Edgecliff Centre

Preliminary Geotechnical & Structural Engineering Assessment Report

Longhurst

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The planning proposal will support amendments to the Woollahra Local Environmental Plan 2014 in order to facilitate the future redevelopment of the site for a mixed-use development comprising retail / commercial / medical uses podium and residential tower.

Specifically, in order to facilitate the future redevelopment of the site for the intended purpose, the planning proposal seeks to:

- Increase the maximum Height of Buildings development standards
- Increase the maximum Floor Space Ratio development standard.

The indicative scheme suggests that the excavation or basement excavation would be located to the south and adjacent to the existing underground railway station.

This report provides a review of available geotechnical information, and identifies geotechnical constraints that may impact the proposed development of the site. The existing rail infrastructure located within the site boundary was given particular consideration of its impact from/ on the future redevelopment for the site for its intended purpose (i.e. mixed use development).

As part of the assessment, the following scope of works was completed:

- Conduct a geotechnical desktop study
- Collate and review of available information relevant to the site and immediate surrounds
- Identify geotechnical constraints and considerations relevant to the proposed development.

Geotechnical constraints and risks identified included:

- Uncertain subsurface profile
- Deep excavation in sand
- Groundwater ingress into basement excavation and induced settlements
- Structural integrity of existing retaining structures
- The impact of stress relaxation and / or ground movement due to the demolition of existing building and proposed basement excavation, on surrounding sensitive infrastructure
- Uncertainty of the protection zone definition

The following design considerations and mitigations are recommended to manage and assess the potential risks associated with the near ESR railway tunnels:

- Early consultation with TfNSW regarding the definition of first reserve zone, hence confirm the location and restriction of basement excavation
- Undertaking geotechnical investigation to confirm the subsurface and hydrogeologic condition in more detail
- Design of foundation and supported excavation shall consider, minimise and assess the impact on the adjacent underground railway station
- Engaging AEO competent geotechnical engineer to provide professional assessment as per the requirement of the standard in different stages of the development
- The design and performance requirements as stated in the Development Near Rail Tunnels Standard (TfNSW, 2018) or equivalent (approved) standard shall be followed and included in the overall project budget and program.

Based on our Geotechnical and Structural assessment of the proposed development, the existing site and the expected geotechnical conditions, we believe the proposed development can feasibly be designed and constructed to ensure no adverse impact to the rail corridor below, provided the above design recommendations and mitigation measures are followed.

1 Introduction

1.1 Background

Aurecon Australasia Pty Ltd (Aurecon) has prepared this geotechnical and structural engineering assessment report (this report) on behalf of Longhurst Investments No. 1 Pty Ltd in supporting of a planning proposal for the Edgecliff Centre, 203-233 New South Head Road, Edgecliff (Lot 203 DP 1113922) (the site). The Edgecliff Centre currently comprises a six-storey retail / commercial building over a two-storey basement carpark.

The planning proposal will support amendments to the Woollahra Local Environmental Plan 2014 in order to facilitate the future redevelopment of the site for a mixed-use development comprising retail / commercial / medical use podium and residential tower.

Specifically, in order to facilitate the future redevelopment of the site for the intended purpose, the planning proposal seeks to:

- Increase the maximum Height of Buildings development standards
- Increase the maximum Floor Space Ratio development standard.

The Edgecliff train station platform is located directly beneath the lowest level of the basement carpark. This station is part of the Eastern Suburbs Railway (ESR) tunnels from Central Station to Bondi Junction, completed in 1979.

The site is shown in Figure 1-1 below. A wider site locality is shown in Figure 1, **Appendix A**.

Figure 1-1 Edgecliff Centre, 203-233 New South Head Road, Edgecliff (Lot 203 DP 1113922) (the site)

1.2 Objectives and scope

The objectives of the assessment was to review relevant available geotechnical information, to provide a preliminary ground model for the site, to provide preliminary design recommendations, to identify geotechnical constraints that may impact the proposed development of the site, and to determine the impact on the rail corridor.

As part of the assessment, the following scope of works was completed:

- Conduct a geotechnical desktop study
- Collate and review of available information relevant to the site and immediate surrounds:
  - Site location details
  - Review of available existing reports for the project area
  - Geology, soil and topography
  - Review of acid sulfate soil (ASS) and salinity risk maps
  - Review of available as-built records of the existing building provided by the client.
- Provide preliminary ground model and geotechnical parameters for concept design development
- Identify geotechnical constraints and considerations relevant to the proposed development
  - Due to subsurface conditions
  - Due to the proximity to underground rail infrastructure
- Determine the impact on the rail corridor

1.2.1 Documentation considered

The following documents (historical drawings and standards) were considered in the preparation of the geotechnical desktop study:

- Clarke Gazzard Architects and Rankine & Hill, 1969. Edgecliff Glebe Redevelopment Precinct B Stage 1 Commercial Development for Edgecliff Development Corporation (DSO376)
- Clarke Gazzard Architects, 1970 - 1971. Edgecliff Glebe Redevelopment Precinct B Stage 2 Podium (70128)
- TfNSW, 2018. Development Near Rail Tunnels (T HR CI 12051 ST)
- Transport Infrastructure, 2008. ECRL Underground Infrastructure Protection Guidelines. Report No. 20007300 / P0-4532

2 Information

2.1 Site location and description

2.1.1 Location and key features

A summary of site identification features is presented in **Table 2-1.**

Table 2-1 Site identification

Aspect	Details
Site identification	203-233 New South Head Road, Edgecliff NSW 2027
Legal property description	Lot 203 DP 1113922
Site area	Approx. 4 950 m^2
Local council	Woollahra Municipal Council
Current zoning	B2 Local Centre (Woollahra Local Environmental Plan 2014)
Current site status	Commercial building, Edgecliff Centre, including above and below ground car parking facilities
Surrounding infrastructure	**Road:** New South Head Road to the north and New McLean Street to the south **Rail:** Overlying the ESR underground station **Water:** Rushcutters Creek is located about 330 metres west feeding north to Rushcutters Bay about 660 metres north-west of the site. Double Bay is located about 830 metres north-east of the site

2.1.2 Site visit observations

A site visit was conducted on 7 April 2020 as part of the Preliminary Site Investigation report. From images captured during the site visit, it is seen that the existing Edgecliff Centre building is located on a downward slope, within a highly developed urban area. No sign of ground subsidence is observed. No sensitive gravity retaining wall structure is observed at the site or adjacent area.

2.2 Site history

2.2.1 Site background

Eastern Suburbs Railway Tunnel

The Eastern Suburbs Railway Tunnel from Central Station to Bondi Junction began construction in 1915, and opened in 1979. It was constructed in several stages over these years. The tunnel encompasses 10 km of track tunnels and five underground stations (Pells 1990 & TfNSW 2018). Sections of the tracks are also located above ground surface, between Martin Place Station and Edgecliff Station.

Between Edgecliff and Bondi Junction a Caldweld TBM machine and roadheader was used to excavate a conventional horseshow shaped tunnel. The tunnel is lined with between 200 mm (unreinforced) to 600 mm (reinforced) concrete. Steel sets or rock bolting was carried out in areas of unstable ground conditions (mainly where dykes were encountered) or where the easement above the tunnel was greater than 3 m. Aside from two dykes (encountered in eight locations) the tunnelling was entirely through Hawkesbury Sandstone.

Edgecliff Station

As part of the ESR tunnel, Edgecliff station finished construction before the construction of the existing Edgecliff Centre in the 1970s (Project named as Edgecliff Glebe Redevelopment Precinct B Stage 1 Commercial Development).

Towards the City, the tracks are mainly above the ground surface with sections along viaducts. From Edgecliff station to Bondi Junction station the tracks are entirely underground, tunnelled through Hawkesbury Sandstone.

It has been observed from historical drawings that Edgecliff station is located at the interface between Hawkesbury Sandstone and Quaternary soil deposits. It is believed the station and the tunnel tracks were constructed as a cut and cover structure. The roof of the station is the slab of the lowest basement carpark of the Edgecliff Centre.

2.2.2 Historical aerial imagery

Aurecon undertook a review of available historical aerial photographs of the site dating back to the 1940s as part of the Preliminary Site Investigation report.

In summary, the site has been situated in a well-developed urban environment since the 1940s, appearing primarily residential and / or commercial with interspaced recreational spaces. The existing Edgecliff Centre was developed in 1971. Significant development evident in aerial imagery since this decade include:

- construction of the Eastern Suburbs railway corridor (completed in 1979)
- construction of the adjacent Eastpoint Food Fair and residential multi-level building, and widening of New South Head Road (1980s)

No substantial development has occurred since the construction of the rail corridor and Edgecliff Centre (1970s). The origin and extent of potential man-made fill at the site is unknown.

2.3 Topography

Topography at the site and surrounding suburbs is shown in Figure 2 **Appendix A**.

The site increases from an elevation of approximately 28 m AHD at the southern boundary (New McLean Street) to approximately 34 m AHD at the northern boundary (New South Head Road).

Generally, the suburb of Edgecliff derives its name from its location on the edge of a rocky cliff. Local terrain relative to the site slopes upwards to Darling Point in the north and Woollahra in the south-east. Contrastingly, terrain slopes downwards towards Rushcutters Bay and Double Bay to the north-east and north-west respectively, and Paddington to the south-west.

2.4 Published geology

2.4.1 Sydney 1:100 000 Geological map

The Sydney 1:100 000 Geological Sheet 9130 (Herbert, 1983) shows the site is underlain by medium to fine-grained “marine” sand with podsols (Qhd). Inclusions of man-made fill (mf) over silty to peaty quartz sand, silt and clay (Qha) is mapped near the site. These deposits are overlying Triassic-aged Hawkesbury Sandstone (Rh).

2.4.2 Sydney Quaternary Geology map

The Sydney 1:100 000 Quaternary Geology map (Troesdon, 2015) shows the site is underlain by Holocene bedrock-mantling dune, consisting of marine sand (Qhbdr). Anthropogenic disturbed land unit (Qmx) is mapped near the site, defined as “extensive fill or excavation disrupting natural land surface within area of Quaternary deposits”. These deposits are overlying Triassic-aged Hawkesbury Sandstone (Tuth).

2.4.3 NSW Seamless Geology dataset

The NSW Seamless Geology dataset (Colquhoun et al., 2019) is mapped in Figure 3 **Appendix A**. This dataset is the product of the NSW Seamless Geology Project, undertaken to compile the best available geological data for the state, organised into a series of layers representing the stratigraphic relationships of rock units through time. A summary of the map codes displayed in Figure 3 **Appendix A** is in Table 2-2 below.

