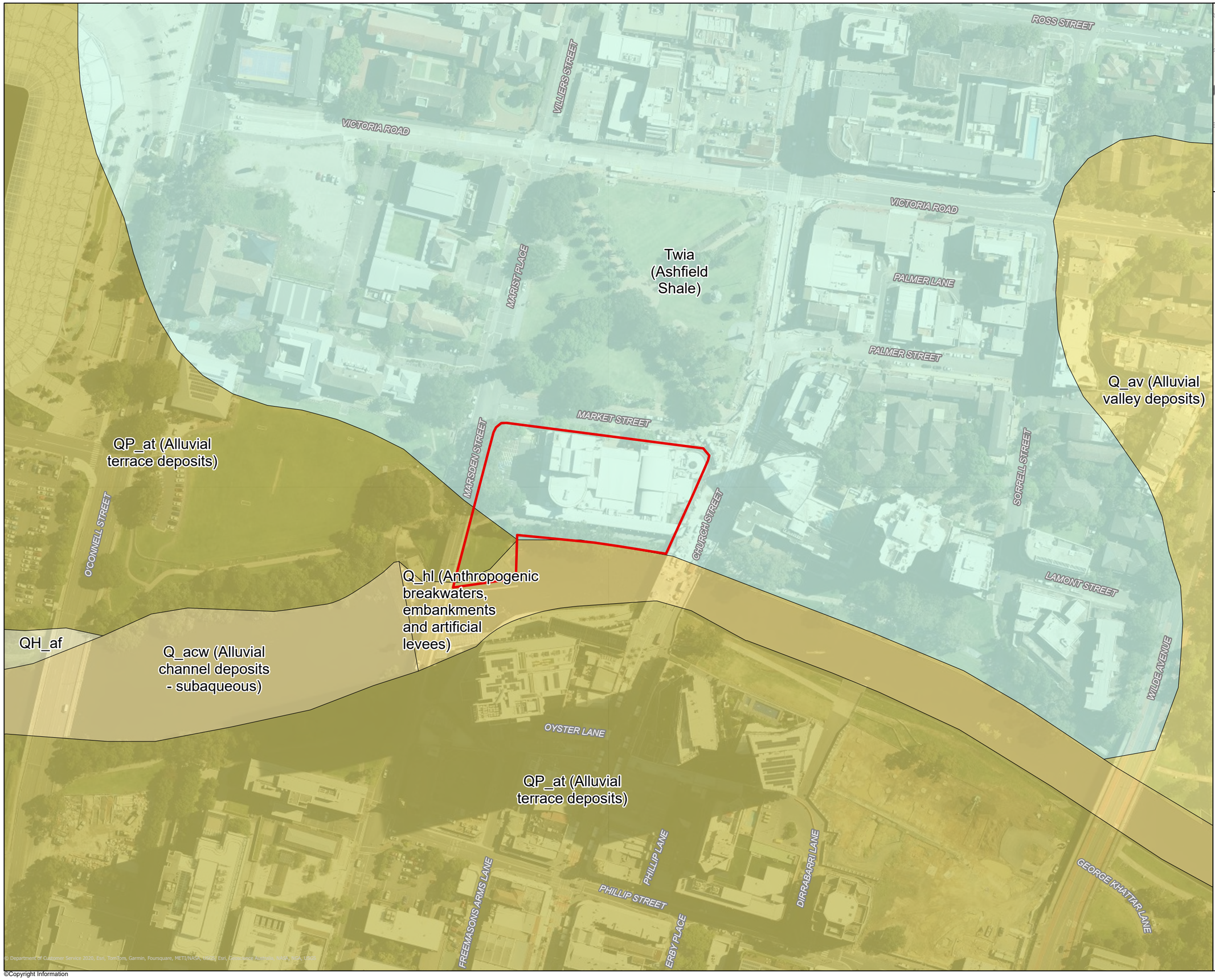

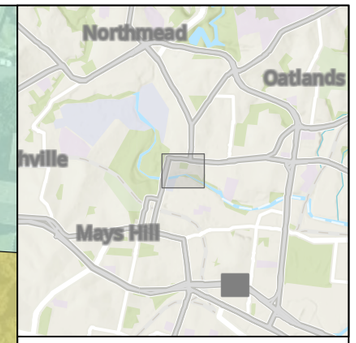

Legend

Site Extent

Geological Units

- QH_af
- QP_at
- Q_acw
- Q_av
- Q_hl
- Twia

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Metres

0 10 20 30 40 50

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Job Title
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Figure Title
Regional Geology

