
Acid Sulfate Management Plan

Proposed Seniors Housing

2-32 Junction Street, Forest Lodge NSW

Prepared for Corio Projects Pty Ltd

Project 229796.02

2 June 2025

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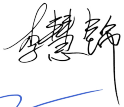
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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature

Date

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Reviewer		2 June 2025

Executive Summary

Douglas Partners Pty Ltd (Douglas) has been engaged by Corio Projects Pty Ltd to prepare this Acid Sulfate Soil Management Plan (ASSMP) for a proposed seniors housing at 2-32 Junction Street, Forest Lodge NSW (the site).

The objective of this ASSMP is to provide management methods and procedures to minimise environmental impacts resulting from the disturbance of acid sulfate soils (ASS) during the construction of the proposed development. It is understood that the report will be used to support a State Significant Development (SSD-75493483) application addressing the Planning Secretary's Environment Assessment Requirements (SEARs) Contamination and Remediation (SEARs Item 13).

This ASSMP provides a summary of previous ASS test results, neutralisation and treatment methods, verification testing and monitoring requirements, emergency response procedures and contingency measures.

The proposal involves the construction and operation of a Seniors Housing at 2-32 Junction Street, Forest Lodge, comprising, as indicated by the project planner:

- Earthworks involving cut and fill;
- Augmentation of existing services and infrastructure such as water, power and sewer;
- Construction of car parking comprising 79 car parking spaces on Lower Ground Floor and Ground Floor;
- Construction of a 6-storey building containing a Residential Aged Care Facility (RACF) and Independent Living Units (ILUs), including:
 - o 71 ILUs. Including 4 one-bedroom units, 43 two-bedroom units and 24 three-bedroom units, split across Levels G-5;
 - o Residential Care Units comprising 12 beds, located on Level 1;
 - o Staff administration areas; and
 - o Amenities including cinema, hair salon, café, courtyard and multipurpose space.
- Construction of publicly accessible open space located at the rear of the building and expanding on the existing Larkin Street Reserve;
- Construction of a paved accessway along the north boundary of the site;
- Construction of a dedicated pedestrian laneway along the south boundary of the site; and
- Provision of associated landscaping.

From a groundworks perspective the proposed development of the site may be summarised as the partial demolition of the existing buildings and pavements on the site, and construction of a new six storey building with two levels of parking at Ground and Lower Ground floor levels, over a Loading Bay Lower Floor level. The front part of the existing building (fronting Junction Street) is considered heritage 'contributing' and will be retained.

Douglas previously conducted a geotechnical investigation with ASS investigation in 2025 including ASS screening and laboratory testing for Chromium Suite (SCr) testing. PASS was identified above the action criteria for management in fill below the water table in proximity to the buried creek, at depths ranging from approximately 3 m to 5 m bgl (approximately RL 5.5 m to 7.5 m AHD).

The works for the proposed development are expected to disturb PASS, including during remediation and piling. On-site treatment followed by off-site disposal is considered to be the most appropriate treatment method for the PASS impacted fill for the proposed works. PASS present in uncontaminated natural alluvial soil may be suitable for off-site reburial below the permanent water table without treatment, if further testing indicates this option is appropriate.

All works must also be undertaken in accordance with the RAP (Douglas, 2025c), including appropriate controls for managing risk from asbestos.

This ASSMP provides the ASS management procedures to be enacted to minimise the impact of ASS disturbance on the environment during the proposed works.

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Acid Sulfate Management Plan

Proposed Seniors Housing

2-32 Junction Street, Forest Lodge NSW

1. Introduction

Douglas Partners Pty Ltd (Douglas) has been engaged by Corio Projects Pty Ltd to prepare this Acid Sulfate Soil Management Plan (ASSMP) for a proposed seniors housing at 2-32 Junction Street, Forest Lodge NSW (the site). The site is shown on Drawing 1, Appendix A.

The objective of this ASSMP is to provide management methods and procedures to minimise environmental impacts resulting from the disturbance of acid sulfate soils (ASS) during the construction of the proposed development. It is understood that the report will be used to support a State Significant Development (SSD-75493483) application addressing the Planning Secretary's Environment Assessment Requirements (SEARs) Contamination and Remediation (SEARs Item 13).

This ASSMP provides a summary of previous ASS test results, neutralisation and treatment methods, verification testing and monitoring requirements, emergency response procedures and contingency measures.

This ASSMP is devised on the basis of the guidelines and reference documents endorsed by NSW EPA and with reference to other national guidelines where considered appropriate and includes the following key guidelines:

- Acid Sulfate Soil Management Advisory Committee (ASSMAC), *Acid Sulfate Soil Manual 1998* (Stone, Ahern, & Blunden, 1998).
- QLD Department of Resources, QLD Department of Environment and Science, *Acid Sulfate Soil Technical Manual: Soil Management Guidelines, Version 5.1* (Dear, et al., 2024).
- Department of Agriculture and Water Resources (DAWR), *National Acid Sulfate Soils Guidance: National acid sulfate soils identification and laboratory methods manual* (Sullivan, et al, 2018a).
- DAWR, *National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual* (Sullivan, et al, 2018b).

This report must be read in conjunction with all appendices, including the notes provided in Appendix A.

2. Site information and environmental setting

Site address	2-32 Junction Street, Forest Lodge NSW
Legal description	Lot 1 Deposited Plan 575200 Lot B Deposited Plan 87371 Lot 1 Deposited Plan 584394

	Lot 1 Deposited Plan 1035720 Lot 1 Deposited Plan 1092420 Lots A to C Deposited Plan 439209
Area	4,870 m ²
Zoning	MU1 Mixed Use
Local Council Area	Council of the City of Sydney
Current use	Office buildings with parking
Surrounding uses	North-west – Residential, commercial, followed by Bridge Road and residential. North-east – Junction Street followed by residential. South-west – Residential and commercial, and Larkin Street. West – Residential and commercial, and Sparkes Street.
Regional topography	Regional topography appears to slope gently towards the site (from the west, east and south) and Orphan School Creek, and then trends north following the creek.
Site topography	Site topography appears to slope gently downwards towards the adjacent Orphans School Creek (south-west). Reference to the NSW 2 m Elevation Contour Map indicates that site levels are at approximately 14 m relative to Australian Height Datum (AHD) along the eastern boundary, and 12 m AHD along the western boundary (bordering Orphans School Creek).
Soil landscape	Reference to the Sydney 1:100 000 Soils Landscape Sheet indicates that the site is underlain by Blacktown residual soils, which typically comprises shallow to moderately deep red and brown podzolic soils on crests, upper slopes and well-drained areas, as well as deep yellow podzolic soils and soloths on lower sloped in areas of poor drainage. The site is also mapped to be within 50 m (northwest) of GyMEA erosional soils which typically comprises localised podzolic soils and yellow podzolic sands, and shallow to moderately deep siliceous sands and leached sands.
Geology	Reference to the Sydney 1:100 000 Geology Sheet indicates that the site is underlain by Ashfield Shale of the Wianamatta Group, which typically comprises black to dark-grey shale and laminite. The site is also mapped to be within 50 m (north-west) of Hawkesbury Sandstone, which typically comprises medium to coarse grained quartz sandstone, very minor shale and laminite lenses. Hawkesbury Sandstone is expected to underlie the Ashfield Shale. The site is also mapped to be underlain by anthropogenic material along the western boundary, which appears to follow Orphan School Creek. Anthropogenic deposits typically vary from large man-made clasts (concrete blocks to demolition rubble) to quarried natural boulders, with interstitial sand-sized to clay matrix.

Surface water	Surface water flows are anticipated to be collected by local stormwater systems, or flow directly into Orphans School Creek, adjacent to the western boundary of the site (present as a covered concrete culvert stormwater drainage channel).
Groundwater	A search of the publicly available registered groundwater bore database indicated that there are six registered groundwater bores within 500 m of the site. The six bores were typically south or southeast of the site, and the standing water level (SWL) was recorded at 2.7 m at a monitoring bore 250 m south-east of the site. Based on the regional topography and the inferred flow direction of nearby water courses, the anticipated flow direction of groundwater beneath the site is to the north-west, along the Orphans School Creek valley. Orphans School Creek is a tributary of Johnstons Creek, which flows into Blackwattle Bay (located approximately 1.3 km north of the site), the likely receiving surface water body for the groundwater flow path. Given the highly urbanised nature of the catchment, sensitive beneficial uses of the groundwater are considered unlikely.
Acid sulfate soils (ASS)	Reference to the NSW Department of environmental and Climate Change 1:25,000 Acid Sulfate Soil Risk Mapping indicates that the site is within 30 m of an area of disturbed terrain (north-west of the site), where soil investigations are required to assess the area for ASS. It is, however, noted that the site itself is not mapped as having a risk of ASS. Reference to the Sydney Local Environmental Plan 2012 indicates that the site is mapped as 'Class 5' land. For 'Class 5' land, development consent is required for works within 500 m of adjacent Class 1, 2, 3 or 4 land that is below 5 m AHD, and by which the water table is likely to be lowered below 1 m AHD on adjacent Class 1, 2, 3 or 4 land. An ASS assessment was completed as part of the geotechnical investigation (Douglas, 2025a) and is summarised in Section 5.2 of this report.

3. Background on acid sulfate soils, risk categories and action criteria

ASS are naturally occurring sediments that contain reduced inorganic sulfur (RIS), including iron sulfides, (primarily pyrite), commonly deposited in estuarine environments.

Further details on the formation of ASS are in Appendix C and the relevant guidelines cited in Section 1. ASS can either be classified as 'actual acid sulfate soils' (AASS) which are soils that have already reacted with oxygen to produce acid, or 'potential acid sulfate soils' (PASS) and are often found in the same soil profile, with AASS overlying PASS. PASS are soils containing iron sulfide that have not been exposed to oxygen (e.g. soils below the water table). PASS therefore have not produced sulfuric acid but have the potential to do so if exposure to oxygen occurs.

ASS field and laboratory-based criteria for assessing whether soils are classified as PASS / AASS and/or, exceed the action criteria for management if disturbed, are provided in Appendix C.

Dear, et al. (2024) relates environmental risk from ASS to the treatment level and volume of disturbance of ASS. Based on the tonnage of ASS to be disturbed and the average net acidity, the proposed disturbance of the site soils is categorised as one of the following:

- Low level of treatment: Category L;
- Medium level of treatment: Category M;
- High level of treatment: Category H;
- Very High level of treatment: Category VH; and
- Extra High level of treatment: Category XH.

The assessment of risk categorisation for this ASSMP is provided in Section 7.2

The action criteria adopted for this ASSMP for determination of the presence of PASS / AASS are provided in Appendix C and included in Table 1, Appendix B. The action criteria adopted for this ASSMP for determination of when management of ASS and an ASSMP is required are provided in Appendix C.

4. Proposed development

The proposal involves the construction and operation of a Seniors Housing at 2-32 Junction Street, Forest Lodge, comprising, as indicated by the project planner:

- Earthworks involving cut and fill;
- Augmentation of existing services and infrastructure such as water, power and sewer;
- Construction of car parking comprising 79 car parking spaces on Lower Ground Floor and Ground Floor;
- Construction of a 6-storey building containing a Residential Aged Care Facility (RACF) and Independent Living Units (ILUs), including:
 - o 71 ILUs. Including 4 one-bedroom units, 43 two-bedroom units and 24 three-bedroom units, split across Levels G-5;
 - o Residential Care Units comprising 12 beds, located on Level 1;
 - o Staff administration areas; and
 - o Amenities including cinema, hair salon, café, courtyard and multipurpose space.
- Construction of publicly accessible open space located at the rear of the building and expanding on the existing Larkin Street Reserve;
- Construction of a paved accessway along the north boundary of the site;
- Construction of a dedicated pedestrian laneway along the south boundary of the site; and
- Provision of associated landscaping.

From a groundworks perspective the proposed development of the site may be summarised as the partial demolition of the existing buildings and pavements on the site, and construction of a new five storey building with two levels of parking at Ground and Lower Ground floor levels, over a Loading Bay Lower Floor level. The front part of the existing building (fronting Junction Street) is considered heritage 'contributing' and will be retained.

As shown on the provided architectural drawings prepared by WMK Architecture, attached in Appendix A, the parking levels will generally be suspended above existing ground levels across most of the site. It is understood that there will be no general access to the subfloor area except for the loading dock area.

The lowest proposed 'Loading Bay Lower Floor' level (generally comprising a loading dock and storage areas), for which the proposed floor level is at RL 10.6 m AHD, which is close to or only slightly below existing site levels at the southwest edge of the site, and generally below existing site levels towards the northeast, up to a maximum of approximately 3 m below existing site levels near the northern end of the site and the driveways adjacent to either side of the existing office building, where maximum existing surface levels are up to approximately RL 14 m. It is expected that bulk excavation to form the 'Loading Bay Lower Floor' will be required up to maximum depths of approximately 3.5 m.

5. Review of previous investigations

5.1 Previous investigations

The following previous reports are relevant to the current investigation:

- Douglas *Report on Geotechnical Investigation, Proposed Seniors Housing, 2-32 Junction Street, Forest Lodge NSW*, Douglas Partners Pty Ltd, ref 229796.00.R.001.Rev1, dated 26 May 2025 (Douglas, 2025a);
- Douglas *Report on Detailed Site Investigation, Proposed Seniors Housing, 2-32 Junction Street, Forest Lodge NSW*, Douglas Partners Pty Ltd, ref 229796.01.R.001.Rev1 (Douglas, 2025b); and
- Douglas *Remediation Action Plan, Proposed Seniors Housing, 2-32 Junction Street, Forest Lodge NSW*, Douglas Partners Pty Ltd, ref 229796.01.R.002.Rev1 (Douglas, 2025c).

5.2 Geotechnical Investigation – Douglas (2025a)

Douglas previously conducted a geotechnical investigation and ASS investigation for the site in 2025 to assess the subsurface soil, rock and groundwater conditions and included a preliminary ASS screening and laboratory testing including Chromium Suite (SCr) testing. The investigation included:

- Drilling of three boreholes – BH101, BH102, and BH103 – to depths of 7.05 m, 5.84 m and 6.8 m below ground level (bgl) respectively;
- Installation of groundwater wells at all three locations to assess groundwater depth and quality; and
- Analysis of selected soil samples from below the observed water table for ASS (field) screening tests and detailed laboratory testing for suspension peroxide oxidation combined

acidity & sulfur (SPOCAS) and chromium reducible sulfur (S_{cr}) testing, including net acidity (acid base accounting).

Locations of the boreholes is included in Drawing 2, Appendix A.

Borehole logs for BH101 to BH103 are provided in Appendix B. The top of rock was encountered at depths of 6.65 m, 5.8 m and 1.4 m bgl respectively. Groundwater was recorded during augering in two of the boreholes (BH101, in fill at 3.4 m bgl / 8 m AHD; BH102, in fill at 3 m bgl / 7.7 m AHD) and in the groundwater wells at depths between 7.2 m to 8.4 m AHD. The groundwater was recorded in fill soils in BH101 and BH102 and in sandstone in BH103.

Soils were encountered below the water table in two of the three boreholes (BH101 and BH102), and comprised:

- Fill;
- Possible alluvial clayey sand (BH101 only); and
- Residual clayey sand.

The results of the previous ASS testing results and summary table are provided in Appendix B and included in Table 1 below.

Table 1: Results of Laboratory Results

Borehole ID	Depth (m)	Material Description	S_{cr} (%w/w S)	Net Acidity without ANC (%w/w S)
BH101 (BH01)	3.0-3.1	Light to Medium Clay (fill)	0.008	0.03
BH101 (BH01)	3.5-3.6	Sandy Clay (fill)	0.01	0.04
BH101 (BH01)	3.9-4.0	Sandy Clay (fill)	0.02	0.03
BH101 (BH01)	4.5-4.6	Sandy Clay (fill)	0.06	0.06
BH101 (BH01)	5.0-5.1	Clayey Sand (possible alluvial)	0.03	0.04
BH102 (BH02)	3.0-3.1	Sandy Clay (fill)	0.04	0.05
BH102 (BH02)	3.5-3.6	Sandy Clay (fill)	0.12	0.15
BH102 (BH02)	3.9-4.0	Sandy Clay (fill)	0.1	0.02
Action Criteria				
>1000 tonnes disturbed		All textures	0.03	0.03
1 to 1000 tonnes disturbed	Sands to loamy sands		0.03	0.03
	Clayey sand to light clays		0.06	0.06
	Light, medium to heavy clays		0.1	0.1

Note: 2.7 = red font: exceeds action criteria, refer to Table 1, Appendix B

As a result of the confirmed presence of PASS, Douglas (2025a) recommended an ASSMP was required prior to the commencement of excavation and piling works.

5.3 Detailed Site Investigation (Douglas, 2025b)

Douglas (2025b) is a detailed site investigation (DSI) report. The objective of the DSI was to assess the suitability of the site for the proposed development and whether further investigation and / or management is required.

The scope of work for the DSI comprised a desktop review of historical information and an intrusive investigation comprising of 11 contamination boreholes (BH201 to BH210) drilled to depths ranging from 0.5 m to 3.5 m bgl to auger refusal and the three geotechnical boreholes (BH101 to BH103, as discussed above). Selected soil samples collected from the 14 boreholes and a groundwater sample collected from the well installed in BH101 were analysed for contaminants of potential concern (CoPC). Locations of the boreholes is included in Drawing 2, Appendix A.

Boreholes BH201 to BH210 encountered fill, with sandstone or inferred sandstone recorded in nine encountered in nine of the ten boreholes. Natural soil was not recorded in any of the boreholes. Groundwater was recorded during augering in one of the boreholes (BH208, at 1.4m bgl / 8.9 m AHD).

Various contaminants in soil samples were detected above the adopted site assessment criteria (SAC) including asbestos, lead, copper, nickel, zinc, benzo(a)pyrene (B(a)P) TEQ, and total recoverable hydrocarbon (TRH). In relation to the locations where PASS was detected, asbestos was detected above the adopted health investigation level (HIL) in BH101, with friable asbestos potentially present at 1.5-1.6 m bgl. Lead was detected above the adopted HIL at BH102 at 2.4-2.5 m bgl and B(a)P TEQ exceeded the adopted HIL for the proposed public park at BH208 at 0.4-0.5 m bgl which is within the vicinity of BH102.

CoPC in groundwater collected from BH101 were below practical quantitation limit (PQL) or the SAC. Anthracene and chlorpyrifos were above the ecological SAC, however, this was not expected to pose an unacceptable risk to ecological receptors.

Based on the results of the DSI, it was considered that the site could be made suitable for the proposed development subject to the implementation of a remediation action plan (RAP) in accordance with the NSW EPA (2020).

5.4 Remediation Action Plan – Douglas (2025c)

Douglas (2025c) is a RAP prepared for the Proposed Seniors Housing at the site. The objective of the RAP was to address potentially unacceptable risk to relevant environmental values from contamination and render the site suitable, from a contamination perspective, for the proposed development. The extent of remediation comprises uncontrolled fill within remediation area 1 (RA1) in the proposed seniors housing area which includes identified CoPC such as copper, nickel, zinc, TRH F3, and asbestos and remediation area 2 (RA2) within the proposed park and laneway area which includes identified CoPC such as copper, lead, zinc, B(a)P TEQ, and potentially asbestos (Refer to Drawing 3, Appendix A for remediation areas).

An on-site management remediation strategy has been adopted for RA1, and excavation and off-site disposal has been adopted for RA2.

5.5 Summary of ASS at the site

The results of the field investigation and laboratory testing undertaken as part of the above investigations (Douglas, 2025a; 2025b) identified the following:

- The PASS is present within the fill, and possibly within alluvial sediments, with soil potentially containing PASS identified in three boreholes (BH101, BH102 and BH208);
- PASS is present in the west of the site below the water table in proximity to the buried creek. PASS is not expected to be present in the east of the site, where the groundwater table is within the bedrock (noting localised PASS may be present associated with former infilled drainage channels – if any are present at the site). A sketch of the approximate possible extent of PASS based on the available data is provided on Drawing 4 and 5, Appendix A; and
- Material potentially containing PASS were encountered at depths ranging from approximately 3 m to 5 m bgl (approximately RL 5.5 m to 7.5 m AHD). Note the depth to PASS in the profile is likely to vary across the impacted area, noting it was only encountered in three boreholes.

6. Data gap assessment

The current data is considered appropriate to support management of ASS based on conservative assumptions. However, given only two boreholes, located relatively close to each other, have been tested for ASS, thus, additional investigation in areas of proposed excavation along the potential ASS occurrence zone may be able to better delineate the extent of PASS, and thereby reduce the volume of materials subject to ASS management. Further assessment is considered necessary if management of alluvial PASS in accordance with Section 8.5 of this ASSMP is being considered.

7. Potential for oxidising acid sulfate soil and risk categorisation

7.1 Acid sulfate soil oxidation potential

Based on the results of previous investigations (refer to Section 5), any excavations which disturb or uncover fill or alluvial sediments below the water table in proximity to the buried creek (refer to Drawing 4, Appendix A) have the potential to disturb / oxidise PASS. Based on the proposed development (refer to Section 4) this could include:

- Excavation of contaminated fill potentially containing PASS in RA2 (proposed park and road to be dedicated to Council);
- Piling for building foundations / shoring;
- Excavation of fill potentially containing PASS in the west portion of the site to divert the existing sewerage line at 7.9 m AHD; and
- ASS may also be exposed during dewatering, where required (i.e. if excavation beneath the groundwater table and subsequent dewatering of ASS is required).

No finalised plans were provided by the client, therefore, the volume of ASS likely to be disturbed by the development is approximately in the order of 1000T as a conservative measure based on areas to be excavated as part of the proposed development.

Upon finalisation of plans for the proposed development, the total volume of ASS likely to be disturbed by the development should be calculated prior to the start of construction works to allow appropriate planning for treatment in accordance with this ASSMP.

Any disturbance (e.g. excavation or dewatering) of ASS must be undertaken in accordance with this ASSMP.

On the basis of the result of assessment in Douglas (2025a; 2025b) and the conceptual site model above, the following proposed construction activities are unlikely to require ASS management:

- Excavations in areas where the water table is in the rock, as has previously been identified in the east of the site.

7.2 Assigned risk categorisation

The risk categorisation and formulating this ASS management strategy considers:

- Proximity to the adjacent Orphans School Creek which is a tributary of Johnstons Creek which flows to Blackwattle Bay (located approximately 1.3 km north of the site) and associated ecosystem; and
- Previous ASS results and soil types.

Dear, et al. (2024) relates environmental risk from ASS to the treatment level and volume of disturbance of ASS. Based on the proposed development, the subsequent tonnage of ASS to be disturbed (estimated 1000 tonnes as per Section 7.1), maximum net acidity (0.15%w/w S as per Section 5.2), the proposed disturbance of the site soils is considered to be:

- Extra High level of Treatment (XH).

8. Acid sulfate soil management

8.1 Roles and responsibilities

The following key roles and responsibilities are relevant to this ASSMP:

- Contractor: the contractor with responsibility to implement this ASSMP during earthworks / dewatering etc.;
- Site Supervisor: head representative for the Contractor responsible for the day-to-day site operations including management of ASS; and
- Environmental Consultant: data collection / verification testing and documentation of the works, as per this ASSMP.

8.2 Management of contamination

All works must also be undertaken in accordance with the RAP (Douglas, 2025c), including appropriate controls for managing risk from asbestos. General information on controls for

asbestos is outlined in Table 2 below. The RAP and asbestos removal control plan (ARCP) (when prepared) should be referenced for further information.

Table 2: Summary of Asbestos Controls

Item	Requirement	
Status of works (licence)	Non-friable Class B	Friable, Class A *
Access	Work area to be fenced and signposted (refer to Appendix E).	
PPE	PPE is required (refer to RAP / ARCP).	
Dust control	Moisture condition the stockpile. Cover with plastic whilst not being treated, where feasible (refer to RAP / ARCP).	
Decontamination	Decontamination is required (refer to RAP / ARCP).	
Clearance inspection(s)	Licensed Asbestos Assessor (LAA) or Competent Person	LAA
Air monitoring	Air monitoring is required to be undertaken for the duration of treatment works.	
	Undertaken by LAA or Competent Person	Undertaken by LAA

8.3 Management options

Stone, Ahern, & Blunden (1998) and Dear, et al. (2024) provides the following potential soil management options:

Option 1	On-site treatment (neutralisation) followed by off-site disposal; and / or
Option 2	Off-site treatment and disposal.
Option 3	On-site reburial below the permanent water table without treatment (PASS only).

Based on the proposed development, the following options are covered by this ASSMP:

- Option 1 – On-site treatment followed by off-site disposal.
- Option 3 – Off-site reburial below the permanent water table without treatment. This option is only available for PASS in natural alluvial sediments and is not suitable for PASS in fill which forms the majority of PASS identified at the site. Note current data suggests only limited soil may be potentially suitable for this option, and further investigation should be conducted to assess if this option is appropriate prior to its adoption.

Non-excavation would be an appropriate option from an ASS management perspective, for the proposed park and road excavation, however this would require Council to agree to on-site containment of potentially contaminated fill in these areas. This has therefore not been considered further at this stage.

The preferred management options have been selected with reference to the relevant guidelines and reference materials, and site constraints. Other options generally have higher cost implications and/or are not viable options for the site. It is the responsibility of the Contractor to

manage ASS under this ASSMP and in accordance with relevant standards and statutory requirements. Verification sampling and testing must be undertaken by the Environmental Consultant.

8.4 **Proposed management strategy for on-site treatment followed by disposal**

8.4.1 **General**

The process for treatment of excavated ASS comprises:

- Preparation of a treatment pad as described in Section 8.4.2;
- Excavation and segregation / stockpiling and treatment of ASS:
 - o For coarse soils (i.e. sands), treatment should occur within approximately 12 to 18 hours (or less) following excavation; and
 - o For fine-grained soils (i.e. clays), treatment should occur within approximately 40 to 60 hours following excavation. Faster oxidation rates are possible, particularly in warm weather.
- Treatment via spreading the ASS over the guard layer in layers of up to 0.3 m thick, leaving a 1 m buffer between the toe of the spread soil and the containment bund or drain. When spreading the first soil layer, care should be taken not to churn up the guard layer;
- Application of aglime over the 0.3 m layer at the minimum lime dosing rate (refer to Section 8.4.3) and harrow / mix thoroughly. Use of rotary plough equipment (e.g. auger bucket) may be appropriate for cohesive soils, where adequate mixing is difficult to achieve. If ASS materials are too wet, adequate mixing of aglime cannot be achieved and soils may require a period of drying prior to mixing;
- Undertaking verification testing (as outlined in Section 10) to confirm that the ASS has been adequately neutralised in each layer prior to placement of the next layer to be treated. If verification testing indicates that additional neutralisation is required, add additional aglime (at an appropriate liming rate) and mix as described above;
- Continuing the spreading / liming / harrowing / verification cycle for each 0.3 m layer until excavation is finished;
- Verification testing to confirm that the ASS has been adequately neutralised. Upon confirmation, the soil should be removed from the treatment pad for off-site disposal (under an assigned waste classification) and/or re-use (which may be appropriate for uncontaminated alluvial soils subject to EPA approval under a Resource Recovery Order (RRO), noting this ASSMP does not cover the requirement to apply for an RRO);
- Management of leachate and groundwater may also be required where leachate is produced and/or if groundwater is impacted by the works as outlined in Section 9; and
- Adding a layer of fine aglime at the base of excavations in ASS (5 kg/m³ is recommended) to neutralise downward seepage from exposed ASS, or to minimise acidification of groundwater following re-establishment of groundwater levels.

8.4.2 **Preparation of treatment pads**

The treatment pad should be located as far as practical from any ecological receptors (i.e. Orphans School Creek and any drainage lines which enter the stormwater system or Orphans

School Creek). The pad should be of an appropriate area to accommodate the volume of soil to be treated / stored and should be prepared on relatively level or gently sloping ground to minimise the risk of potential instability issues, with a fall to the local drainage sump.

Construction of the treatment pad involves:

- Lining the footprint of the pad with either:
 - o Natural low permeability clay;
 - o A compacted clay layer;
 - o Geosynthetic liner (e.g. HDPE); and
 - o Impervious barrier (e.g. concrete or bitumen hardstand).
- Placement of a guard layer of fine aglime at approximately 5 kg/m² per 300 mm layer of ASS proposed. The guard layer should be re-applied each time treated soils are removed, prior to placement of the next batch of un-treated ASS; and
- Construction of a perimeter clay bund (or equivalent) to collect any leachate runoff and to prevent surface water from entering the treatment pad. The inner bund slopes should be lined to prevent leachate seeping into the ground surface and sized to prevent overflow of untreated leachate onto the site.

A standard treatment pad is shown on in Figure 1, below.

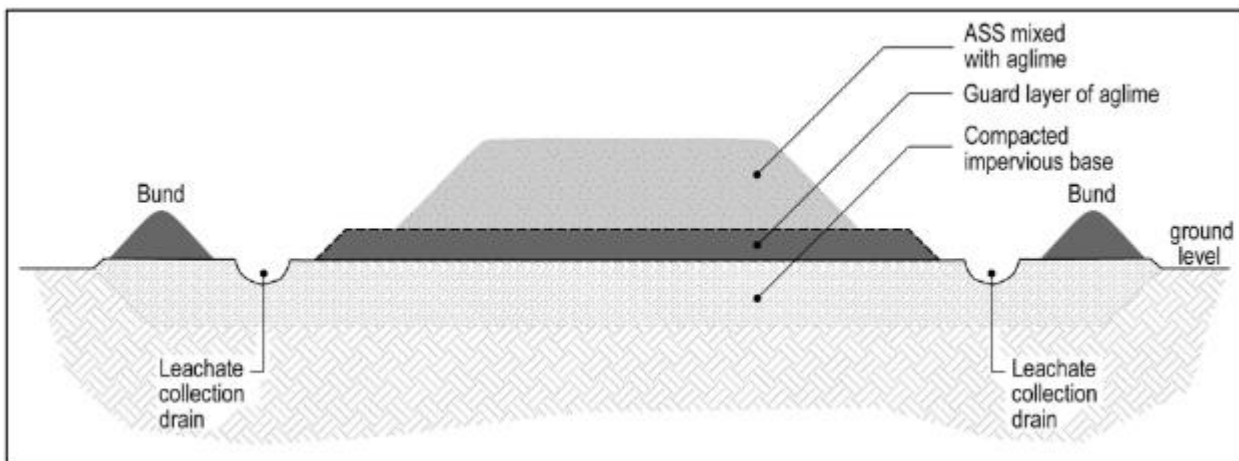


Figure 1: Schematic cross-section of a treatment pad, including compacted impervious base (clay layer), guard layer, leachate collection drains and bunding (source: Dear, et al. (2024))

Reapplication of the guard layer will be necessary under treatment pads if the treated soil is being removed as the guard layer could be removed with the treated soil. Guard layers may need to be applied between each placed ASS layer in situations where multiple layers of ASS are placed on the same treatment pad.

8.4.3 Neutralising materials and liming rate

Agricultural lime (aglime) is the preferred neutralisation material.

Refer to Appendix D for additional information on aglime and purity of specific aglime.

Based on the assessment results, fill / alluvial soils beneath the groundwater table that are to be disturbed during excavation are to be treated using aglime prior to reuse off-site. Based on the 'worst case' net acidity result of 0.15%S, an initial lime application rate of **4.1 kg or aglime per tonne of PASS** is recommended using the equation in Appendix D, and assuming an ENV of 95%, a factor of safety of 1.5 and a bulk density of 1.4 t/m³. Further intrusive assessment may provide a better estimate of an appropriate initial liming rate.

Depending upon the source of the aglime and ultimately the representative effective neutralising value (ENV) of the aglime selected, the minimum lime dosing rate may be increased or decreased. Prior to the commencement of works, the minimum lime dosing rate should be finalised following review of the ENV of the selected aglime.

8.5 Proposed management strategy for off-site of alluvium disposal as PASS

8.5.1 Definition of PASS

For the purpose of this ASSMP, PASS is defined by NSW EPA *Waste Classification Guidelines Part 4: Acid Sulfate Soils* (NSW EPA, 2014). PASS is defined as:

- 'Soils that contain iron sulfides or sulfidic materials that have not been exposed to air and thus are not oxidised. The pH of these soils in their undisturbed state is 5.5 or more, making them neutral or slightly alkaline.'

8.5.2 PASS criteria for disposal without treatment

NSW EPA (2014) states that PASS may be disposed of in water below the permanent water table, provided:

- The soils meet the definition of VENM in all aspects other than the presence of sulfidic soils or ores;
- The pH of soils in their undisturbed state is pH 5.5 or more;
- The soil has not dried out or undergone any oxidation of its sulfidic minerals;
- Soil is received at the disposal point within 16 hours of excavation, and kept wet at all times between excavation and reburial at the disposal point;
- Appropriate records are provided to the receiving site with every truck load confirming that it meets the above criteria; and
- The receiving site meets its obligations under NSW EPA (2014) and its EPL conditions.

This is applicable for direct disposal of untreated PASS to a facility licenced by the EPA to accept untreated PASS.

Prior approval from the relevant licensed facility and the NSW EPA is recommended prior to implementation of this disposal option.

Note: this option is not suitable for fill, which makes up the majority of PASS recorded at the site.

8.5.3 Management Requirements

The below works will be undertaken by appropriately trained staff:

- Conduct further investigation to assess the extent of alluvial soils at the site which potentially classify as PASS to assess the applicability of this option;
- Agreement with receiving site on acceptance times for trucks, and allowable time lapse between excavation and acceptance by receiving site;
- Preparing document templates to be completed during excavation and transport and provided to the receiving site to support their acceptance of the materials. The documentation requirements should be agreed with the receiving site in advance, with minimum requirements provided in Section 8.5.4;
- Removal and treatment of the overlying fill, including the fill containing PASS. Validation of the upper surface of the alluvium as meeting the requirements of VENM (other than the presence of PASS) by an Environmental Consultant. This will require a visual inspection, sampling and analysis, and provision of a report stating the results of the assessment;
- Soils will be kept wet at all times, and should be sprayed with water if required to keep them wet;
- Prior to commencement of excavation, the pH of the upper surface of the natural alluvial soils should be tested by an Environmental Consultant to assess for potential oxidation during the VENM assessment process. Any soils with a pH less than 5.5 (or more stringent pH criteria if required by the receiving site) are to be excavated separately and managed in accordance with Section 8.4;
- Recording of the excavation date, time and source chainage of the excavated soil;
- Inspection of the excavated soil for moisture content, material texture / signs of contamination concern, such as anthropogenic odours, staining or inclusions by all personnel involved in the management / handling of the spoil;
- If visual inspection of the spoil identifies materials not consistent with the materials assessed *in situ* (e.g. anthropogenic impact or fill are observed), then the spoil will be segregated for further assessment;
- Measuring the pH in at least one sample per 50 m³, or a minimum of 10 per shift, using a calibrated pH meter;
- If the pH is less than 5.5 (or more stringent pH criteria if required by the receiving site), the soil will not be classified as PASS, and the soil will be segregated for management in accordance with Section 8.4;
- Loading the soil into trucks and ensuring the soil is moist enough to prevent it drying out during transport. Note: due to the soils being wet, they will be heavier than soils as normally transported at field moisture (PASS estimated to be approximately 2 T/m³). This should be taken into consideration when loading trucks to ensure that trucks are not overloaded;
- Soil should be loaded and transported as soon as possible to minimise the risk of oxidation, which prevents it from being classified as PASS; and
- Transport must be conducted in a sealed truck which prevents water leaking from the truck during transport.

8.5.4 Documentation

Completion of site records of the above:

- Completion of records of all information required by the receiving site, and provision of copies of these records to the receiving site, including copies sent with the truck driver for the load being carried;
- Transporting of soil meeting the PASS requirements to the receiving site within 16 hours of excavation (or earlier if required by the receiving site);
- Once the PASS has been accepted by the receiving site, they are required to manage it in accordance with their EPL conditions and NSW EPA (2014). It is not the role of this document to discuss management of soil once they have been accepted by the receiving site; and
- Any soil which is rejected by the receiving facility will be transported back to the site and managed in accordance with Section 8.4 of this ASSMP.

8.6 Alternative strategy or contingency plan

Where the proposed primary management option is not possible, or practical, alternate or contingency strategies, with reference to the applicable guidelines, may be considered and following a 'fit for purpose' assessment. These contingency options are outlined in Appendix E.

9. Leachate and groundwater management

Potential leachate and groundwater management strategies are provided in Appendix F.

10. Verification testing of treated soils and water

Verification testing to assess whether ASS has been adequately neutralised will be undertaken by means of:

- Screening tests (pH_F and pH_{FOX}) at the frequencies in Table 3; and
- Acid base accounting (e.g. using the chromium suite) testing at the frequencies in Table 3.