Table 2-2 Geology map codes

Period	Ref.	Name	Description
Quaternary deposits	QH_bd	Coastal deposits dune facies	Marine-deposited and aeolian-reworked coastal sand dunes.
	QH_ebw	Estuarine basin and bay (subaqueous)	Clay, silt, shell, very fine- to fine-grained lithic-quartz (± carbonate) sand (fluvially- and/or marine-deposited).
	QH_bdr	Bedrock-mantling dune deposits	Fine- to coarse-grained quartz-lithic sand with abundant carbonate and sporadic inclusions of humic debris.
	QH_byw	Coastal deposits - Bay sand sheet (subaqueous)	Medium to fine-grained quartzose sand; slightly shelly; well-sorted.
	QH_hr	Anthropogenic deposits - reclaimed estuarine areas	Natural surface elevation raised by placement of fill over former estuarine swamps and subaqueous estuarine margins (supratidal to subtidal zone); estuarine banks and islands formed from dredge spoil.
	QH_h	Anthropogenic stored water, pondage, reservoirs, canals	Thinly laminated muds and silts with humic to biogenic debris (as bottom sediment to the overlying stored waters).
Middle Triassic bedrock	Twia	Ashfield shale	Typically comprises laminite and dark grey siltstone. Phosphatic siderite nodules are present as thin beds or horizons.
	Tuth	Hawkesbury Sandstone	Typically comprises medium to coarse grained quartz sandstone, with very minor shale, mudstone, siltstone and laminite lenses.

The site is underlain by Holocene bedrock-mantling dune deposits (QH_bdr), also known as cliff-top dunes. These marine deposits are characterised by fine- to coarse-grained quartz-lithic sand with abundant carbonate and sporadic inclusions of humic debris. This coastal deposit is derived from the Port Jackson drowned valley estuary.

This sandy deposit is underlain by Hawkesbury Sandstone bedrock (Tuth), exposed at the northern end of the site. Hawkesbury Sandstone is defined as medium- to coarse-grained quartz sandstone with minor shale and laminite lenses. This unit may be either massive or blocky in nature due to a combination of horizontal bedding planes and widely spaced vertical or sub-vertical joints.

No structural features (dykes or veins) are mapped at the site.

2.5 Soil landscapes

The site is within the Soil Landscapes of the Sydney 1:100,000 Sheet (Chapman et al., 2009). The Hawkesbury (ha) Soil Landscape is mapped at the site location. Deposits of the Gymea (gy) soil landscape and Disturbed Terrain (xx) are mapped in areas adjacent to the site.

Typical characteristics of these soil landscapes is provided in Table 2-3 below.

Table 2-3 Typical characteristics of soil landscapes mapped at and surrounding the site.

Ref.	Name	Soil characteristics	Local relief	Slope grade
ha	Hawkesbury	Dominant soil materials over Hawkesbury sandstone bedrock include loose coarse quartz sand topsoil over sandy clay loam subsoil with gravels, stones and sandstone fragments sometimes included. Clay subsoil derived from shale lenses within the Hawkesbury Sandstone may be present. Soils are shallow (> 0.5 m) and discontinuous. Sandstone rock outcrops are frequent. Residual soils are typically shallow and granular, being highly permeable soil. They pose as extreme soil erosion hazard, mass movement or rock fall hazard, steep slopes, rock outcrop, shallow and stony soils.	40 m – 200 m	> 25%
gy	Gymea	Dominant soil materials over Hawkesbury sandstone bedrock include loose, coarse sandy loam topsoil over clayey sand or sandy clay loam subsoil. Clay subsoil may occur over shale lenses. Localised steep slopes, high soil erosion hazard, and outcropping Hawkesbury sandstone rock benches are characteristics of this landscape.	20 m – 80 m	10% – 25%
xx	Disturbed Terrain	Areas which have been disturbed by human activity to a depth of at least 0.1m. The limitations of the soils are dependent on the nature of the fill material and may pose subsidence, mass movement, and drainage issues.	-	-

The soil landscape at the site and surrounding suburbs is shown in Figure 4 **Appendix A**.

2.6 Acid sulphate soils

Acid Sulphate Soils mapped at the site are shown Figure 5 **Appendix A**.

According to the Acid Sulphate Soils Risk Maps (DLWC, 1998), ASS is not mapped at the site. This is due to ASS being unlikely to be found above 10 m AHD.

Rushcutters Bay and Double Bay are located approximately 660 m and 880 m respectively from the site. These areas represent environments suitable for ASS and are mapped to have a high probability of occurrence. Area surrounding tributaries to these bays are mapped to contain disturbed terrain.

2.7 Soil salinity and aggressivity

Information on soil salinity or aggressivity is not available at the site.

2.8 Groundwater

Static groundwater levels within the study area depend on topography and can change over time and in response to a range of factors including seasonal fluctuations and changes in catchment properties.

Groundwater borehole information available through the NSW Water data set (NSW Department of Planning, Industry and Environment, 2019) within 500 m of the site is summarised in Table 2-4 below. These records are not in close proximity to the site, therefore conditions at the site should not be inferred from this information (particularly due to large changes in ground elevation and topography in the area).

Table 2-4 Groundwater borehole information (NSW Department of Planning, Industry and Environment, 2019)

ID	Approximate location relative to site	Depth to standing water level	Strata
GW107358	200 m SE	41.8 m	0.0 - 0.2 m: Fill 0.2 – 0.5 m: Sand 0.5 – 1.4 m: Clay 1.4 – 2.0 m: Sand 2.0 – 3.5 m: Sandstone (weathered) 3.5 – 180.5 m: Sandstone with think bands of shale/siltstone
GW109375	250 m SW	not available	0.0 – 1.0 m: Soil 0.1 – 3.8 m: Sand 3.8 – 5.0 m: Clay 5.0 – 7.0: Sand
GW107539	430 m NE	8.5 m	0.0 – 13.0 m: Sand
GW026439	490 m NW	not available	0.0 – 2.1 m: Clay 2.1 – 7.9 m: Sand

2.9 Seismicity

In accordance with Australian Standard AS1170.4 (2007), the study area has a hazard factor (Z) of 0.08 and a range of site sub-soil classes. Likely sub-soil classes to be encountered at the site include rock (Be) and shallow soil (Ce). Investigations are required to verify indicative sub-soil classes.

2.10 Underground mining

The publicly available information held by the Mine Subsidence Board (MSB) indicates that the proposed infrastructure is not within a mine subsidence district.

2.11 Previous investigations

2.11.1 NSW public works reports

There were no ground investigation records within 500 m of the site available through NSW public works records (NSW Department of Planning, Industry and Environment, 2019).

2.11.2 Historical drawings

A summary of historical drawings used in the construction of existing buildings at the site is shown in Table 2-5. The proposed development is within the existing Stage 1 Podium (B1) structure. The Stage 2 (B2) excavation plan and cross sections are also included to provide ground information immediately east of the site. The historical drawings have been included in **Appendix B** with key information highlighted.

Table 2-5 Drawings with relevant geotechnical information

Stage	Author & Drawing Set	Year	Drawing	Information
Stage 1 Podium	Clarke Gazzard Architects and Rankine & Hill (DSO376)	1970	DS0376-1 version E: Footing Layout	• Assumed rock level RL in design • Assumed min. safe bearing capacity on rock and sand.
		1969	DS0376- P5 version C: Footing Layout	Ground investigation information and interpolated rock RL.
Stage 2 Podium	Clarke Gazzard Architects (70128)	1970	16G: Plan at R.L. 75.58' Railway Platform	Extent of Edgecliff station railway platform.
		1971	29E: Excavation Plan	Ground investigation information and interpolated rock RL adjacent to the site.
		1972	42J, 43F & 44E: Sections	Cross-sections showing approximate rock and soil levels adjacent to the site.

Expected Strata

The following subsurface conditions are expected:

- **Fill**: As this is a developed site, fill of unknown depth or origin may be encountered.
- **Natural Soil**: As per historical drawings descriptions, sandy soil is expected. Clayey or silty soils may also be encountered.
- **Weathered Bedrock:** Refer to Table 2-6 below for expected depth to weathered Hawkesbury Sandstone. Refer to Section 3.3 for preliminary design parameters for Class IV Sandstone.
- **Fresh Bedrock:** Refer to Table 2-6 below for expected depth to weathered Hawkesbury Sandstone. Refer to Section 3.3 for preliminary design parameters for Class III Sandstone.

Bedrock

The Stage 1 footing layout drawings show that the sandstone bedrock RL declines from approximately 24.4 m at the northern section (Grid A) of the existing tower to 15.2 m at the southern section (Grid E) of the existing tower. It appears this has been inferred from a number of boreholes located across the site, marked on the preliminary footing drawing. Individual records are summarised in Table 2-6 below.

Table 2-6 Approximate depth to rock at ground investigation locations.

Grid Reference	"Soft Rock" RL (m)	"Hard Rock" / "Sound Rock" RL (m)
A4	26.2	24.1
A10	25.6	24.4
E1	15.7	13.1
E5	19.2	18.6
E11	15.2	13.4
F11	18.3	17.7
L7	3	0.6
L11	7.9	3.4

Furthermore, a historical drawing included in the Edgecliff Centre Redevelopment Briefing Summary (Longhurst, 2019) reproduced in Figure 2-1 below shows the approximate rock level decreasing from relatively shallow at the northern end of the site, to relatively deep at the southern end of the site. This trend is reflected in the adjacent site (Stage 2), as seen in the cross sections provided in **Appendix B**.