Scale at A3	Figure Status
1:2,000	DRAFT

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	GEO-A-4

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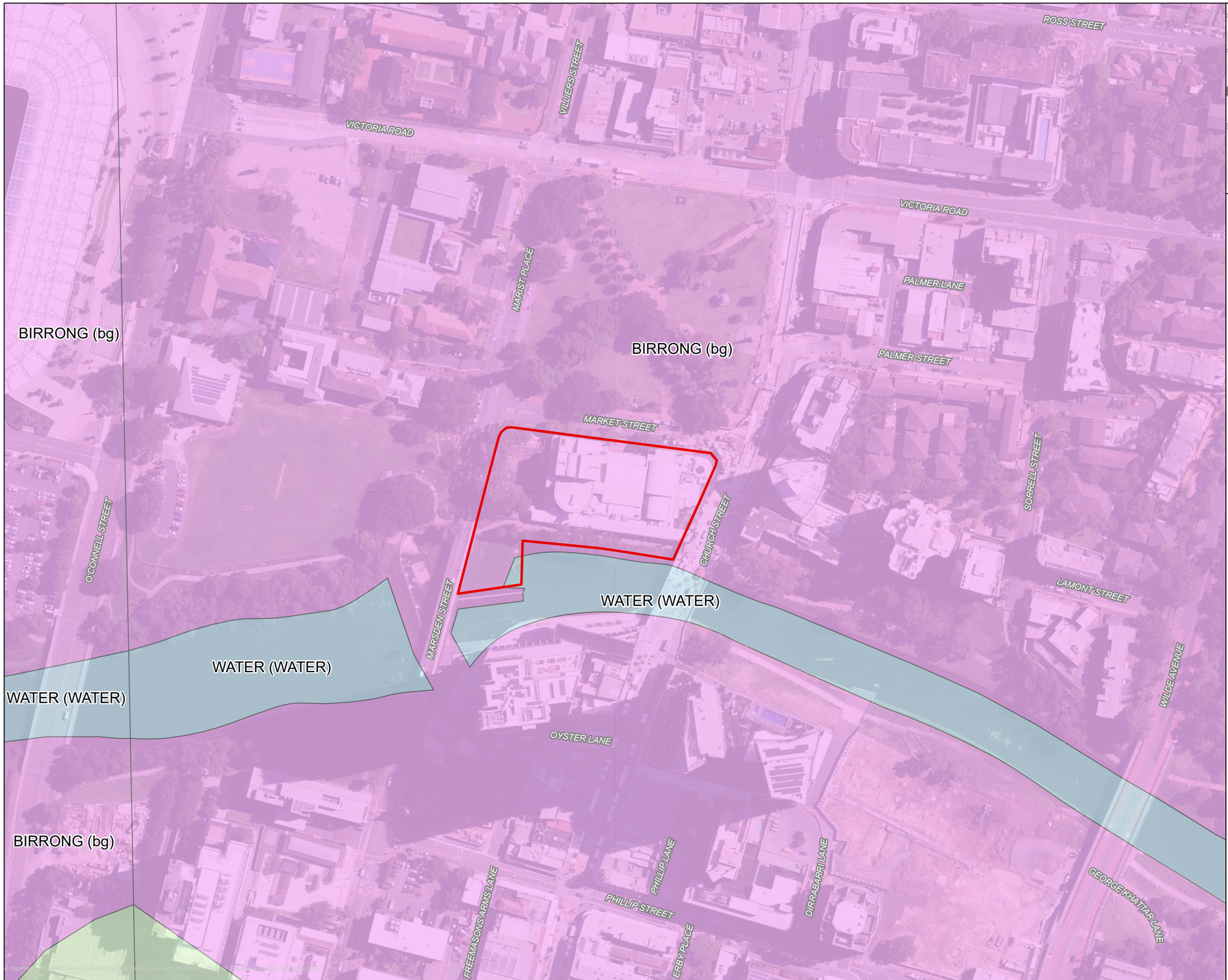

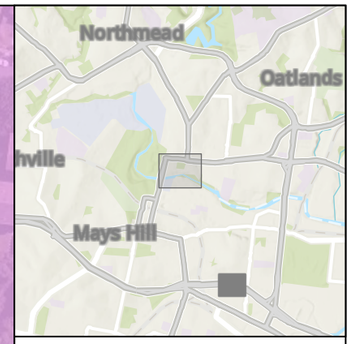

Legend

- Site Extent

Soil Landscape Process

- Alluvial
- Residual
- Water

DRAFT	6/08/2024	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Job Title
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Figure Title
Soil Landscapes

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
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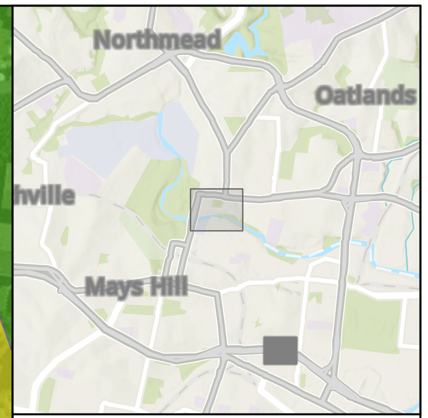

Legend

- Site Extent

Salinity Potential of Western Sydney

- Moderate
- Low
- Water

DRAFT	6/08/2024	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres
0 10 20 30 40 50

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Figure Title
Soil Salinity Potential

Scale at A3	Figure Status
1:2,000	DRAFT

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
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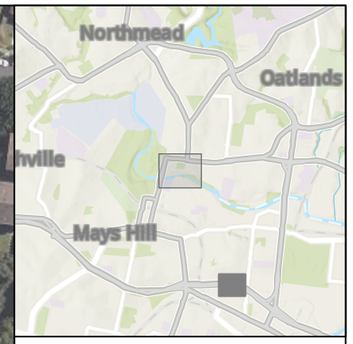

Legend

- Site Extent

Acid Sulfate Soil Risk (Naylor et al.)