Based on a 'Category XH' treatment level, verification testing of the ASS and leachate (if present) is required after the addition of lime to test whether the soil / water has been adequately neutralised, whether or not adequate mixing of the ASS has been achieved, and to reduce the risk of acidic water being returned to the environment (including watercourses). The verification testing frequency for ASS is in Table 3.

Table 3: Verification testing frequency for treated acid sulfate soils

Test	Frequency
Field test: pH _F and pH _{Fox} screening	Sampling of every batch of treated soil as required to meet the below requirements: - One sample / soil type - One sample / 100 m³ of treated soil - At least six samples / 200 mm to 300 mm deep soil treatment layer / batch of treated soil
Net acidity (acid base accounting)	Sampling of every batch of treated soil as required to meet the below requirements: - One sample / soil type AND - Volumes of <250 m³ = two samples OR - Volumes 251–500 m³ = three samples OR - Volumes >500 m³ and ≤2 %S = three samples, plus one sample per additional 500 m³ OR - Volumes of >500 m³ and >2 %S = three samples, plus one sample per additional 250 m³

Note:

Verification testing frequencies should be adjusted (either increased or decreased) depending on net acidity value, performance, material quantities and purpose/reuse, and may be subject to change by the appropriate regulatory authority in the event of a review.

Laboratory analysis on untreated soils for each treatment layer should be considered where heterogenous materials are present and initial ASS investigations indicate the presence of existing ANC (unverified).

The soil contained within the bunded treatment area should not be removed until the target values in Table 4 have been achieved.

In addition, the pH of all ponded leachate around the confines of the treatment bunds and adjacent surface waters should be measured on a regular basis and results assessed against the criteria provided in Table 4 and against background (pre-construction) levels. The soil and water contained within the bunded treatment area should not be removed until the target values in Table 4, below, have been achieved. Treatment of deeper soil layers should not be commenced until the existing surface layer has been validated and removed.

Table 4: Target levels of neutralised soil and water

Test	Component	Target level
Monitoring of water (leachate, surface water, ponded water in excavation)	pH	pH 6.5 < pH < 8.5, or one pH unit from background levels
	Turbidity	To comply with either values determined in consultation with the Authority or less than local background levels (baseline monitoring required).
	Aluminium (Al) and iron (Fe)	Establish local water quality data prior to site disturbance for comparison.

Test	Component	Target level
	Dissolved oxygen (DO)	To comply with either values determined in consultation with the Authority or less than local background levels established by baseline monitoring.
	Electrical conductivity (EC)	To comply with either values determined in consultation with the Authority or less than local background levels established by baseline monitoring.
Field screening of soil ^a	pH _F	6.5 ≤ pH _F ≤ 8.5
	pH _{FOX}	6.5 ≤ pH _{FOX} ≤ 8.5
Acid base accounting (including chromium reducible sulfur (Scr) method)	Net acidity ^b	Zero or negative
	pH _{KCL}	6.5 ≤ pH _{KCL} ≤ 10

Notes:

a used as a guide only to assess when adequate neutralisation and soil mixing has been achieved.

b determined using the equation in Appendix C

It should be noted that laboratory tests for acid base accounting will require at least four days turnaround, possibly longer, and hence sufficient time should be allowed in the treatment program for such verification testing. Only appropriately skilled staff should collect and test verification samples.

11. General monitoring requirements

It is recommended that prior to commencement of works, a construction environmental management plan (CEMP) be developed by the lead Contractor. The CEMP should also include a program for general site monitoring pertinent to the ASS. A typical monitoring program is provided below and should be implemented by the responsible parties.

Table 5: General monitoring requirements

Task	Frequency	Standard	Reporting/ record keeping	Responsibility
Inception Meeting	Pre-start	ASSMP	Minutes	Contractor / Site Supervisor, Environmental Consultant
Assessing background values of key parameters groundwater / surface water	Three events, at least one week apart	ASSMP	Memo	Environmental Consultant

Task	Frequency	Standard	Reporting/ record keeping	Responsibility
Site inspection	Daily	Visual / olfactory signs of ASS	File note	Site Supervisor
Site inspection	Monthly	Visual / olfactory signs of ASS	File Note	Environmental Consultant
Monitoring of disturbed excavations that are in ASS	Daily	Visual until backfilled	File note	Site Supervisor
Monitoring of ASS treatment area/s	Daily	Visual Daily pH testing until results show ASS or leachate has been neutralised (refer Section 10 for criteria and testing requirements)	File note and results of pH testing to be recorded in field sheets	Site Supervisor
Dewatering excavation in ASS	Prior to planned discharge	Treated and tested to demonstrate compliance with ASSMP guidance or regulatory requirements prior to discharge	Field sheets and permit to discharge	Site Supervisor, Environmental Consultant (subject to requirements of Consent approval)
Surface Waters	Daily (field parameters) Weekly (metals), plus prior to and following discharge	pH, EC, DO, total and dissolved metals (including Al and Fe) tested to demonstrate compliance with ASSMP guidance or regulatory requirements prior to discharge	Field sheets and permit to discharge	Site Supervisor / Environmental Consultant

12. Emergency incident response plan

Construction activities which may cause potential environmental impacts with respect to ASS are summarised in the table below together with recommendations for emergency response procedures.

Table 6: Emergency response procedures

Activity	Environmental threat	Emergency response
Excavations	Flooding of open excavation causing adjacent groundwater levels to rise, leading to potential acid leachate once the excavation is drained.	Inform site foreman and project manager / environmental officer. Determine pH of groundwater / floodwater in excavation. Correct groundwater / floodwater pH by application of slaked lime (hydrated lime) to bring pH in range of 6.5 to 8.5 or to pre-construction background levels. Drain pit to tanks / ponds for water quality assessment prior to discharge.
Treatment / neutralisation	Soil washes or slips outside of bunded treatment area	Inform site foreman and project manager / environmental officer. Estimate volume of material breaching bund. Conduct pH analysis of adjacent watercourses (if any) and correct pH if potentially impacted. Remove escaped soil into a bunded treatment area. Over-excavate impacted area to 0.2 m depth, apply and mix lime at rate as for guard layers (5 kg to 10 kg lime per m² of surface).
	Breach in containment bund	Inform site foreman and project manager / environmental officer. Close breach in bund. Conduct pH analysis of adjacent watercourse. Report to NSW EPA / consent authority (if required) Correct pH in any adjacent watercourse (if required, practicable and approved).
	Extracted untreated groundwater, surface water or leachate is exiting the site in an uncontrolled manner.	Inform site foreman and project manager / environmental officer. Restrict / stop source of water. Conduct pH analysis of adjacent watercourse. Report to NSW EPA / consent authority (if required) Correct pH in any adjacent watercourse (if required, practicable and approved).

For all construction activity incidents which pose a potential environmental impact, an incident report must be completed in order that:

- The cause of the incident may be determined;
- The incident can be reported to the NSW EPA and consent authority, as required (e.g. under the NSW *Protection of the Environment Operations Act 1997* and / or consent conditions);
- Additional control measures may be implemented; and
- Work procedures may be modified to reduce the likelihood of the incident re-occurring.

13. Reporting and record keeping

With reference to Dear, et al. (2024), it is good practice for the Contractor to maintain a record of treatment of ASS. Such records should include the following details:

- Date;
- Location / area / treatment pad;
- Time of excavation;
- Neutralisation process undertaken;
- Lime rate used including;
 - o Records which demonstrate a safety factor of 1.5 has been applied in calculating liming rates;
 - o Receipts showing quantities of aglime purchased;
 - o Evidence of composition, purity, particle size and ENV of the aglime used;
 - o Record of aglime use (e.g. per treatment pad, use in guard layers etc); and
 - o Photographic evidence of incorporation of neutralising agent (aglime).
- Results of monitoring;
- Disposal and/or reuse location; and
- Tonnages and disposal / transfer dockets (if applicable).

A record should also be maintained confirming contingency measures and additional treatment if undertaken. A final report should be issued upon completion of the works presenting the monitoring regime and results and confirming that appropriate management of ASS has occurred during the works.

14. Conclusions and recommendations

This ASSMP provides the ASS management procedures to be enacted to minimise the impact of ASS disturbance on the environment during the proposed works.

If ASS are encountered, then the ASS management procedures provided herein will be enacted to minimise the impact of ASS disturbance on the environment.

15. References

Dear, et al. (2024). *Queensland acid sulfate soil technical manual : soil management guidelines version 5.1*. Dear, S E; Williams, K M; McElnea, A E; Ahern, C R; Dobos, S K; Moore, N G; O'Brien, L E; Department of Environment, Science and Innovation.

Dear, S. E., Williams, K. M., McElnea, A. E., Ahern, C. R., Dobos, S. K., Moore, N. G., & O'Brien, L. E. (2024). *Queensland acid sulfate soil technical manual : soil management guidelines version 5.1*. Department of Environment, Science and Innovation.

Douglas. (2025a). *Report on Geotechnical Investigation, Proposed Seniors Housing, 2-32 Junction Street, Forest Lodge NSW*. Ref 229796.00.R.001.Rev1, dated 26 May 2025: Douglas Partners Pty Ltd.

Douglas. (2025b). *Report on Detailed Site Investigation, Proposed Seniors Housing, 2-32 Junction Street, Forest Lodge NSW*. Ref 229796.01.R.001.Rev1: Douglas Partners Pty Ltd.

Douglas. (2025c). *Remediation Action Plan, Proposed Seniors Housing, 2-32 Junction Street, Forest Lodge NSW*. Ref 229796.01.R.002.Rev1 : Douglas Partners Pty Ltd.

NSW EPA. (2014). *Waste Classification Guidelines, Part 4: Acid Sulfate Soils*. NSW Environment Protection Authority.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land*. Contaminated Land Guidelines: NSW Environment Protection Authority.

Stone, Y., Ahern, C. R., & Blunden, B. (1998). *Acid Sulfate Soils Manual*. Wollongbar, NSW, Australia: Acid Sulfate Soil Management Advisory Committee.

Sullivan, et al. (2018a). *National Acid Sulfate Soils Guidance: National Acid Sulfate Soils Identification and Laboratory Methods Manual*. Canberra ACT CC BY 4.0: Sullivan, L; Ward, N; Toppler, N; Lancaster, G, Department of Agriculture and Water Resources.

Sullivan, et al. (2018b). *National Acid Sulfate Soils Guidance: National Acid Sulfate Soils Sampling and Identification Methods Manual*. Canberra ACT CC BY 4.0: Sullivan, L; Ward, N; Toppler, N; Lancaster, G, Department of Agriculture and Water Resources.

16. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 2-32 Junction Street, Forest Lodge NSW in line with Douglas' email proposal dated 19 May 2025 and acceptance received from Jim McBirnie of Corio Projects Pty Ltd dated 19 May 2025. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of Corio Projects Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the environmental components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Appendix A

Notes about this Report

Drawings

Client Drawings

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at

the time of construction as are indicated in the report; and

- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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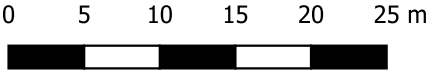
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SITE LOCATION

LEGEND

- Site Boundary
- Approximate Built Area
- Proposed Road
- Approximate Grassed Area

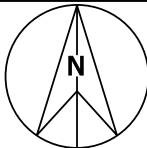


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from aerial imagery from metromap dated August 2024



CLIENT:	Corio Projects Pty Ltd	
OFFICE:	Sydney	DRAWN BY: ML
SCALE:	1:500 @A3	DATE: 27.May.2025

TITLE: **Site Boudary**
Proposed Senior Housing
2-32 Junction Street, Forest Lodge, NSW



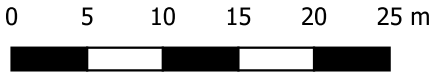
PROJECT:	229796.02
DRAWING No:	1
REVISION:	0



SITE LOCATION

LEGEND

- Site Boundary
- Approximate Grassed Area
- Approximate Built Area
- Proposed Road
- Environmental Borehole Location
- Geotechnical Borehole Location

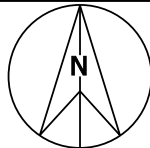


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from aerial imagery from metromap dated August 2024
2. Test locations are approximate only and were located using differential GPS typically accurate to ± 0.1 m depending on satellite coverage



CLIENT: Corio Projects Pty Ltd
OFFICE: Sydney
DRAWN BY: ML
SCALE: 1:500 @A3
DATE: 27.May.2025

TITLE: **Site Boundary and Douglas (2025a & 2025b) Test Location Plan**
Proposed Senior Housing
2-32 Junction Street, Forest Lodge, NSW



PROJECT: 229796.02
DRAWING No: 2
REVISION: 0



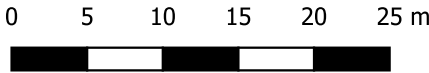
SITE LOCATION

LEGEND

- Site Boundary
- Proposed Seniors Housing Area
- Park to be dedicated to Council
- Road to be dedicated to council
- Remediation Area 1 Boundary
- Remediation Area 2 Boundary
- Environmental Borehole Exceedances (Douglas, 2024a)
- Geotechnical Borehole Exceedances (Douglas 2024a)

The extent of the remediation area shown is approximate and is based on an interpretation of the available borehole and sampling data.

Red highlighted indicates the identified asbestos contamination.

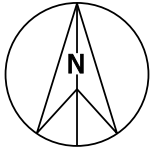


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from aerial imagery from metromap dated August 2024
2. Test locations are approximate only and were located using differential GPS typically accurate to ± 0.1 m depending on satellite coverage



CLIENT: Corio Projects Pty Ltd
OFFICE: Sydney
SCALE: 1:500 @A3
DRAWN BY: ML
DATE: 29.May.2025

TITLE: Previous Exceedances and Remediation Area Boundary
Proposed Senior Housing
2-32 Junction Street, Forest Lodge, NSW



PROJECT: 229796.02
DRAWING No: 2
REVISION: 0



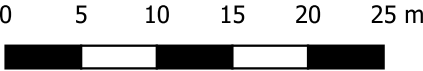
SITE LOCATION

LEGEND

- Site Boundary
- Proposed Seniors Housing Area
- Park to be dedicated to Council
- Road to be dedicated to council
- Approximate area of PASS impact
- Remediation Area 1 Boundary
- Remediation Area 2 Boundary
- Environmental Boreholes
- Geotechnical Boreholes

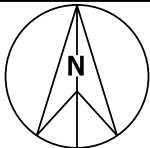
The extent of the PASS impact is approximate and is based on an interpretation of the available borehole and sampling data.

NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from aerial imagery from metromap dated August 2024
2. Test locations are approximate only and were located using differential GPS typically accurate to ± 0.1 m depending on satellite coverage

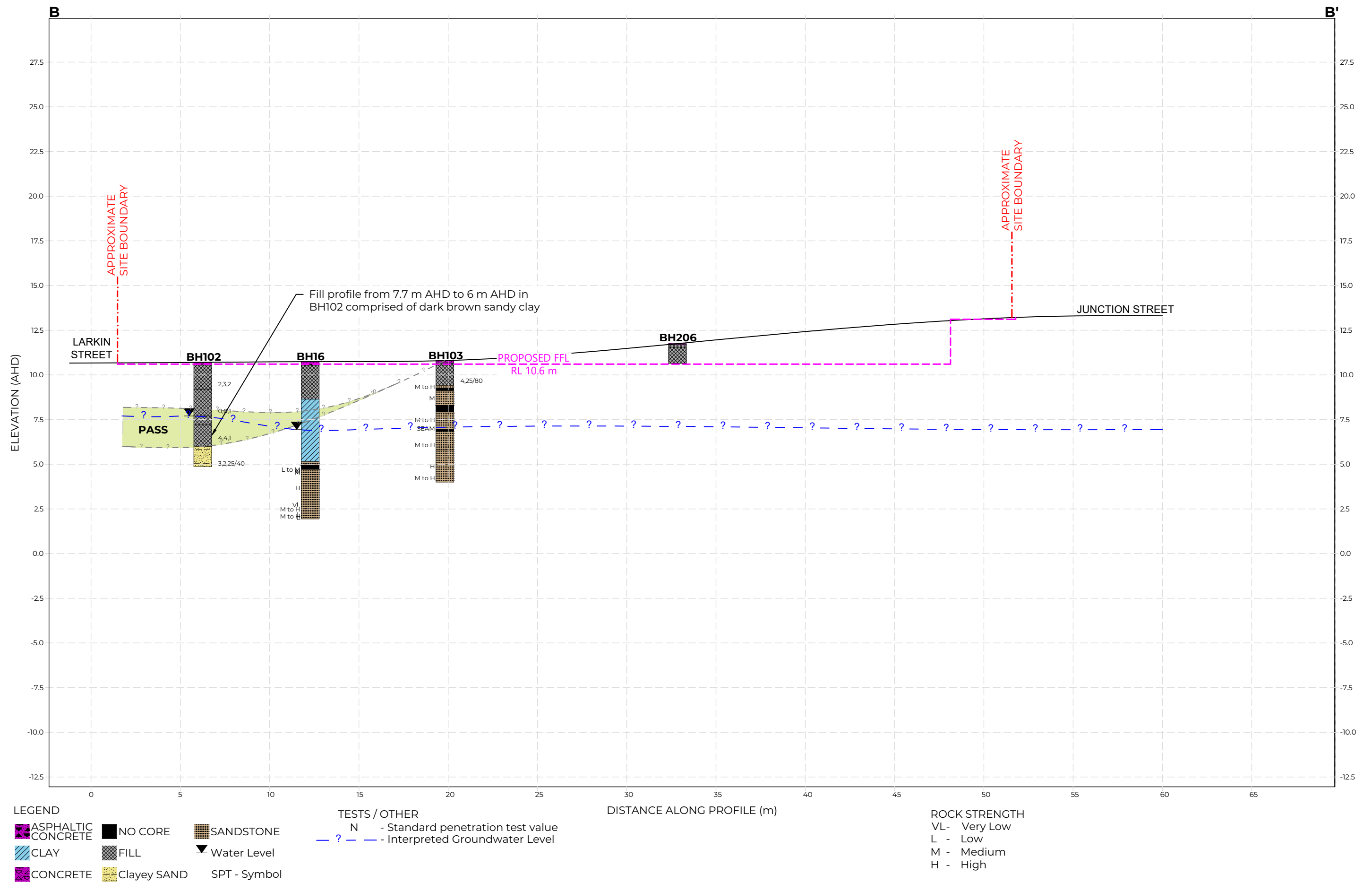


CLIENT: Corio Projects Pty Ltd
OFFICE: Sydney
SCALE: 1:500 @A3
DRAWN BY: ML
DATE: 30.May.2025

TITLE: **Approximate area of PASS impact**
Proposed Senior Housing
2-32 Junction Street, Forest Lodge, NSW



PROJECT: 229796.02
DRAWING No: 4
REVISION: 0



23110 2-32 JUNCTION STREET, FOREST LODGE

SENIOR'S LIVING DEVELOPMENT
2-32 JUNCTION STREET, FOREST LODGE 2037

CLIENT:
CORIO PROJECTS

ISSUED FOR:
DEVELOPMENT APPLICATION

DRAWING LIST

SHEET NUMBER	SHEET NAME
DA000	COVER PAGE
DA001	SITE & COMPLIANCE INFORMATION
DA002	UNIT SCHEDULES
DA003	BASIX COMMITMENT NOTES
DA004	RENDER - JUNCTION STREET
DA005	SURVEY PLAN - LANDPARTNERS
DA006	EXISTING SITE & DEMOLITION PLAN
DA007	EXISTING - DEMOLITION PLANS
DA010	SITE PLAN
DA011	SITE PLAN - DCP SET BACKS
DA012	SITE PLAN - LEP HEIGHT
DA100	LOADING BAY LOWER FLOOR PLAN
DA101	LOWER GROUND FLOOR
DA102	GROUND FLOOR
DA103	LEVEL 01
DA104	LEVEL 02
DA105	LEVEL 03
DA106	LEVEL 04
DA107	LEVEL 05
DA108	ROOF PLAN
DA150	TYPICAL APARTMENT PLANS
DA200	ELEVATION - EAST (ALONG JUNCTION ST)
DA200.1	ELEVATION - EAST
DA201	ELEVATION - WEST
DA202	ELEVATION - NORTH
DA203	ELEVATION - SOUTH
DA204	ELEVATION - INTERNAL WEST
DA204.1	ELEVATION - INTERNAL WEST
DA205	ELEVATION - INTERNAL EAST
DA206	STREETSCAPE ELEVATION - JUNCTION ST
DA300	SECTION 01
DA301	SECTION 02 - LOADING DOCK
DA302	SECTION 03 - HERITAGE BUILDING
DA303	SECTION 04
DA304	SECTION 05 - DRIVEWAY
DA400	GFA AREA PLANS
DA401	COMMUNAL AREA, DEEP SOIL & LANDSCAPE CALCULATIONS
DA402	SUN EYE VIEWS - SHEET 01
DA403	SUN EYE VIEWS - SHEET 02
DA404	SOLAR ACCESS COMPLIANCE
DA405	CROSS VENTILATION
DA406	STORAGE PLAN DIAGRAM
DA407	STORAGE PLAN & SCHEDULE
DA500	SHADOW DIAGRAM - JUNE 21ST - 9-10AM
DA501	SHADOW DIAGRAM - JUNE 21ST - 11-1PM
DA502	SHADOW DIAGRAM - JUNE 21ST - 2PM-3PM
DA503	ELEVATIONAL SHADOW
DA504	ELEVATIONAL SHADOW
DA600	MATERIALS & FINISHES



ARTIST IMPRESSION - EASTERN ELEVATION ALONG JUNCTION ST

WMK WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue 1	Description Development Application	Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	Title COVER PAGE	Drawing No. DA000	Issue 1
							Scale N/A	Drawing Size A3
							Project No. 23110	Drawn By JT
DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION							CAD Reference 19/06/2025 4:16:52 PM	

PROJECT INFORMATION	
JOB REFERENCE	23110
LOCALITY/SUBURB	Forest Lodge
STREET ADDRESS	2-32 Junction Street, Forest Lodge NSW
LOT & DP	Lot A,B,C DP 439209, Lot 1 DP 1092420, Lot 1 DP 1035720, Lot 1 DP 613650, Lot 1 DP 584394, Lot B DP 87371, Lot 1 DP 575200
LAND ZONING	MU1 – Mixed Use
SITE INFORMATION	
SITE AREA (m2)	4824m ²
MAX. FSR <i>(As per City of Sydney LEP – Part 6 Division 5 Section 6.40)</i>	1.56:1
GFA MAXIMUM (m2) <i>(As per City of Sydney LEP – Part 6 Division 5 Section 6.40)</i>	7525m ²
MAX. FSR with Seniors ILU & RAC Bonus (25%) <i>[As per SEPP Housing 2021Part 5 Division 3 Clause 87.2 (iii)]</i>	1.95
MAX. GFA with Bonuses <i>[As per SEPP Housing 2021Part 5 Division 3 Clause 87.2 (iii)]</i>	7525m ² + 1882 m ² (additional 25% GFA bonus) = 9407m ²
PROPOSED GFA	9407m ² (Including 776m ² Residential Age Care GFA = 10% GFA bonus) (Including 1106m ² additional Independent Living Units GFA = 15% GFA bonus)

INDEPENDENT LIVING UNIT YIELD INFORMATION	
TOTAL NUMBER OF UNITS	71
TOTAL 1 BED UNITS	4
TOTAL 2 BED UNITS	43
TOTAL 3 BED UNITS	24

CAR PARKING REQUIREMENTS				
Independent Living Units Car Parking Requirements:				
		Parking Rate:	Quantum	No. of Spaces required
As per SEPP Housing 2021 [Part 5 Division 7 Clause 108.2.(K)]	1 BED	0.5 per bedroom (0.5 per 1 Bed)	4 x Apartments	2
	2 BED	0.5 per bedroom (1.0 per 2 Bed)	43 x Apartments	43
	3 BED	0.5 per bedroom (1.5 per 3 Bed)	24 x Apartments	36
	Visitor	See note below	71 units	81
TOTAL REQUIRED ILU CAR SPACES - 81				
TOTAL PROPOSED ILU CAR SPACES - 75				
Residential Age Care Car Parking Requirements:				
		Parking Rate:	Quantum	No. of Spaces required
As per SEPP Housing 2021 [Part 5 Division 7 Clause 107.2(G)]	Residential Care Facility	Min. 1 parking space per 15 beds	12 Beds	1
		Min. 1 parking space every 2 employees on duty at same time.	Approx. 4 staff	2
		Min. 1 x ambulance parking		1
TOTAL REQUIRED RAC CAR SPACES – 3 + 1 Ambulance Space				
TOTAL PROPOSED RAC CAR SPACES – 3 + 1 Ambulance Space				

Level	2.4m Wide Car Spaces	3.2m Wide Car Spaces	Accessible Car Spaces	Ambulance Space	Total Car Spaces
Lower Ground Floor	25	38	0	0	63 car spaces
Ground Floor	15 <i>(incl. accessible spaces)</i>	0	13	1	15 car spaces (including 13 accessible car space) + 1 Ambulance
Total	40	38 <i>(50% of total ILU car parking spaces)</i>	13 <i>(12 x ILU Accessible + 1 RAC Accessible)</i>	1	78 car spaces (including 13 accessible car spaces) 1 ambulance

BICYCLE SPACES				
		DCP Bike Parking Rate	Quantum	No. of Spaces required
	Residents	1/unit	71 units	71
	Visitors	1/10 units	71 Units	7
TOTAL MIN. REQUIRED BICYCLE SPACES - 78				
TOTAL PROPOSED BICYCLE SPACE – 18 BICYCLE SPACES + 71 Bicycle storage within apartment basement storage area				
MOTORCYCLE SPACES				
PROPOSED: 5 X Motorcycle spaces				

RETIREMENT LIFESTYLE LIVING AND LIFETIME CARE RESIDENTIAL

	GFA COMM (m²)	GFA RACF (m²)	GFA RESI (m²)	1 BED	2 BED	3 BED	TOTAL	SOLAR 2H	SOLAR 15min	SOLAR 0H	CROSS VENT
Roof											
Level 05			289	1	2		3	3	0	0	2
Level 04			1160		4	6	10	10	0	0	7
Level 03			2022	1	11	7	19	14	4	1	12
Level 02			2083	1	12	6	19	13	1	5	12
Level 01		779	1357	1	7	4	12	9	1	2	8
Ground floor		799	875		7	1	8	4	0	4	2
Loading Dock Level			43								
	799	779	7829	4	43	24	71	53	6	12	43
Provided	9407			6%	61%	34%		74.6%	8.5%	16.9%	60.6%
Allowable GFA	9407	Target		5%	60%	35%		70%	85%	15%	60%

COMPLIANCE TABLE			
CONTROL	REQUIRED	PROPOSED	COMPLIANCE
Maximum FSR + ILU & RAC Bonuses	1.95	1.95	YES
Maximum Building Height (City of Sydney LEP 2012 & SEPP Housing 2021)	Maximum Building Height RL as per COS LEP = RL 29.5 & RL.35.5 Maximum Building Height RL with addition 3.8 height bonus as per SEPP Housing 2021 = RL.33.3 & RL. 39.3	Proposed maximum building height RL = RL.33.2 (at lower buildings (B,C & D) & RL. 36.3 at Building A	YES
Deep Soil [SEPP Housing 2021 Part 5 – Division 7.108(2)(f)]	Deep Soil zone on at least 15% of the site area, where each deep soil zone has min. dimension of 3m. Min. Deep Soil Area = 723.6m ²	Proposed Deep Soil Area = 1215m ²	YES
Communal Open Space [SEPP Housing 2021 Part 5 – Division 7.107(2)(d)]	RAC Communal Internal & Open Space requirement = 10m ² for every bed = 10 x 12 beds = 120m ² ADG - 25% of total site area = 1206m ²	Total Proposed RAC internal & external Communal Open Space = 176m ² Total Proposed Communal Open Space = 764 m ²	Refer to Town Planning Report
Landscape Area [SEPP Housing 2021 - Part 5 – Division 7.108(2)(d) & 107(2)(e)]	RAC Landscape Area Requirement = at least 15m ² of landscaped area for every bed = 15 x 12 beds = 180m ² ILU Landscape Area Requirement = 30% of the site area = 1447.2m ²	Proposed total Landscaped Area = 1748m ²	YES
Solar Access to open space (City of Sydney DCP 6.3.12.4)	Ensure solar access to Larkin Street Reserve Complies with Section 3.1.4 of this DCP a)50% of the total area is to receive sunlight for 4 hours from 9am to 3pm on 21 June; b)protection from direct sun is to be available on 21 December for a minimum of 20% of the area used for passive recreation and c) protection from strong winds is to be provided where practicable.	The proposal allows 50% of the total area of Larkin St Reserve to receive sunlight for approximately 4 hours from 9am to 3pm on 21 June.	YES
Solar Access: (SEPP Housing 2021 & ADG Requirement)	SEPP Housing 2021: At least 70% of the dwelling receive at least 2 hours of direct solar access between 9am and 3pm at mid-winter in living rooms and private open spaces ADG: Min 70% of dwellings to receive min. 2hrs of sunlight to living rooms and private open spaces between 9am and 3pm in mid-winter.	74.6% of units receive a min. 2hrs of sunlight to living rooms and private open spaces between June 9am and 3pm mid-winter.	YES
Natural Cross Ventilation (ADG Requirement)	Min 60% of dwellings are naturally cross ventilated for first 9 storeys. Max. cross-over/cross-through apartment 18m.	60.6% of units are naturally cross ventilated	YES
Minimum Internal Area (ADG Requirement)	Studio 35 m ² 1 bedroom 50m ² 2 bedroom 70m ² 3 bedroom 90 m ² (Minimum additional 5 m ² for every additional bathroom within unit)	All units comply with the minimum unit areas	YES
Minimum Private Open Space Area (SEPP Housing 2021 & ADG Requirement)	SEPP Housing 2021: (h) for a dwelling in a single storey building or a dwelling located, wholly or in part, on the ground floor of a multi storey building i) at least 15m2 of private open space per dwelling and ii)at least 1 private open space with minimum dimensions i) For a dwelling not located on the ground floor a balcony with minimum dimensions of 2m and i) an area of at least 10m2, or ii) for each dwelling containing 1 bedroom, an area of at least 6m2	All units comply with the minimum private open space areas	YES
Liveable Housing (ADG – 4Q-1)	20% of total apartments to incorporate Livable Housing Guidelines silver level Total ILU Units – 71 Required min. livable units = 14	At least 14 ILU Units incorporates Livable Housing Guidelines silver level	YES

PROPOSED DEEP SOIL CALCULATION

LEVEL	AREA
GROUND	885 m ²
GROUND	282 m ²
GROUND	48 m ²
TOTAL DEEP SOIL AREA	1215 m ²

INDEPENDENT LIVING UNITS - PROPOSED COMMUNAL AREA CALCULATION

LEVEL	AREA
GROUND	360 m ²
LEVEL 01	327 m ²
LEVEL 05	77 m ²
TOTAL ILU COMMUNAL AREA	764 m ²

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			1	Development Application	19.06.2025	CORIO PROJECTS	Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	SITE & COMPLIANCE INFORMATION	DA001	1
								Scale	Drawing Size	
								Project No. 23110	A3	
								CAD Reference	Drawn By JT	
DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION									19/06/2025 4:16:53 PM	

INDEPENDENT LIVING UNITS SCHEDULE					
LEVEL	UNIT NO.	UNIT TYPE	INTERNAL AREA	CROSS VENT.	SOLAR COMPLIANCE

GROUND	D.001	2 BED	89 m²	No	PARTIAL SUN - BALCONY ONLY
GROUND	D.002	3 BED	106 m²	Yes	PARTIAL SUN - BALCONY ONLY
GROUND	D.003	2 BED	99 m²	Yes	2H SOLAR
GROUND	D.004	2 BED	91 m²	No	2H SOLAR
GROUND	D.005	2 BED	91 m²	No	2H SOLAR
GROUND	D.006	2 BED	91 m²	No	2H SOLAR
GROUND	D.007	2 BED	99 m²	No	NO SOLAR
GROUND	D.008	2 BED	90 m²	No	PARTIAL SUN - BALCONY ONLY
LEVEL 01	B.101	1 BED	50 m²	No	NO SOLAR
LEVEL 01	B.102	2 BED	88 m²	No	2H SOLAR
LEVEL 01	B.103	2 BED	81 m²	Yes	2H SOLAR
LEVEL 01	B.104	2 BED	80 m²	Yes	2H SOLAR
LEVEL 01	C.101	3 BED	154 m²	Yes	2H SOLAR
LEVEL 01	C.102	3 BED	151 m²	Yes	2H SOLAR
LEVEL 01	D.101	3 BED	112 m²	Yes	PARTIAL SUN
LEVEL 01	D.102	2 BED	103 m²	Yes	2H SOLAR
LEVEL 01	D.103	2 BED	90 m²	Yes	2H SOLAR
LEVEL 01	D.104	2 BED	87 m²	Yes	2H SOLAR
LEVEL 01	D.105	2 BED	94 m²	No	2H SOLAR
LEVEL 01	D.106	3 BED	103 m²	No	NO SOLAR
LEVEL 02	A.201	2 BED	76 m²	No	PARTIAL SUN - BALCONY ONLY
LEVEL 02	A.202	2 BED	80 m²	Yes	PARTIAL SUN - BALCONY ONLY
LEVEL 02	A.203	2 BED	90 m²	Yes	2H SOLAR
LEVEL 02	A.204	2 BED	85 m²	No	2H SOLAR
LEVEL 02	A.205	3 BED	114 m²	Yes	2H SOLAR
LEVEL 02	A.206	3 BED	115 m²	Yes	2H SOLAR
LEVEL 02	A.207	2 BED	84 m²	No	PARTIAL SUN - BALCONY ONLY
LEVEL 02	B.201	1 BED	50 m²	No	NO SOLAR
LEVEL 02	B.202	2 BED	89 m²	No	2H SOLAR
LEVEL 02	B.203	2 BED	81 m²	Yes	2H SOLAR
LEVEL 02	B.204	2 BED	80 m²	Yes	2H SOLAR
LEVEL 02	D.201	3 BED	112 m²	Yes	PARTIAL SUN
LEVEL 02	D.202	2 BED	103 m²	Yes	2H SOLAR
LEVEL 02	D.203	2 BED	90 m²	Yes	2H SOLAR
LEVEL 02	D.204	2 BED	87 m²	Yes	2H SOLAR
LEVEL 02	D.205	2 BED	94 m²	No	2H SOLAR
LEVEL 02	D.206	3 BED	103 m²	No	NO SOLAR
HERITAGE - LEVEL 2	C.201	3 BED	154 m²	Yes	2H SOLAR
HERITAGE - LEVEL 2	C.202	3 BED	151 m²	Yes	2H SOLAR
LEVEL 03	A.301	2 BED	76 m²	No	PARTIAL SUN
LEVEL 03	A.302	2 BED	81 m²	Yes	2H SOLAR
LEVEL 03	A.303	2 BED	90 m²	Yes	2H SOLAR
LEVEL 03	A.304	2 BED	85 m²	No	2H SOLAR
LEVEL 03	A.305	3 BED	114 m²	Yes	2H SOLAR
LEVEL 03	A.306	3 BED	114 m²	Yes	2H SOLAR
LEVEL 03	A.307	2 BED	84 m²	No	PARTIAL SUN
LEVEL 03	B.301	1 BED	50 m²	No	NO SOLAR
LEVEL 03	B.302	2 BED	89 m²	No	2H SOLAR
LEVEL 03	B.303	2 BED	81 m²	Yes	2H SOLAR
LEVEL 03	B.304	2 BED	80 m²	Yes	2H SOLAR

INDEPENDENT LIVING UNITS SCHEDULE					
LEVEL	UNIT NO.	UNIT TYPE	INTERNAL AREA	CROSS VENT.	SOLAR COMPLIANCE

LEVEL 03	D.301	3 BED	112 m²	Yes	PARTIAL SUN
LEVEL 03	D.302	2 BED	103 m²	Yes	2H SOLAR
LEVEL 03	D.303	2 BED	90 m²	Yes	2H SOLAR
LEVEL 03	D.304	3 BED	102 m²	Yes	2H SOLAR
LEVEL 03	D.305	2 BED	94 m²	No	2H SOLAR
LEVEL 03	D.306	3 BED	103 m²	No	PARTIAL SUN
HERITAGE - LEVEL 3	C.301	127 m²	111 m²	Yes	2H SOLAR
HERITAGE - LEVEL 3	C.302	124 m²	112 m²	Yes	2H SOLAR
LEVEL 04	A.401	3 BED	121 m²	Yes	2H SOLAR
LEVEL 04	A.402	2 BED	88 m²	No	2H SOLAR
LEVEL 04	A.403	2 BED	97 m²	Yes	2H SOLAR
LEVEL 04	A.404	3 BED	121 m²	Yes	2H SOLAR
LEVEL 04	B.401	3 BED	113 m²	Yes	2H SOLAR
LEVEL 04	B.402	3 BED	104 m²	Yes	2H SOLAR
LEVEL 04	D.401	3 BED	109 m²	Yes	2H SOLAR
LEVEL 04	D.402	2 BED	79 m²	No	2H SOLAR
LEVEL 04	D.403	2 BED	79 m²	No	2H SOLAR
LEVEL 04	D.404	3 BED	123 m²	Yes	2H SOLAR
LEVEL 05	A.501	1 BED	54 m²	Yes	2H SOLAR
LEVEL 05	A.502	2 BED	88 m²	No	2H SOLAR
LEVEL 05	A.503	2 BED	106 m²	Yes	2H SOLAR

Grand total: 71

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		1	Development Application	19.06.2025	CORIO PROJECTS	Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	UNIT SCHEDULES	DA002	1	
								Scale		Drawing Size
								Project No.		Drawn By
								23110		JT
							DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION	CAD Reference		
								19/06/2025 4:48:20 PM		

3 BASIX Energy

3.1 Energy

The following minimum standards will be required to comply with the BASIX targets for the project.