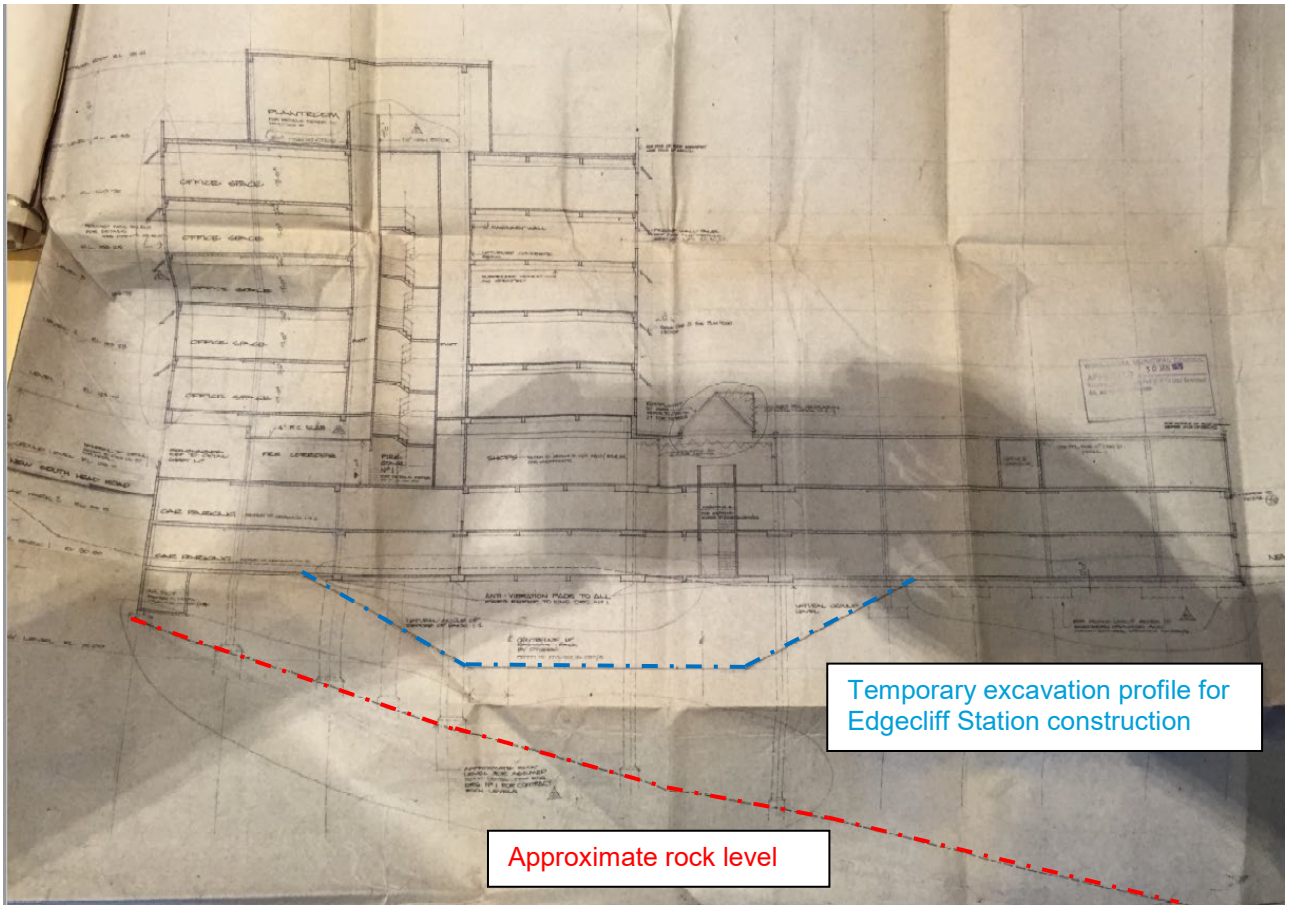

Figure 2-1: Extract from the Edgecliff Centre Redevelopment Briefing Summary (Longhurst, 2019) showing approximate rock level

Foundations

The Stage 1 footing layout drawings show that the northern portion of the foundations are piled footings on rock approximately 1 m to 1.4 m in diameter with belled base of 1.5 m to 1.8 m in diameter. Pad footings with a typical size of approximate 2.6 m x 2.6 m founded on sand were construction at the southern portion.

It is stated that footings were designed for an allowable bearing capacity as below:

- Footings on rock shall have a minimum safe bearing capacity of 20 tons/ft^2 (equivalent to 1915 kPa)
- Footings on sand shall have a minimum safe bearing capacity of 2 tons/ft^2 (equivalent to 191 kPa)

Based on the designed bearing capacity, it is inferred the rock could be considered as Class IV sandstone as per Pells' Classification (Pells, 2019), and the soil could be considered as loose to medium dense sand.

2.12 In situ stress

It is noted that at the location of the proposed basement excavation, it is anticipated that the subsurface conditions predominantly comprise soil as the rock level dips down towards the southern end of the site. This reduces the effects of in-situ stress on the basement excavation and the adjacent rail infrastructure in which rock is not encountered.

Triassic rocks within the Sydney Basin are known to have relatively high locked in horizontal in-situ stresses from tectonic origins, often exceeding the vertical overburden pressure. An extract from a paper by McQueen (2004) showing principle in-situ horizontal stress magnitude plotted against depth for numerous Sydney projects is shown in Figure 2-2.

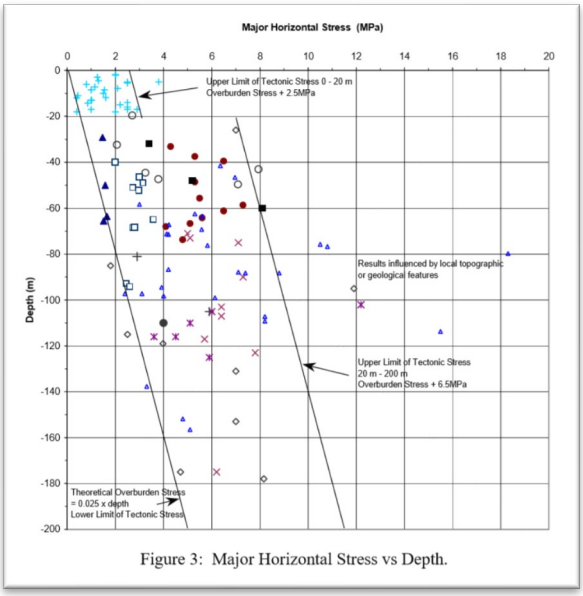

Figure 3: Major Horizontal Stress vs Depth.

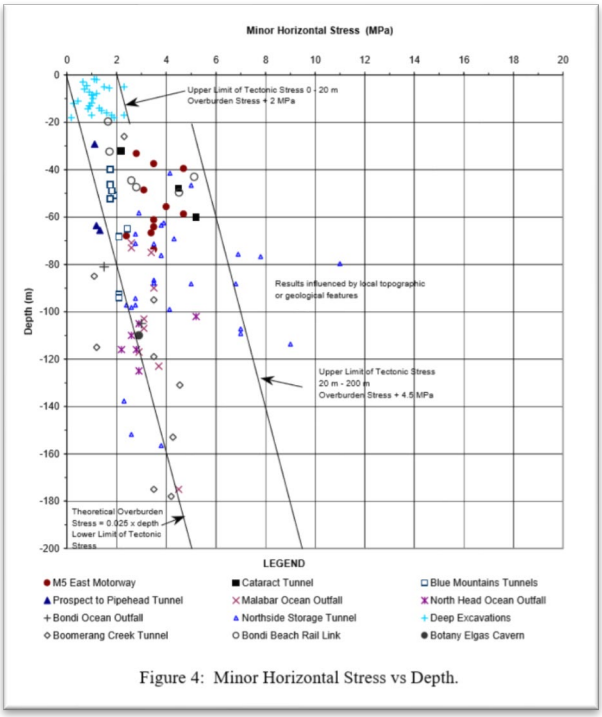

Figure 4: Minor Horizontal Stress vs Depth.

Figure 2-2 Extract of major and minor horizontal in-situ stress (McQueen, 2004)

Field measurements have recorded lateral movement at the sides of excavations in Hawkesbury Sandstone caused by the release of in situ horizontal stress. These measurements have been in the range of 0.5 mm to 2.5 mm per metre depth of excavation. Furthermore, at locations greater than twice the depth of basement excavations away, displacements exceeding 5 mm have been known to occur (Pells, 1990).

Horizontal stress relief in heterogeneous rock masses during excavation can also cause brittle or shear failure along major discontinuities. In Hawkesbury Sandstone, slipping along continuous clay seams with low shear strength and opening of near-vertical or vertical joint sets may occur, causing differential movement at the face of the excavation.

Redistribution of in situ stresses during excavation can also affect nearby existing structures. Induced tensile stresses at nearby railway tunnels has been known to cause cracking of concrete lining or movement of the tunnel towards the excavation.

2.13 Proposed indicative development scheme

The following documents were considered with regards to the proposed development:

- Longhurst, 2019. The Edgecliff Centre Redevelopment Briefing Summary. Rev 1.0, April 2019.
- FJMT, 2020. Edgecliff Full Architectural Package. 2 April 2020.

The indicative development scheme includes:

- Commercial, retail, medical/wellness facilities and residential
- Provision for a publicly accessible open green space at podium level
- Introduction of public community space
- Revitalisation and enhancement of the existing internodal and transport interchange within the site
- Public domain improvements at ground level including a new plaza and permeable transit interchange entry way
- Improvements to existing vehicular access and loading dock arrangement.

The indicative scheme suggests that the excavation or basement excavation would be located to the south and adjacent to the existing underground railway station. Based on the current architectural plan provided, the proposed excavation of basement levels will provide a distance offset between 5.4 m and 10.2 m from the edge of existing railway tunnel wall. The area of the excavation will be in the order of 24.9 m wide, 69.7 m long and 19 m deep.

3 Considerations and mitigations for developments near and above rail tunnels

In accordance with the key objective of the State Environmental Planning Policy (Infrastructure) 2007 (SEPP), to protect the safety and integrity of key transport infrastructure from adjacent developments, Transport of New South Wales (TfNSW) has an obligation to review the development applications of projects near to underground infrastructure, to ensure that their consequential impacts are appropriately assessed and managed.

The Development Near Rail Tunnels Standard (TfNSW, 2018) (the standard) sets out requirements to "assess the impacts on existing rail tunnels and underground infrastructure during developments near such tunnels and infrastructure in the metropolitan rail area". This standard primarily covers the developments near ESR tunnels.

3.1 Protection reserves

Section 5.1 of the standard defines rail protection reserves for the purpose of assessing the effects of adjacent developments, categorised as 'first reserve' and 'second reserve'. An extract from the standard showing the defined reserves is shown in Figure 3-1.

- The first reserve width (B) is defined by the greater of half of tunnel width (W) or the existing pre-defined easement width (to be confirmed by TfNSW)
- The second reserve width (B + Y) is equal to an additional 25 m from the first reserve boundary.