- High Risk 2-4m AHD
- High Risk Sediments
- Disturbed Terrain

Rev	Date	By	Chkd	Appd
DRAFT	6/08/2024	MA	DL	AC

Metres

0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Acid Sulfate Soil Risk (Naylor et al.)

Scale at A3	Figure Status
1:2,000	DRAFT

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	GEO-A-7

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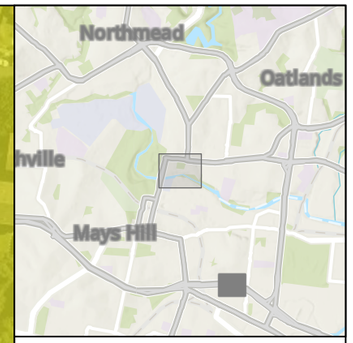

Legend

- Site Extent

Acid Sulfate Soil Risk (CSIRO)

- High probability of occurence of actual ASS
- High probability of occurence of MBO
- High probability of occurence of PASS
- Low probability of occurence of MBO
- Low probability of occurence of PASS
- Extremely low probability of occurence of PASS
- No probability of occurence

Rev	Date	By	Chkd	Appd
DRAFT	6/08/2024	MA	DL	AC

Metres

0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Acid Sulfate Soil Risk (CSIRO)

Scale at A3	Figure Status
1:2,000	DRAFT

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	GEO-A-8

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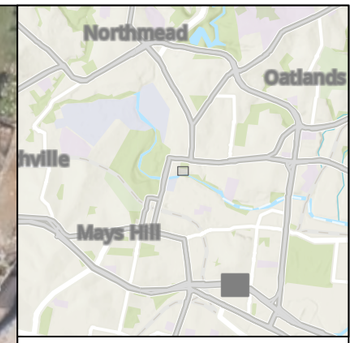

Legend

- Site Extent

Geotechnical Investigations

ARUP 2024

- Hand Auger hole with DCP
- Hand Auger Hole

Other Investigations

- JK 1984/1985
- JK 1993
- JK 2018
- Coffey 2017

Rev	Date	By	Chkd	Appd
A	11/12/2024	MA	DL	ASH

Metres

0 4.5 9 13.5 18 22.5

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Job Title
Riverside Theatres Redevelopment

Figure Title
Geotechnical Investigations Location Plan

Scale at A3	Figure Status
1:500	**For Issue**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-A-9**

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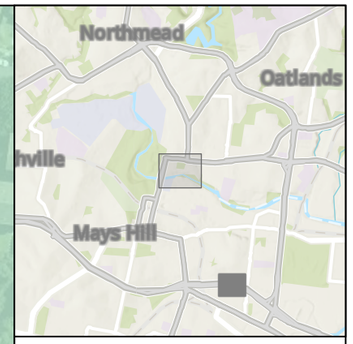

Legend

- Site Extent
- Water Supply
- Watercourse
- Drainage Line

Hydrogeological Landscapes

- Bankstown
- Parramatta/Georges River

Rev	Date	By	Chkd	Appd
DRAFT	6/08/2024	MA	DL	AC

Metres
0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Hydrogeological Landscapes and Groundwater Bores