Table 4: BASIX Energy Requirements

Design Element	Compliance Criteria
Domestic hot water systems	Centralised electric heat pump (air sourced) with a 3.0< COP <=3.5 and minimum R1.0 insulation to internal and external pipework
Sauna x 2	Heating System: Electric Infrared system controlled by BMS
Heated Swimming Pool	Heating System: Electric Heat Pump controlled by timer
Cooking	Induction cooktop & electric oven
Mechanical heating and cooling	Reverse cycle air-conditioning (1-Phase ducted) for each dwelling Minimum EER ratings – Cooling/Heating 3.5-4.0 and 3.0-3.5 respectively.
Apartment ventilation	Bathroom: individual fan, ducted to façade or roof – Manual on/off Laundry: individual fan, open to façade or roof – Manual on/off Kitchen range hood: Individual fan, open to façade or roof– Manual on/off
Apartment artificial lighting	LED throughout with dedicated fittings
Appliances in Apartments (minimum Energy Star rating)	Dishwashers: 4.5 Energy Star Clothes: 2 Energy Star
Building Management System (BMS)	Yes
Vertical transport	All Lifts: gearless traction with VVVF motor and regenerative (>= 1001 kg but <= 1500kg)
On-site generation (peak)	55kW

Common area Ventilation & artificial lighting

Common area	Ventilation system type	Ventilation efficiency measure	Primary type of artificial lighting	Lighting efficiency measure
Indoor Swimming Pool	Air conditioning system	Time clock or BMS controlled	Light-emitting diode	Time clocks
Sauna	Air conditioning system	Time clock or BMS controlled	Light-emitting diode	Manual on/ manual off
Gym	Air conditioning system	Time clock or BMS controlled	Light-emitting diode	Manual on/ manual off
Car park	Ventilation (Supply + Exhaust)	Carbon monoxide monitor + VSD fan	Light-emitting diode	Zoned switching with motion sensors
Comms Room	Air conditioning system	Thermostatically Controlled	Light-emitting diode	Manual on/ manual off
Main Switch Room	Ventilation Supply	n/a	Light-emitting diode	Manual on/ manual off
Waste Rooms	Ventilation exhaust only	n/a	Light-emitting diode	Manual on/ manual off
Mult Purpose Room	Air conditioning System	Time clock or BMS controlled	Light-emitting diode	Time clocks
Fire Pump Room	Ventilation (supply + exhaust)	Thermostatically controlled	Light-emitting diode	Manual on/ manual off
Grease Arrestor	Ventilation Supply only	Thermostatically Controlled	Light-emitting diode	Manual on/ manual off
Plant Room (LG)	Ventilation Supply only	Time clock or BMS controlled	Light-emitting diode	Motion sensors
Storage	Ventilation Supply only	Time clock or BMS controlled	Light-emitting diode	Motion sensors
Corridor	Ventilation Supply only	Time clock or BMS controlled	Light-emitting diode	Motion sensors
Cinema	Air conditioning system	Time clock or BMS controlled	Light-emitting diode	Time clocks
Services (Toilets)	Ventilation exhaust only	Time clock or BMS controlled	Light-emitting diode	Motion sensors
Pool Bathroom	Ventilation exhaust only	Time clock or BMS controlled	Light-emitting diode	Motion sensors
Bathroom	Ventilation exhaust only	Time clock or BMS controlled	Light-emitting diode	Motion sensors
Meeting Room / Offices	Air conditioning system	Time clock or BMS controlled	Light-emitting diode	Time clock and motion sensors
Hair Salon	Air conditioning system	Time clock or BMS controlled	Light-emitting diode	Time clock and motion sensors
Basement Fire stairs	No mechanical ventilation	n/a	Light-emitting diode	Motion sensors
Ground Floor Lobby	Air conditioning system	Time clock or BMS controlled	Light-emitting diode	Zoned switching with motion sensors
Basement lobby	Air conditioning system	Time clock or BMS controlled	Light-emitting diode	Zoned switching with motion sensors
Mail room	No mechanical ventilation	n/a	Light-emitting diode	Motion sensors
Fire stairs - D	No mechanical ventilation	n/a	Light-emitting diode	Motion sensors
Fire stairs – B	No mechanical ventilation	n/a	Light-emitting diode	Motion sensors
Fire stairs – A	No mechanical ventilation	n/a	Light-emitting diode	Motion sensors
Hallway – D	Air conditioning System	Time clock or BMS controlled	Light-emitting diode	Zoned switching with motion sensors
Hallway – C	Air conditioning System	Time clock or BMS controlled	Light-emitting diode	Zoned switching with motion sensors
Hallway – B	Air conditioning System	Time clock or BMS controlled	Light-emitting diode	Zoned switching with motion sensors
Hallway - A	Air conditioning System	Time clock or BMS controlled	Light-emitting diode	Zoned switching with motion sensors
All lifts	n/a	n/a	Light-emitting diode	Connected to lift call button

4 BASIX Thermal Comfort

4.1 Thermal Comfort

The following minimum standards are required to comply with the BASIX Thermal Comfort requirements for the project.

Table 5: BASIX Thermal Comfort Requirements

Design Element	Compliance Criteria
	The following glazed elements are used throughout the development: <u>Fixed and Sliding Windows/Doors</u> Total System U-Value = 4.10 (equal to or less than) Total System SHGC = 0.52 (+/- 5%) <u>Awning and Casement Windows/Doors</u> Total System U-Value = 4.10 (equal to or less than) Total System SHGC = 0.47 (+/- 5%) The following glazed elements are used throughout for apartment units A.302 A.404 A.501 C.302 D.301
Glazed Doors / Windows	<u>Fixed and Sliding Windows/Doors</u> Total System U-Value = 3.10 (equal to or less than) Total System SHGC = 0.49 (+/- 5%) <u>Awning and Casement Windows/Doors</u> Total System U-Value = 3.10 (equal to or less than) Total System SHGC = 0.39 (+/- 5%) <u>Operable Skylight</u> Total System U-Value = 4.22 (equal to or less than) Total System SHGC = 0.72 (+/- 5%) Operability – max available while meeting window safety device requirements defined in the BCA. Note – all glazing systems are whole of system, including glazing and frame systems.
External Solid Walls	Added R2.5 bulk insulation for all apartment external walls. Minimum nominal 20mm unventilated non-reflective airgap. No thermal break considered for the metal stud frame for thermal bridging controls. Refer to Appendix C insulation markups for locations of insulation and additional details. Medium or light colour
Walls to Internal Corridors or Non-Conditioned Zones:	Added R1.5 bulk insulation for all internal walls between apartment unit and non-conditioned enclosed internal zones. Minimum R0.2 thermal break to all metal stud frame for wall/ceiling thermal bridging control should consider.
Exposed Roofs/Balconies (Over conditioned spaces)	Refer to Appendix C insulation markups for locations of insulation and additional details. Added R4.0 soffit slab insulation to apartments concrete slab roofs. Refer to Appendix C insulation markups for locations of insulation and additional details. Medium or light colour.
Suspended Floor Slabs (Enclosed floor levels between conditioned and internal non-conditioned spaces and open to outside)	Added R2.5 soffit slab insulation to underside of suspended concrete slabs. Refer to Appendix C insulation markups for locations of insulation and additional details.
Insulation Penetrations	As a lighting plan/RCP is not yet available, downlights have been modelled at a scale of 1 downlight/ 5m2. Exhaust fans have been modelled as 1 per bathroom, 1 per laundry if available and 1 per kitchen. Ceiling fans with 1200mm diameter have been modelled in following units Bedrooms: <u>All units</u> Bedroom & Living room A.404 A.502 B.102 B.103 B.202 B.203 B.302 C.301 C.302 D.102 D.105 D.202 D.205 D.306 D.402 D.404 D.401
Floors Covering	Carpet in Bedrooms Timber in Living/Dining Rooms. Tile in Kitchen/Bathrooms.

5 BASIX Water

5.1 Water

The following minimum standards are required to comply with the BASIX Water Targets for the project.

Table 6: BASIX Water Requirements

Design Element	Compliance Criteria
Fixtures	Showers: Minimum 4 Star (>4.5 but <= 6 L/min) WELS Rated Toilets: Minimum 4 Star WELS Rated Bathroom Taps: Minimum 6 Star WELS Rated Kitchen Sink Taps: Minimum 6 Star WELS Rated
Fixtures within common areas	Showerheads: 4 Star (>4.5 but <= 6 L/min) Toilets: Minimum 4 Star WELS Rated All Taps: Minimum 6 Star WELS Rated
Fittings/Appliances within units	Clothes Washer: Minimum 5 Star WELS Rated Dishwasher: Minimum 6 Star WELS Rated
Fittings/Appliances within common areas	Clothes Washer: no common laundry facility
Fire Sprinkler Water Test	Fire sprinkler systems are assigned to basement levels and each building individually. All Fire sprinkler systems test water contained in a closed system so that fire sprinkler test water is contained within the fire sprinkler system for re-use, rather than disposed.
Hot Water Recirculation or diversion system	Not hot water recirculation or diversion system
Alternative Water	Rainwater Tank - Minimum 120,000L Rainwater tank to harvest roof area of not less than 1,900m2 and Impervious area (paving, balcony etc) of not less than 500 m2 to serve development landscape irrigation, toilet flush and laundry of all apartments
Landscape	Common lawn area: 1,000 m² Common garden area of indigenous or low water use species: 500m²
Indoor Swimming Pool	90 kL indoor swimming pool is located within the development

REFER TO BASIX COMPLIANCE REPORT PREPARED BY E-LAB CONSULTING

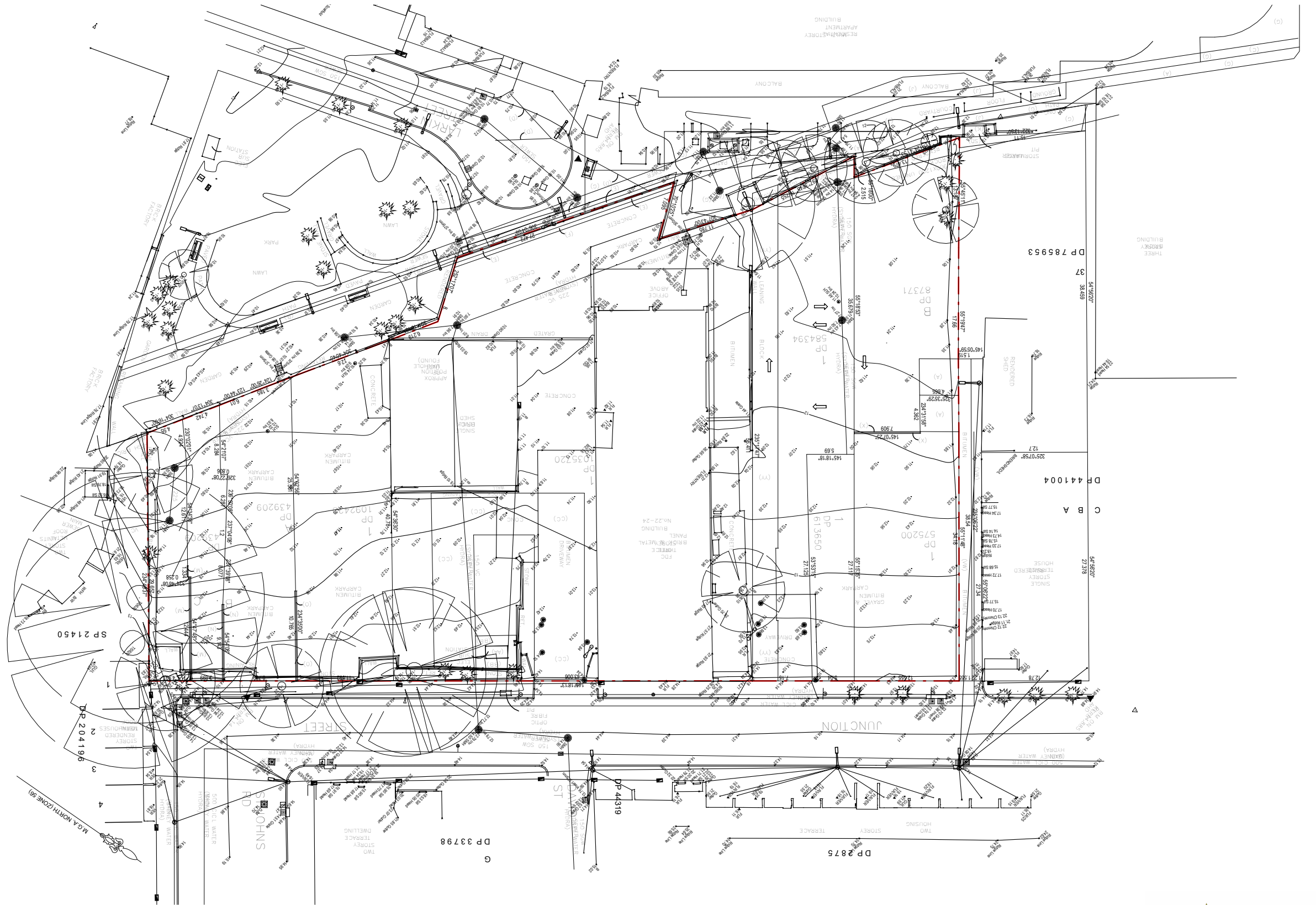


 WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue	Description	Date	Client	Project	Title	Drawing No.	Issue
		1	Development Application	19.06.2025	CORIO PROJECTS	Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	BASIX COMMITMENT NOTES	DA003	1
								Scale	Drawing Size
								N/A	A3
								Project No.	Drawn By
						23110	JT	CAD Reference	
							DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION	19/06/2025 4:16:55 PM	



ARTIST IMPRESSION - EASTERN ELEVATION ALONG JUNCTION ST

WMK WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue 1	Description Development Application	Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	Title RENDER - JUNCTION STREET	Drawing No. DA004	Issue 1
							Scale N/A	Project No. 23110	Drawing Size A3
							DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION	CAD Reference 19/06/2025 4:16:55 PM	Drawn By JT

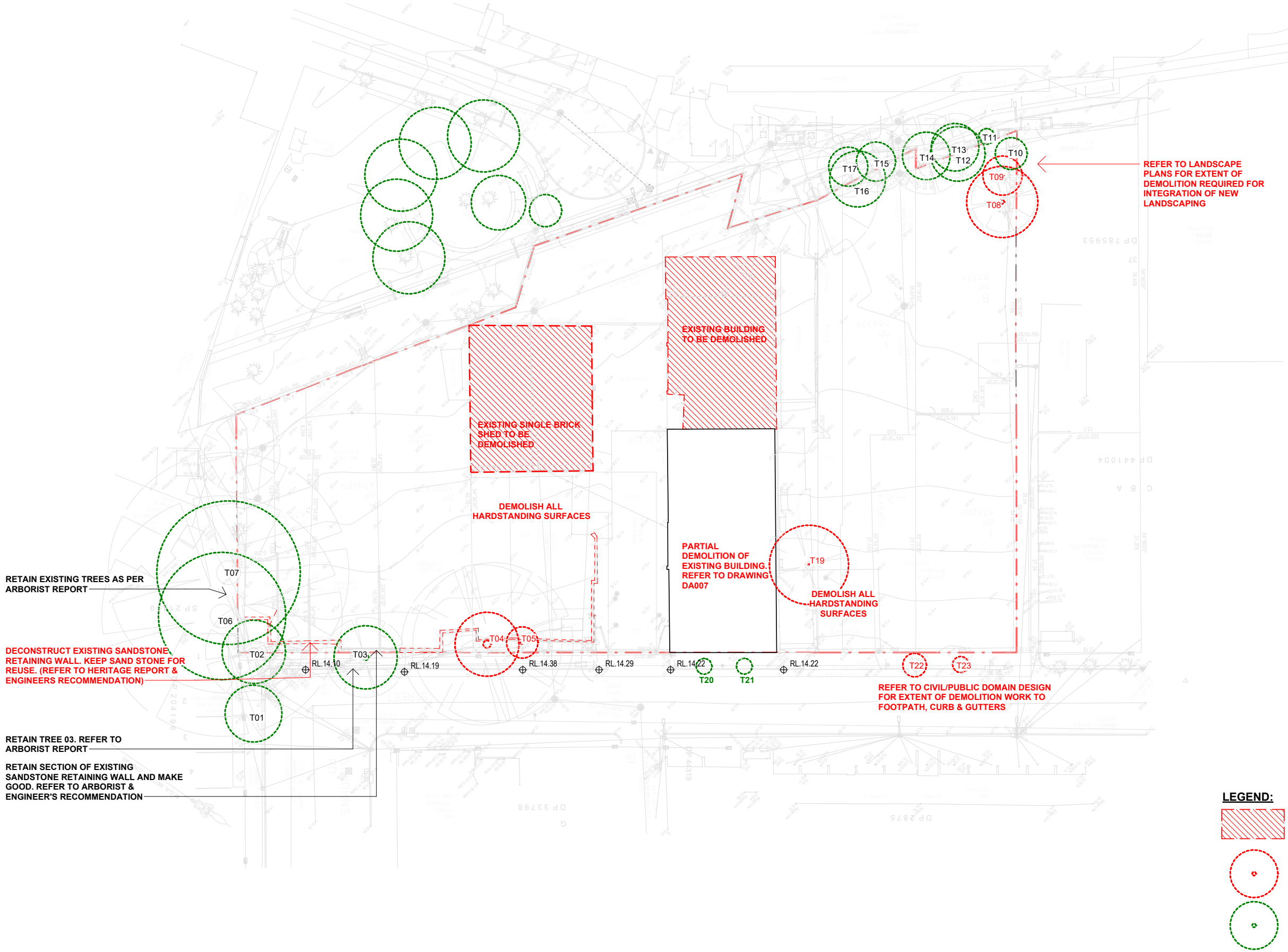


NOTE: SURVEY PLAN PREPARED BY LAND PARTNERS

WMK WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	</
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DEVELOPMENT APPLICATION ONLY
NOT FOR CONSTRUCTION

CAD Reference
19/06/2025 4:16:57 PM



LEGEND:

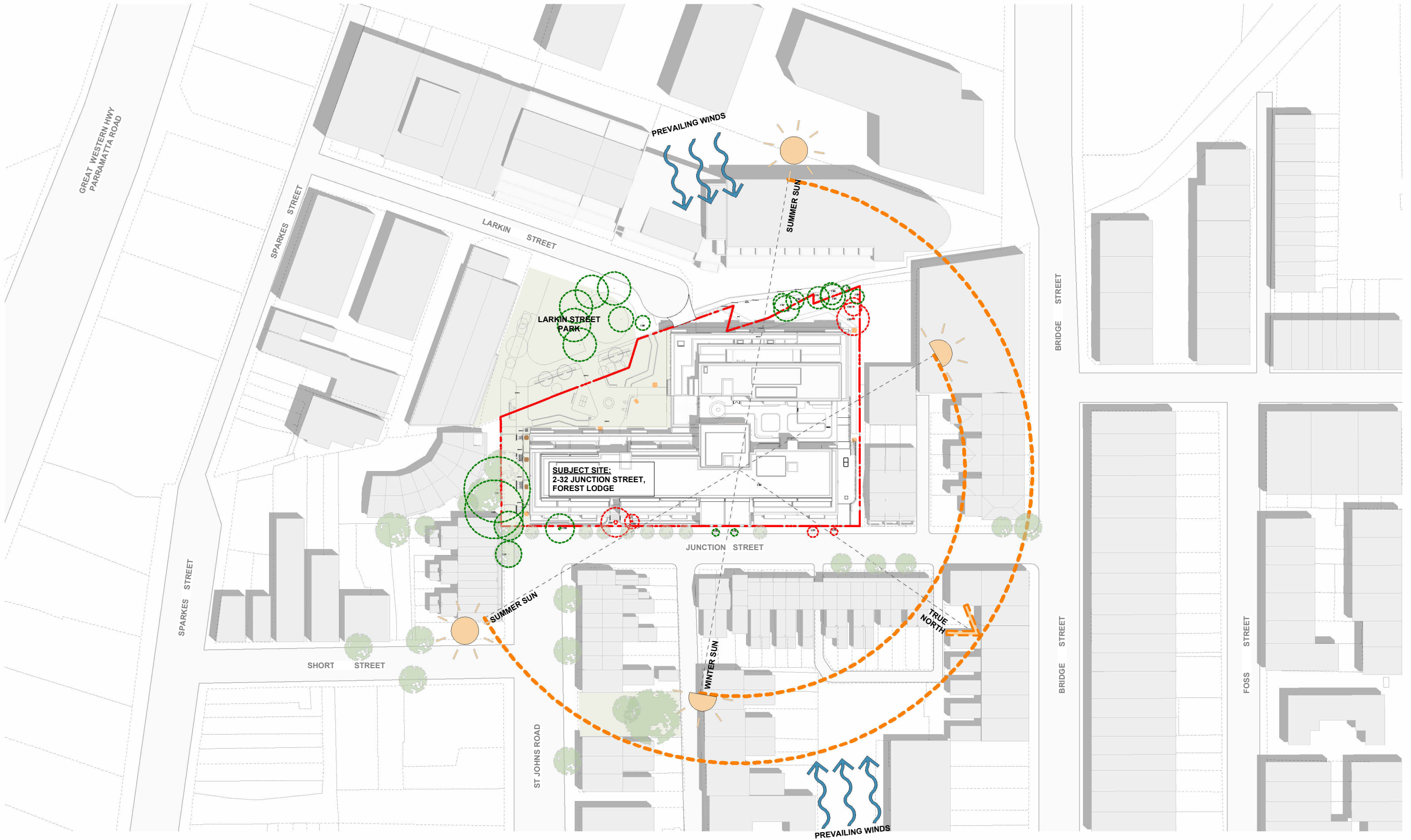
BUILDINGS AND STRUCTURES TO BE DEMOLISHED

DENOTES EXISTING TREES TO BE REMOVED

DENOTES EXISTING TREES TO BE RETAINED

WMK WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	051015m 1:500 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue	Description	Date	Client	Project	Title	Drawing No.	Issue
		1	Development Application	19.06.2025	CORIO PROJECTS	Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	EXISTING SITE & DEMOLITION PLAN	DA006	1
							Scale 1 : 500	Scale 1 : 500	Drawing Size A3
							Project No. 23110	Project No. 23110	Drawn By JT
DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION								CAD Reference	
								19/06/2025 4:16:59 PM	





WMK Architecture
The Atrium, Ground
9 Castlereagh St
Sydney NSW 2000
Telephone 02 9299 0401
wmkarchitecture.com
ABN 25 082 956 929



0 10 20 30m
1:1000

Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)

Issue	Description	Date
1	Development Application	19.06.2025

Client
CORIO PROJECTS

Project
Seniors Living Development 2-32 Junction Street, Forest Lodge NSW

Title
SITE PLAN

DEVELOPMENT APPLICATION ONLY
NOT FOR CONSTRUCTION

Drawing No.
DA010

Scale
1 : 1000

Project No.
23110

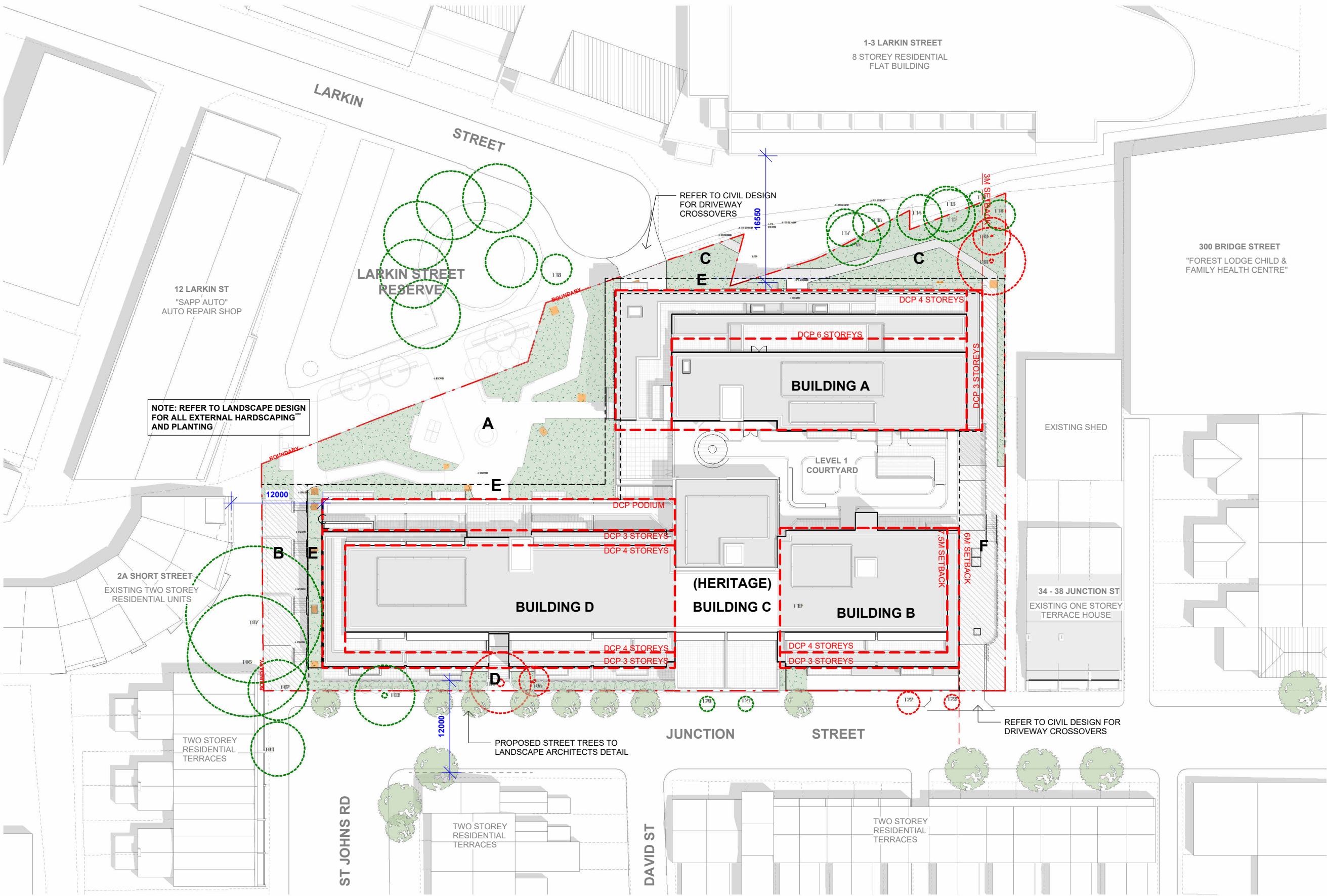
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19/06/2025 4:17:07 PM

Issue
1

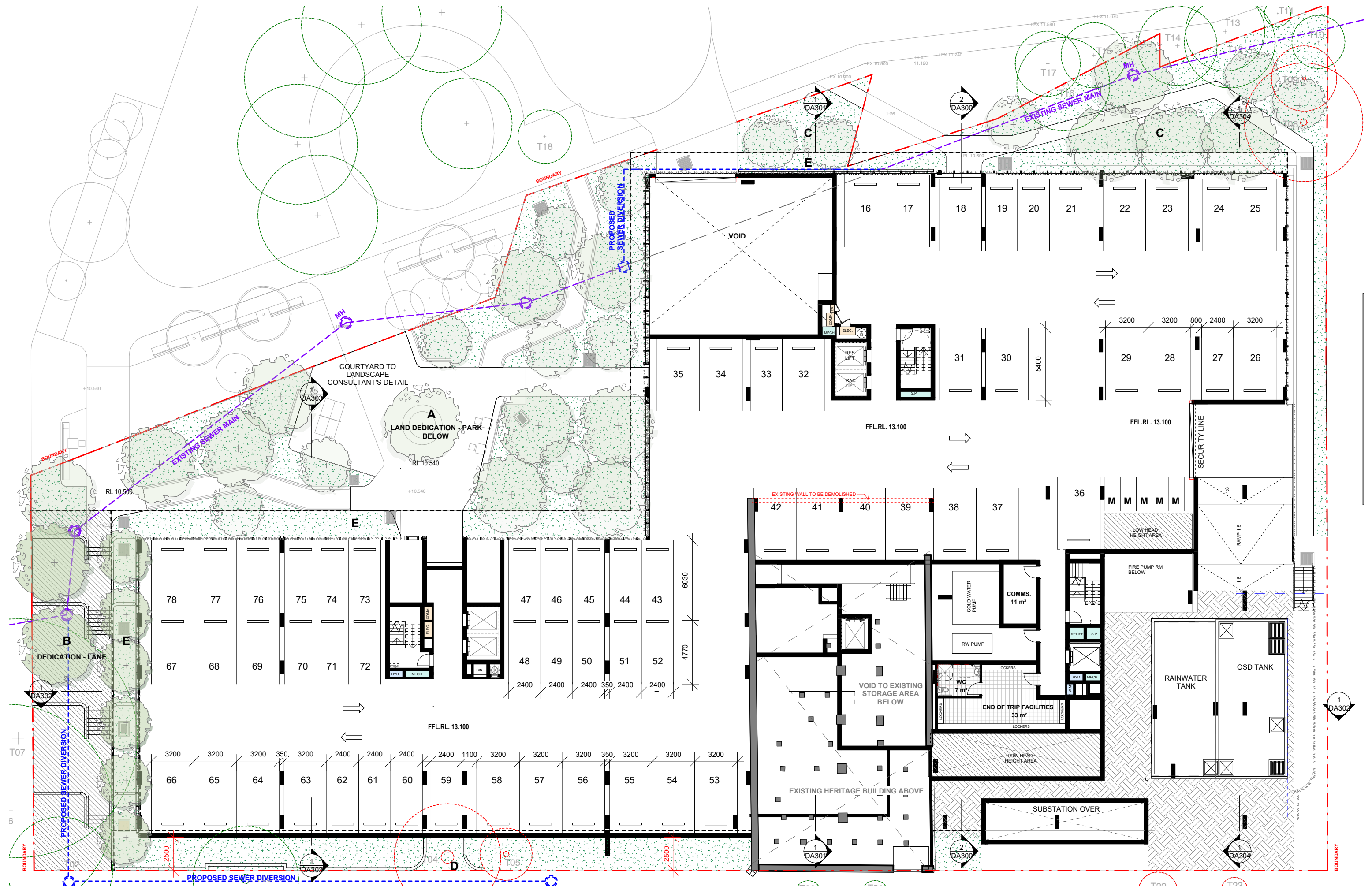
Drawing Size
A3

Drawn By
JT



GRAPHICAL LEGEND:

- A** Dedication - Park (At Grade With Larkin Street Reserve)
- B** Dedication - Lane (Even Grade from St Johns Road to Larkin Street Reserve)
- C** Easement for Public Access - Larkin Street Extension
- D** Primary Setback 3m - Clear to Sky
- E** Above Ground Parking Screen Planting 2m - Clear to Sky
- F** Paved Driveway & Pedestrian Access - Cert to Sky, includes landscaped screening



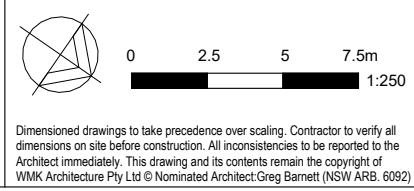
WMK WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	 02.557.5m 1:250 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue 1	Description Development Application	Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	Title LOWER GROUND FLOOR	Drawing No. DA101	Issue 1
		Scale 1 : 250	Drawing Size A3						
		Project No. 23110	Drawn By JT						
DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION							CAD Reference 19/06/2025 4:18:17 PM		



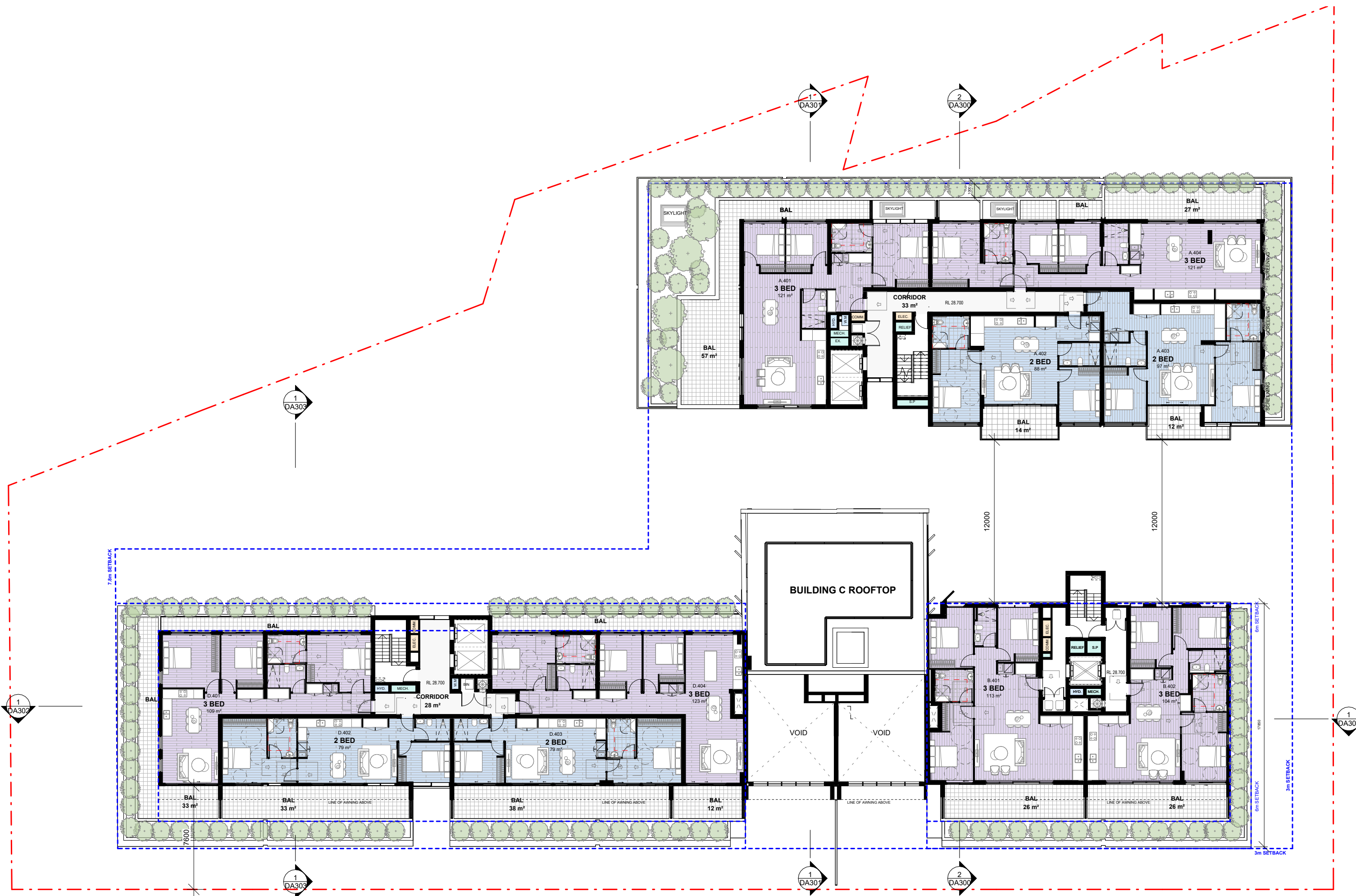
WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	0 2.5 5 7.5m 1:250 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue 1 Description Development Application Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	Title LEVEL 02	Drawing No. DA104 Scale 1 : 250 Project No. 23110	Issue 1 Drawing Size A3 Drawn By JT
		DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION					CAD Reference 19/06/2025 4:18:32 PM