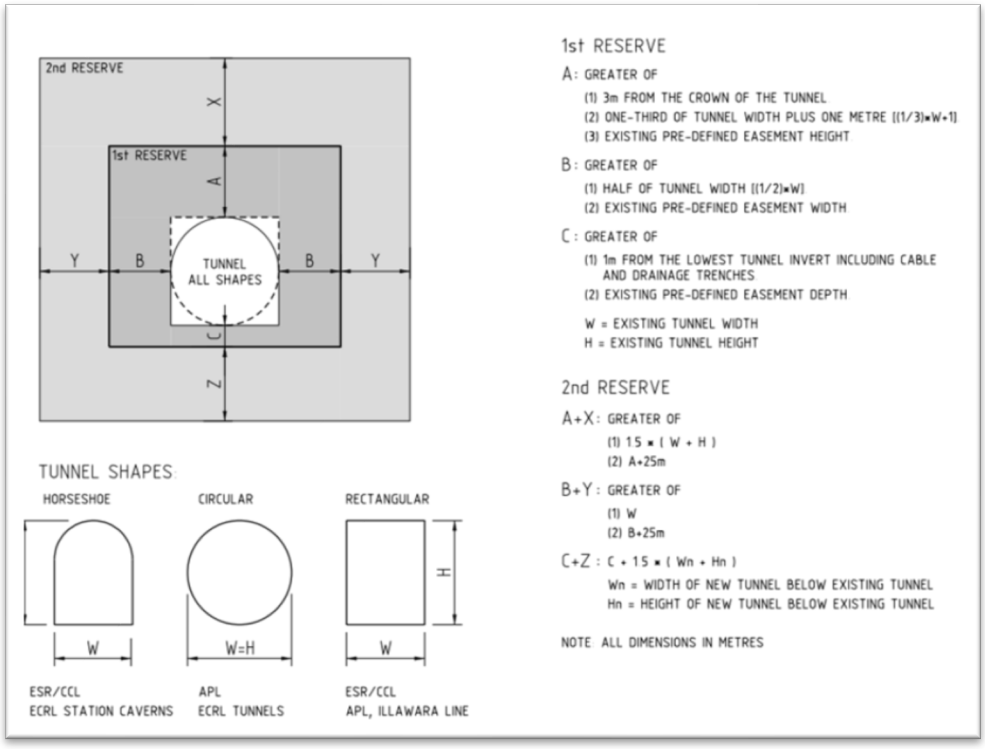

Figure 3-1 Extract from Development Near Rail Tunnels Section 5.1 (TfNSW, 2018)

The width (W) of the tunnel is determined based on the width of the ground load arching induced by the tunnel excavation. With reference to the ECRL Underground Infrastructure Protection Guidelines (Transport Infrastructure, 2008), rail protection reserves for cut and cover and dive structures is defined as below:

- The first reserve width is defined as minimum 5 m from the edge of the tunnel wall with variation based on the support zone, which comprises the installed support elements, including rock bolts, ground anchors and forward reinforcement.
- The second reserve width is equal to an additional 20 m from the first reserve boundary.

An extract from the standard showing the defined reserves is shown in Figure 3-2.

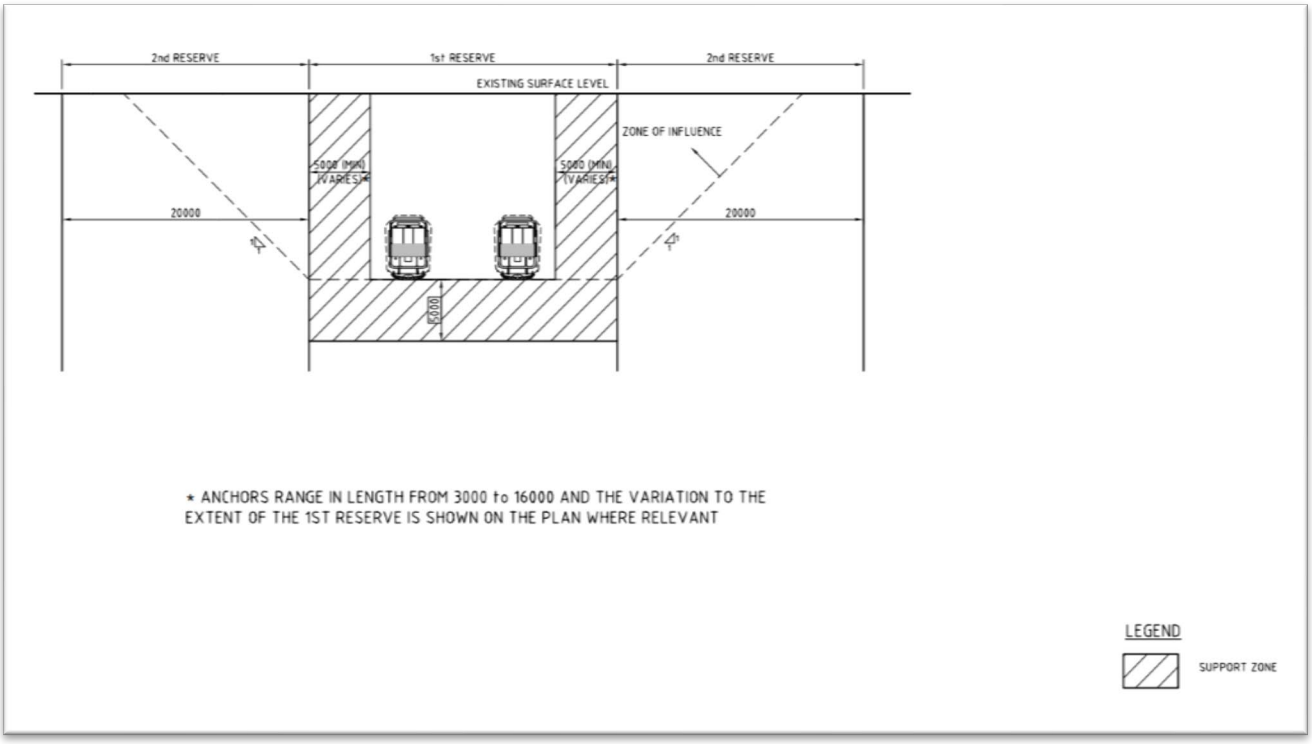

Figure 3-2 Extract from ECRL Underground Infrastructure Protection Guidelines (Transport Infrastructure, 2008)

At the site location, since the station and the rail tracks are believed to be built by cut and cover method, the definition provided in the ECRL projection guidelines could be more applicable. Further consultation with TfNSW for the definition of the first reserve zone is required in order to confirm the location of the basement extension and any construction restriction.

3.1.1 First reserve zone

The first reserve zone comprises the immediate surrounds of the tunnel. This zone represents the area that shall not be encroached upon by any future construction or development. Construction restriction outline in the standard for this area is not allowed, including (but not limited to):

- excavations for basements and footings
- shallow footings or pile foundations
- ground anchors.

Only penetrative subsurface investigation is allowed, if away from support zone, but assessment is required.

3.1.2 Second reserve zone

The second reserve zone is the envelope in which stress changes and rock joint and bedding displacement has occurred in the construction of the existing tunnel. Construction restrictions outlined in the standard for this area require assessment for underground works, including (but not limited to):

- excavations for basements and footings exceeding 2 m
- shallow footings or pile foundations subject to load restrictions
- ground anchors
- penetrative subsurface investigations.

Based on the current architectural plan provided, the proposed basement excavation could likely be outside the first reserve zone but is very likely within the second reserve.

3.2 Supported excavation

Excavation for the additional proposed six-storey carpark on the side of the existing ESR underground station can alter the in-situ stress regime in the ground in areas of rock, and may cause ground movement.

Based on the available ground information, the excavation is expected to be in sandy soil. Retention wall with internal struts could be likely required. The use of anchoring adjacent to the ESR infrastructure will not be allowed due to the proximity of first reserve zone. Special glassfiber anchor could also be required to prevent any potential effects of stray electrical currents and electrolysis in the electrified area of the rail network. Alternatively, top down construction could be an option with the ground floor slab acting as the top level of internal struts to provide lateral support during the excavation and in permanent condition.

Sandy soil is expected to have relatively high permeability. Excavation in this material would require groundwater proofing retention wall to minimise groundwater drawdown and hence ground settlement.

3.3 Foundations

Guidelines for the imposed load limits on ESR tunnels is provided in section 6.2 of the standard for typical tunnel or tunnel section with a cubicle and refuge with sound rock cover. This guideline may not be suitable for the site, hence effects due to loads applied by the proposed development shall be assessed.

Redistribution of footing loads away from first reserve zone is required to minimise the effect on the rail tunnels. The effects of vibration from activities such as pile driving or bored pile installation and sheet pile installation shall be assessed as well.

From the result of previous investigations, pad footing or piled foundation founding on sandstone would be feasible foundation options depends on the column loads and top of rock. Foundation design would consider the preliminary design parameters as suggested by Pells (2019) and reproduced in Table 3-1.

Table 3-1 Preliminary foundation design parameters

Materials	Allowable End Bearing Pressure (MPa)	Allowable Shaft Adhesion in Compression (kPa)	Ultimate End Bearing Pressure (MPa)	Ultimate Shaft Adhesion in Compression (kPa)	Elastic Modulus (MPa)
Class IV Sandstone	1 to 3.5	100 to 350	4 to 15	250 to 800	100 to 700
Class III Sandstone	3.5 to 6	350 to 600	20 to 40	800 to 1500	350 to 1200

3.4 Structural Design and Construction methods

Based on our review of the existing structural drawings we understand the tunnel roof slab doubles as a suspended car park slab for a portion of the lower basement. We would advise that a secondary protective structural platform be constructed to span over the tunnel roof in order to prevent any potential construction or impact loading acting on it. We would also advise that this secondary platform should form part of the permanent structure to ensure no potential future over-loading of the roof slab. In addition to this the tower and podium structural forms shall be developed within the recommendations of this report and TfNSW requirements with construction methodologies and staging plans to be developed to ensure no adverse loading or impacts to the Rail Corridor during or after completion of construction.

Temporary loads such as crane loads and temporary support systems, excessive noise and vibration from rock breaking, pile driving, rock drilling works, grouting in ground improvement could impact the existing tunnels. The vibration and ground improvement induced impacts shall be investigated and assessed in detail.

3.5 Site investigation and instrumentation holes

Further site investigation including borehole drilling, laboratory testing and groundwater well installation and monitoring is recommended to confirm the subsurface and hydrogeology condition of the site, in particular at the southern section of the site where basement extension is proposed.

Preliminary scope of further ground investigation is outlined below:

- 4 no. of boreholes located at northern portion, to a depth of approximately 20m with rock recovery
- 6 no. of boreholes located at southern portion, to a depth of approximately 35m with rock recovery
- 2 no. of standpipe piezometer, to top of rock for groundwater monitoring
- In-situ SPT testing
- Laboratory tests including soil classification, aggressivity and rock strength tests.

Borehole drilling is allowed within second reserve zone and location away from support zone within first reserve zone, subject to assessment. Borehole location shall be verified against the as-built location of the existing tunnel to minimise the risk of damage. The holes shall be fully grouted with cement group on completion.

During construction, instrumentation holes such as inclinometers, piezometers and extensometers could be required to measure the ground reaction and the impact. Installation of instrumentation is allowed within first reserve zone if located away from the support zone.

3.6 Engineering assessment and other requirements

An engineering assessment in accordance with Section 8 of the standard may be required. This will include all applicable extreme load combinations from the proposed basement development and the effect of vibration induced by excavation activities on existing rail infrastructure.

The Development Near Rail Tunnels Standard (TfNSW, 2018) requires numerical modelling of the construction (including additional temporary loadings) and operation of the proposed development to assess the effect on the adjacent rail infrastructure. This will form part of the engineering analysis and impact assessment. Scope of design and performance requirement are described in detail in section 9 of the standard and briefly summarised in Table 3-2 below.