Scale at A3	Figure Status
1:2,000	DRAFT

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	GEO-A-10

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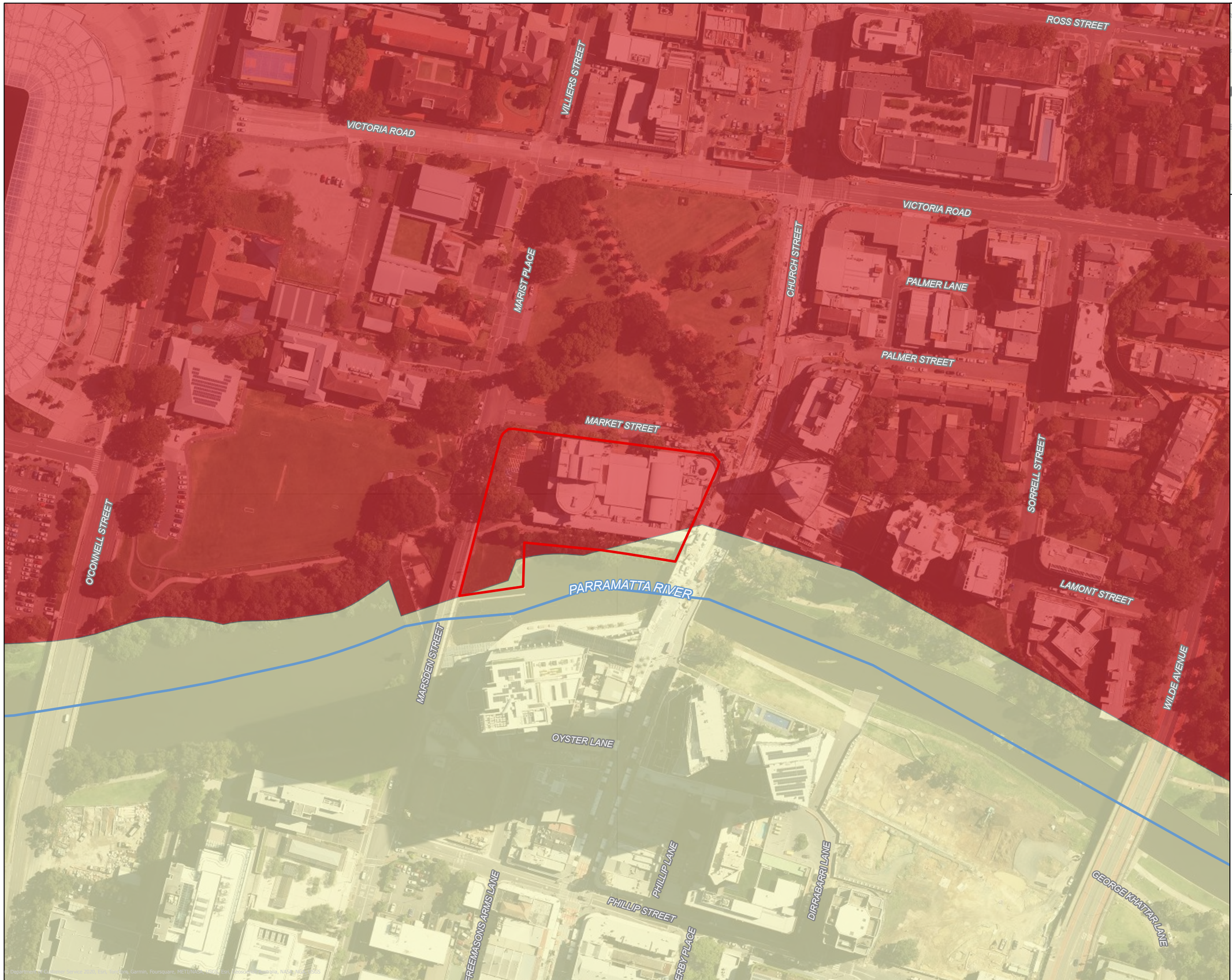

Legend

- Site Extent
- Watercourse
- Drainage Line

Groundwater Salinity Hazard

- Very High
- High
- Moderate
- Low
- Very Low
- Water

Rev	Date	By	Chkd	Appd
DRAFT	6/08/2024	MA	DL	AC

Metres

0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Groundwater Salinity Hazard

Scale at A3	Figure Status
1:2,000	DRAFT

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	GEO-A-11

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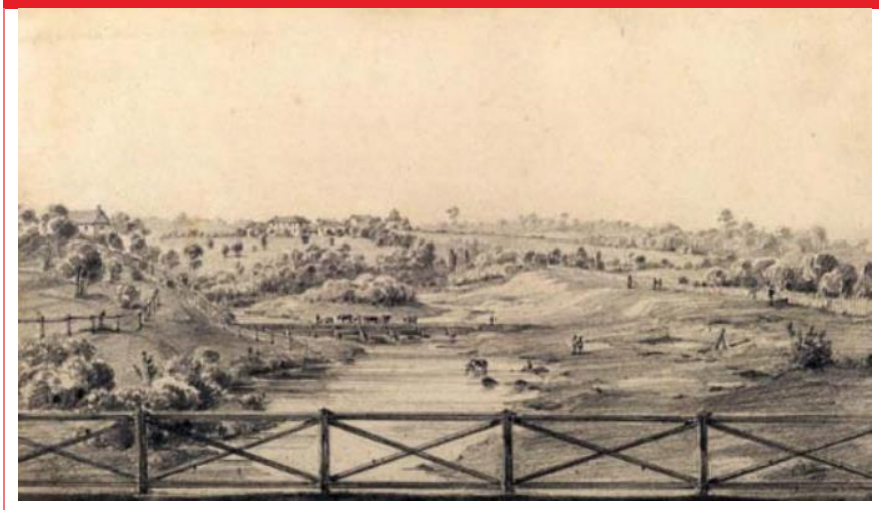
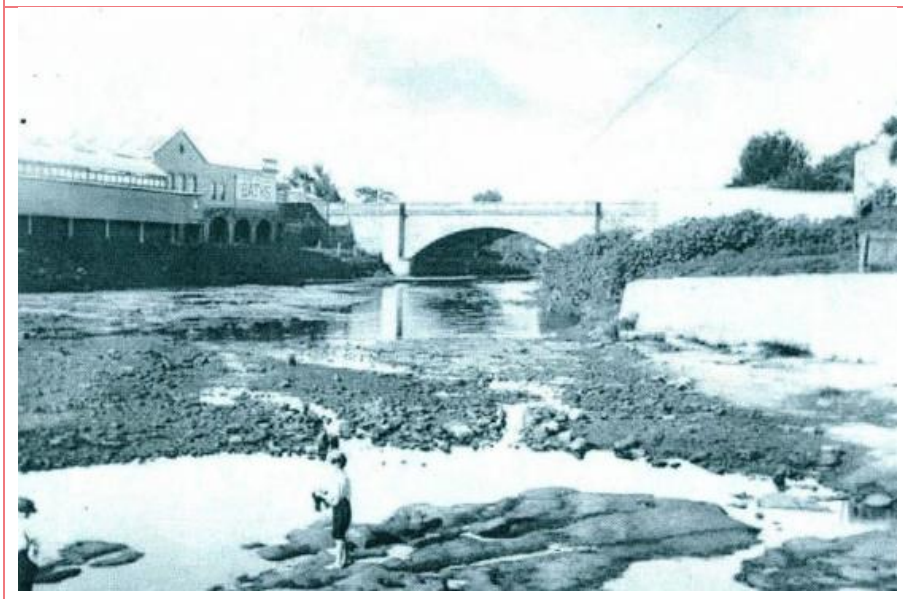
Appendix B