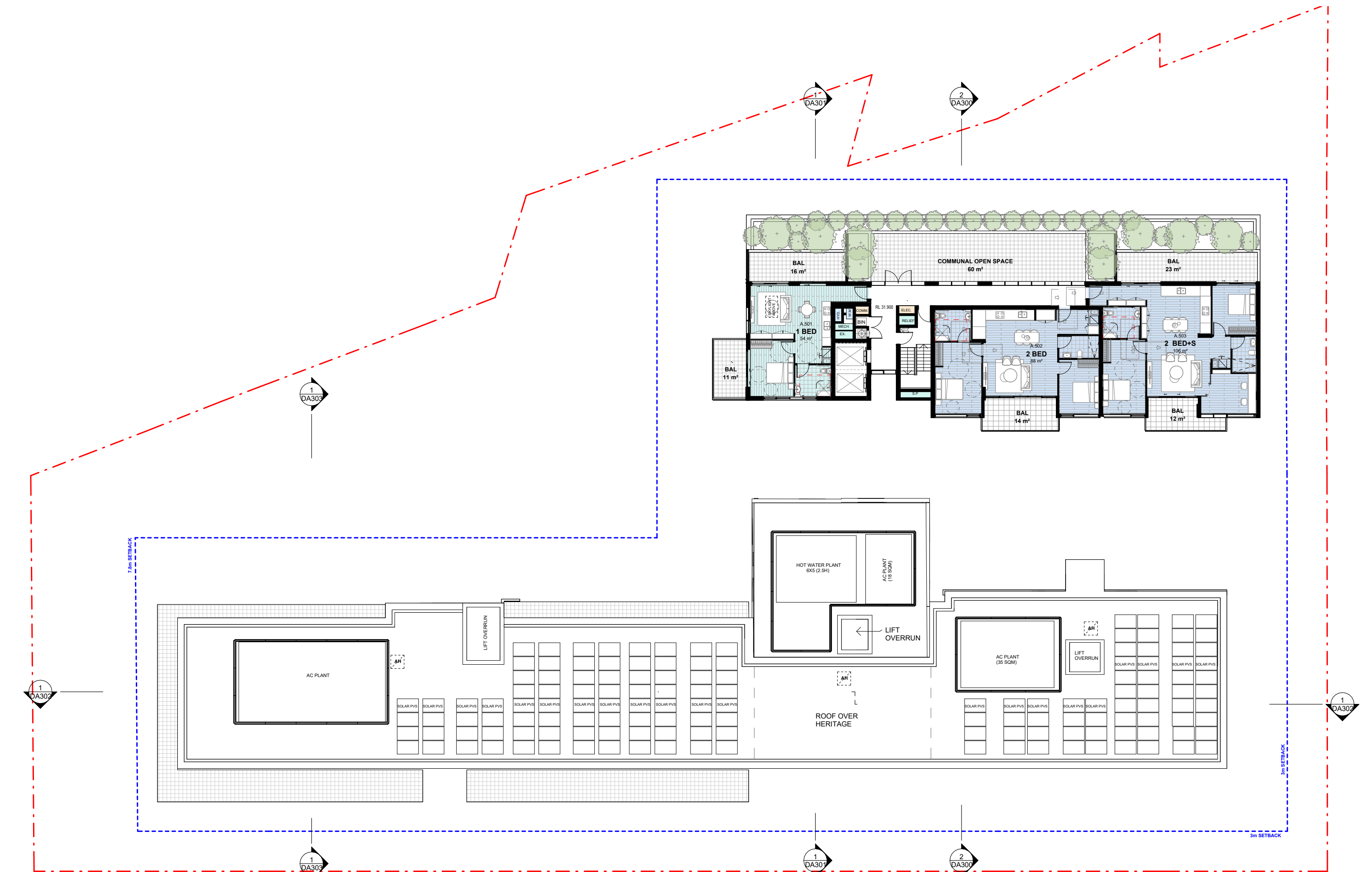
DEVELOPMENT APPLICATION ONLY
NOT FOR CONSTRUCTION

CAD Reference
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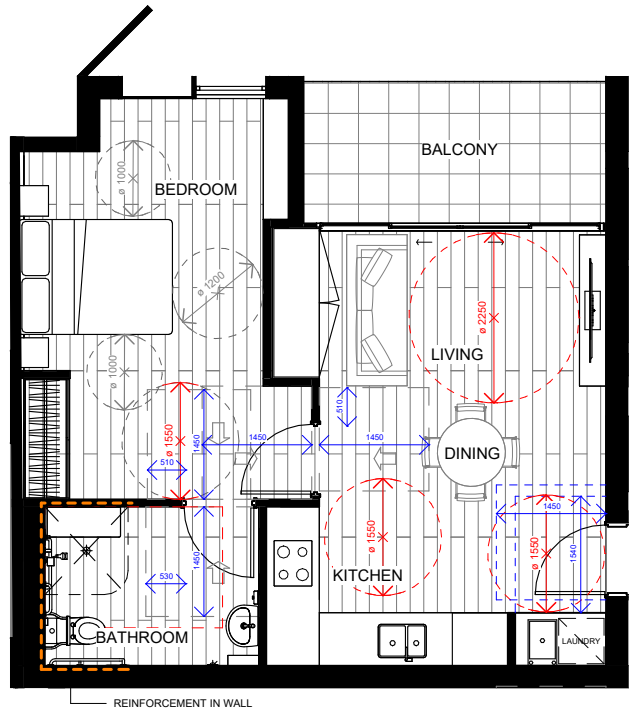


Issue	Description	Date	Client	Project	Title	Drawing No.	Issue
1	Development Application	19.06.2025	CORIO PROJECTS	Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	LEVEL 03	DA105	1
						Scale 1 : 250	Drawing Size A3
						Project No. 23110	Drawn By JT
					DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION	CAD Reference	
						19/06/2025 4:18:36 PM	

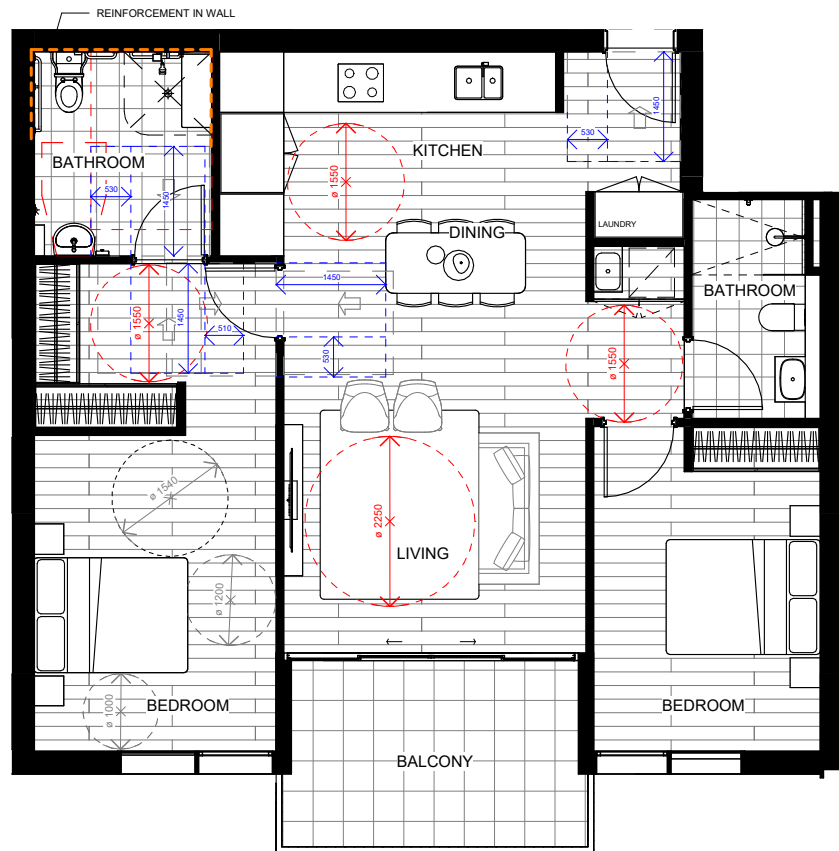




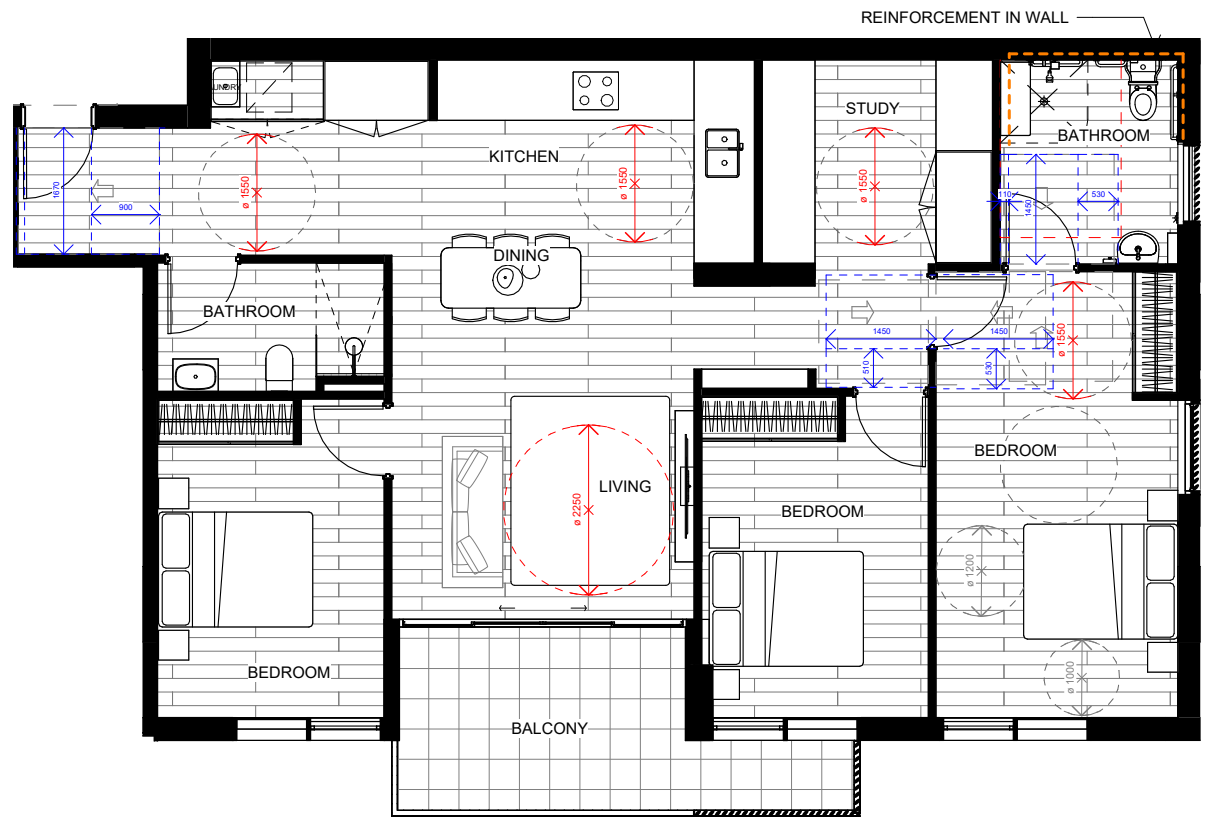
WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	0 2.5 5 7.5m 1:250 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue 1	Description Development Application	Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	Title LEVEL 05	Drawing No. DA107	Issue 1
		Scale 1 : 250	Drawing Size A3						
		Project No. 23110	Drawn By JT						
		DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION		CAD Reference					
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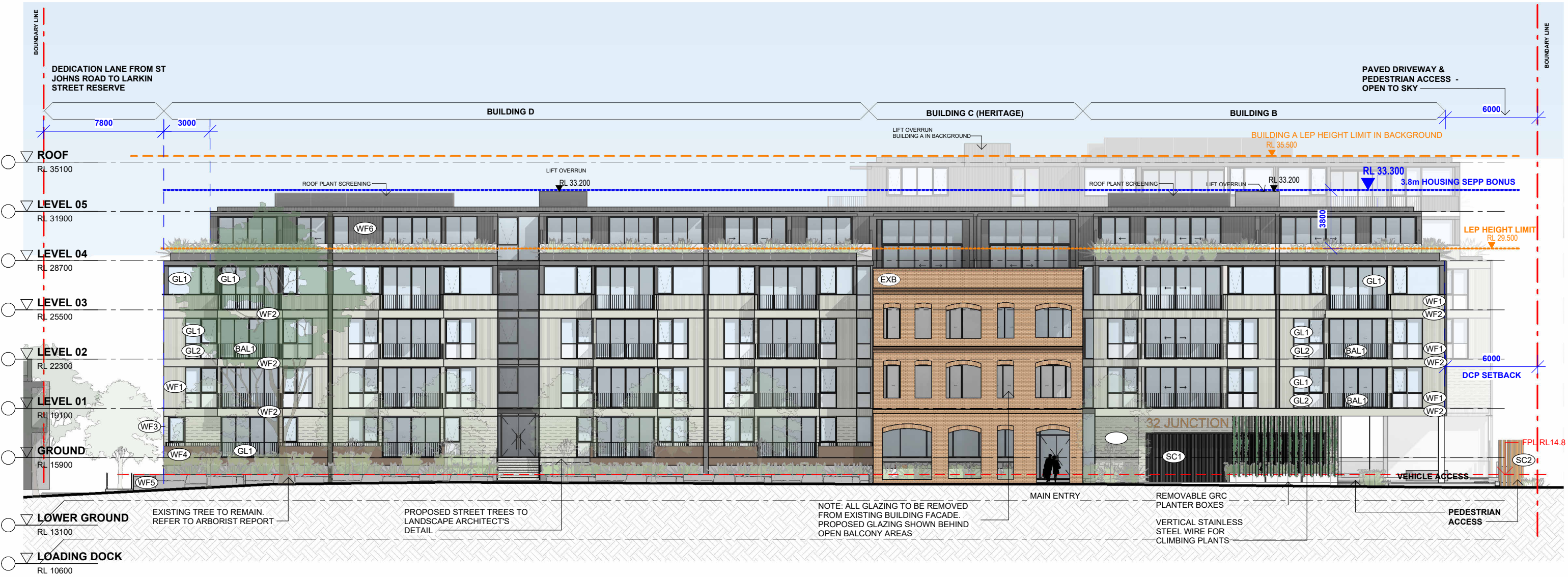
1 TYPICAL APARTMENT TYPE 1 BED
SCALE 1 : 100



2 TYPICAL APARTMENT TYPE 2 BED
SCALE 1 : 100



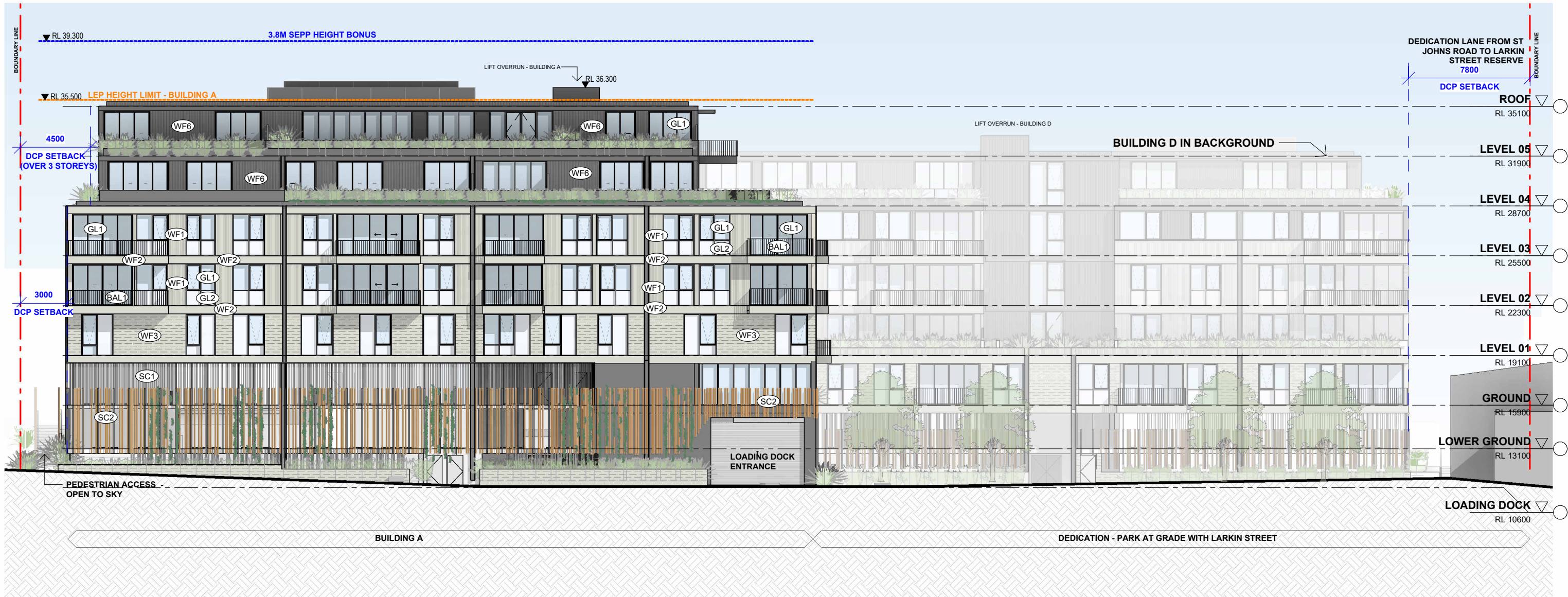
3 TYPICAL APARTMENT TYPE 3 BED
SCALE 1 : 100



1 EAST ELEVATION (ALONG JUNCTION ST)
SCALE 1 : 250

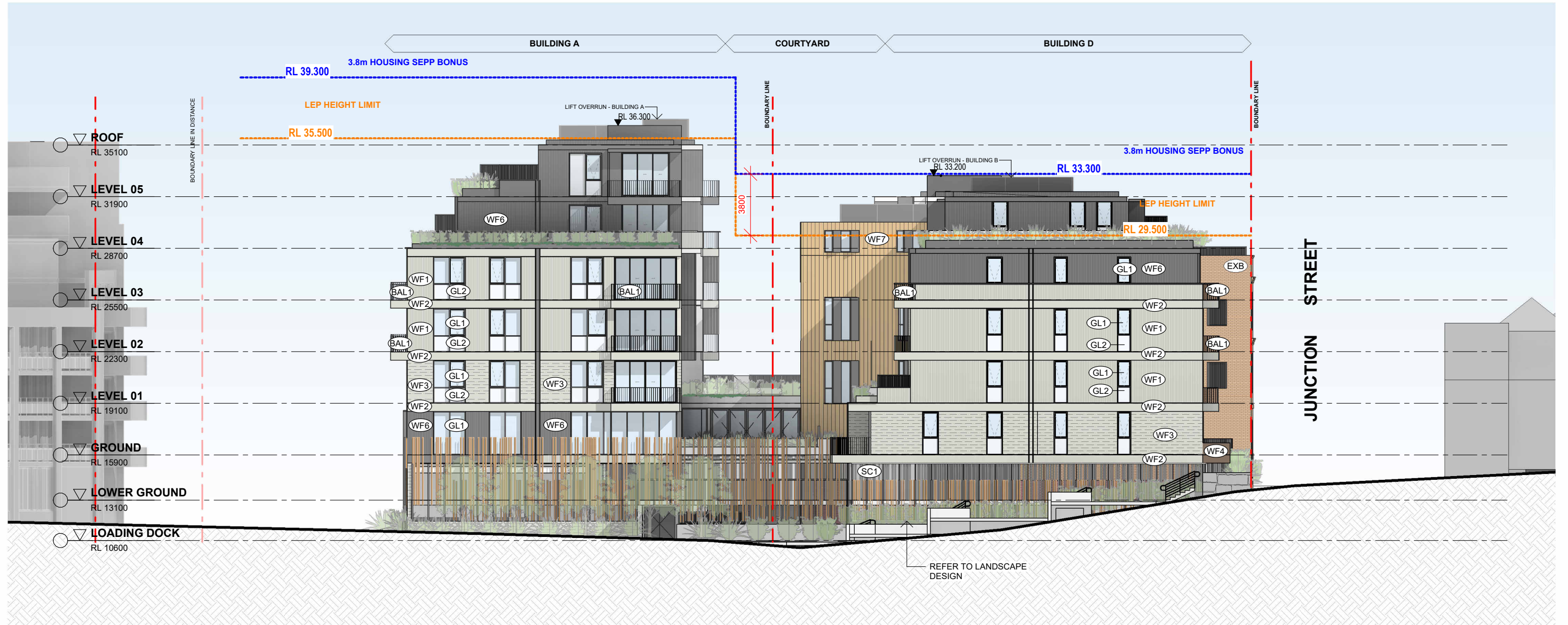
WMK WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	02.557.5 1:250	Issue 1	
		Description Development Application	Drawing Size A3
		Date 19.06.2025	Drawn By JT
		Client CORIO PROJECTS	
		Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	
Title ELEVATION - EAST (ALONG JUNCTION ST)		Drawing No. DA200	
Scale 1 : 250		Drawing Size A3	
Project No. 23110		Drawn By JT	
DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION		CAD Reference 19/06/2025 4:19:08 PM	





1 WEST ELEVATION
SCALE 1 : 250

WMK WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	02.557.5m 1:250 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue 1	Description Development Application	Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	Title ELEVATION - WEST	Drawing No. DA201	Issue 1
		Scale 1 : 250	Drawing Size A3						
		Project No. 23110	Drawn By JT						
DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION							CAD Reference 19/06/2025 4:19:32 PM		



1

SOUTH ELEVATION

SCALE 1 : 250



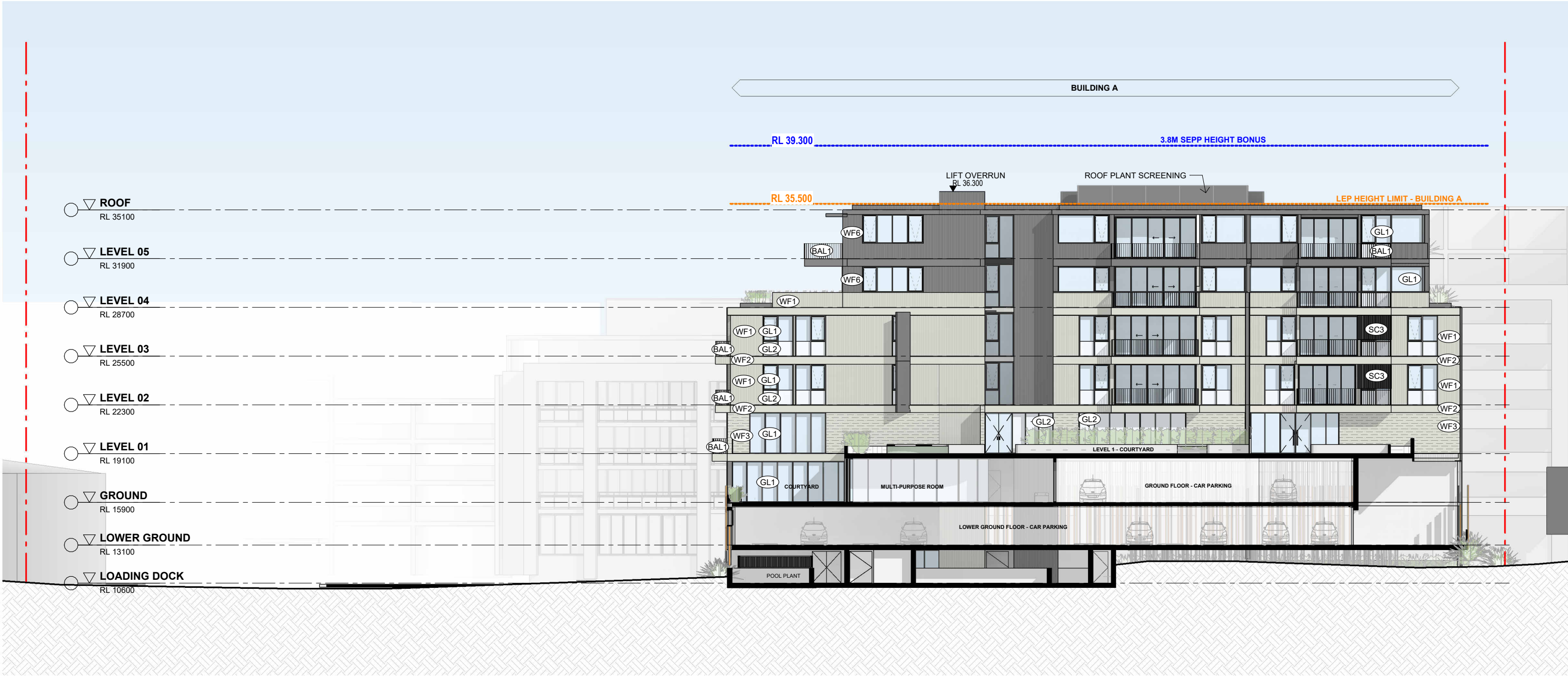
INTERNAL COURTYARD WEST
ELEVATION

1

SCALE 1 : 250

 WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	02.557.5m1:250 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue	Description	Date	Client	Project	Title	Drawing No.	Issue
		1	Development Application	19.06.2025	CORIO PROJECTS	Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	ELEVATION - INTERNAL WEST	DA204	1
								Scale 1 : 250	Drawing Size A3
								Project No. 23110	Drawn By JT
							DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION	CAD Reference 19/06/2025 4:20:23 PM	

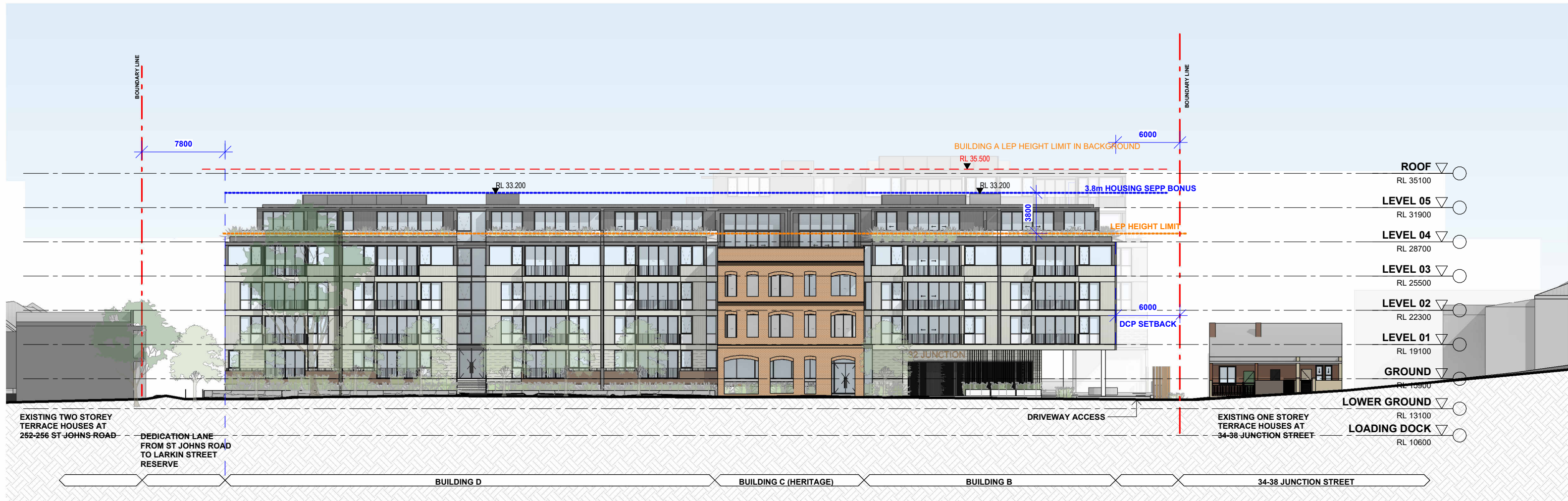




1 INTERNAL COURTYARD EAST ELEVATION

SCALE 1 : 250

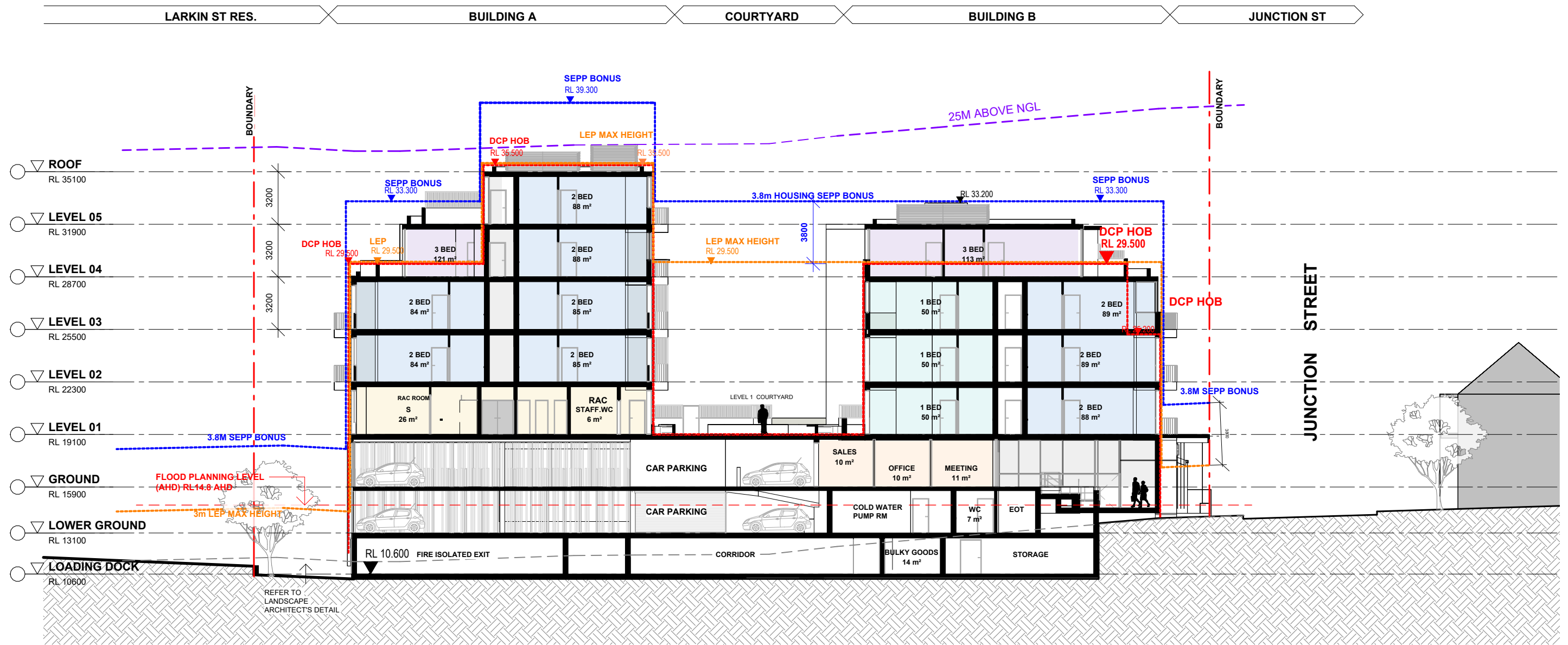
WMK WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	02.557.5m1:250 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect:Greg Barnett (NSW ARB. 6092)	Issue	Description	Date	Client	Project	Title	Drawing No.	Issue	
		1	Development Application	19.06.2025	CORIO PROJECTS	Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	ELEVATION - INTERNAL EAST	DA205	1	
								Scale 1 : 250	Scale 1 : 250	Drawing Size A3
								Project No. 23110	Project No. 23110	Drawn By JT
DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION								CAD Reference	19/06/2025 4:21:14 PM	



STREETSCAPE ELEVATION - JUNCTION STREET

SCALE 1 : 350

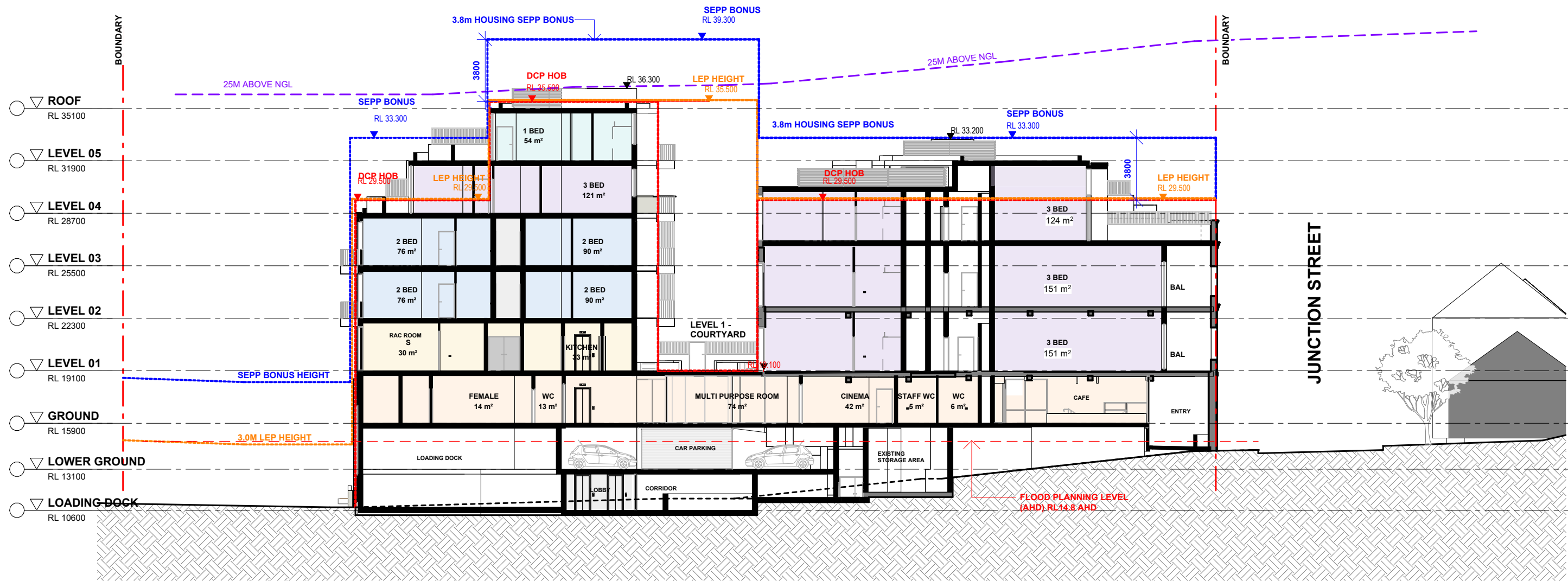
 WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue 1	Description Development Application	Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	Title STREETSCAPE ELEVATION - JUNCTION ST	Drawing No. DA206	Issue 1
								Scale 1 : 350	Drawing Size A3
							DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION	Project No. 23110 CAD Reference 19/06/2025 4:22:13 PM	Drawn By JT