Table 3-2 Requirement of engineering assessment

Section	Requirements	Description
8	Engineering Assessment	• Geotechnical investigation • Engineering analysis and impact assessment (including numerical modelling) • Engineering assessment report (including geotechnical investigation report, impact assessment report and risk assessment report) • Potentially required independent verification
9	Design and performance requirements	• Structural stability and integrity (including limits on design loads, cracking of tunnel lining and support structures, displacements and differential movements) • Design (including stray current and electrolysis from rail operations and drainage) • Excavation (including before, during and after excavation) • Noise and vibration (effects, construction vibration monitoring, impact) • Monitoring plan (minimum requirement on type of instrument, assessment and trigger level) • Construction (dilapidation survey, risk assessment, demolition works and construction impacts, piling and excavation works) • Documentation (planning stage or pre-lodgement stage, development application or concurrence stage, prior to construction, during construction, after construction completion and prior to issue of occupation certificate)

4 Recommendations and conclusion

4.1 Geotechnical constraints and risks

The following geotechnical constraints and risks have been identified for further consideration in detailed design development:

- Uncertain subsurface profile
- Deep excavation in sandy soils
- Groundwater ingress into basement excavation and induced settlements
- Structural integrity of existing retaining structures
- The impact of stress relaxation and / or ground movement due to the demolition of existing building and proposed basement excavation, on surrounding sensitive infrastructure
- Uncertainty of the protection zone definition

4.2 Recommendations

Design recommendations and mitigations as provided mainly in section 3 of this study are summarised in below:

- Further review as-built drawings to determine support at the station location, hence to identify the support zone of the tunnel
- Early consultation with TfNSW regarding the definition of first reserve zone, hence confirm the location and restriction of basement excavation
- Undertaking geotechnical investigation to confirm the subsurface and hydrogeologic condition in more detail
- Design of foundation and supported excavation shall consider, minimise and assess the impact on the adjacent railway tunnel
- Engaging AEO competent geotechnical engineer to provide professional assessment as per the requirement of the standard in different stage of the development
- The design and performance requirements as stated in the Development Near Rail Tunnels Standard (TfNSW, 2018) or equivalent (approved) standard shall be followed and included in the overall project budget and program.

The information and guidelines for the application lodgement and approval process for developments near existing rail tunnels can be obtained from the TfNSW (building near the railway) website. This is outside the scope of this assessment.

4.3 Conclusion

Based on our Geotechnical and Structural assessment of the proposed development, the existing site and the expected geotechnical conditions, we believe the proposed development can feasibly be designed and constructed to ensure no adverse impact to the rail corridor below, provided the above design recommendations and mitigation measures are followed.

5 Limits of this report

Aurecon has prepared this report for use by the Client. This report has not been prepared for use by parties other than the Client and the Client's respective consulting advisers. The sole purpose of this report is to present the factual desktop study findings carried out by Aurecon in connection with Edgecliff Centre Redevelopment Project.

This report has been written with the express intent of providing preliminary information for project planning purposes. Sub-surface conditions relevant to design and construction works should be further assessed by a competent geotechnical engineer engaged by the Client and perform any additional tests as necessary.

It is strongly recommended that any plans and specifications prepared by others and relating to the content of this report or amendments to the original plans and specifications be reviewed by Aurecon Australia to verify that the intent of our data is properly reflected in the design.

There are always some variations in sub-surface conditions across a site that cannot be defined even by exhaustive investigation. Further, sub-surface conditions, including groundwater levels can change over time. This should be borne in mind, particularly if the report is used after a protracted delay or a period of protracted climatic conditions.

6 References

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Appendix A – Figures

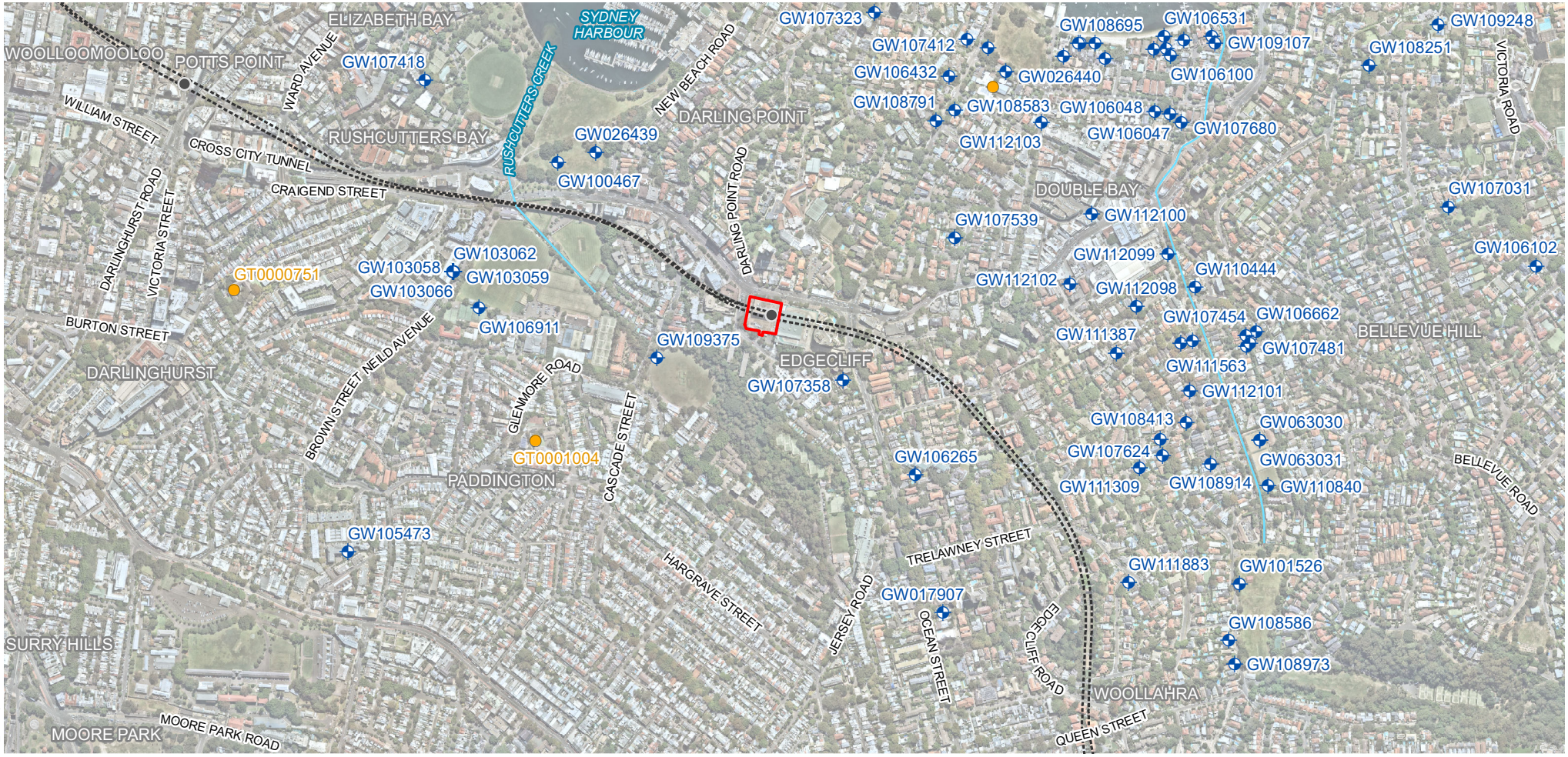
Figure 1: Site Location

Figure 2: Topography

Figure 3: Geology

Figure 4: Soil Landscapes

Figure 5: Acid Sulphate Soils



Edgecliff Centre (203/DP1113922)

Groundwater boreholes

NSW public works geotechnical reports

Base Data

Watercourse

Railway

Source: Aurecon, DPIE, LPI, Nearmap, ESRI

1:12,500

0 250 500m

Projection: GDA 1994 MGA Zone 56

Edgecliff Centre **Geotechnical Desktop Study**

Figure 1: Site Locality

P:\GIS\Project-4\project\Edgecliff_Centre\Site_locality.mxd\JOB No.\09-04-20\Bridie_Jackson\Rev 0

Edgecliff Centre (203/DP1113922)

Contours (5m)