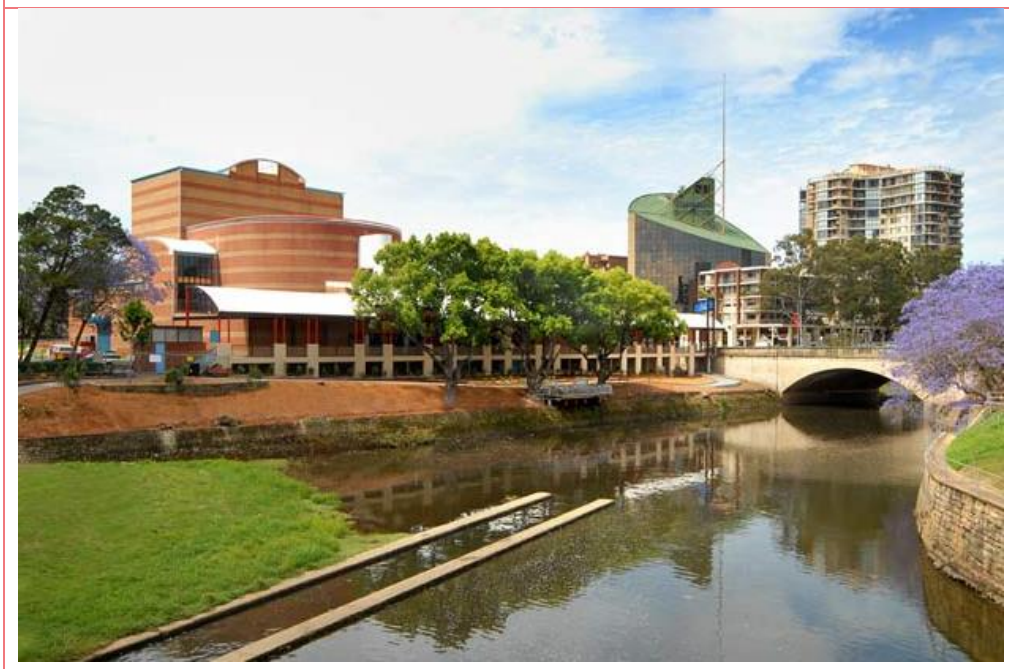
Historical Imageries

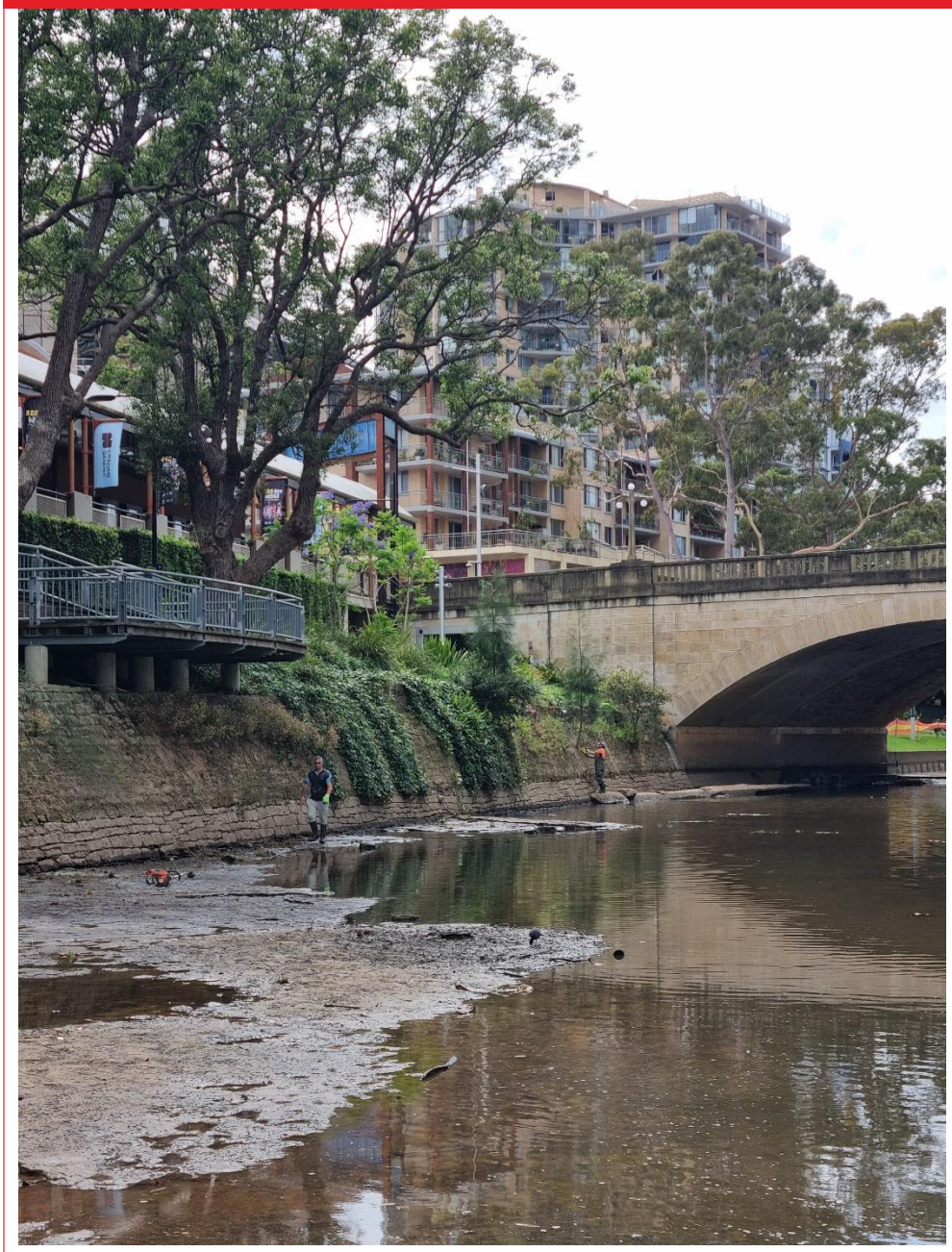
B.1 Summary of Key Historical Imageries

Photograph	Description
	Artistic Impression of the Site (right) from Lennox Bridge (sometime **before 1837**)
	**Late 1800s** – Public Baths Reserve situated on an embankment. Southern side sea wall can be clearly seen in the photo on the right.

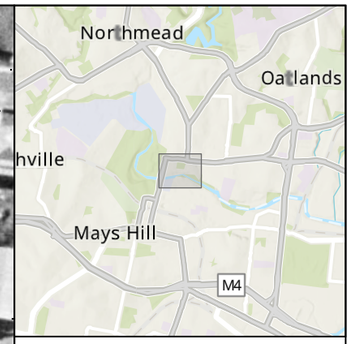
Photograph	Description
	**1943** – Marsden Street Weir, passage of water is pushed through a small channel on the Riverside Theatres side
	**1966** – Marsden Street Weir was used as a river crossing until the 1970s.

Photograph	Description
	**1986** – Old Baths Building and Market Reserve demolished to make way for the Riverside Theatres. The western portion of the Site appears to be left untouched. This is now the Riverside Theatres carpark.
	**1994** – Riverside Theatres constructed and fully operational.

Photograph	Description
	**2004** –A roof has been added to the open-courtyard of the Riverside Theatre