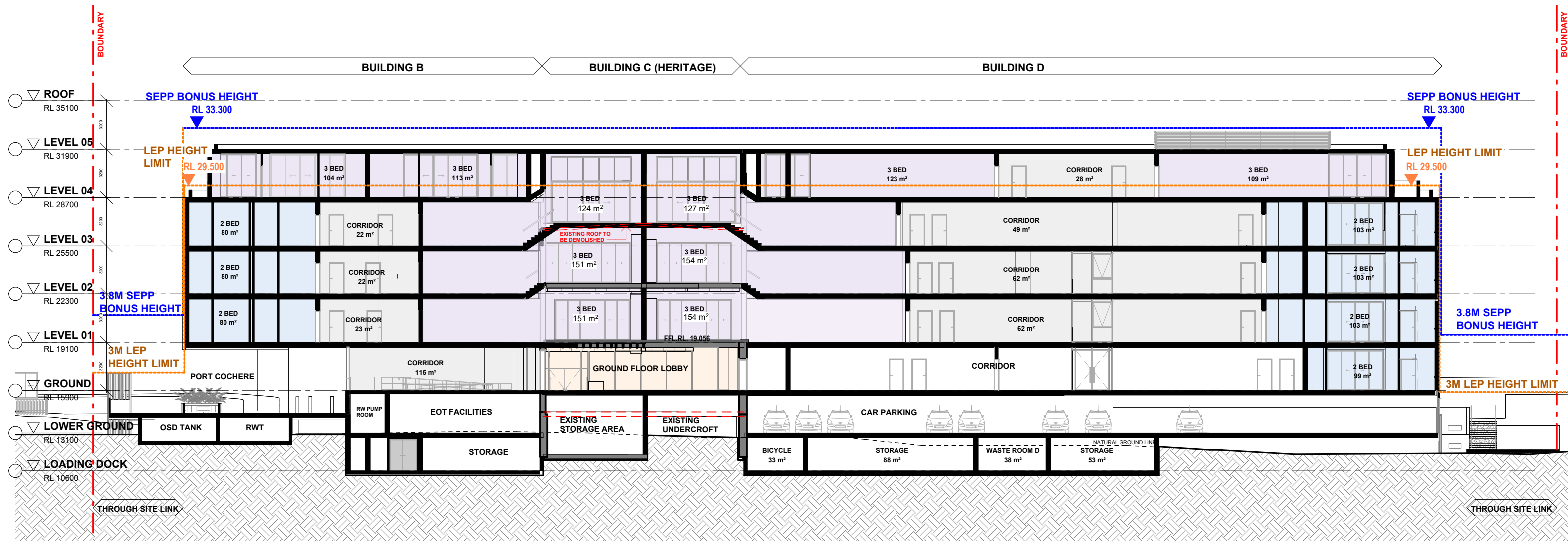
2

SECTION 01

SCALE 1 : 250



1 SECTION 02 - LOADING DOCK
SCALE 1 : 250



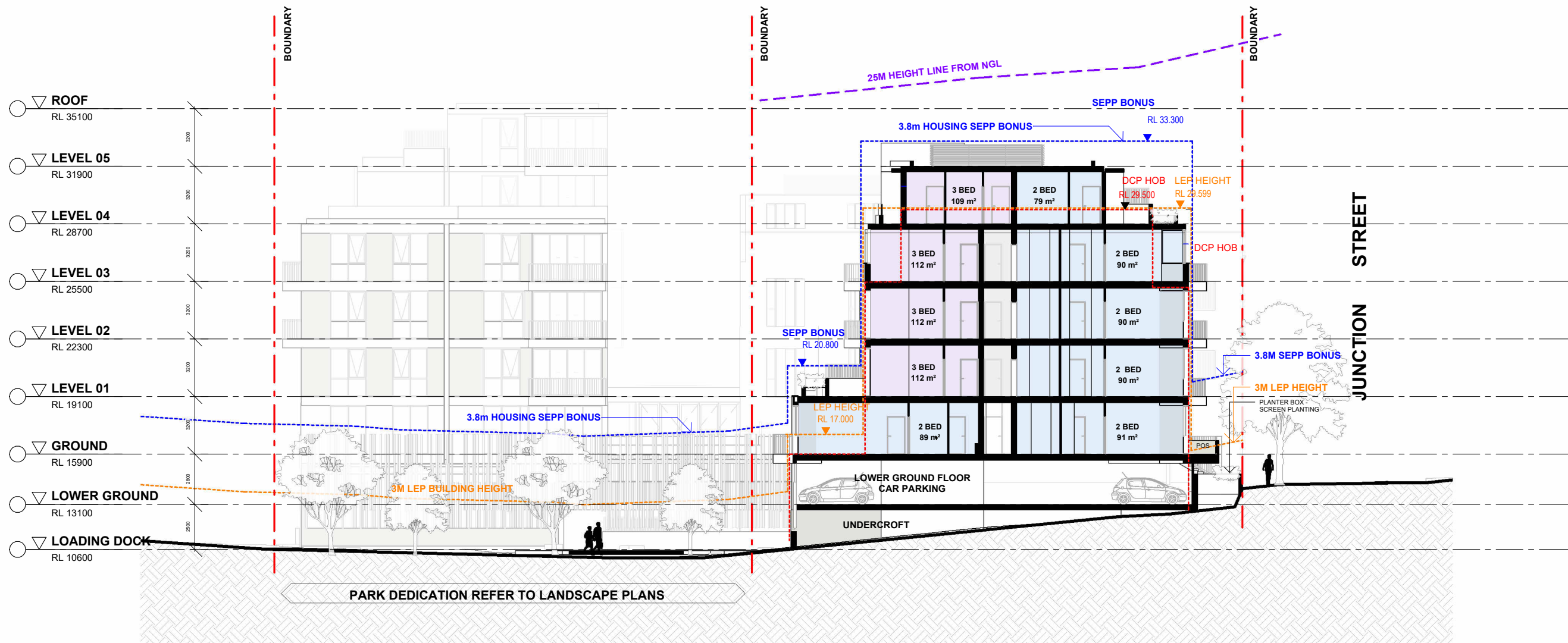
1 SECTION 03

SCALE 1 : 250

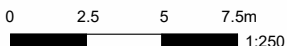
WMK WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	02.557.5m 1:250 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue 1 Description Development Application Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	Title SECTION 03 - HERITAGE BUILDING	Drawing No. DA302	Issue 1
						Scale 1 : 250	Drawing Size A3
					DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION	Project No. 23110	Drawn By JT

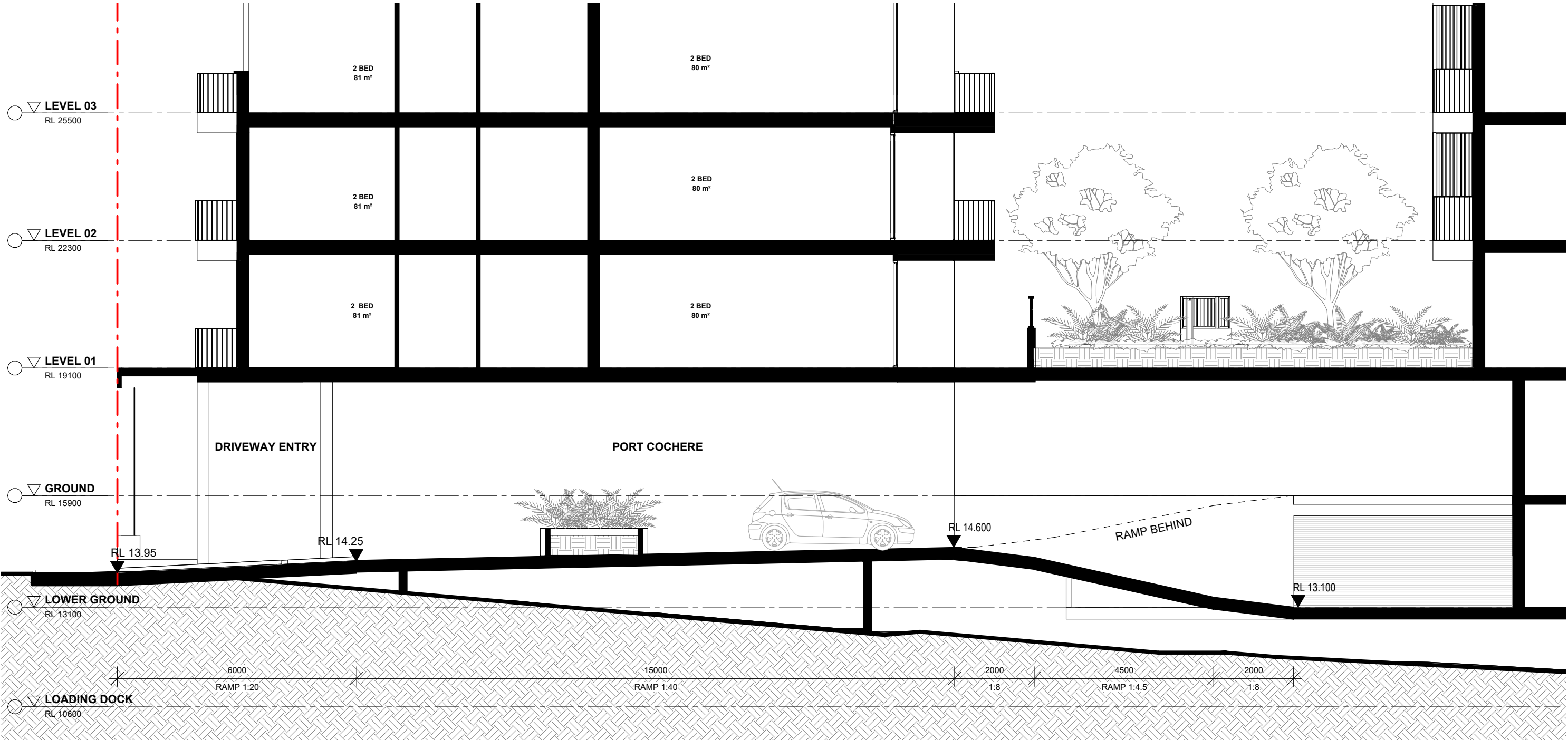
CAD Reference

19/06/2025 4:22:31 PM



1 SECTION 04
SCALE 1 : 250

 WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	 02.557.5m 1:250 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue 1	Description Development Application	Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	Title SECTION 04	Drawing No. DA303	Issue 1
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								Project No. 23110	Drawn By JT
							DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION	CAD Reference 19/06/2025 4:22:35 PM	

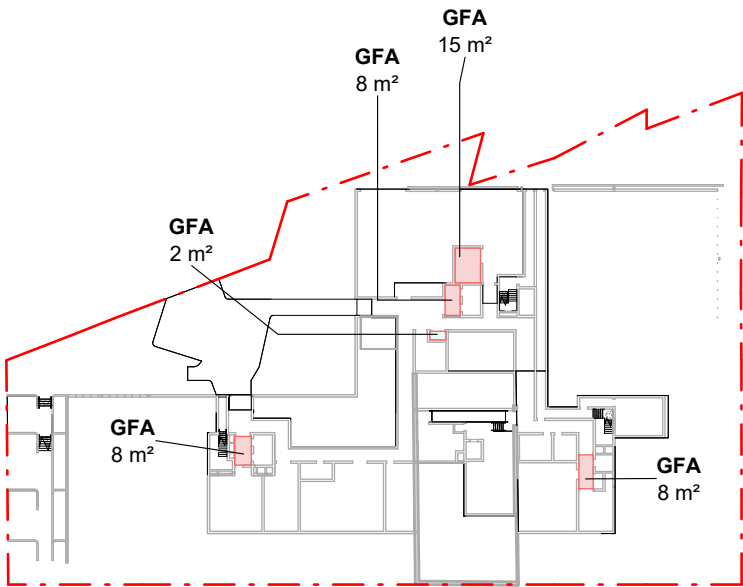


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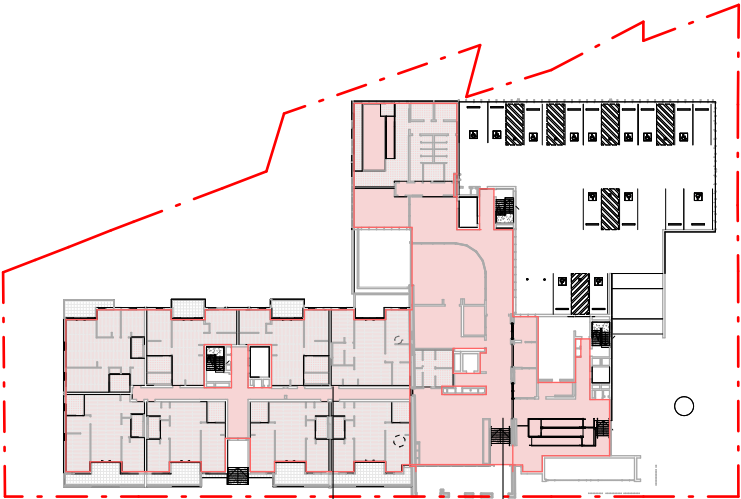
SECTION 05 - DRIVEWAY

SCALE 1 : 100

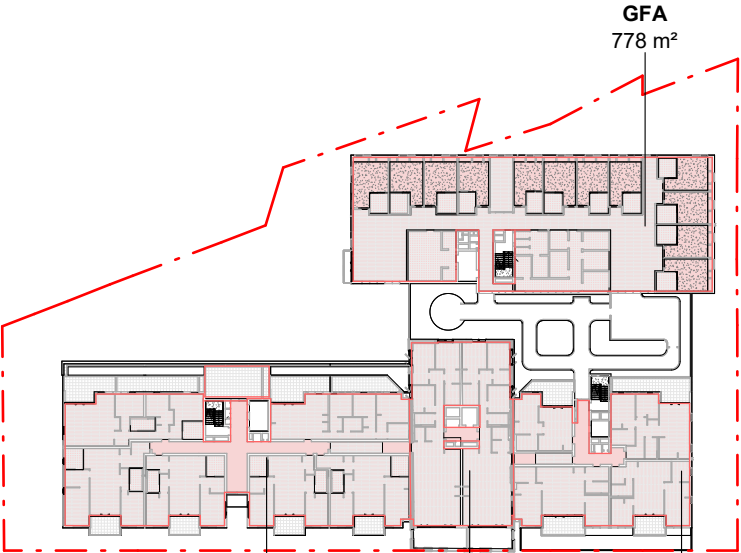
WMK WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	0123m 1:100 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue	Description	Date	Client	Project	Title	Drawing No.	Issue	
		1	Development Application	19.06.2025	CORIO PROJECTS	Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	SECTION 05 - DRIVEWAY	DA304	1	
								Scale 1 : 100	Drawing Size A3	
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DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION								CAD Reference		
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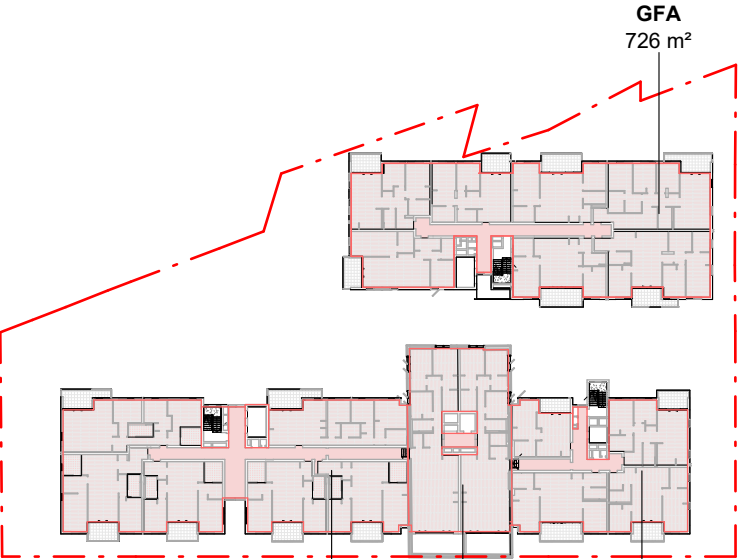
GFA LOADING DOCK LEVEL



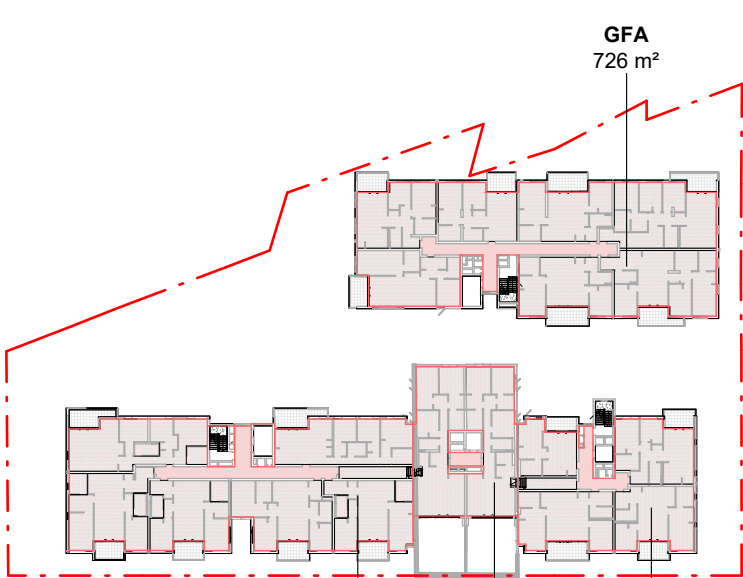
GFA GROUND



GFA LEVEL 01



GFA LEVEL 02



GFA LEVEL 03



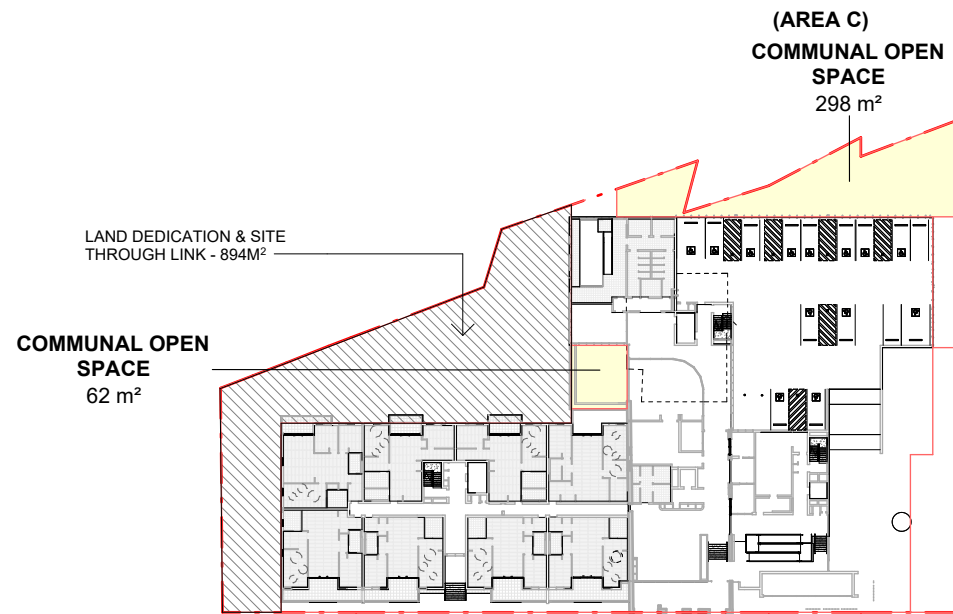
GFA LEVEL 04



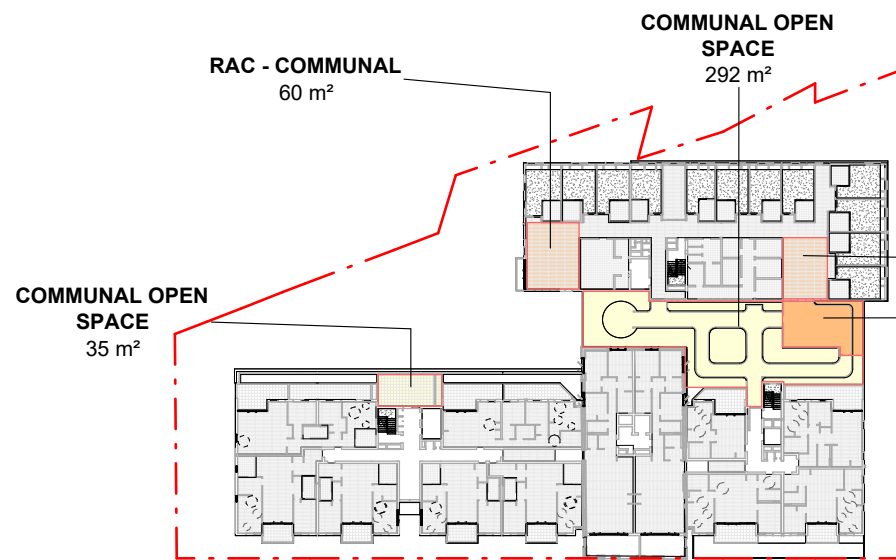
GFA LEVEL 05

GFA CALCULATION	
LOADING DOCK	43 m²
GROUND	1674 m²
LEVEL 01	2136 m²
LEVEL 02	2083 m²
LEVEL 03	2022 m²
LEVEL 04	1160 m²
LEVEL 05	289 m²
TOTAL GFA	9407 m²

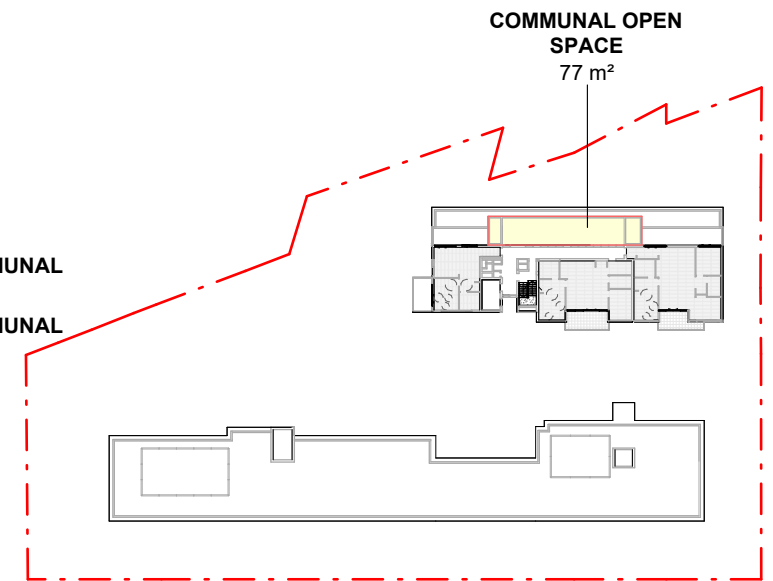
ALL AREAS ARE APPROXIMATE ONLY AND SUBJECT TO CHANGE
FINAL AREAS ARE TO BE CONFIRMED BY A LICENSED SURVEYOR



1 COMMUNAL OPEN SPACE - GROUND
SCALE 1:1000



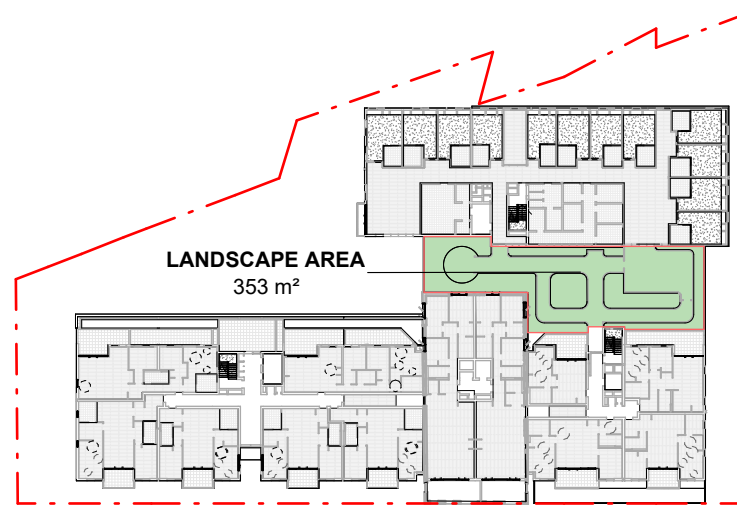
2 COMMUNAL SPACE - LEVEL 01
SCALE 1:1000



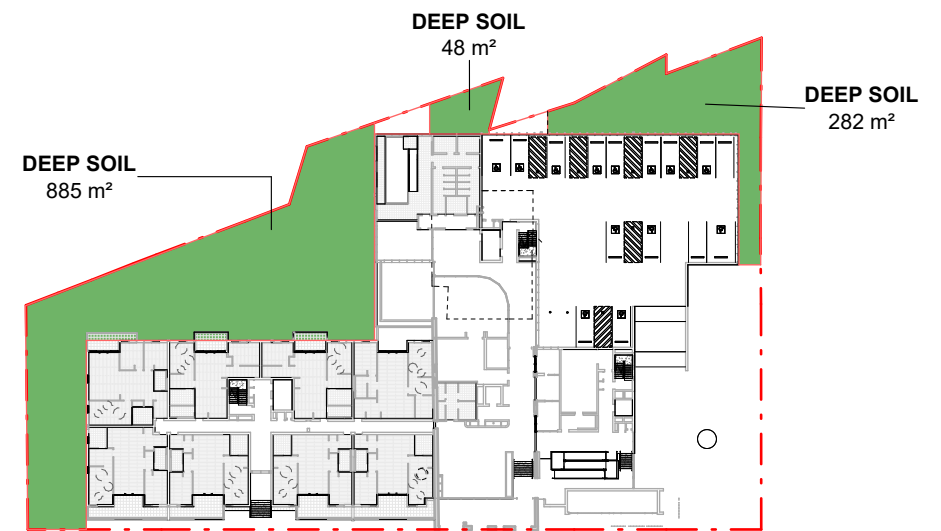
3 COMMUNAL OPEN SPACE - LEVEL 05
SCALE 1:1000



4 LANDSCAPE AREA - GROUND
SCALE 1:1000



5 LANDSCAPE AREA - LEVEL 01
SCALE 1:1000



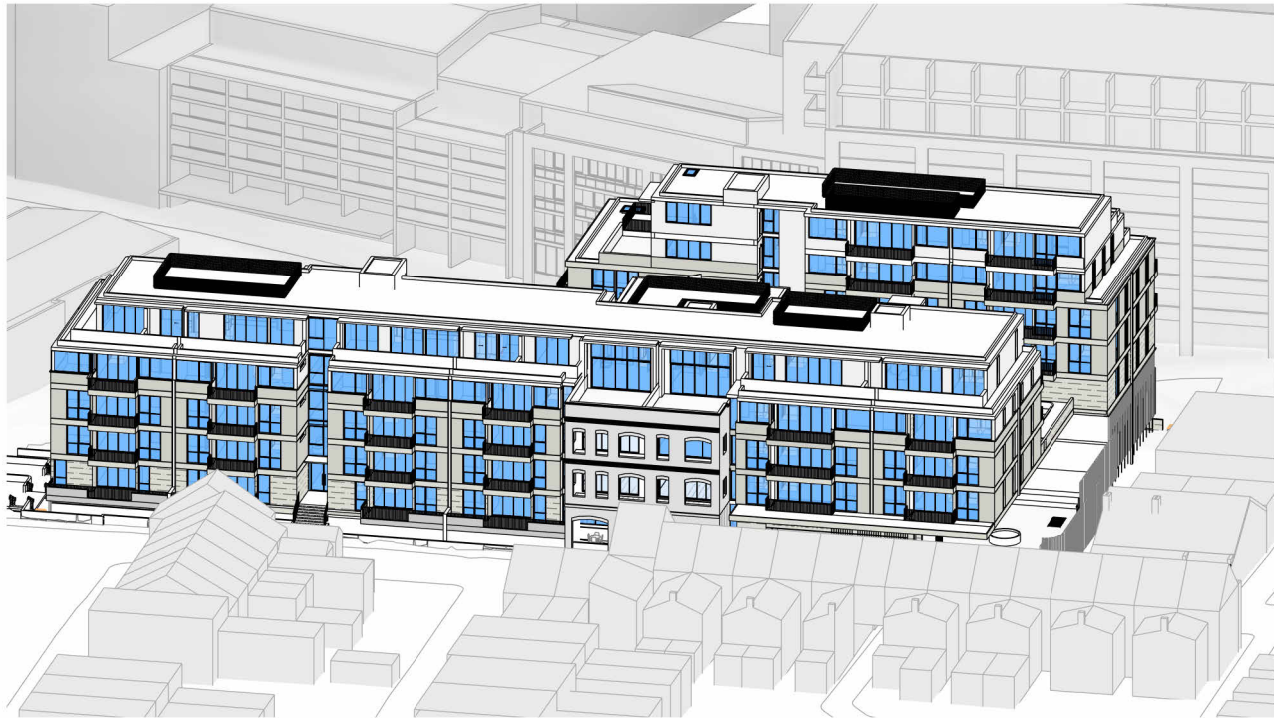
6 DEEP SOIL AREA
SCALE 1:1000

REQUIRED ILU COMMUNAL AREA: Site Area = 4824m ² Minimum Communal Open Area Required = 1206m ² (25% OF SITE AREA AS PER ADG)	INDEPENDENT LIVING UNITS - PROPOSED COMMUNAL AREA CALCULATION <table> <tr> <th>LEVEL</th><th>AREA</th></tr> <tr> <td>GROUND</td><td>360 m²</td></tr> <tr> <td>LEVEL 01</td><td>327 m²</td></tr> <tr> <td>LEVEL 05</td><td>77 m²</td></tr> <tr> <td>TOTAL ILU COMMUNAL AREA</td><td>764 m²</td></tr> </table>	LEVEL	AREA	GROUND	360 m ²	LEVEL 01	327 m ²	LEVEL 05	77 m ²	TOTAL ILU COMMUNAL AREA	764 m ²
LEVEL	AREA										
GROUND	360 m ²										
LEVEL 01	327 m ²										
LEVEL 05	77 m ²										
TOTAL ILU COMMUNAL AREA	764 m ²										
REQUIRED RAC COMMUNAL AREA: As per SEPP Housing 2021: RAC Communal Internal & Open Space = 10m ² for every bed Minimum Required RAC Communal Area = 10m ² x 12beds - 120m ²	RESIDENTIAL AGE CARE - PROPOSED COMMUNAL AREA CALCULATION <table> <tr> <th>LEVEL</th><th>AREA</th></tr> <tr> <td>LEVEL 01</td><td>176 m²</td></tr> <tr> <td>TOTAL RAC COMMUNAL AREA</td><td>176 m²</td></tr> </table>	LEVEL	AREA	LEVEL 01	176 m ²	TOTAL RAC COMMUNAL AREA	176 m ²				
LEVEL	AREA										
LEVEL 01	176 m ²										
TOTAL RAC COMMUNAL AREA	176 m ²										

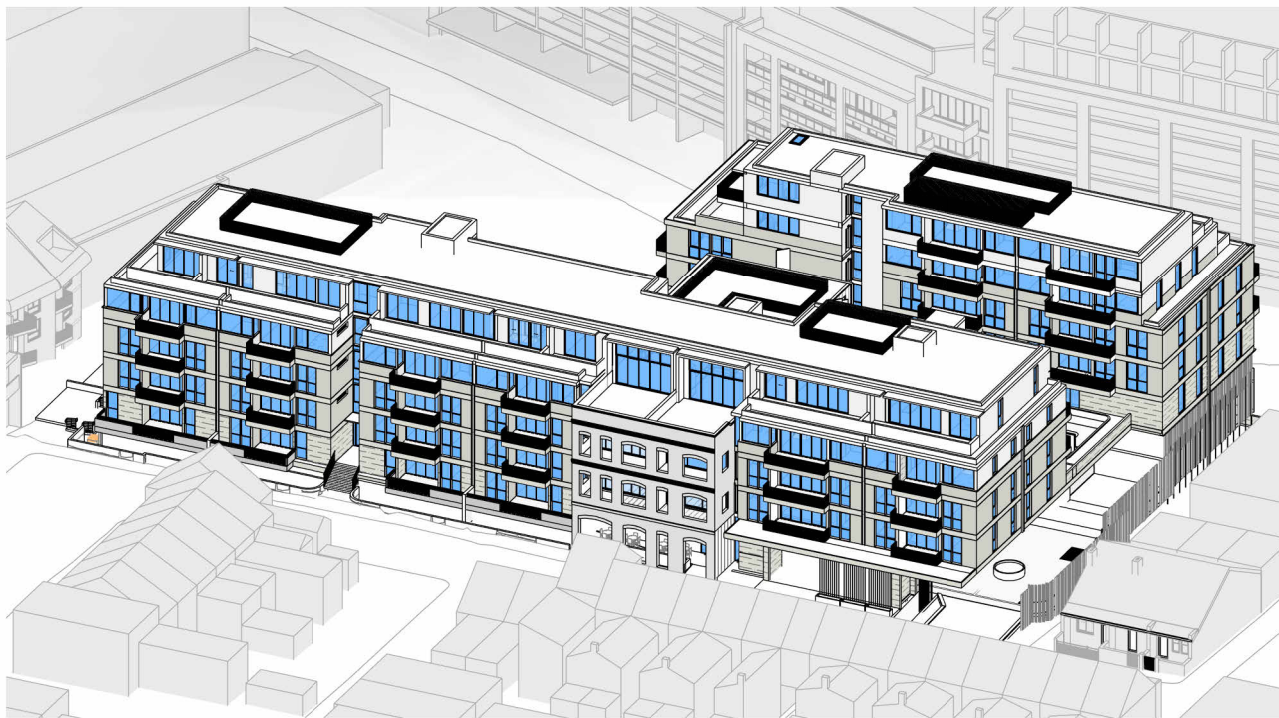
NOTE: TOTAL COMMUNAL AREA + LAND DEDICATION & SITE THROUGH LINK = 764 + 894M² = 1,658 M²

REQUIRED LANDSCAPING AREA: RAC Landscaping Area Requirement: 15m ² of landscaped area for every bed = 15 x 12 beds = 180m ² ILU Landscaping Area Requirement: 30% of the site area = 1447.2m ²	PROPOSED LANDSCAPE AREA CALCULATION <table> <tr> <th>LEVEL</th><th>AREA</th></tr> <tr> <td>GROUND</td><td>1375 m²</td></tr> <tr> <td>GROUND</td><td>11 m²</td></tr> <tr> <td>GROUND</td><td>5 m²</td></tr> <tr> <td>GROUND</td><td>5 m²</td></tr> <tr> <td>LEVEL 01</td><td>353 m²</td></tr> <tr> <td>TOTAL LANDSCAPING AREA</td><td>1748 m²</td></tr> </table>	LEVEL	AREA	GROUND	1375 m ²	GROUND	11 m ²	GROUND	5 m ²	GROUND	5 m ²	LEVEL 01	353 m ²	TOTAL LANDSCAPING AREA	1748 m ²
LEVEL	AREA														
GROUND	1375 m ²														
GROUND	11 m ²														
GROUND	5 m ²														
GROUND	5 m ²														
LEVEL 01	353 m ²														
TOTAL LANDSCAPING AREA	1748 m ²														

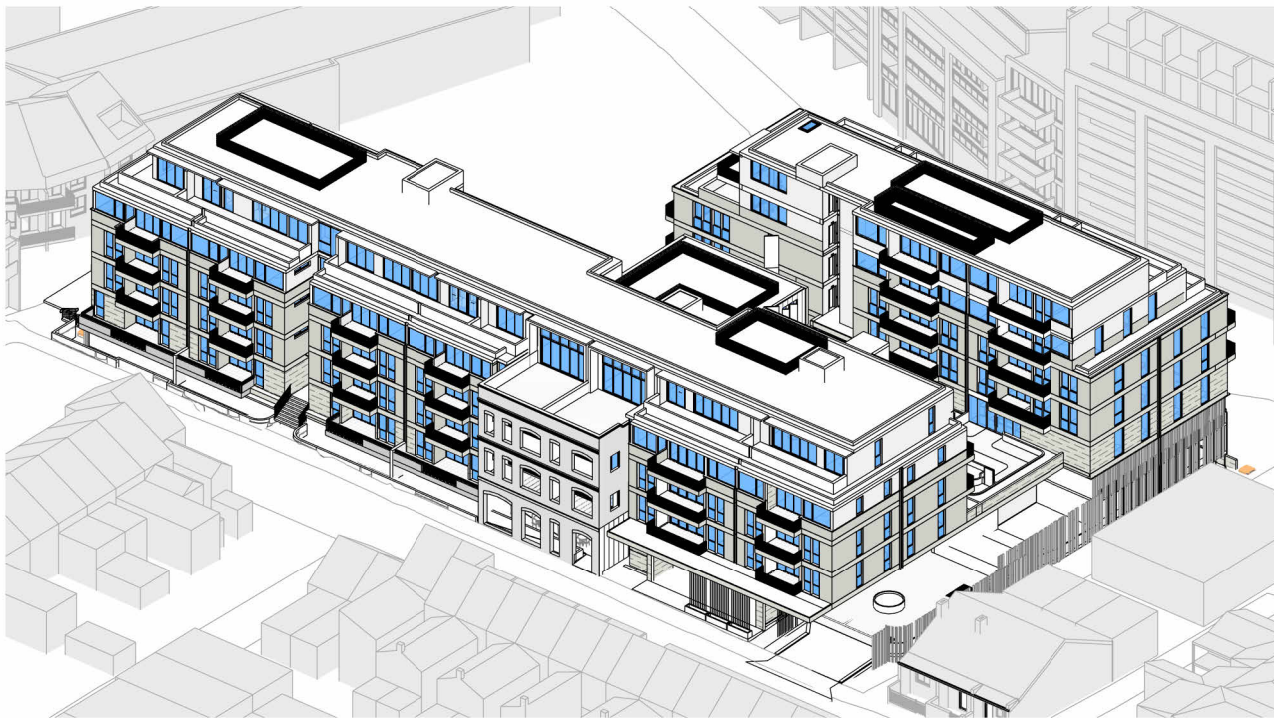
REQUIRED DEEP SOIL CALCULATION: As per [SEPP Housing 2021 Part 5 – Division 7.108(2)(f)] Deep Soil zone on at least 15% of the site area, where each deep soil zone has min. dimension of 3m. Min. Deep Soil Area = 723.6m ²	PROPOSED DEEP SOIL CALCULATION <table> <tr> <th>LEVEL</th><th>AREA</th></tr> <tr> <td>GROUND</td><td>885 m²</td></tr> <tr> <td>GROUND</td><td>282 m²</td></tr> <tr> <td>GROUND</td><td>48 m²</td></tr> <tr> <td>TOTAL DEEP SOIL AREA</td><td>1215 m²</td></tr> </table>	LEVEL	AREA	GROUND	885 m ²	GROUND	282 m ²	GROUND	48 m ²	TOTAL DEEP SOIL AREA	1215 m ²
LEVEL	AREA										
GROUND	885 m ²										
GROUND	282 m ²										
GROUND	48 m ²										
TOTAL DEEP SOIL AREA	1215 m ²										