Base Data

Watercourse

Railway

Source: Aurecon, DPIE, LPI, Nearmap, ESRI

1:12,500

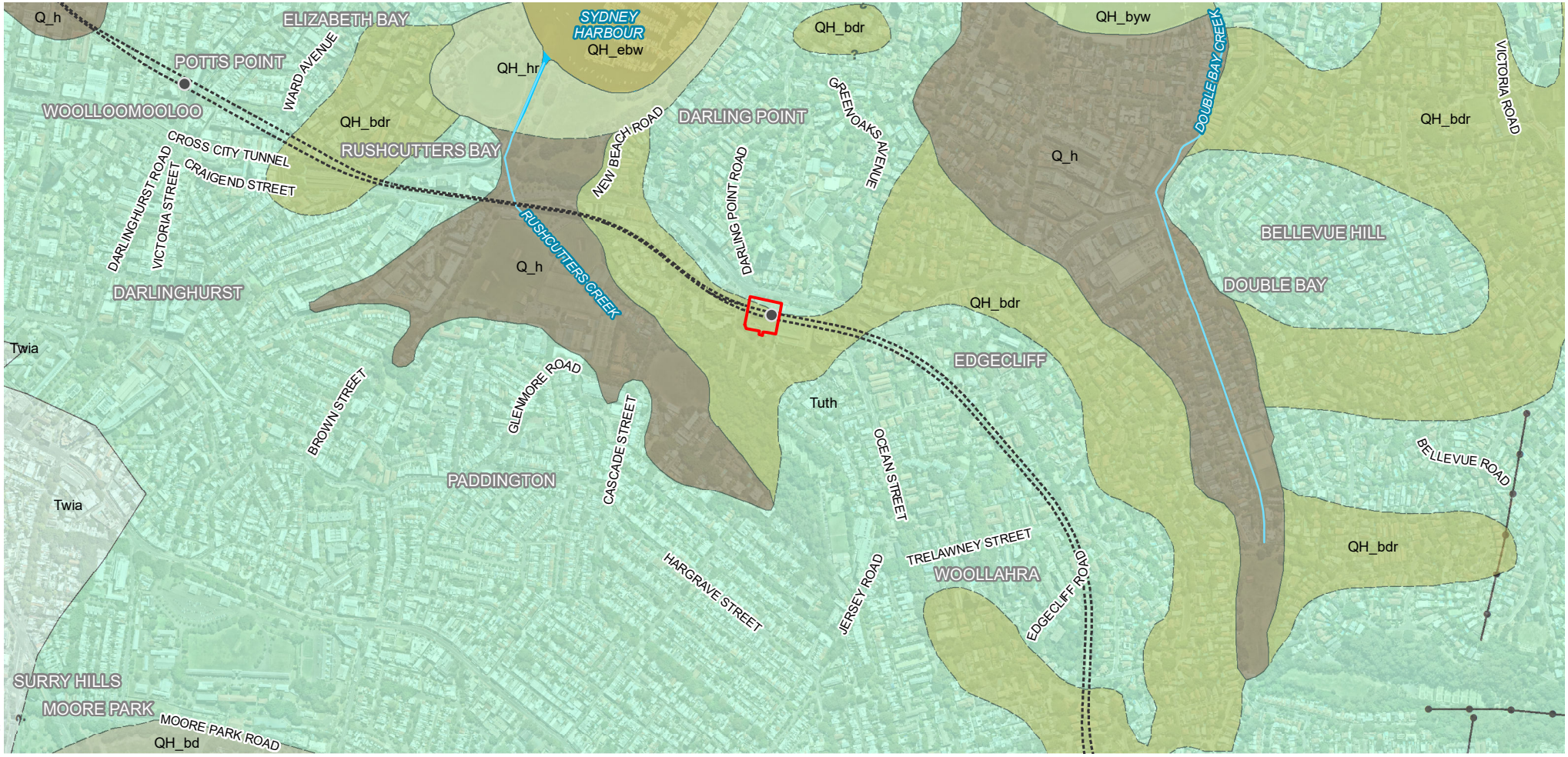
0 250 500m

Projection: GDA 1994 MGA Zone 56

P:\GIS\Project-4\project\Edgecliff_Centre\Topography.mxd\JOB No.\07-04-20\Bridie Jackson\Rev 0

Edgecliff Centre **Geotechnical Desktop Study**

Figure 2: Topography



Edgecliff Centre (203/DP1113922)

Geology (NSW Seamless)

- Dyke or Vein
- Geological boundary, position accurate
- Geological boundary, inferred

Cenozoic Sedimentary Province

- QH_bd
- QH_bdr
- QH_byw
- QH_ebw
- QH_hr
- Q_h

Permian-Triassic Basin

- Tuth
- Twia

Base Data

- Watercourse
- Railway

Source: Aurecon, DPIE, LPI, Nearmap, ESRI

1:12,500

0 250 500m

Projection: GDA 1994 MGA Zone 56

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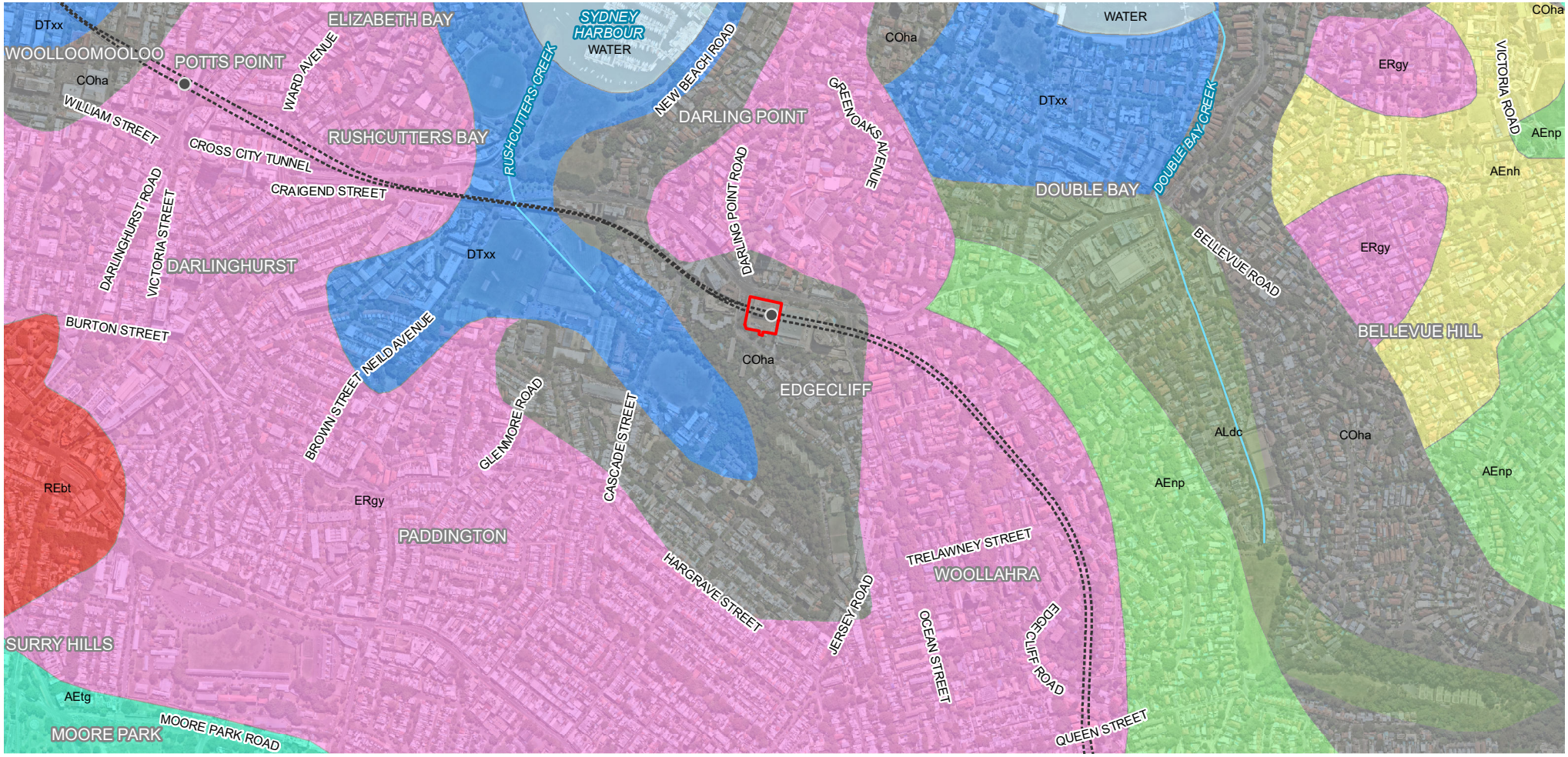
Edgecliff Centre **Geotechnical Desktop Study**

Figure 3: Geology



Edgecliff Centre (203/DP1113922)

Base Data

Watercourse

Railway

Soil Landscapes

AEnh North Head

AEnp Newport

AEtg Tuggerah

ALdc Deep Creek

COha Hawkesbury

DTxx Disturbed Terrain

ERgy Gymea

REbt Blacktown

Water

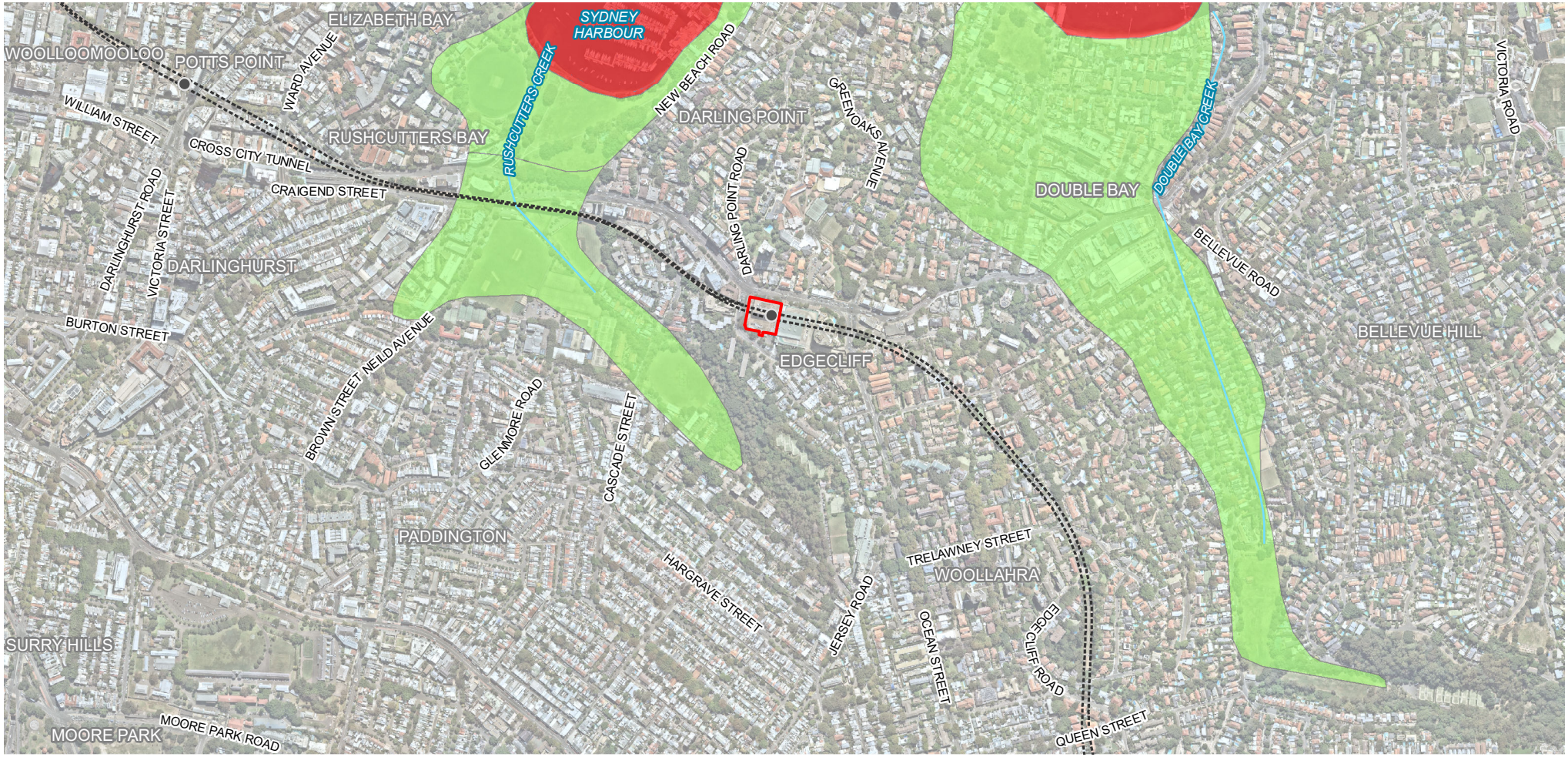
Source: Aurecon, DPIE, LPI, Nearmap, ESRI

1:12,500

0 250 500m

Projection: GDA 1994 MGA Zone 56

P:\GIS\Project-4\project\Edgecliff_Centre\Soil_Landscape.mxd\JOB No.\07-04-20\Bridie.Jackson\Rev 0



Edgecliff Centre (203/DP1113922)

Disturbed Terrain

Base Data

Watercourse

Railway

Acid Sulphate Soils

High probability of occurrence

Source: Aurecon, DPIE, LPI, Nearmap, ESRI

1:12,500

0 250 500m

Projection: GDA 1994 MGA Zone 56

P:\GIS\Project-4\project\Edgecliff_Centre\ASS.mxd\JOB No.\07-04-20\Bridie.Jackson\Rev 0

Appendix B – Historical Drawings with geotechnical mark-up

1. Precinct B Stage 2 (70128) Drawing 16G - Railway Platform
2. Precinct B Stage 1 (DSO376) Drawing 32E - Footing Layout
3. Precinct B Stage 1 (DSO376) Drawing P5C - Footing Layout
4. Precinct B Stage 2 (70128) Drawing 29E - Footing Layout
5. Precinct B Stage 2 (70128) Drawing 42J – Sections
6. Precinct B Stage 2 (70128) Drawing 43F - Sections
7. Precinct B Stage 2 (70128) Drawing 44E - Sections

CHECK ALL DIMENSIONS ON SITE BEFORE ... MENCES. FIGURED DIMENSIONS ONLY TO ... REPORT ANY DISCREPANCIES TO THE ARC... DISCUSSION BEFORE PROCEEDING WITH ... THE CONTRACTOR CONSIDERS THAT EXECU... WORK SHOWN ON THE DRAWING INVOLVES A ... HE SHALL INFORM THE ARCHITECT IN WR... OBTAIN WRITTEN APPROVAL TO PROCEE... EXECUTING THE WORK.