	**2009 –** A piled platform has been added that cantilevers over the existing Riverbank Wall

Photograph	Description
	**2024** - Photo taken during Stage 1 Site Investigation–

B.2 Plan of Historical Aerial Imageries



Legend

Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Historical Aerial Imagery - 1943

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-1943**

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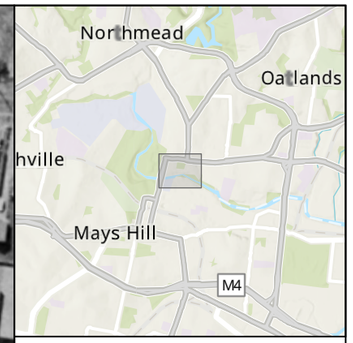

Legend

Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Job Title
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Figure Title
Historical Aerial Imagery - 1965

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-1965**

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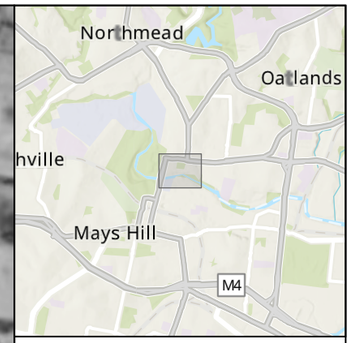

Legend

Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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www.arup.com

Client
City of Parramatta Council

Job Title
Riverside Theatres - Geotechnical Desktop Study

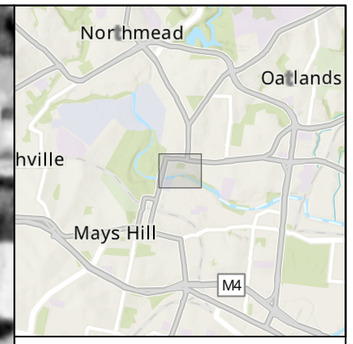
Figure Title
Historical Aerial Imagery - 1971