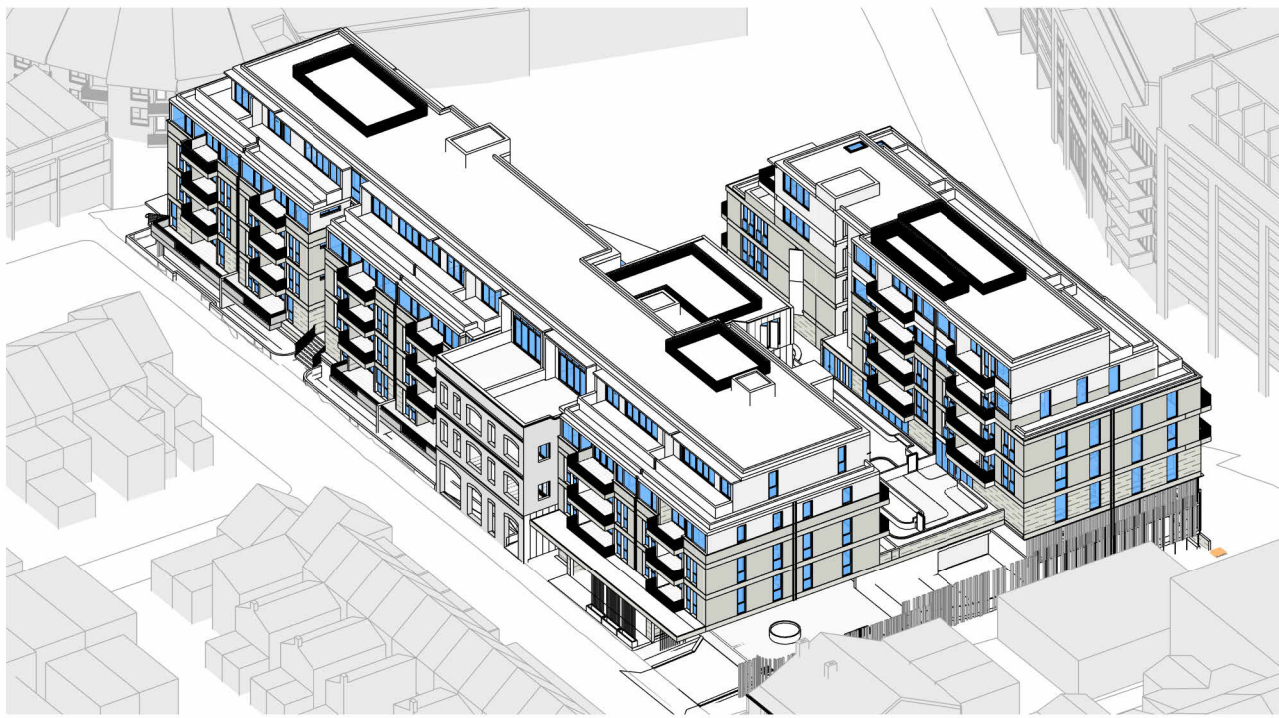
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2 SOLAR ACCESS - 21/06/2024-10.00

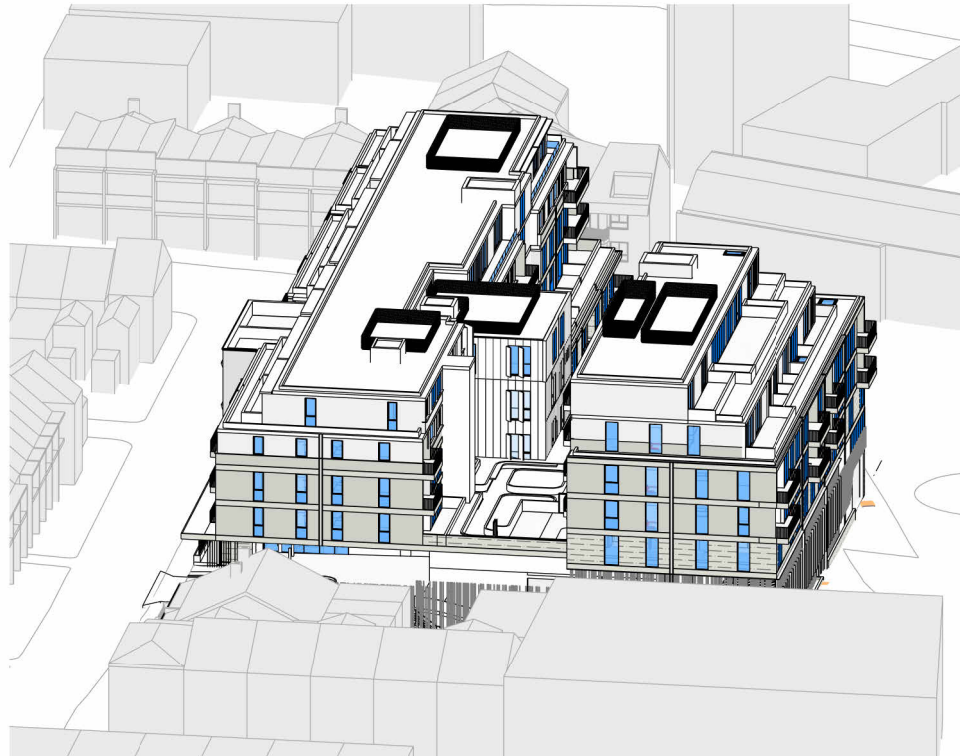


3 SOLAR ACCESS - 21/06/2024-11.00



4 SOLAR ACCESS - 21/06/2024-12.00

WMK WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue 1	Description Development Application	Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	Title SUN EYE VIEWS - SHEET 01	Drawing No. DA402	Issue 1
							Scale N/A	
							Project No. 23110	Drawing Size A3
							CAD Reference	Drawn By JT
							DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION	19/06/2025 4:24:34 PM

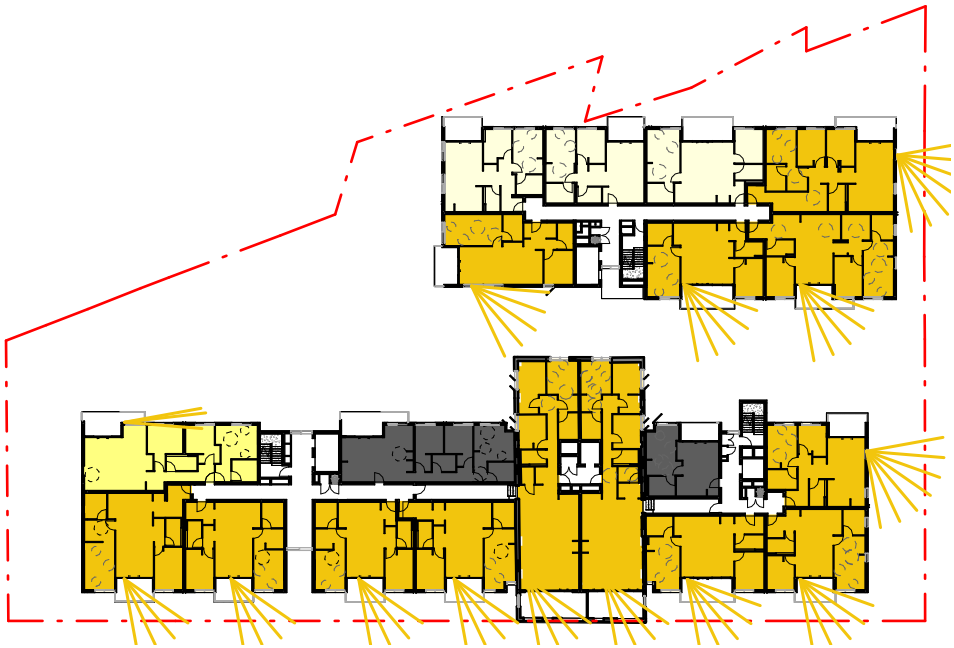




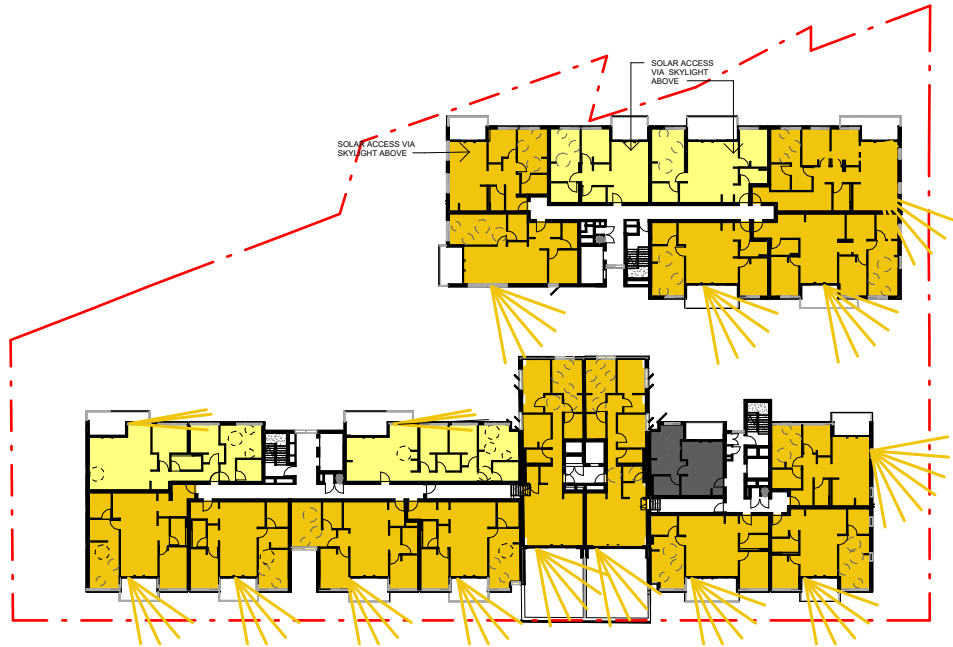
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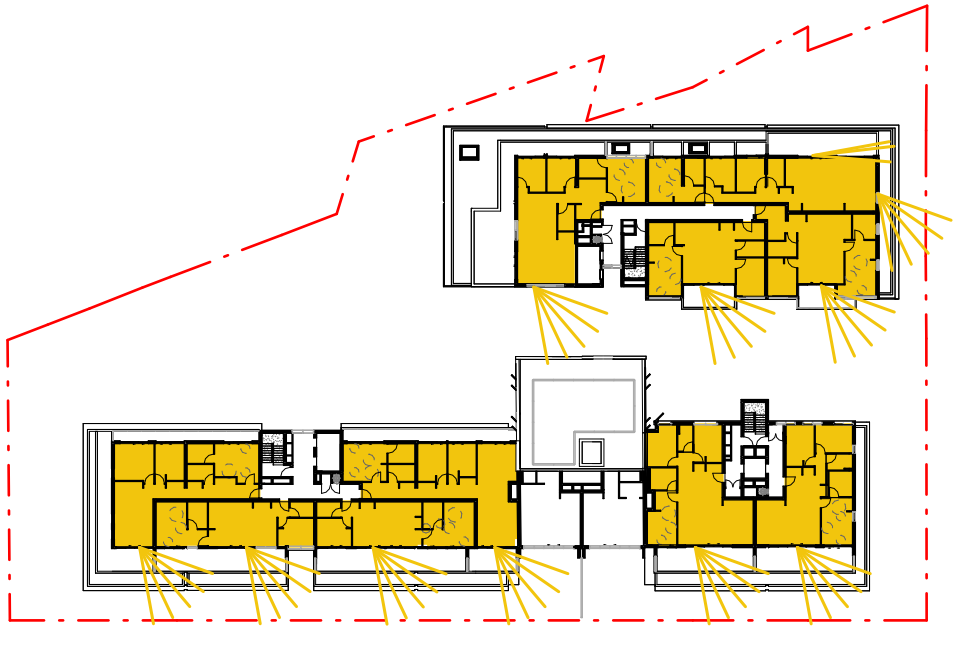
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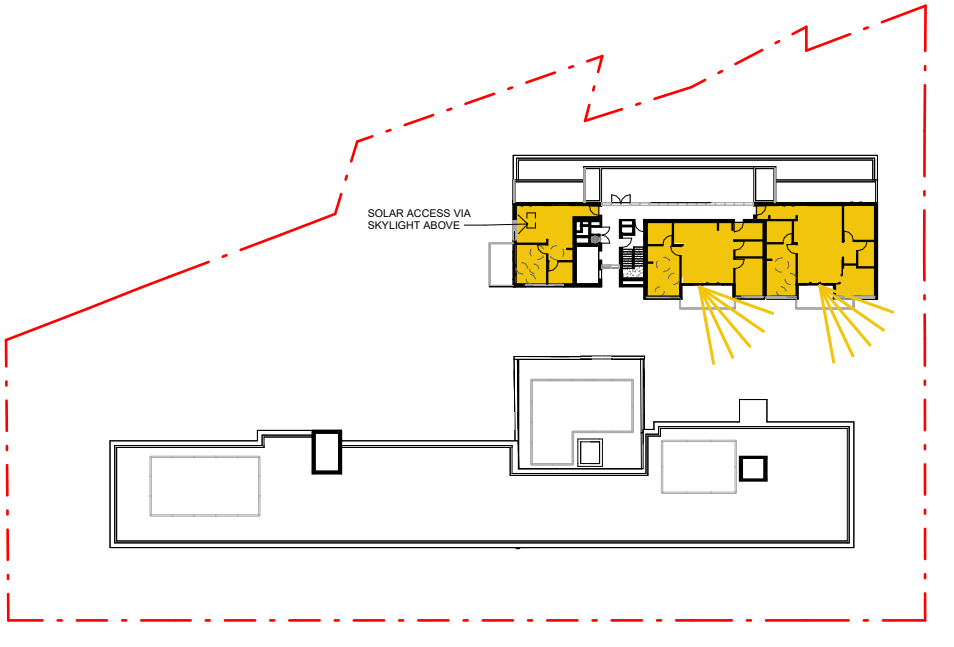
3 SOLAR ACCESS - LEVEL 2



4 SOLAR ACCESS - LEVEL 3



5 SOLAR ACCESS - LEVEL 4



6 SOLAR ACCESS - LEVEL 5

LEGEND

- MINIMUM 2 HOURS OF SOLAR ACCESS COMPLIANCE (LIVING + BALCONY)
- PARTIAL SOLAR ACCESS (LIVING ROOM + BALCONY)
- PARTIAL SOLAR ACCESS (BALCONY ONLY)
- NO SOLAR ACCESS

Solar Access Compliance Schedule

2H Solar		Unit Count	
2H SOLAR	(LIVING + BALCONY)	53	74.6 %
NO SOLAR	(LIVING + BALCONY)	6	8.4 %
PARTIAL SUN	(LIVING + BALCONY)	6	8.5 %
PARTIAL SUN - BALCONY ONLY		6	8.5 %
Grand total		71	

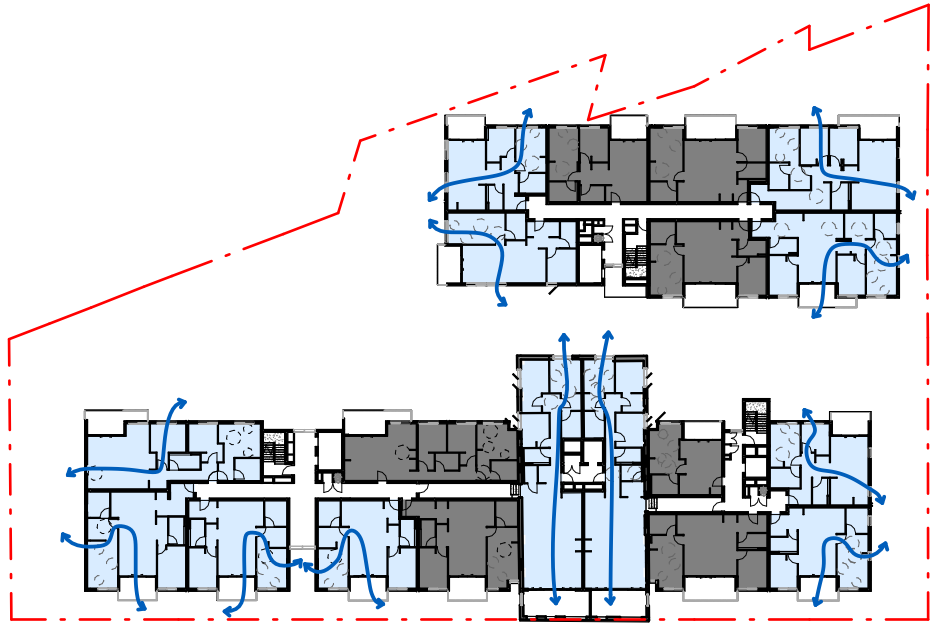




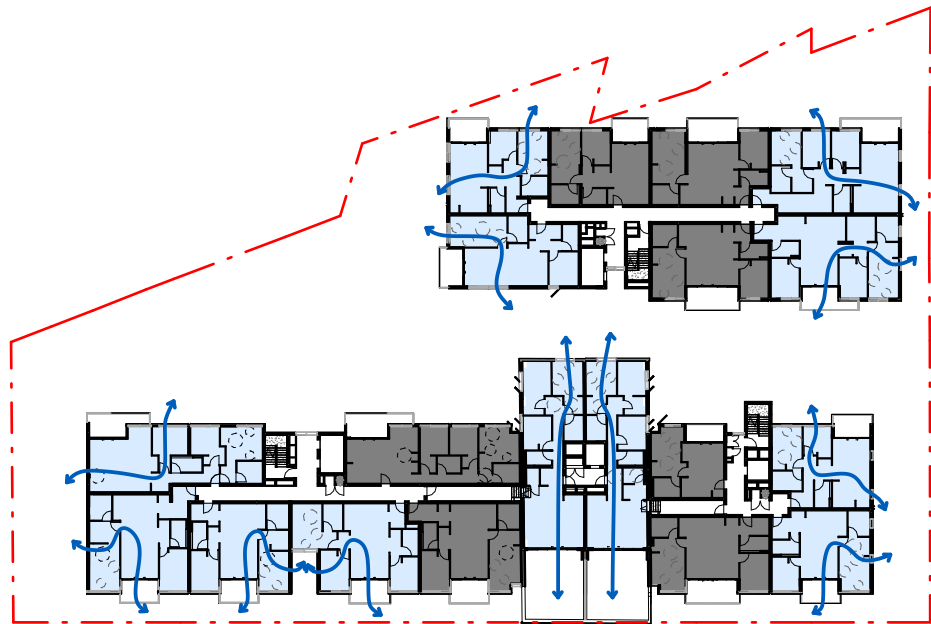
1 CROSS VENT - GROUND



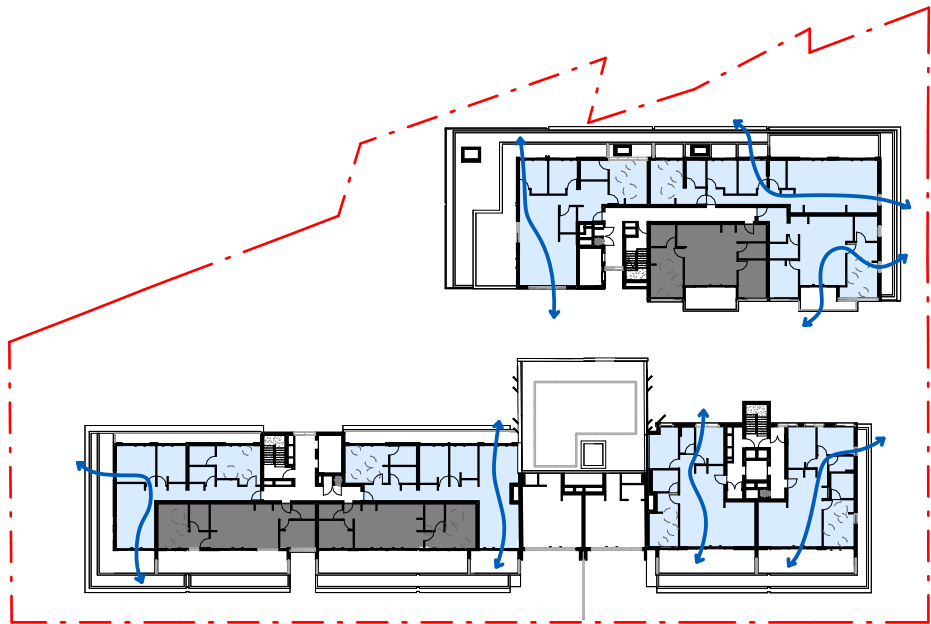
2 CROSS VENT - LEVEL 1



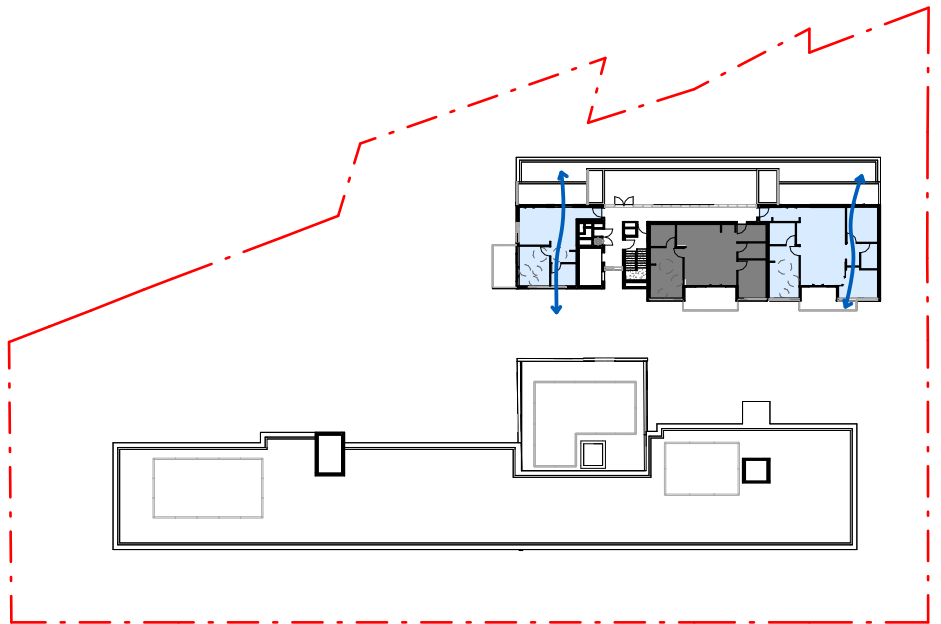
3 CROSS VENT - LEVEL 2



4 CROSS VENT - LEVEL 3



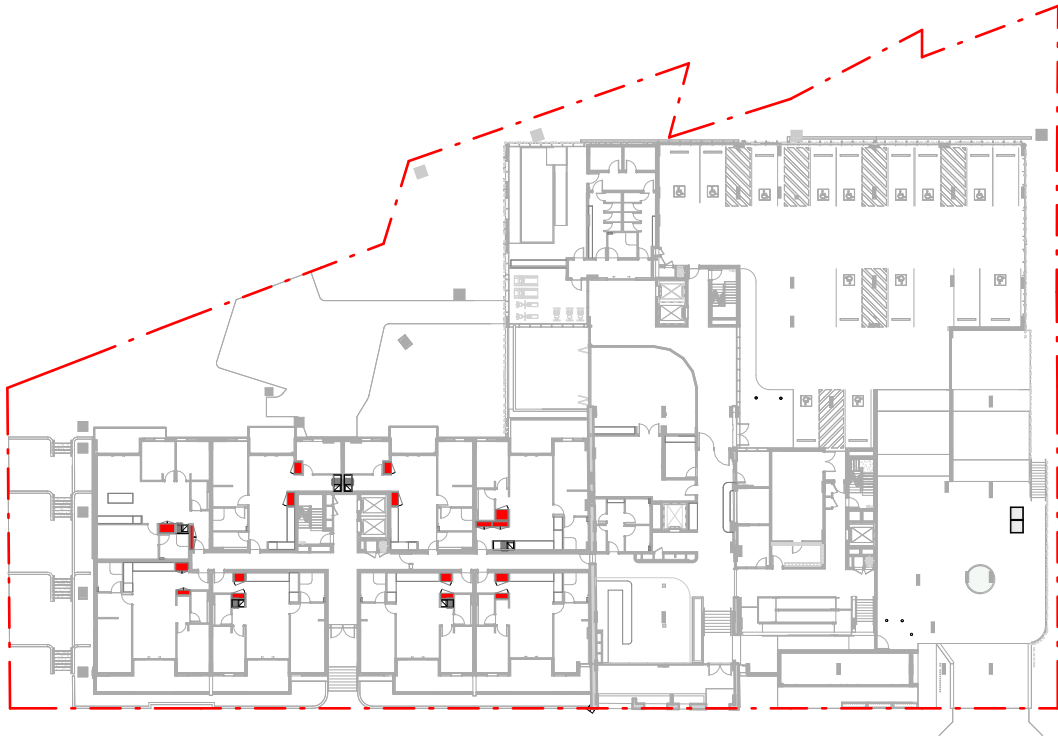
5 CROSS VENT - LEVEL 4



6 CROSS VENT - LEVEL 5

Cross Ventilation Compliance Schedule		
Cross-ventilation Compliance	Count	%
No	28	39.4 %
Yes	43	60.6 %
Grand total: 71		

LEGEND
 APARTMENT WHICH RECEIVE CROSS VENTILATION
 APARTMENT WHICH RECEIVE NO CROSS VENTILATION



1 STORAGE PLAN - GROUND FLOOR



2 STORAGE PLAN - LEVEL 1



3 STORAGE PLAN - LEVEL 2



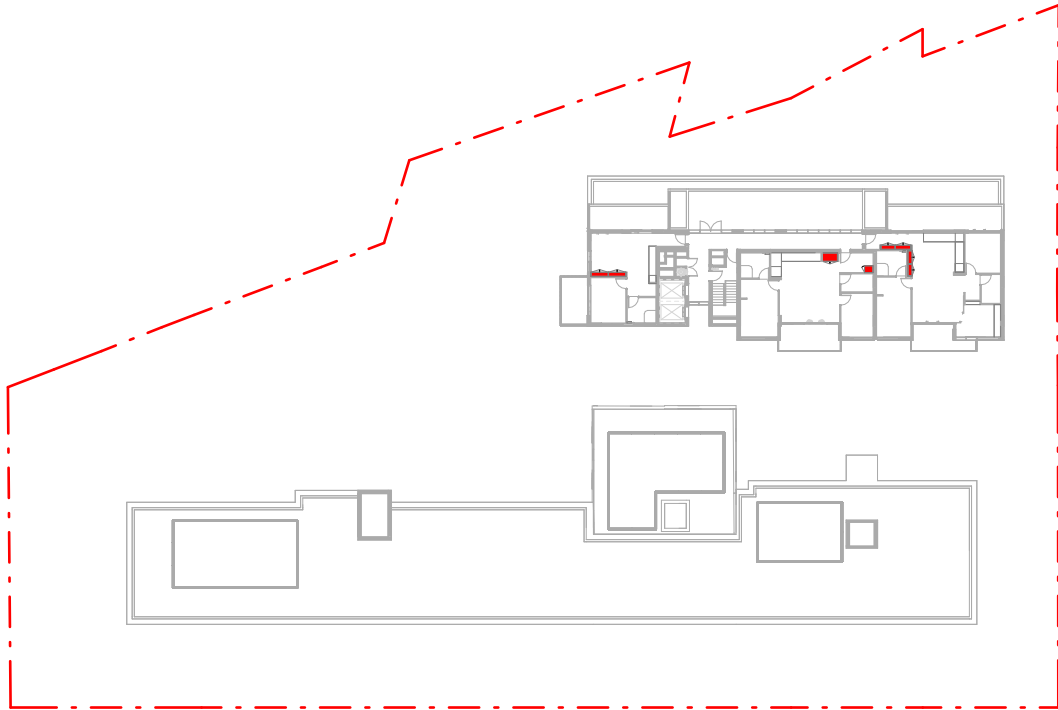
4 STORAGE PLAN - LEVEL 3

STORAGE SCHEDULE					
LEVEL	UNIT NO.	UNIT TYPE	INTERNAL STORAGE (Min. Provided)	BASEMENT STORAGE	TOTAL STORAGE
GROUND	D.001	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.002	3 BED	5.0 m³	5.0 m³	10 m³
GROUND	D.003	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.004	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.005	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.006	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.007	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.008	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	C.101	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 01	C.102	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 01	B.101	1 BED	3.0 m³	3.0 m³	6 m³
LEVEL 01	B.102	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	B.103	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	B.104	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	D.101	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 01	D.102	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	D.103	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	D.104	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	D.105	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	D.106	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	A.201	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	A.202	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	A.203	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	A.204	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	A.205	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	A.206	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	A.207	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	B.201	1 BED	3.0 m³	3.0 m³	6 m³
LEVEL 02	B.202	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	B.203	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	B.204	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	D.201	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	D.202	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	D.203	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	D.204	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	D.205	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	D.206	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	C.201	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	C.202	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	A.301	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	A.302	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	A.303	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	A.304	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	A.305	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	A.306	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	A.307	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	B.301	1 BED	3.0 m³	3.0 m³	6 m³
LEVEL 03	B.302	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	B.303	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	B.304	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	D.301	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	D.302	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	D.303	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	D.304	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	D.305	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	D.306	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	C.301	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	C.302	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	A.401	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	A.402	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 04	A.403	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 04	A.404	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	B.401	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	B.402	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	D.401	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	D.402	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 04	D.403	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 04	D.404	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 05	A.501	1 BED	3.0 m³	3.0 m³	6 m³
LEVEL 05	A.502	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 05	A.503	2 BED+S	4.0 m³	4.0 m³	8 m³