REVISIONS

DATE	REVISION	BY	
23-12-70	INFORMATION & DIMENSIONS ADDED. RAILWAY PLATFORM LEVEL AMENDED.		G
22-12-70	AMMENDMENTS TO REQUIREMENTS OF RAILWAY DEPARTMENT.	A.T.	F
21.12.70	POSITIONS OF ROUND COLUMNS RELOCATED	S.S.	E
17-12-70	COLUMNS GRID FOR ESCALATORS REPOSITION	S.S.	D
15.12.70	POSITIONS OF COLUMNS TO ESCALATORS AMENDED TO ℄ OF PLATFORMS.	S.S.	C
10.12.1970	GRID AMENDED, BUILDINGS ABOVE AMENDED, STRIP FOOTING SHOWN	FM	B

CLARKE GAZZARD PTY. LTD.
ARCHITECTS TEL. 929-0855
2nd FLOOR, M.L.C. BUILDING, NORTH SYDNEY

JOB
EDGECLIFF GLEBE REDEVELOPMENT STAGE 2 PRECINT B PODIUM

TITLE
PLAN AT R.L.75.58' RAILWAY PLATFORM

SCALE
1" TO 16'0"

DATE	DRAWN	CHECKED
31.10.70	S.S.	

JOB No.	DRAWING No.	REV. No.
70128	16	G

1
2
3
4
5
6
7
8
9
10
11
12
13
Assumed Rock Level: 80' ~ 24.4m
Assumed Rock Level: 75' ~ 22.9m
Assumed Rock Level: 70' ~ 21.3m
Assumed Rock Level: 60' ~ 18.3m
Assumed Rock Level: 50' ~ 15.2m
Assumed Rock Level: 45' ~ 13.7m
OUTLINE OF EXISITNG TOWER OVER
E
TUNNEL UNDER
Boundary Line
Column Centre Line
PIER SCHEDULE.
PAD SCHEDULE.
FOOTING LAYOUT
EDGECLIFF GLEBE REDEVELOPMENT
PRECINCT B. STAGE 1.
COMMERCIAL DEVELOPMENT FOR
EDGECLIFF DEVELOPMENT CORPORATION.
RANKINE & HILL
EDGECLIFF DEVELOPMENT CORPORATION.
FOOTING LAYOUT.

Assumed Rock Level: 80' ~ 24.4m

Assumed Rock Level: 75' ~ 22.9m

Assumed Rock Level: 70' ~ 21.3m

Assumed Rock Level: 60' ~ 18.3m

Assumed Rock Level: 50' ~ 15.2m

Assumed Rock Level: 45' ~ 13.7m

No.1:
Sound Rock RL 79' ~ 24.1m
Soft Rock RL 86' ~ 26.2m

Interpolated
Hard Rock RL 80' ~ 24.4m

No.2
Sound Rock RL 80' ~ 24.4
Soft Rock RL 84' ~ 25.6

OUTLINE OF EXISITNG TOWER OVER

Interpolated
Hard Rock RL 70' ~ 21.3m

Interpolated
Hard Rock RL 66' ~ 20.1m

Interpolated
Hard Rock RL 62' ~ 18.9m

Hard Rock RL 61' ~ 18.6m
Soft Rock RL 63' ~ 19.2m

E

No.3:
Hard Rock RL 43' ~ 13.1m
Soft Rock RL 51.5' ~ 15.7m

RAILWAY PLATFORM

Hard Rock RL 44' ~ 13.4m
Soft Rock RL 50' ~ 15.2m

No.4
Hard Rock RL 58' (?) ~ 17.7m
Soft Rock RL 60' (?) ~ 18.3m

No.6
Hard Rock RL 2' ~ 0.6m
Soft Rock RL 10' ~ 3.0m

No.7
Hard Rock RL 11' ~ 3.4m
Soft Rock RL 26' ~ 7.9m

FOOTING LAYOUT

FOOTING TYPE
A 6'-0" dia. on rock Belled dia.
B 5'-0" " " "
C 4'-0" " " "
D 3'-0" " " "
F 8'-0" x 8'-0" x 2ft deep on sand
G 10'-0" x 8'-0"
H 8'-0" x 8'-0"
J 5'-0" x 5'-0"
K 10'-0" x 6'-0"

BEARING INTENSITY:
a) 20 TONS/FT² MAX. ON ROCK.
b) 2 TONS/FT² MAX ON SAND.

FOOTING BEAMS: 18" x 24"

REINFORCEMENT
a) PIERS ON SAND 1.0 cwt/cu yd
b) PIERS ON ROCK 1.0 cwt/cu yd.

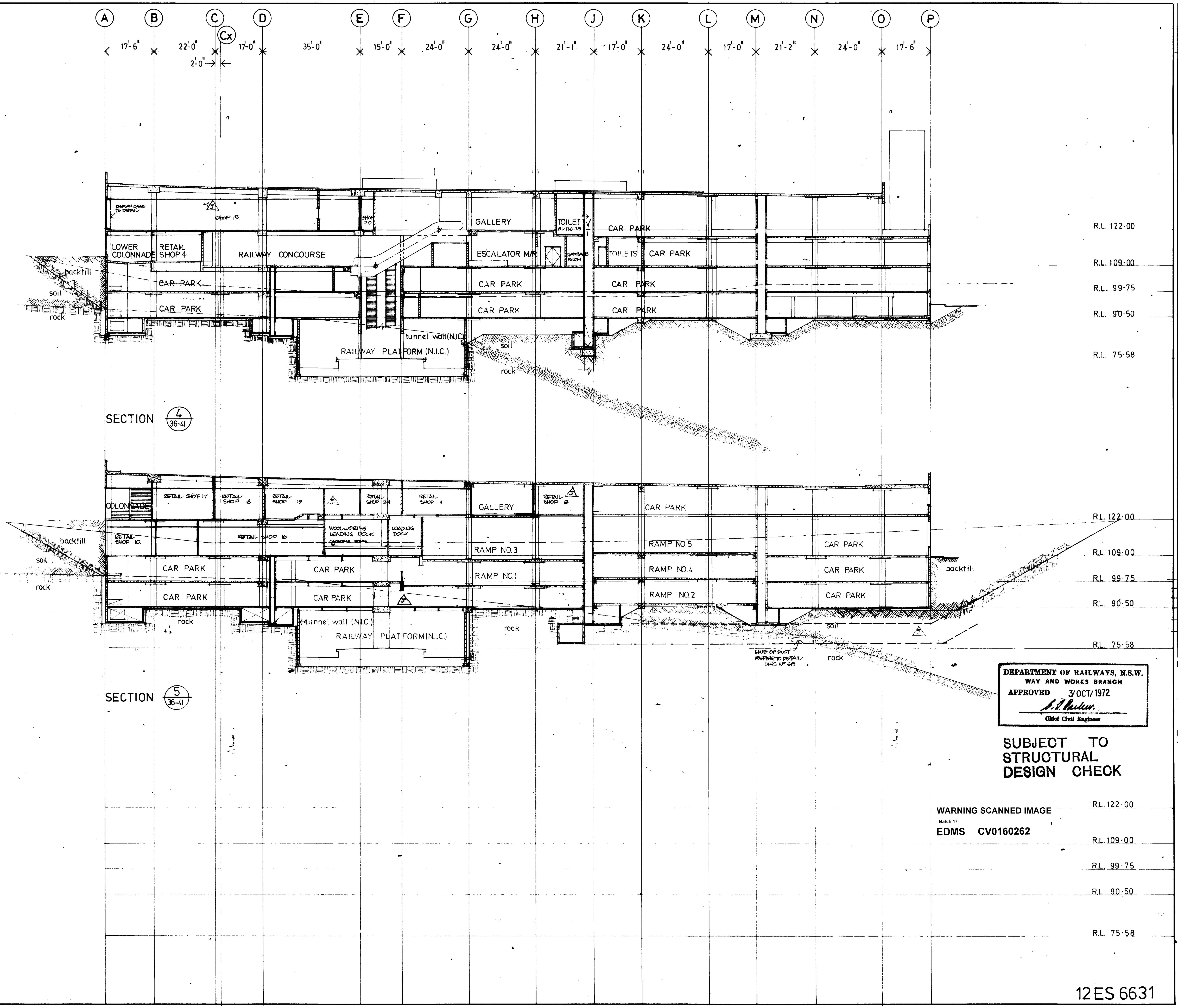
Anti-Vibration pads to be placed on piers on grids ©①Ⓔ + Ⓕ (62 pads)

Do not project first floor slab past wall footing.