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-1971**

\\global.arup.com\australasia\SYD\Projects\296000\296335-00 Riverside Theatre SSD\Work\Internal\3_SSDA\19_Geotechnical\02 GIS\Riverside_GDS_1.aprx



Legend

Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Client
City of Parramatta Council

Job Title
Riverside Theatres - Geotechnical Desktop Study

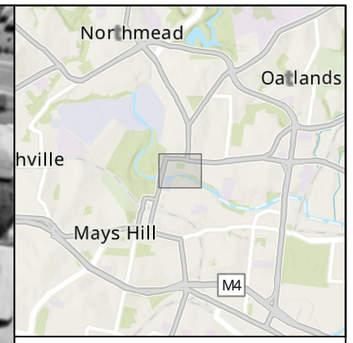
Figure Title
Historical Aerial Imagery - 1975

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-1975**

\\global.arup.com\australasia\SYD\Projects\296000\296335-00 Riverside Theatre SSD\Work\Internal\3_SSDA\19_Geotechnical\02 GIS\Riverside_GDS_1.aprx



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Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Client
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Job Title
Riverside Theatres - Geotechnical Desktop Study

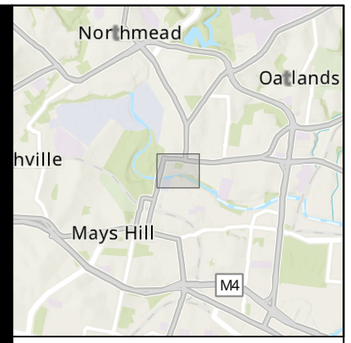
Figure Title
Historical Aerial Imagery - 1978

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-1978**

\\global.arup.com\australasia\SYD\Projects\296000\296335-00 Riverside Theatre SSD\Work\Internal\3_SSDA\19_Geotechnical\02 GIS\Riverside_GDS_1.aprx



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Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Historical Aerial Imagery - 1984

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-1984**

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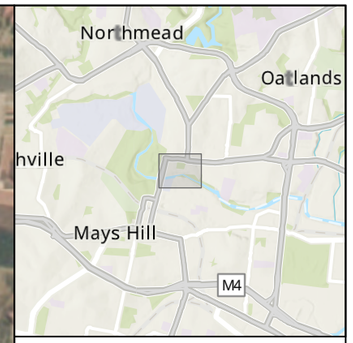

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Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Client
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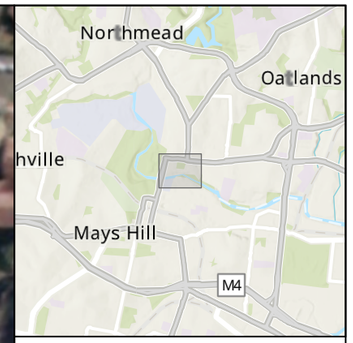
Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Historical Aerial Imagery - 1986

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-1986**



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Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Client
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Job Title
Riverside Theatres - Geotechnical Desktop Study

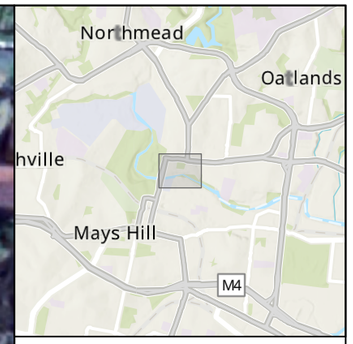
Figure Title
Historical Aerial Imagery - 1991

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-1991**

\\global.arup.com\australasia\SYD\Projects\296000\296335-00 Riverside Theatre SSD\Work\Internal\3_SSDA\19_Geotechnical\02 GIS\Riverside_GDS_1.aprx



Legend

Site Extent

Rev	Date	By	Chkd	Appd
DRAFT	26/02/2025	MA	DL	AC

Metres

0 10 20 30 40 50

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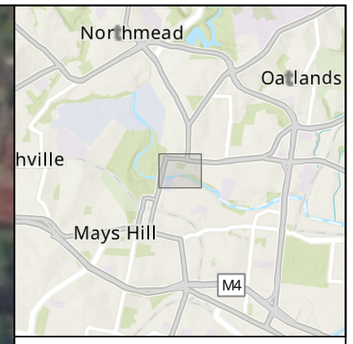
Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Historical Aerial Imagery - 1994

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-1994**



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Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Historical Aerial Imagery - 1996

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-1996**

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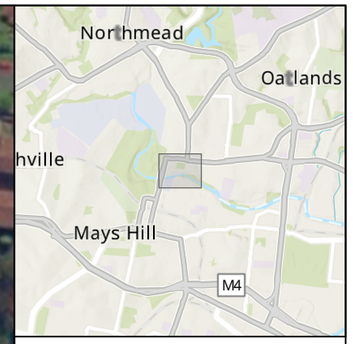