1 STORAGE PLAN - LEVEL 4

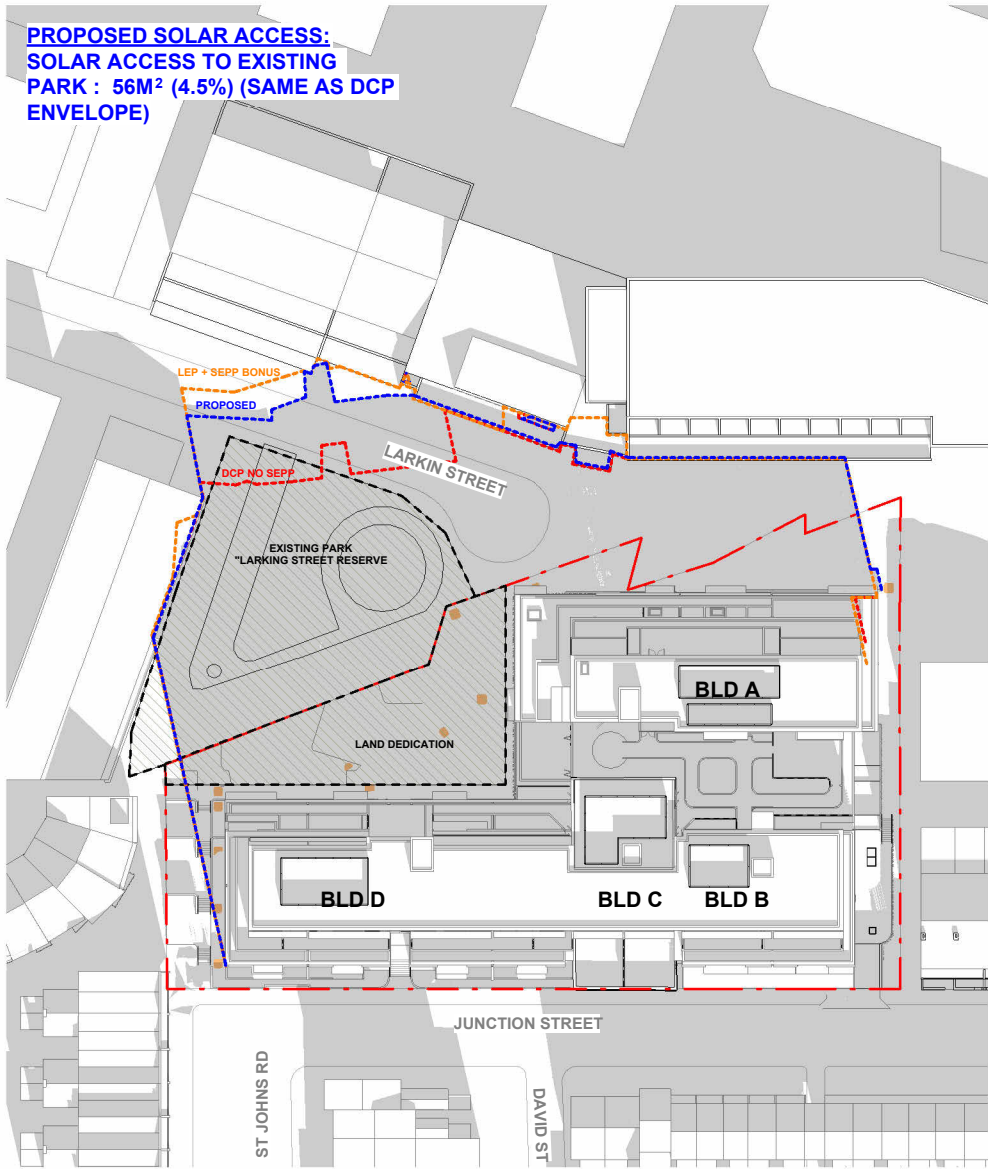


2 STORAGE PLAN - LEVEL 5

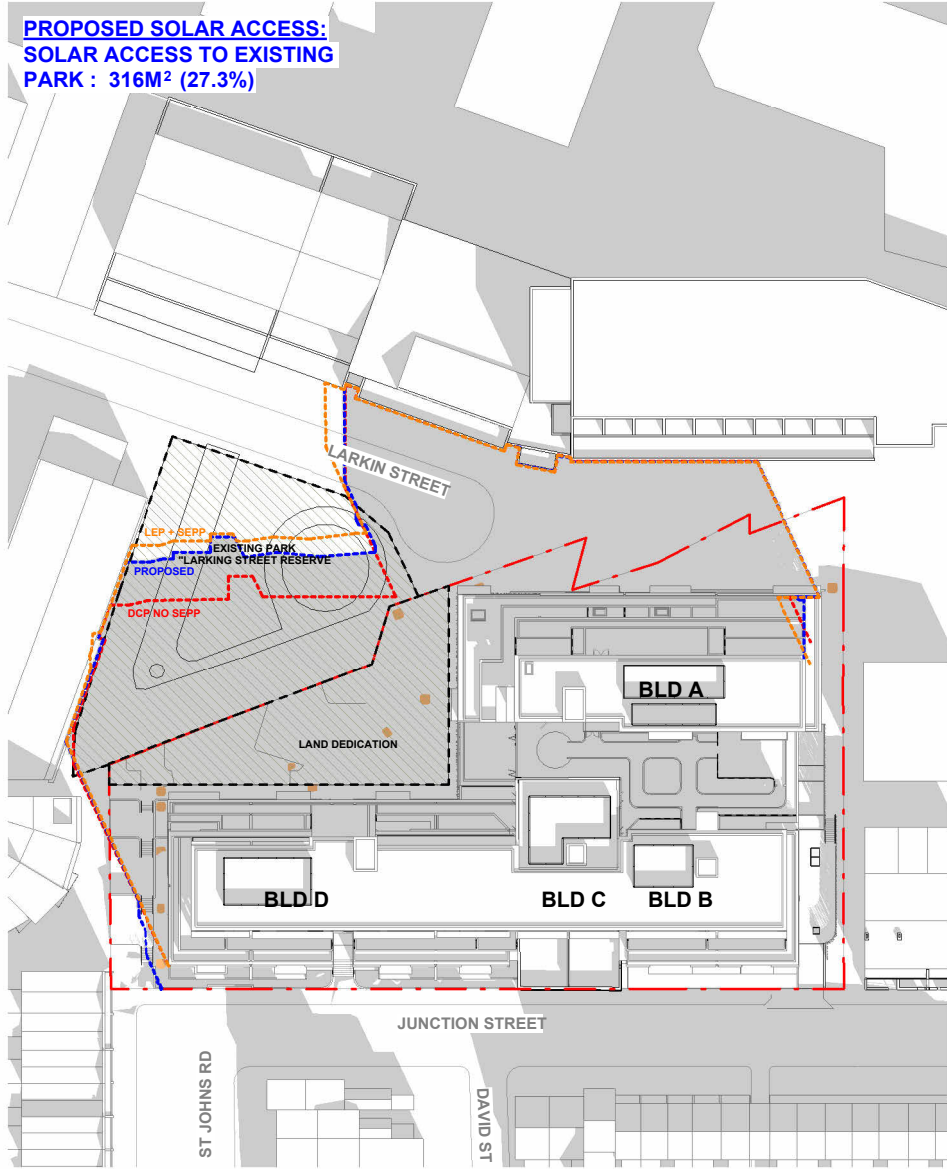


3 STORAGE PLAN - LOADING DOCK

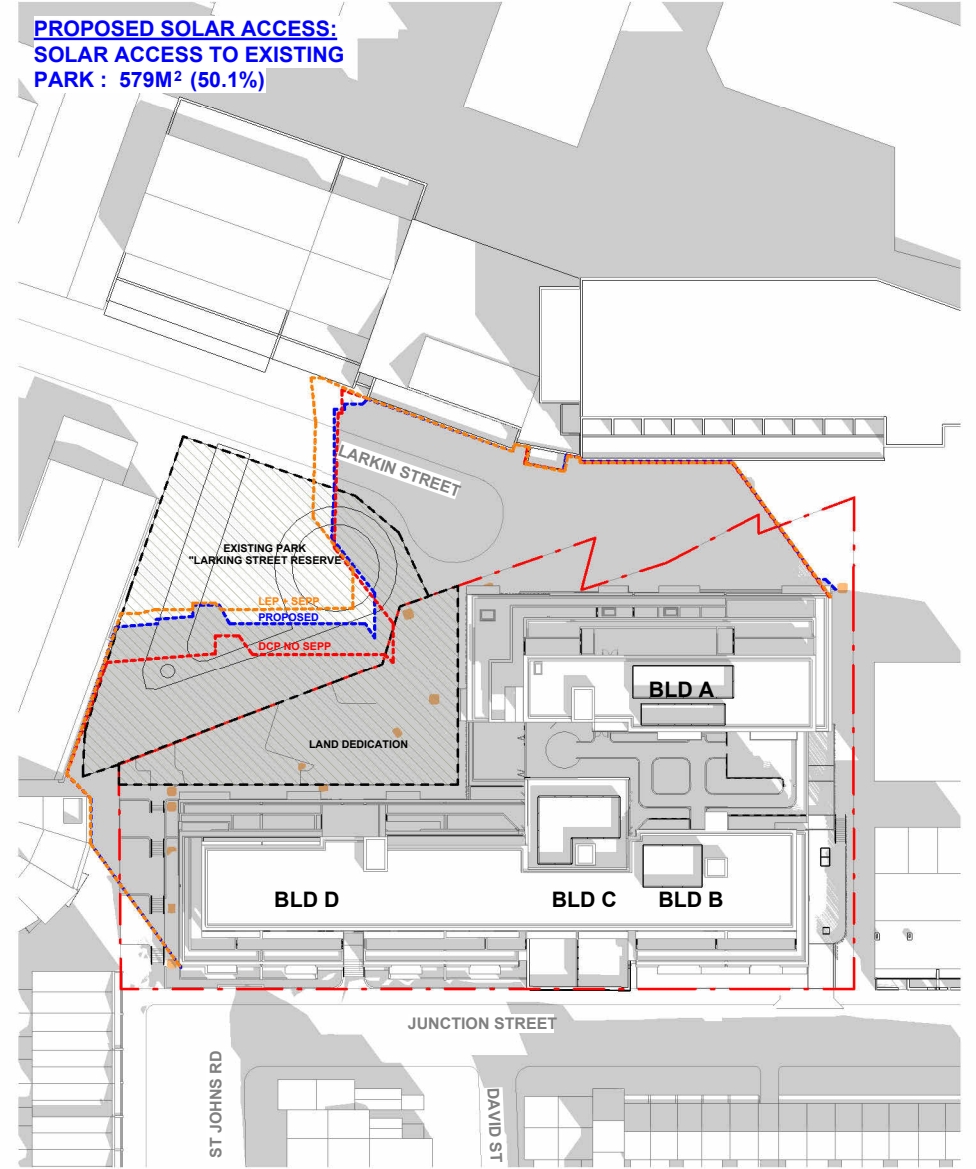
STORAGE SCHEDULE					
LEVEL	UNIT NO.	UNIT TYPE	INTERNAL STORAGE (Min. Provided)	BASEMENT STORAGE	TOTAL STORAGE
GROUND	D.001	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.002	3 BED	5.0 m³	5.0 m³	10 m³
GROUND	D.003	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.004	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.005	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.006	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.007	2 BED	4.0 m³	4.0 m³	8 m³
GROUND	D.008	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	C.101	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 01	C.102	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 01	B.101	1 BED	3.0 m³	3.0 m³	6 m³
LEVEL 01	B.102	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	B.103	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	B.104	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	D.101	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 01	D.102	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	D.103	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	D.104	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	D.105	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 01	D.106	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	A.201	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	A.202	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	A.203	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	A.204	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	A.205	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	A.206	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	A.207	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	B.201	1 BED	3.0 m³	3.0 m³	6 m³
LEVEL 02	B.202	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	B.203	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	B.204	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	D.201	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	D.202	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	D.203	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	D.204	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	D.205	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 02	D.206	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	C.201	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 02	C.202	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	A.301	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	A.302	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	A.303	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	A.304	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	A.305	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	A.306	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	A.307	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	B.301	1 BED	3.0 m³	3.0 m³	6 m³
LEVEL 03	B.302	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	B.303	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	B.304	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	D.301	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	D.302	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	D.303	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	D.304	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	D.305	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 03	D.306	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	C.301	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 03	C.302	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	A.401	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	A.402	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 04	A.403	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 04	A.404	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	B.401	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	B.402	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	D.401	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 04	D.402	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 04	D.403	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 04	D.404	3 BED	5.0 m³	5.0 m³	10 m³
LEVEL 05	A.501	1 BED	3.0 m³	3.0 m³	6 m³
LEVEL 05	A.502	2 BED	4.0 m³	4.0 m³	8 m³
LEVEL 05	A.503	2 BED+S	4.0 m³	4.0 m³	8 m³



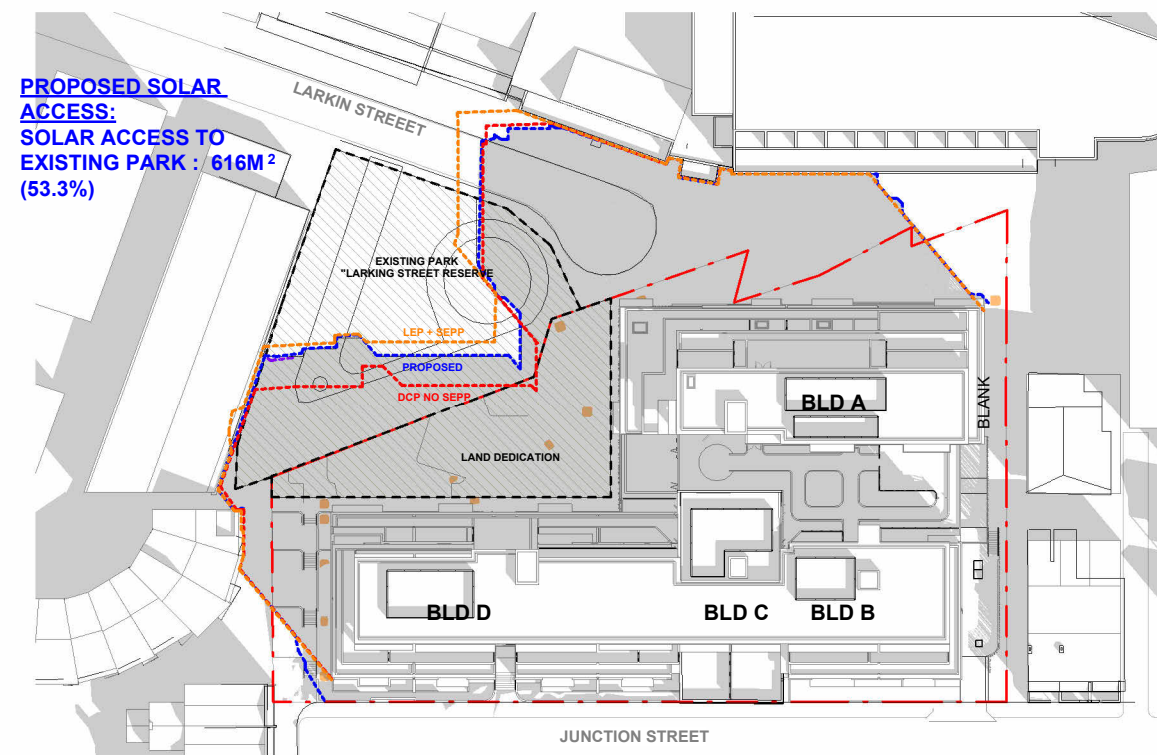
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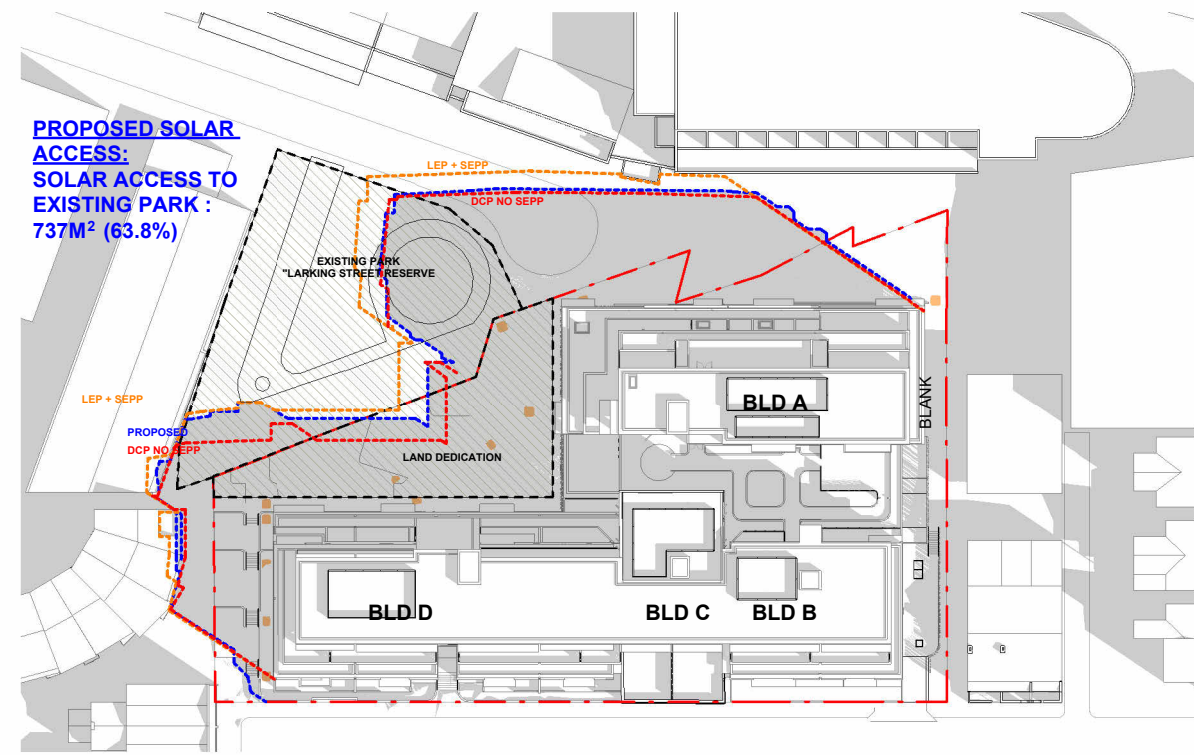
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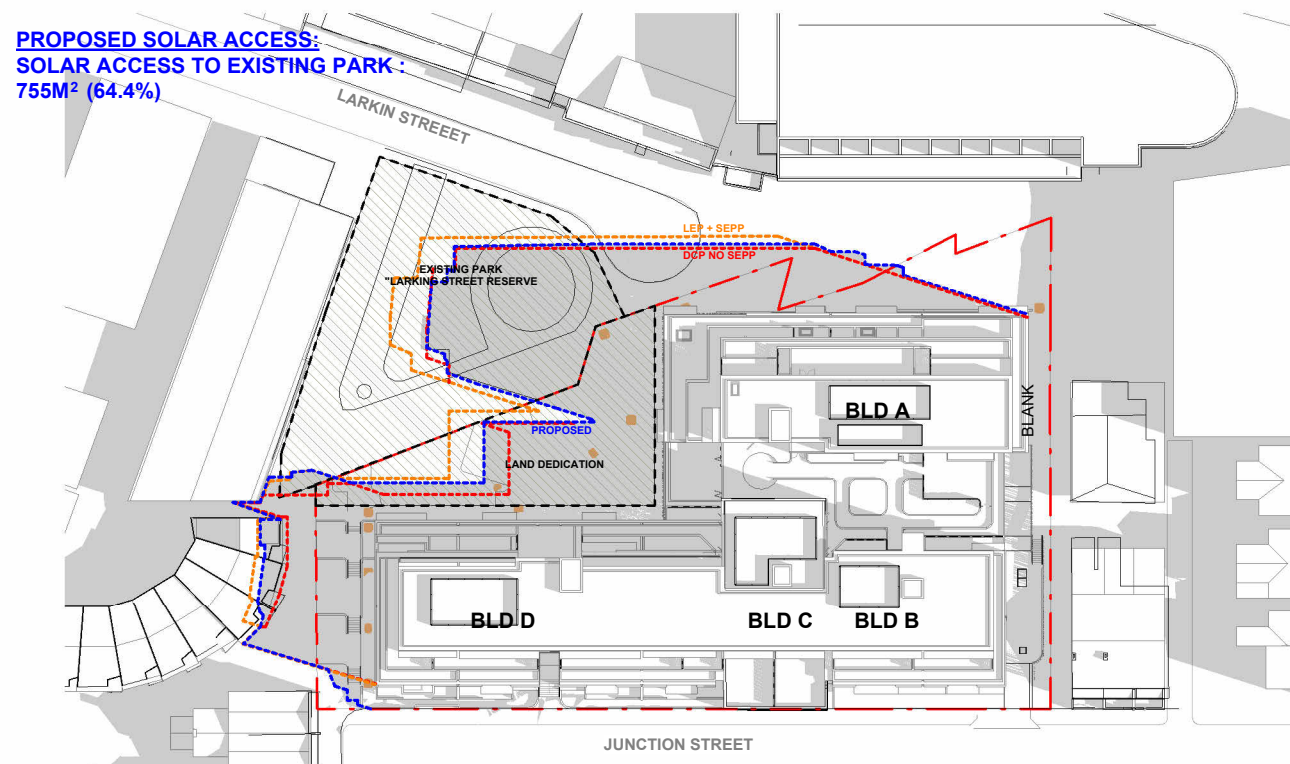
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SCALE 1 : 1000



1 **SHADOW - JUNE 21ST -11AM** SCALE 1 : 1000

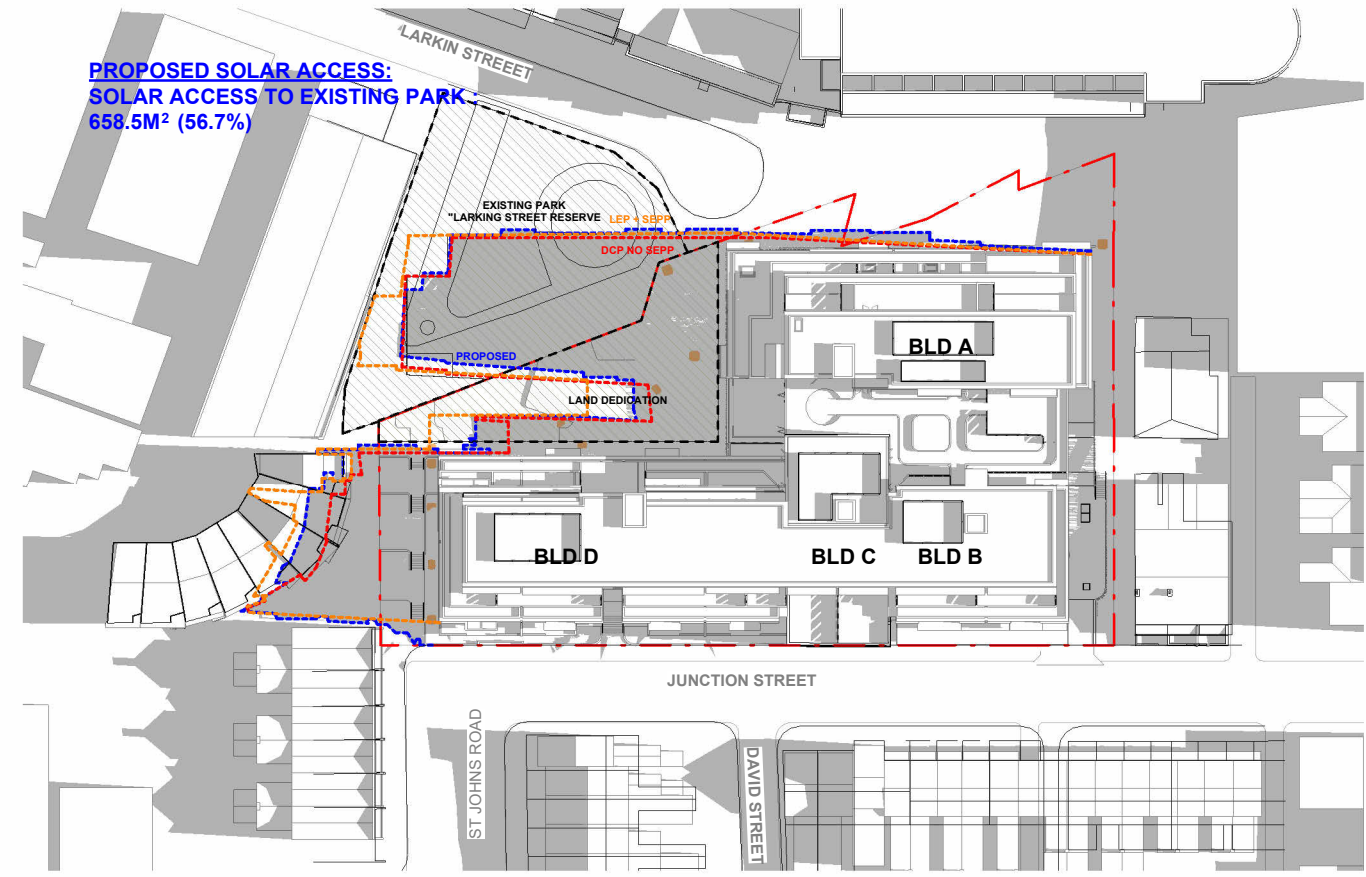


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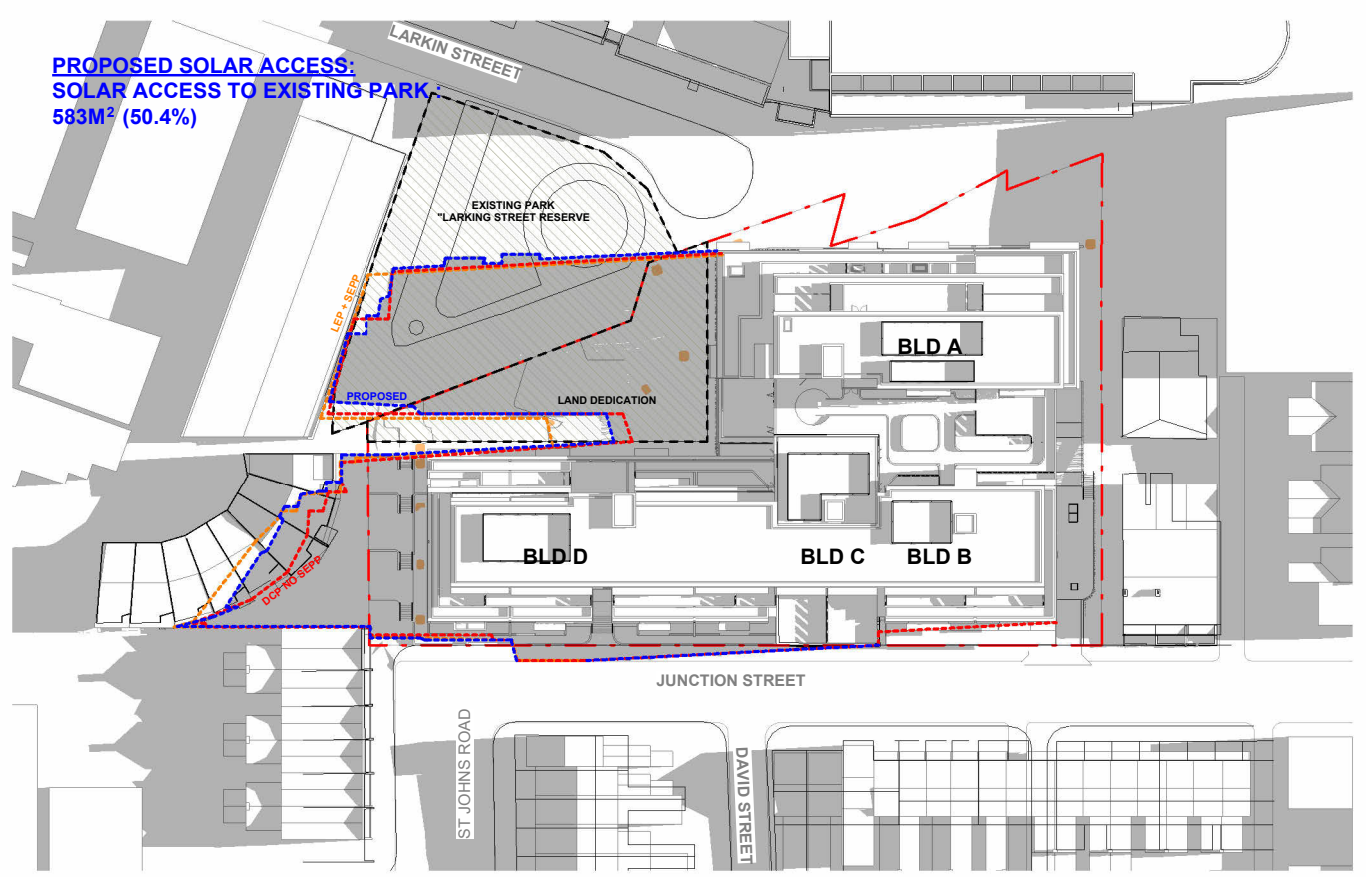


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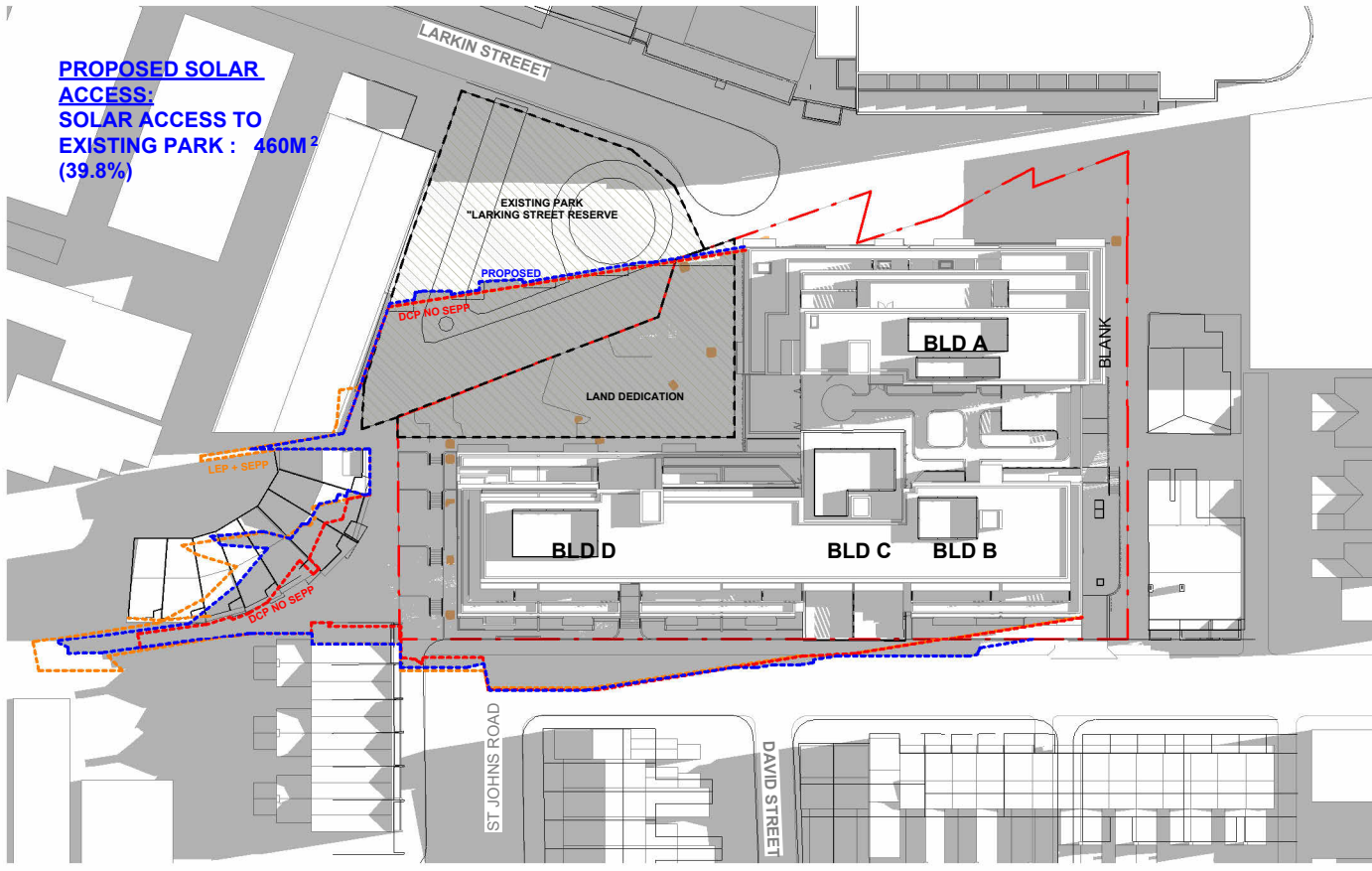
SCALE 1 : 1000



1 SHADOW - JUNE 21ST -2PM
SCALE 1 : 1000



2 SHADOW - JUNE 21ST - 2.30pm
SCALE 1 : 1000

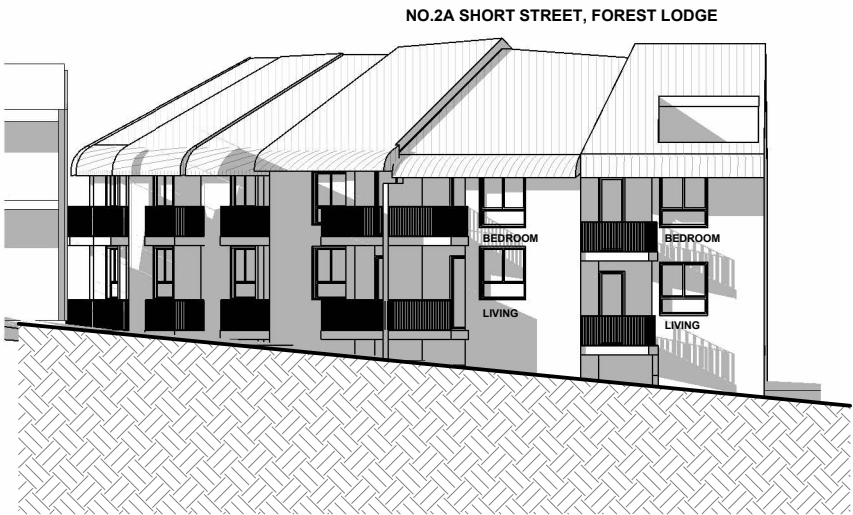


3 SHADOW - JUNE 21ST -3PM
SCALE 1 : 1000

 WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	 Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)	Issue 1	Description Development Application	Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	Title SHADOW DIAGRAM - JUNE 21ST - 2PM-3PM	Drawing No. DA502	Issue 1
								Scale 1 : 1000	Drawing Size A3
								Project No. 23110	Drawn By JT
							DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION	CAD Reference 19/06/2025 4:31:33 PM	



1
ELEVATIONAL SHADOW - JUNE 21ST -
9AM



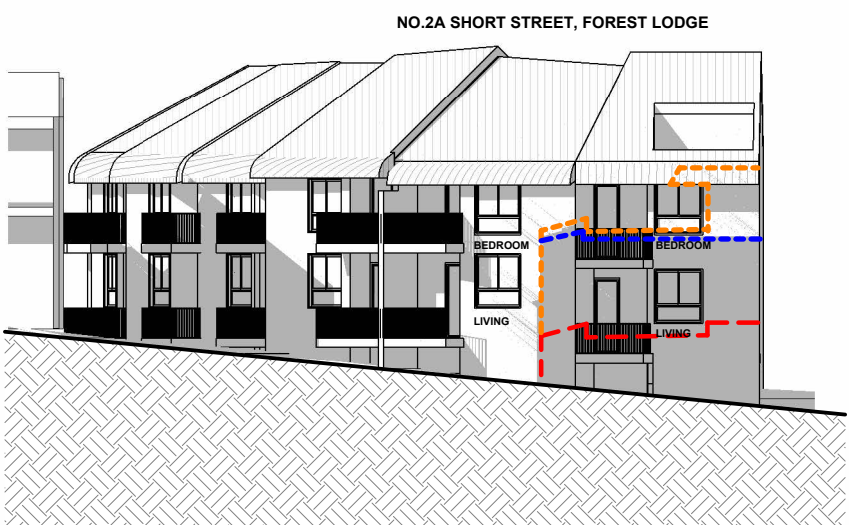
2
ELEVATIONAL SHADOW - JUNE 21ST -
9.30AM



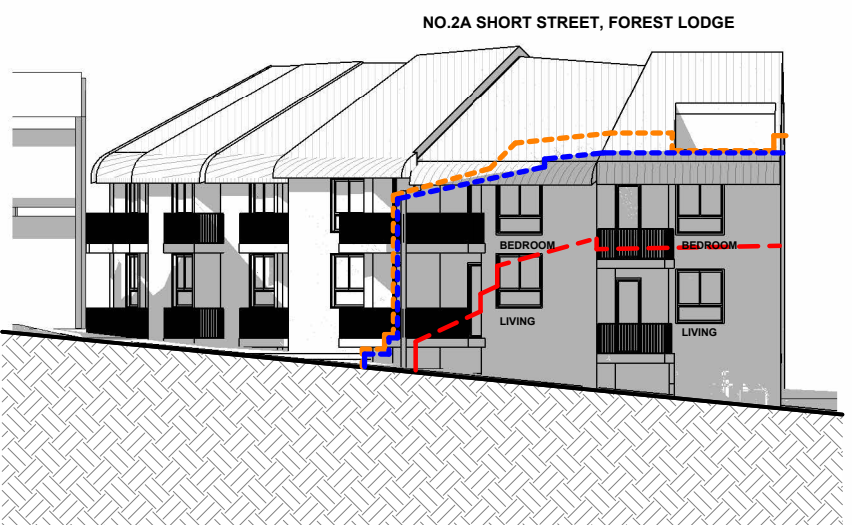
3
ELEVATIONAL SHADOW - JUNE 21ST -
10AM



4
ELEVATIONAL SHADOW - JUNE 21ST -
10.30AM



5
ELEVATIONAL SHADOW - JUNE 21ST -
11AM



6
ELEVATIONAL SHADOW - JUNE 21ST -
12PM

LEGEND:

- DENOTES EXTENT OF LEP+SEPP BUILDING ENVELOPE ELEVATIONAL SHADOWS CAST ONTO NEIGHBOURING BUILDING AT NO.2A SHORT ST.
- DENOTES EXTENT OF PROPOSED BUILDING ELEVATIONAL SHADOW CAST ONTO NEIGHBOURING BUILDING AT NO.2A SHORT ST.
- DENOTES EXTENT OF DCP COMPLIANT ENVELOPE ELEVATIONAL SHADOWS CAST ONTO NEIGHBOURING BUILDING AT NO. 2A SHORT ST
- DENOTES EXISTING SHADOWS CAST BY EXISTING CONTEXT ONTO NO.2A SHORT ST



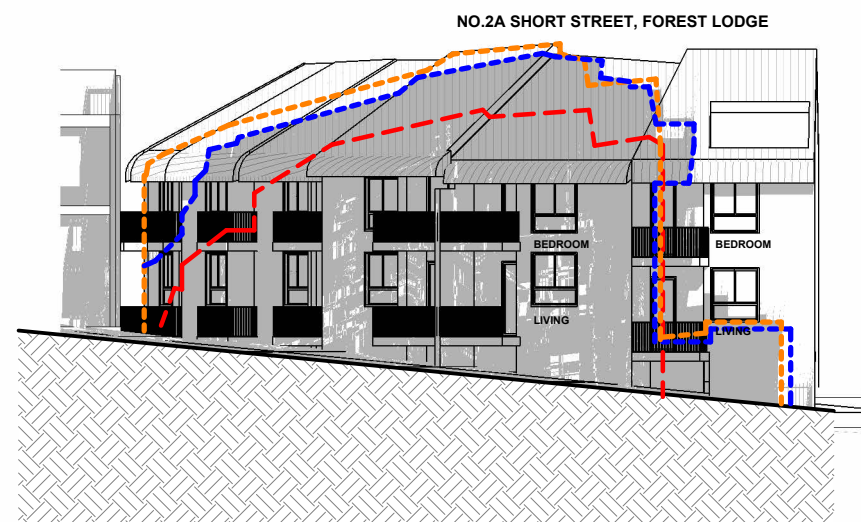
**ELEVATIONAL SHADOW - JUNE 21ST -
1PM**

1



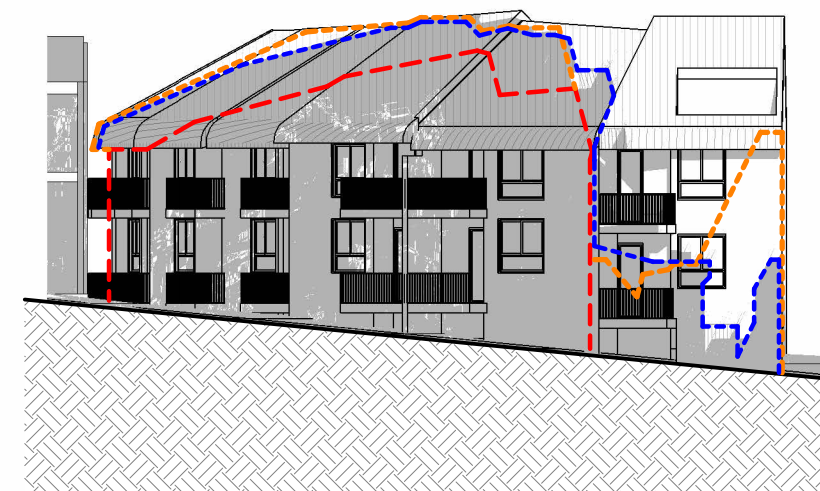
**ELEVATIONAL SHADOW - JUNE 21ST -
2PM**

2



**ELEVATIONAL SHADOW - JUNE 21ST -
2.30PM**

3

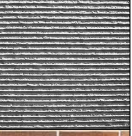
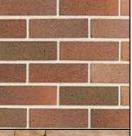
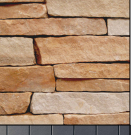
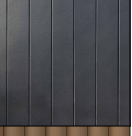
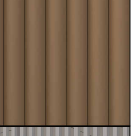
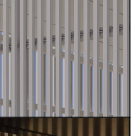
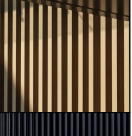
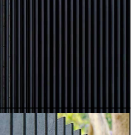
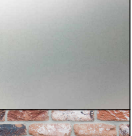


**ELEVATIONAL SHADOW - JUNE 21ST -
3PM**

4

LEGEND:

- DENOTES EXTENT OF LEP+SEPP BUILDING ENVELOPE ELEVATIONAL SHADOWS CAST ONTO NEIGHBOURING BUILDING AT NO.2A SHORT ST.
- DENOTES EXTENT OF PROPOSED BUILDING ELEVATIONAL SHADOW CAST ONTO NEIGHBOURING BUILDING AT NO.2A SHORT ST.
- DENOTES EXTENT OF DCP COMPLIANT ENVELOPE ELEVATIONAL SHADOWS CAST ONTO NEIGHBOURING BUILDING AT NO. 2A SHORT ST
- DENOTES EXISTING SHADOWS CAST BY EXISTING CONTEXT ONTO NO.2A SHORT ST