ST JAMES GLEBE PRECINT B1
FOOTING LAYOUT
GLASHE GAZZARD & PARTNERS-ARCHITECTS
RANKINE & HILL
CHARTERED ENGINEERS (AUST.)
CONSULTING STRUCTURAL ENGINEERS
40 MILLER ST NORTH SYDNEY 92 0295
DATE 7.1.68
SCALE 1" = 1'-0"
DRG. No. DS6376-PS
A REVISED 5.2.68
B REVISED 27.2.68
C REVISED 27.2.68

PRELIMINARY

NEW SOUTH HEAD ROAD
OCEAN STREET
GLEBE STREET
HERBERT STREET
ARTHUR STREET
No.1 Rock RL 99.8' ~ 27.7m
No.4 Rock RL 98.8' ~ 30.1m
No.101 Rock RL 104.5' ~ 31.9m
No.2 Rock RL 82.1' ~ 25.0m
No.7 Rock RL 96.7' ~ 29.5m
No.9 Rock RL 108.7' ~ 33.1m
No.105 Rock RL 89.2' ~ 27.2m
No.12 Rock RL 81.0' ~ 24.7m
No.100 Rock RL 85.8' ~ 26.2m
No.100 Rock RL 103.7' ~ 31.6m
No.9 Rock RL 109.6' ~ 33.4m
No.3 Rock RL 38.5' ~ 11.7m
No.5 Rock RL 64.6' ~ 19.7m
No.6 Rock RL 82' ~ 25.0m
No.104 Rock RL 93.4' ~ 28.5m
No.11 Rock RL 128.4' ~ 39.1m
EXCAVATION LEVEL R.L. 89.75
EXCAVATION LEVEL R.L. 85.00
EXCAVATION LEVEL R.L. 121.25
EXCAVATION LEVEL R.L. 69.75 in rock R.L. 72.00 in sand
EXCAVATION LEVEL R.L. 117.50
EXCAVATION LEVEL R.L. 89.75
EXCAVATION LEVEL R.L. 114.00
APPROX. LOCATION OF PETROL TANKS
APPROXIMATE ROCK CONTOURS
BUILDINGS TO BE RETAINED
TYPICAL SECTION IN SAND 1/16" to 1'-0"
TYPICAL SECTION IN ROCK 1/16" to 1'-0"
NOTE: APPROXIMATE LOCATION OF SOME EXISTING RETAINING WALLS TO BE REMOVED SHOWN ON THE PLAN
NORTH
EXTENT OF EXCAVATION LINE
EXTENT OF BUILDING LINE
Clarke Gazzard Pty Ltd Architects
EDMS CV0160260
EDGECLIFF GLEBE REDEVELOPMENT PRECINCT B STAGE 2 PODIUM FOR THE GLEBE ADMINISTRATION BOARD
EXCAVATION PLAN
1" TO 16' 0"
25.1.71
S.S.
70128
29
E
12 ES 6629



Date	Revisions	By	Ck	No.
8.6.71	AMENDMENT No. A			
2.8.71	AMENDMENT No. B			
23.8.71	AMENDMENT No. C			
10.9.71	AMENDMENT No. D			
17.9.71	AMENDMENT No. E			
3.11.71	AMENDMENT No. F			
JAN 72	NEW DRAWING AND GENERAL REVISIONS			G
				H

Clarke Gazzard Pty Ltd
Architects

MLC Building, Victoria Cross, North Sydney, NSW 2060. Tel. 929 0855

Job
EDGECLIFF GLEBE REDEVELOPMENT
STAGE 2 PRECINCT B
PODIUM FOR GLEBE ADMINISTRATION BOARD

Title
SECTIONS

Scale
1" TO 16'-0"

Date | Drawn | Checked

Job No. 70128 | Drawing No. 42 | Revision No. J

Check all dimensions on site before work commences. Figured dimensions only to be used. Report any discrepancies to the architect for discussion before proceeding with the work. If the contractor considers that execution of any work shown on the drawing involves a variation, he shall inform the architect in writing and obtain written approval to proceed before executing the work.

SECTION 3 36-41
BUS STATION
top of kerb
Slope
7" kerb
CAR PARK
WALKWAY
RETAIL SHOP
CAR PARK ENTRY
DUCT
RAILWAY PLATFORM
R.L. 75.98
R.L. 124.00
LOADING DOCKS
SWITCH ROOM
SUB-STATION
BUS TUNNEL
R.L. 130.00 (SEE CONSULTANTS DRAWINGS)
R.L. 147.00
R.L. 207.00 ROOF
R.L. 195.00
R.L. 184.00
R.L. 172.00 BUILDING 'B'
RL 118.25
RL 109.00
RL 99.75
RL 90.50
R.L. 118.25' CAR PARK
R.L. 109.00' SHOPS AND CAR PARK
R.L. 99.75' CAR PARK
R.L. 90.50' CAR PARK
rock level as existing
NOTE: TRUCK ACCESS ROAD LEVELS AS SET OUT ON CIVIL ENGINEERS DRAWING No. SC0183/2.
DEPARTMENT OF RAILWAYS, N.S.W.
WAY AND WORKS BRANCH
APPROVED 3 OCT 1972
Chief Civil Engineer
SUBJECT TO STRUCTURAL DESIGN CHECK
SECTION 7 36-41
PARK
ramp from Ocean St.
ramp from NSH Rd.
ramp to NSH Rd.
ramp to Ocean St.
PLAZA
RETAIL SHOP 23
RETAIL SHOP 18
line of sub station and plant room behind
line of car park behind
HOLD THIS SECTION
New South Head Road
RL 138.00' PLAZA
RL 118.25' SPECIALTY SHOP
RL 109.00' CAR-PARK
RL 99.75' CAR-PARK
RL 90.50' CAR-PARK
RL 75.58' RAILWAY PLATFORM EDGE
WARNING SCANNED IMAGE
EDMS CV0160263
12ES 6632

Date	Revisions	By	Ck	No.
30-5-72	Addition of building B. Railway ambulances amended. Parking level RL 99.75 extended. Positions of exhaust & supply ducts amended			F
26-7-72	8" conc. block in lieu of conc.			E
4/11/71	Vertical duct at grid 14 & ...			D
5/10/71	Block wall under ramp at RL 90.50 shown. Duct at RL 84.75 on grid 20 altered. Columns at RL 90.50 altered			
28/9/71	Beams in section 3 altered			C
17-8-71	...			B
8/6/71	Section 7 added. Loading dock, plant room altered. Pedestrian access to park added			A

Clarke Gazzard Pty Ltd Architects

MLC Building, Victoria Cross, North Sydney, NSW 2060 Tel. 929 0855

EDGECLIFF GLEBE REDEVELOPMENT STAGE 2 PRECINCT B PODIUM FOR GLEBE ADMINISTRATION BOARD

Title: SECTIONS

Scale: 1" TO 16'0"

Date	Drawn	Checked

Job No.	Drawing No.	Revision No.
70128	43	F

Check all dimensions on site before work commences. Figured dimensions only to be used. Report any discrepancies to the architect for discussion before proceeding with the work. If the contractor considers that execution of any work shown on the drawing involves a variation, he shall inform the architect in writing and obtain written approval to proceed before executing the work.

28 SEP 1972

14 15 16 17 18 19 20 21 22 23 24 25 25A 26 27 28 29 30 31 32 33 34
BUS STATION
PLAZA
GALLERY
RL 138.00
backfill
earth
rock
FINISHES N.I.C.
COVERED WAY
ESCALATOR MACHINE RM
PLANT ROOM
PLANT ROOM
CAR-PARK
CAR-PARK
RAMP NO 3
RAMP NO 1
RETAIL SHOP
RAILWAY PLATFORM
line of tunnel portal
R.L. 122.00
R.L. 118.25
R.L. 109.00
R.L. 99.75
R.L. 90.50
R.L. 122.00 GALLERY & SPECIALTY SHOP
R.L. 118.25 SPECIALTY SHOP & CAR PARK
R.L. 109.00 RAILWAY CONCOURSE & CAR PARK
structural levels
R.L. 99.75 CAR PARK
R.L. 90.50 CAR PARK
R.L. 75.58 RAILWAY PLATFORM
(at edge of platform, R.L. 75.75 at crown)
SECTION 2 36-41
NOTE— REFER TO ENGINEERS DRAWINGS FOR DETAILS ON FOOTINGS
HOLD EAST OF GRIDLINE 22
DEPARTMENT OF RAILWAYS, N.S.W.
WAY AND WORKS BRANCH
APPROVED 3 OCT 1972
Chief Civil Engineer
SUBJECT TO STRUCTURAL DESIGN CHECK
REFER TO STRUCTURAL DRAWINGS FOR TRANSFER BEAM DETAILS
WARNING SCANNED IMAGE
EDMS CV0160264
BUS STATION
WOOL-WORTHS SHOP 15
GOODS HOIST
GOODS HOIST
RETAIL SHOP 23
RAILWAY CONCOURSE finishes N.I.C.
RETAIL SHOP 17
SHOP 18
CAR-PARK
CAR-PARK
CAR-PARK
CAR-PARK
existing ground level
existing rock level
line of duct behind RL 84.00
RAILWAY TUNNEL [Finishes N.I.C.]
tunnel portal
rock excavation R.L. 69.75 N.I.C.
R.L. 122.00 SPECIALTY SHOP
R.L. 109.00 RAILWAY CONCOURSE & SHOPS
structural levels
R.L. 99.75 CAR PARK
R.L. 90.50 CAR PARK
RL 75.58 RAILWAY PLATFORM
(at edge of platform, R.L. 75.75 at crown)
RL 75.58
SECTION 1 36-41
16'-6" 23'-0" 26'-0" 26'-0" 26'-0" 26'-0" 26'-0" 26'-0" 26'-0" 26'-0" 26'-0" 17'-6" 2'-6" 20'-0" 20'-0" 20'-0" 20'-0" 20'-0" 20'-0" 20'-0"
12ES 6633

Date	Revisions	By	Ck	No.
	EXHAUST STACKS EXTENDED R.L. 124.00. ADDED WOOLWORTHS GOODS HOISTS ADDED EAST OF GRID. 25. AMENDED			E
8.6.72	BEAM DOWN TO 131.25 TO GALLERY LEVEL - SECTION 2.			D
27/9/71	ELIMINATES TWO DOORS INTO GALLERY AT SECTION 2. STRUCTURAL LEVELS NOTE ADDED. Beams on sections altered			C
17.8.71	Column between grids 23, 24 added. Doors of former specialty shop removed. Gallery area extended on RL 118.25, ceiling line made uniform. Openings in vertical ducts shown. Column along grid. 21 altered. Line of underground duct shown. Columns in railway tunnel removed			B
8/6/71	Level of plaza changed from RL. 141.00 to RL 138.00			A

Clarke Gazzard Pty Ltd
Architects

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Job
EDGECLIFF GLEBE REDEVELOPMENT STAGE 2 PRECINCT B PODIUM FOR GLEBE ADMINISTRATION BOARD

Title
SECTIONS

Scale 1" TO 16'0"

Date 21.4.71 | Drawn | Checked

Job No. 70128 | Drawing No. 44 | Revision No. E

Check all dimensions on site before work commences. Figured dimensions only to be used. Report any discrepancies to the architect for discussion before proceeding with the work. If the contractor considers that execution of any work shown on the drawing involves a variation, he shall inform the architect in writing and obtain written approval to proceed before executing the work.

28 SEP 1972

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