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Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Historical Aerial Imagery - 1998

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-1998**

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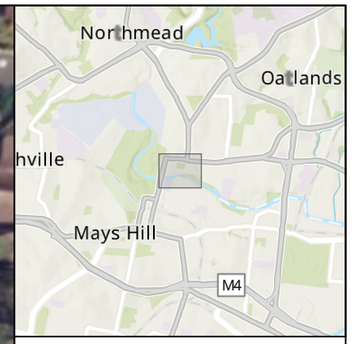

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Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Historical Aerial Imagery - 2005

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-2005**

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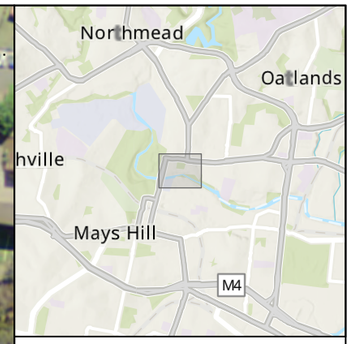

Legend

Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Historical Aerial Imagery - 2013

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-B-2013**

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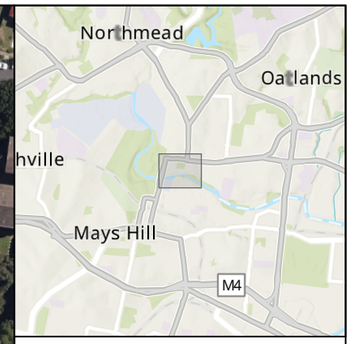

Legend

Site Extent

Rev	Date	By	Chkd	Appd
DRAFT	26/02/2025	MA	DL	AC

Metres

0 10 20 30 40 50

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Client
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Job Title
Riverside Theatres - Geotechnical Desktop Study

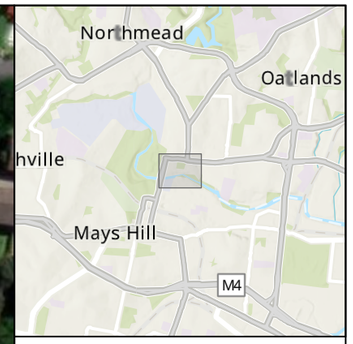
Figure Title
Historical Aerial Imagery - 2021

Scale at A3	Figure Status
1:2,000	DRAFT

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	GEO-B-2021

\\global.arup.com\australasia\SYD\Projects\296000\296335-00 Riverside Theatre SSD\Work\Internal\3_SSDA\19_Geotechnical\02 GIS\Riverside_GDS_1.aprx



Legend

Site Extent

DRAFT	26/02/2025	MA	DL	AC
Rev	Date	By	Chkd	Appd

Metres

0 10 20 30 40 50

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Client
City of Parramatta Council

Job Title
Riverside Theatres - Geotechnical Desktop Study

Figure Title
Historical Aerial Imagery - 2023

Scale at A3	Figure Status
1:2,000	**DRAFT**

Coordinate System
GDA2020 MGA Zone 56

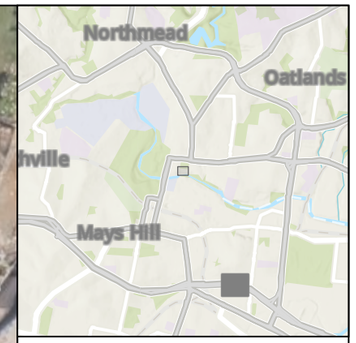
Job No	Doc Ref
296335	**GEO-B-2023**

\\global.arup.com\australasia\SYD\Projects\296000\296335-00 Riverside Theatre SSDWork\Internal\3_SSDA\19_Geotechnical\02 GIS\Riverside_GDS_1.aprx

Appendix C

Plan of Available GI locations and Selected Site Photos from Site Walkovers

C.1 Available GI and Arup GI Completed



Legend

- Site Extent

Geotechnical Investigations

ARUP 2024

- Hand Auger hole with DCP
- Hand Auger Hole

Other Investigations

- JK 1984/1985
- JK 1993
- JK 2018
- Coffey 2017

Rev	Date	By	Chkd	Appd
A	11/12/2024	MA	DL	ASH

Metres

0 4.5 9 13.5 18 22.5

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Client
City of Parramatta Council

Job Title
Riverside Theatres Redevelopment

Figure Title
Geotechnical Investigations Location Plan

Scale at A3	Figure Status
1:500	**For Issue**

Coordinate System
GDA2020 MGA Zone 56

Job No	Doc Ref
296335	**GEO-1**

\\global.arup.com\australasia\SYD\Projects\296000\296335-00 Riverside Theatre SSD\Work\Internal\3_SSDA\19_Geotechnical\02 GIS\Riverside_GDS_1.aprx

C.2 Selected Site Photos from Site Walkovers

APPENDIX C-2: Selected Photos from Site Walkovers

APPENDIX C-2: Selected Photos from Site Walkovers

APPENDIX C-2: Selected Photos from Site Walkovers

APPENDIX C-2: Selected Photos from Site Walkovers

APPENDIX C-2: Selected Photos from Site Walkovers