MATERIAL SCHEDULE			
MARK	NAME	DESCRIPTION	REFERENCE
WF1	WALL FINISH 01	CONCRETE FINISH (LIGHT GREY, RIBBED)	
WF2	WALL FINISH 02	CONCRETE FINISH (LIGHT GREY, SMOOTH)	
WF3	WALL FINISH 03	CONCRETE FINISH (MID GREY, TEXTURED)	
WF4	WALL FINISH 04	BRICK FINISH (BROWN)	
WF5	WALL FINISH 05	REPURPOSED SANDSTONE (FROM EXISTING RETAINING WALL)	
WF6	WALL FINISH 06	METAL CLADDING (COLOUR: GREY)	
WF7	WALL FINISH 07	METAL CLADDING (COLOUR: BRONZE)	
SC1	SCREEN TYPE 01	LOUVRE SCREENING (LIGHT GREY)	
SC2	SCREEN TYPE 02	LOUVRE SCREENING (COLOUR: BRONZE)	
SC3	SCREEN TYPE 03	LOUVRE SCREENING (DARK GREY)	
BAL1	BALUSTRADE TYPE 01	VERTICAL METAL RAILING (DARK GREY)	
GL1	GLAZING TYPE 01	GLASS	
GL2	GLAZING TYPE 02	OPAQUE GLASS (INSULATED BACKING WHERE REQUIRED. REFER TO BASIX)	
EXB	EXISTING BUILDING	AGED BRICK (CLEANED AND MADE GOOD)	



ARTIST IMPRESSION - EASTERN ELEVATION ALONG JUNCTION ST

 WMK Architecture The Atrium, Ground 9 Castlereagh St Sydney NSW 2000 Telephone 02 9299 0401 wmkarchitecture.com ABN 25 082 956 929	Issue 1	Description Development Application	Date 19.06.2025	Client CORIO PROJECTS	Project Seniors Living Development 2-32 Junction Street, Forest Lodge NSW	MATERIALS & FINISHES	Drawing No. DA600	Issue 1
						DEVELOPMENT APPLICATION ONLY NOT FOR CONSTRUCTION	Scale N/A Project No. 23110 CAD Reference 19/06/2025 4:32:34 PM	Drawing Size A3 Drawn By JT

Dimensioned drawings to take precedence over scaling. Contractor to verify all dimensions on site before construction. All inconsistencies to be reported to the Architect immediately. This drawing and its contents remain the copyright of WMK Architecture Pty Ltd © Nominated Architect Greg Barnett (NSW ARB. 6092)

Appendix B

Previous Results

Borehole Logs



Table 1: Summary of Results - Acid Sulfate Soils

Project No:	229796.02
Project Name:	Proposed Seniors Housing
Location:	2-32 Junction Street, Forest Lodge NSW

Sample information						Screening test results				Laboratory analysis results (acid base accounting)								
Location ID	Depth from (m)	Depth to (m)	Reduced level (AHD)	Sample description	Adopted texture	pH _F (pH units)	pH _{FOX} (pH units)	Reaction strength	pH change (pH units)	pH _{KCl} (pH units)	S _{KCl} (%S)	S _{HCl} (%S)	Scr (%S)	TAA (%S)	S _{NAS} (%S)	ANC _{BT} (%S)	ANC corroborated (Y/N or NA)	Net acidity (without ANC) (%S)
Assessment criteria (pH units)						<4	<3	-	1.0	Action criteria (%S)		Coarse texture: sands to loamy sands and peats						0.03
												Medium texture: clayey sand to light clays						0.06 ^a /0.03 ^b
												Fine texture: light medium to heavy clays						0.1 ^a /0.03 ^b
Location ID	Depth from (m)	Depth to (m)	Reduced level (AHD)	Sample Description	Adopted Texture	pH _F (pH units)	pH _{FOX} (pH units)	Reaction Strength	pH change (pH units)	pH _{KCl} (pH units)	S _{KCl} (%S)	S _{HCl} (%S)	Scr (%S)	TAA (%S)	S _{NAS} (%S)	ANC _{BT} (%S)	ANC corroborated (Y/N or NA)	Net Acidity (%S)
BH101	0.50	0.60	10.90 to 10.80	Sandy gravelly clay	C	7.9	5.4	Medium	2.5									
BH101	0.90	1.00	10.50 to 10.40	Sandy gravelly clay	C	5.9	4.5	Medium	1.4									
BH101	1.50	1.60	9.90 to 9.80	Sandstone	C	6.2	4.2	Medium	2.0									
BH101	2.00	2.10	9.40 to 9.30	Sandstone	C	7.8	6.1	Medium	1.7									
BH101	2.50	2.60	8.90 to 8.80	Sandstone	C	7.6	5.9	Medium	1.7									
BH101	3.00	3.10	8.40 to 8.30	Light to Medium Clay	C	7.6	5.6	High	2.0	8.4	0.040	NT	0.008	<0.01	NT	NT	NA	0.030
BH101	3.50	3.60	7.90 to 7.80	Sandy Clay	C	7.7	5.7	High	2.0	8.4	0.060	NT	0.010	<0.01	NT	NT	NA	0.040
BH101	3.90	4.00	7.50 to 7.40	Sandy Clay	C	6.9	3.2	Extreme	3.7	7.2	0.020	NT	0.020	<0.01	NT	NT	NA	0.030
BH101	4.50	4.60	6.90 to 6.80	Sandy Clay	C	7.7	4.2	Extreme	3.5	7.3	0.020	NT	0.060	<0.01	NT	NT	NA	0.060
BH101	5.00	5.10	6.40 to 6.30	Clay sand	C	7.1	2.6	Medium	4.5	7.0	0.010	NT	0.030	<0.01	NT	NT	NA	0.040
BH101	6.00	6.10	5.40 to 5.30	Sandstone	C	7.6	4.0	Medium	3.6		0.010	NT		<0.01	NT	NT		
BH102	0.50	0.60	10.20 to 10.10	Clay	C	8.1	5.3	Medium	2.8			NT		<0.01	NT	NT		
BH102	0.90	1.00	9.80 to 9.70	Clay	C	8.8	6.5	Medium	2.3			NT		<0.01	NT	NT		
BH102	1.50	1.60	9.20 to 9.10	Silty Clay	C	8.4	6.2	Medium	2.2			NT		<0.01	NT	NT		
BH102	2.00	2.10	8.70 to 8.60	Silty Clay	C	8.4	5.7	Medium	2.7			NT		<0.01	NT	NT		
BH102	2.40	2.50	8.30 to 8.20	Silty Clay	C	8.4	5.4	Medium	3.0			NT		<0.01	NT	NT		
BH102	3.00	3.10	7.70 to 7.60	Sandy Clay	C	7.7	3.2	Extreme	4.5	6.6	0.020	NT	0.040	<0.01	NT	NT	NA	0.040
BH102	3.50	3.60	7.20 to 7.10	Sandy Clay	C	7.0	2.0	Medium	5.0	6.0	0.020	NT	0.120	<0.01	NT	NT	NA	0.120
BH102	3.90	4.00	6.80 to 6.70	Sandy Clay	C	7.8	2.4	Medium	5.4	7.2	0.020	NT	0.100	<0.01	NT	NT	NA	0.100
			-															

Notes:

Adopted texture - C = coarse, M = medium, F = fine

pH_F - Soil pH in water

pH_{FOX} - Soil pH in peroxide

Reaction strength: L - Low , M - Medium, H - High, X - Extreme, V - Volcanic, F - Frothing (indicative of organic material)

pH change = pH_F - pH_{FOX}

pH_{KCL} - KCl extractable pH

S_{KCl} - KCl extractable sulfur

S_{HCl} - HCl extractable sulfur

S_{cr} - potential sulfidic acidity

TAA - titratable actual acidity (reported if pH_{KCL}<6.5)

S_{NAS} – retained acidity (reported if pH_{KCl} < 4.5)

ANC_{BT} – acid neutralising capacity (reported if pH_{KCl} ≥ 6.5)

NT - Not tested

Blue depths indicate where samples have been collected at or below the groundwater table

Bold results are indicators of ASS conditions, noting:

- Assessment criteria are considered a reasonable initial screening for AASS or PASS

- pH_F<4 is indicative of the presence of actual ASS (AASS), although it is not conclusive of ASS on its own as naturally occurring non ASS soils can have pH_F<5

- pH_{FOX}<3 or pH Change ≥1 may indicate potential ASS (PASS), although exceptions apply. Laboratory testing required to confirm presence of Reduced Inorganic Sulfur (RIS)

- Refer to Table 5.1, A2, A3 of Sullivan,L. et al (2018) for further details

Shaded results trigger action (i.e. equal to or exceed the action criteria). Criteria is specific for soil texture and anticipated tonnage of soil disturbed.

Net Acidity can only include the measured ANC where the ANC has been corroborated by other data (for example slab incubation data) that demonstrates the soil material does not experience acidification during complete oxidation under field conditions.

a - Action criterion for disturbance of 1-1000 tonnes of material

b - Action criterion for disturbance of more than 1000 tonnes of material

The action criteria apply only to ASS materials and not to other acidic soils such as acidic peatlands and coastal heaths.

CERTIFICATE OF ANALYSIS 360804

Client Details

Client	Douglas Partners Pty Ltd
Attention	Rhys McMillan
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	<u>229796.00 Forest Lodge</u>
Number of Samples	26 Soil
Date samples received	03/09/2024
Date completed instructions received	03/09/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	10/09/2024
Date of Issue	09/09/2024
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Diego Bigolin, Inorganics Supervisor
 Giovanni Agosti, Group Technical Manager
 Jenny He, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

ESP/CEC					
Our Reference		360804-1	360804-2	360804-3	360804-4
Your Reference	UNITS	BH01	BH01	BH01	BH01
Depth		0.9-1	3.9-4	5-5.1	6-6.1
Date Sampled		30/08/2024	30/08/2024	30/08/2024	30/08/2024
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	05/09/2024	05/09/2024	05/09/2024	05/09/2024
Date analysed	-	05/09/2024	05/09/2024	05/09/2024	05/09/2024
Exchangeable Ca	meq/100g	4.9	7.6	1.5	0.9
Exchangeable K	meq/100g	0.2	0.4	0.1	0.2
Exchangeable Mg	meq/100g	1.1	0.8	0.2	0.7
Exchangeable Na	meq/100g	0.4	<0.1	<0.1	<0.1
Cation Exchange Capacity	meq/100g	6.5	8.8	1.9	1.8
ESP	%	6	[NT]	[NT]	[NT]

Texture and Salinity*						
Our Reference		360804-1	360804-2	360804-3	360804-4	360804-5
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH03
Depth		0.9-1	3.9-4	5-5.1	6-6.1	0.9-1
Date Sampled		30/08/2024	30/08/2024	30/08/2024	30/08/2024	30/08/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	04/09/2024	04/09/2024	04/09/2024	04/09/2024	04/09/2024
Date analysed	-	05/09/2024	05/09/2024	05/09/2024	05/09/2024	05/09/2024
Electrical Conductivity 1:5 soil:water	µS/cm	290	110	53	33	32
Texture Value	-	8.5	9.0	8.0	8.0	[NA]
Texture	-	LIGHT CLAY	CLAY LOAM	LIGHT MEDIUM CLAY	LIGHT MEDIUM CLAY	[NA]
ECe	dS/m	2.4	<2	<2	<2	[NA]
Class	-	SLIGHTLY SALINE	NON SALINE	NON SALINE	NON SALINE	[NA]

Texture and Salinity*		
Our Reference		360804-24
Your Reference	UNITS	BH02
Depth		4.5-4.6
Date Sampled		30/08/2024
Type of sample		Soil
Date prepared	-	04/09/2024
Date analysed	-	05/09/2024
Electrical Conductivity 1:5 soil:water	µS/cm	170

Misc Inorg - Soil				
Our Reference		360804-4	360804-5	360804-24
Your Reference	UNITS	BH01	BH03	BH02
Depth		6-6.1	0.9-1	4.5-4.6
Date Sampled		30/08/2024	30/08/2024	30/08/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	04/09/2024	04/09/2024	04/09/2024
Date analysed	-	04/09/2024	04/09/2024	04/09/2024
pH 1:5 soil:water	pH Units	6.0	7.1	7.4
Chloride, Cl 1:5 soil:water	mg/kg	28	<10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	<10	10	86

sPOCAS field test

Our Reference		360804-1	360804-2	360804-3	360804-4	360804-5
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH03
Depth		0.9-1	3.9-4	5-5.1	6-6.1	0.9-1
Date Sampled		30/08/2024	30/08/2024	30/08/2024	30/08/2024	30/08/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/09/2024	03/09/2024	03/09/2024	03/09/2024	03/09/2024
Date analysed	-	05/09/2024	05/09/2024	05/09/2024	05/09/2024	05/09/2024
pH _F (field pH test)	pH Units	5.9	6.9	7.1	7.6	7.4
pH _{FOX} (field peroxide test)	pH Units	4.5	3.2	2.6	4.0	5.0
Reaction Rate*	-	Medium reaction	Extreme reaction	Medium reaction	Medium reaction	Medium reaction

sPOCAS field test

Our Reference		360804-6	360804-7	360804-8	360804-9	360804-10
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH01
Depth		0.5-0.6	1.5-1.6	2-2.1	2.5-2.6	3-3.1
Date Sampled		30/08/2024	30/08/2024	30/08/2024	30/08/2024	30/08/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/09/2024	03/09/2024	03/09/2024	03/09/2024	03/09/2024
Date analysed	-	05/09/2024	05/09/2024	05/09/2024	05/09/2024	05/09/2024
pH _F (field pH test)	pH Units	7.9	6.2	7.8	7.6	7.6
pH _{FOX} (field peroxide test)	pH Units	5.4	4.2	6.1	5.9	5.6
Reaction Rate*	-	Medium reaction	Medium reaction	Medium reaction	Medium reaction	High reaction

sPOCAS field test

Our Reference		360804-11	360804-12	360804-13	360804-14	360804-15
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH02
Depth		3.5-3.6	4.5-4.6	0.5-0.6	0.9-1	1.5-1.6
Date Sampled		30/08/2024	30/08/2024	30/08/2024	30/08/2024	30/08/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/09/2024	03/09/2024	03/09/2024	03/09/2024	03/09/2024
Date analysed	-	05/09/2024	05/09/2024	05/09/2024	05/09/2024	05/09/2024
pH _F (field pH test)	pH Units	7.7	7.7	8.1	8.8	8.4
pH _{FOX} (field peroxide test)	pH Units	5.7	4.2	5.3	6.5	6.2
Reaction Rate*	-	High reaction	Extreme reaction	Medium reaction	Medium reaction	Medium reaction

sPOCAS field test

Our Reference		360804-16	360804-17	360804-18	360804-19	360804-20
Your Reference	UNITS	BH02	BH02	BH02	BH02	BH02
Depth		2-2.1	2.4-2.5	3-3.1	3.5-3.6	3.9-4
Date Sampled		30/08/2024	30/08/2024	30/08/2024	30/08/2024	30/08/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/09/2024	03/09/2024	03/09/2024	03/09/2024	03/09/2024
Date analysed	-	05/09/2024	05/09/2024	05/09/2024	05/09/2024	05/09/2024
pH _F (field pH test)	pH Units	8.4	8.4	7.7	7.0	7.8
pH _{FOX} (field peroxide test)	pH Units	5.7	5.4	3.2	2.0	2.4
Reaction Rate*	-	Medium reaction	Medium reaction	Extreme reaction	Medium reaction	Medium reaction

sPOCAS field test

Our Reference		360804-21
Your Reference	UNITS	BH03
Depth		0.5-0.6
Date Sampled		30/08/2024
Type of sample		Soil
Date prepared	-	03/09/2024
Date analysed	-	05/09/2024
pH _F (field pH test)	pH Units	7.9
pH _{FOX} (field peroxide test)	pH Units	5.5
Reaction Rate*	-	Medium reaction

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell.
Inorg-063	pH- measured using pH meter and electrode. Soil is oxidised with Hydrogen Peroxide or extracted with water. To ensure accurate results these tests are recommended to be done in the field as pH may change with time thus these results may not be representative of true field conditions.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
INORG-123	Determined using a "Texture by Feel" method.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.

Client Reference: 229796.00 Forest Lodge

QUALITY CONTROL: ESP/CEC					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			05/09/2024	[NT]	[NT]	[NT]	[NT]	05/09/2024	[NT]
Date analysed	-			05/09/2024	[NT]	[NT]	[NT]	[NT]	05/09/2024	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	111	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]

QUALITY CONTROL: Texture and Salinity*					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			04/09/2024	[NT]	[NT]	[NT]	[NT]	04/09/2024	[NT]
Date analysed	-			05/09/2024	[NT]	[NT]	[NT]	[NT]	05/09/2024	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]

Client Reference: 229796.00 Forest Lodge

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			04/09/2024	[NT]	[NT]	[NT]	[NT]	04/09/2024	[NT]
Date analysed	-			04/09/2024	[NT]	[NT]	[NT]	[NT]	04/09/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	106	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	107	[NT]

Client Reference: 229796.00 Forest Lodge

QUALITY CONTROL: sPOCAS field test					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			03/09/2024	[NT]	[NT]	[NT]	[NT]	03/09/2024	[NT]
Date analysed	-			05/09/2024	[NT]	[NT]	[NT]	[NT]	05/09/2024	[NT]
pH _F (field pH test)	pH Units		Inorg-063	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
pH _{FOX} (field peroxide test)	pH Units		Inorg-063	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: sPOCAS field test					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date prepared	-			[NT]	[NT]	[NT]	[NT]	[NT]	03/09/2024	[NT]
Date analysed	-			[NT]	[NT]	[NT]	[NT]	[NT]	05/09/2024	[NT]
pH _F (field pH test)	pH Units		Inorg-063	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
pH _{FOX} (field peroxide test)	pH Units		Inorg-063	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

ESP: Where the exchangeable Sodium is less than the PQL and CEC is less than 10meq/100g, the ESP cannot be calculated.

CERTIFICATE OF ANALYSIS 360804-A

Client Details

Client	Douglas Partners Pty Ltd
Attention	Rhys McMillan
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	<u>229796.00 Forest Lodge</u>
Number of Samples	26 Soil
Date samples received	03/09/2024
Date completed instructions received	10/09/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	17/09/2024
Date of Issue	17/09/2024
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By
Jenny He, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Client Reference: 229796.00 Forest Lodge

sPOCAS + %S w/w						
Our Reference		360804-A-2	360804-A-3	360804-A-10	360804-A-11	360804-A-12
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH01
Depth		3.9-4	5-5.1	3-3.1	3.5-3.6	4.5-4.6
Date Sampled		30/08/2024	30/08/2024	30/08/2024	30/08/2024	30/08/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/09/2024	03/09/2024	03/09/2024	03/09/2024	03/09/2024
Date analysed	-	11/09/2024	11/09/2024	11/09/2024	11/09/2024	11/09/2024
pH _{KCl}	pH units	7.2	7.0	8.4	8.4	7.3
TAA pH 6.5	moles H ⁺ /t	<5	<5	<5	<5	<5
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
pH _{Ox}	pH units	4.5	7.0	7.1	6.8	6.7
TPA pH 6.5	moles H ⁺ /t	<5	<5	<5	<5	<5
s-TPA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
TSA pH 6.5	moles H ⁺ /t	<5	<5	<5	<5	<5
s-TSA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
ANC _E	% CaCO ₃	[NT]	0.12	0.38	0.25	0.12
a-ANC _E	moles H ⁺ /t	[NT]	25	75	50	25
s-ANC _E	%w/w S	[NT]	<0.05	0.12	0.08	<0.05
S _{KCl}	%w/w S	0.02	0.01	0.04	0.06	0.02
S _P	%w/w	0.05	0.05	0.06	0.10	0.09
S _{POS}	%w/w	0.03	0.04	0.03	0.04	0.06
a-S _{POS}	moles H ⁺ /t	20	22	17	23	38
Ca _{KCl}	%w/w	0.19	0.11	0.44	0.50	0.21
Ca _P	%w/w	0.23	0.16	0.46	0.42	0.27
Ca _A	%w/w	0.034	0.051	0.015	<0.005	0.061
Mg _{KCl}	%w/w	0.015	0.009	0.024	0.024	0.015
Mg _P	%w/w	0.016	0.010	0.035	0.037	0.015
Mg _A	%w/w	<0.005	<0.005	0.011	0.012	<0.005
S _{HCl}	%w/w S	[NT]	[NT]	[NT]	[NT]	[NT]
S _{NAS}	%w/w S	[NT]	[NT]	[NT]	[NT]	[NT]
a-S _{NAS}	moles H ⁺ /t	[NT]	[NT]	[NT]	[NT]	[NT]
s-S _{NAS}	%w/w S	[NT]	[NT]	[NT]	[NT]	[NT]
Fineness Factor	-	1.5	1.5	1.5	1.5	1.5
a-Net Acidity	moles H ⁺ /t	20	<5	<5	<5	<5
s-Net Acidity	%w/w S	0.03	<0.01	<0.01	<0.01	<0.01
Liming rate	kg CaCO ₃ /t	1.5	<0.75	<0.75	<0.75	<0.75
s-Net Acidity without -ANCE	%w/w S	0.03	0.04	0.03	0.04	0.06
a-Net Acidity without ANCE	moles H ⁺ /t	20	22	17	23	38
Liming rate without ANCE	kg CaCO ₃ /t	1.5	1.7	1.3	1.8	2.9

sPOCAS + %S w/w				
Our Reference		360804-A-18	360804-A-19	360804-A-20
Your Reference	UNITS	BH02	BH02	BH02
Depth		3-3.1	3.5-3.6	3.9-4
Date Sampled		30/08/2024	30/08/2024	30/08/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	03/09/2024	03/09/2024	03/09/2024
Date analysed	-	11/09/2024	11/09/2024	11/09/2024
pH _{KCl}	pH units	6.6	6.0	7.2
TAA pH 6.5	moles H ⁺ /t	<5	<5	<5
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01
pH _{Ox}	pH units	6.0	4.3	6.6
TPA pH 6.5	moles H ⁺ /t	<5	37	<5
s-TPA pH 6.5	%w/w S	<0.01	0.06	<0.01
TSA pH 6.5	moles H ⁺ /t	<5	36	<5
s-TSA pH 6.5	%w/w S	<0.01	0.06	<0.01
ANC _E	% CaCO ₃	[NT]	[NT]	0.25
a-ANC _E	moles H ⁺ /t	[NT]	[NT]	50
s-ANC _E	%w/w S	[NT]	[NT]	0.08
S _{KCl}	%w/w S	0.02	0.02	0.02
S _P	%w/w	0.07	0.17	0.04
S _{POS}	%w/w	0.05	0.15	0.02
a-S _{POS}	moles H ⁺ /t	32	93	14
Ca _{KCl}	%w/w	0.28	0.26	0.31
Ca _P	%w/w	0.26	0.26	0.03
Ca _A	%w/w	<0.005	<0.005	<0.005
Mg _{KCl}	%w/w	0.022	0.011	0.017
Mg _P	%w/w	0.022	0.012	<0.005
Mg _A	%w/w	<0.005	<0.005	<0.005
S _{HCl}	%w/w S	[NT]	[NT]	[NT]
S _{NAS}	%w/w S	[NT]	[NT]	[NT]
a-S _{NAS}	moles H ⁺ /t	[NT]	[NT]	[NT]
s-S _{NAS}	%w/w S	[NT]	[NT]	[NT]
Fineness Factor	-	1.5	1.5	1.5
a-Net Acidity	moles H ⁺ /t	32	93	<5
s-Net Acidity	%w/w S	0.05	0.15	<0.01
Liming rate	kg CaCO ₃ /t	2.4	7.0	<0.75
s-Net Acidity without -ANCE	%w/w S	0.05	0.15	0.02
a-Net Acidity without ANCE	moles H ⁺ /t	32	93	14
Liming rate without ANCE	kg CaCO ₃ /t	2.4	7.0	1.0

SCr						
Our Reference		360804-A-2	360804-A-3	360804-A-10	360804-A-11	360804-A-12
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH01
Depth		3.9-4	5-5.1	3-3.1	3.5-3.6	4.5-4.6
Date Sampled		30/08/2024	30/08/2024	30/08/2024	30/08/2024	30/08/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/09/2024	03/09/2024	03/09/2024	03/09/2024	03/09/2024
Date analysed	-	11/09/2024	11/09/2024	11/09/2024	11/09/2024	11/09/2024
Chromium Reducible Sulfur	%w/w	0.02	0.03	0.008	0.01	0.06
a-Chromium Reducible Sulfur	moles H ⁺ /t	12	17	5	6	37

SCr				
Our Reference		360804-A-18	360804-A-19	360804-A-20
Your Reference	UNITS	BH02	BH02	BH02
Depth		3-3.1	3.5-3.6	3.9-4
Date Sampled		30/08/2024	30/08/2024	30/08/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	03/09/2024	03/09/2024	03/09/2024
Date analysed	-	11/09/2024	11/09/2024	11/09/2024
Chromium Reducible Sulfur	%w/w	0.04	0.12	0.1
a-Chromium Reducible Sulfur	moles H ⁺ /t	28	74	61

Method ID	Methodology Summary
Inorg-064	sPOCAS determined using titrimetric and ICP-AES techniques. Ideally samples should be received in the laboratory at <6oC. Please refer to SRA for sample temperature on receipt. Net acidity including ANC has a safety factor of 1.5 applied. Neutralising value (NV) of 100% is assumed for liming rate The recommendation that the SHCL concentration be multiplied by a factor of 2 to ensure retained acidity is not underestimated, has not been applied in the SHCL result. However, it has been applied in the SNAS calculation: $SNAS \% = (SHCL-SKCL) \times 2$
Inorg-068	Chromium Reducible Sulfur - Hydrogen Sulfide is quantified by iodometric titration after distillation to determine potential acidity. Net acidity including ANC has a safety factor of 1.5 applied. Neutralising value (NV) of 100% is assumed for liming rate. The recommendation that the SHCL concentration be multiplied by a factor of 2 to ensure retained acidity is not underestimated, has not been applied in the SHCL result. However, it has been applied in the SNAS calculation: $SNAS \% = (SHCL-SKCL) \times 2$

Client Reference: 229796.00 Forest Lodge

QUALITY CONTROL: sPOCAS + %S w/w						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			03/09/2024	2	03/09/2024	03/09/2024		03/09/2024	[NT]
Date analysed	-			11/09/2024	2	11/09/2024	11/09/2024		11/09/2024	[NT]
pH _{KCl}	pH units		Inorg-064	[NT]	2	7.2	7.2	0	99	[NT]
TAA pH 6.5	moles H ⁺ /t	5	Inorg-064	<5	2	<5	<5	0	93	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	2	<0.01	<0.01	0	[NT]	[NT]
pH _{OX}	pH units		Inorg-064	[NT]	2	4.5	4.6	2	100	[NT]
TPA pH 6.5	moles H ⁺ /t	5	Inorg-064	<5	2	<5	<5	0	98	[NT]
s-TPA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	2	<0.01	<0.01	0	[NT]	[NT]
TSA pH 6.5	moles H ⁺ /t	5	Inorg-064	<5	2	<5	<5	0	[NT]	[NT]
s-TSA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	2	<0.01	<0.01	0	[NT]	[NT]
ANC _E	% CaCO ₃	0.05	Inorg-064	<0.05	2	[NT]	[NT]		[NT]	[NT]
a-ANC _E	moles H ⁺ /t	5	Inorg-064	<5	2	[NT]	[NT]		[NT]	[NT]
s-ANC _E	%w/w S	0.05	Inorg-064	<0.05	2	[NT]	[NT]		[NT]	[NT]
S _{KCl}	%w/w S	0.005	Inorg-064	<0.005	2	0.02	0.02	0	[NT]	[NT]
S _P	%w/w	0.005	Inorg-064	<0.005	2	0.05	0.05	0	[NT]	[NT]
S _{POS}	%w/w	0.005	Inorg-064	<0.005	2	0.03	0.04	29	[NT]	[NT]
a-S _{POS}	moles H ⁺ /t	5	Inorg-064	<5	2	20	22	10	[NT]	[NT]
Ca _{KCl}	%w/w	0.005	Inorg-064	<0.005	2	0.19	0.20	5	[NT]	[NT]
Ca _P	%w/w	0.005	Inorg-064	<0.005	2	0.23	0.23	0	[NT]	[NT]
Ca _A	%w/w	0.005	Inorg-064	<0.005	2	0.034	0.022	43	[NT]	[NT]
Mg _{KCl}	%w/w	0.005	Inorg-064	<0.005	2	0.015	0.016	6	[NT]	[NT]
Mg _P	%w/w	0.005	Inorg-064	<0.005	2	0.016	0.016	0	[NT]	[NT]
Mg _A	%w/w	0.005	Inorg-064	<0.005	2	<0.005	<0.005	0	[NT]	[NT]
S _{HCl}	%w/w S	0.005	Inorg-064	<0.005	2	[NT]	[NT]		[NT]	[NT]
S _{NAS}	%w/w S	0.005	Inorg-064	<0.005	2	[NT]	[NT]		[NT]	[NT]
a-S _{NAS}	moles H ⁺ /t	5	Inorg-064	<5	2	[NT]	[NT]		[NT]	[NT]
s-S _{NAS}	%w/w S	0.01	Inorg-064	<0.01	2	[NT]	[NT]		[NT]	[NT]
Fineness Factor	-	1.5	Inorg-064	<1.5	2	1.5	1.5	0	[NT]	[NT]
a-Net Acidity	moles H ⁺ /t	5	Inorg-064	<5	2	20	22	10	[NT]	[NT]
s-Net Acidity	%w/w S	0.01	Inorg-064	<0.01	2	0.03	0.04	29	[NT]	[NT]
Liming rate	kg CaCO ₃ /t	0.75	Inorg-064	<0.75	2	1.5	1.6	6	[NT]	[NT]
s-Net Acidity without -ANCE	%w/w S	0.01	Inorg-064	<0.01	2	0.03	0.04	29	[NT]	[NT]

Client Reference: 229796.00 Forest Lodge

QUALITY CONTROL: sPOCAS + %S w/w						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
a-Net Acidity without ANCE	moles H ⁺ /t	5	Inorg-064	<5	2	20	22	10	[NT]	[NT]
Liming rate without ANCE	kg CaCO ₃ /t	0.75	Inorg-064	<0.75	2	1.5	1.6	6	[NT]	[NT]

Client Reference: 229796.00 Forest Lodge

QUALITY CONTROL: SCr						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			03/09/2024	2	03/09/2024	03/09/2024		03/09/2024	[NT]
Date analysed	-			11/09/2024	2	11/09/2024	11/09/2024		11/09/2024	[NT]
Chromium Reducible Sulfur	%w/w	0.005	Inorg-068	<0.005	2	0.02	0.02	0	98	[NT]
a-Chromium Reducible Sulfur	moles H ⁺ /t	3	Inorg-068	<3	2	12	12	0	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
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Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

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Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

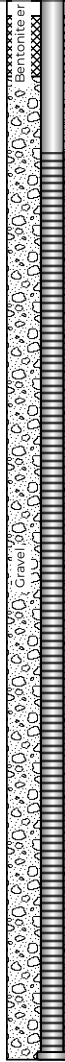
Sample 360804-A-20 has been observed a-Chromium Reducible Sulfur>a-SPOS and CaKCl>CaP, this may be considered acceptable due to inhomogeneous nature of the sample matrix.

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 11.4 AHD
COORDINATE: E:331730.0, N:6249203.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH101
PROJECT No: 229796.00
DATE: 30/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE				TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾	DENSITY. ⁽²⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE					
Groundwater observed at 3.4m whilst augering 30/08/24	0.02		ASPHALTIC CONCRETE		FILL	(L)		D to M		ES	0.15			2,2,2							
	0.30		FILL / Silty Gravelly SAND: dark grey; fine to medium; fine, igneous gravel.		FILL	(S) to (F)		w=PL		ES	0.50										
	1		FILL / Silty CLAY, with gravel, trace rootlets: pale grey mottled red and orange; medium plasticity; fine to coarse, igneous, slag, ceramic gravel.		FILL	(S) to (F)		w=PL		ES	0.90										
	1.50		FILL / Clayey Gravelly SAND: dark grey; fine to coarse; fine to coarse, slag, ironstone gravel.		FILL	(L)		D to M		ES	1.45										
	2				FILL	(L)		D to M		ES	1.60										
	2.40		FILL / Sandy Gravelly CLAY: dark grey; medium plasticity; fine to medium sand; fine to coarse, slag, ironstone, sandstone gravel.		FILL	(F)		w=PL		ES	2.00										
	2.90		FILL / Silty Sandy CLAY, trace glass, ceramic, trace gravel: dark grey-brown; medium plasticity; fine to medium sand; fine to medium, sandstone gravel.		FILL	(F)		w=PL		SPT	2.50										
	3.40		FILL / Sandy CLAY, trace gravel: dark brown; high plasticity; fine to medium sand; fine to medium, ironstone gravel.		possibly FILL / possibly ALV	(S) to (F)		w>PL		ES	2.60										
	4				possibly ALV	(S) to (F)		w>PL		SPT	2.95										
	4.80		Clayey SAND (SC): grey-brown; fine to medium; medium plasticity clay.		possibly ALV	(S) to (F)		w>PL		ES	3.10										
	5				possibly ALV	(S) to (F)		w>PL		ES	3.50										
	5.50		Clayey SAND (SC): red and orange-brown; fine to medium; medium plasticity clay.		RS	L		W		ES	3.60										
	6				RS	L		W		SPT	3.90										
	6.65		SANDSTONE: pale yellow, fine to medium grained; apparently low strength. Hawkesbury Sandstone					D		ES	4.00										
	7		Borehole discontinued at 7.05m depth.							ES	4.45										
									ES	4.60											
									ES	5.00											
									ES	5.10											
									ES	5.40											
									SPT	5.50											
									ES	5.95											
									ES	6.10											
									ES	6.50											
									ES	6.60											
									ES	6.90											
									SPT	7.00											
													5/50 (HB)								

NOTES: ⁽¹⁾Soil origin is "probable" unless otherwise stated. ⁽²⁾Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

NOTES: #Soil origin is "probable" unless otherwise stated. °Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio GEO305
METHOD: AD/T to 7.05m
REMARKS:

OPERATOR: Ground Test (LC)

LOGGED: L.Lau
CASING: Uncased



Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 10.7 AHD
COORDINATE: E:331756.0, N:6249177.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH102
PROJECT No: 229796.00
DATE: 30/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS							
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE	
Groundwater observed at 3.0m whilst augering 30/08/24		0.15	CONCRETE: pale grey; mixed angular aggregate, up to 30mm, 5mm diameter steel reinforcement observed .			NA	NA									
		1.0	FILL / CLAY, with gravel: brown mottled pale grey and red; high plasticity; fine to medium, igneous gravel.			(F)	w=PL		ES	0.50 0.60	SPT	2,3,2				
		1							ES	0.90 1.00						
		1.50							SPT	1.45						
		2	FILL / Silty CLAY, with gravel: dark brown; medium plasticity; fine to medium, sandstone gravel.						(VS)	ES			1.60			
		2			ES	2.00 2.10										
					ES	2.40 2.50										
					SPT	2.95										
		3.00	FILL / Sandy CLAY, with gravel: dark brown-grey; medium plasticity; fine to medium sand; fine to coarse, slag, ceramic, glass gravel.		(F)	w>PL	ES		3.10	SPT	4,4,1					
		3.50					ES		3.50 3.60							
		4	3.70m: Sandstone boulder 3.80m-4.70m: With tree roots/rootlets						ES			3.90 4.00				
		4							SPT			4.45				
		4.70	Clayey SAND: red; fine to medium; medium plasticity clay; with low and low strength sandstone bands; extremely weathered; Hawkesbury Sandstone.		(L)	D	ES		5.00 5.10	SPT	3,2,25/40					
		5					SPT		5.50							
		5	5.80m: low strength sandstone													
	6	Borehole discontinued at 5.84m depth.														
		6														
		7														
		8														
		9														
		10														

NOTES: ^(*)Soil origin is "probable" unless otherwise stated. ^(*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

NOTES: #Soil origin is "probable" unless otherwise stated. °Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio GEO305
METHOD: AD/T to 5.84m
REMARKS:

OPERATOR: Ground Test (LC)

LOGGED: L.Lau
CASING: Uncased

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 10.8 AHD
COORDINATE: E:331765.0, N:6249188.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 229796.00
DATE: 30/08/24
SHEET: 1 of 2

CONDITIONS ENCOUNTERED										SAMPLE			TESTING AND REMARKS										
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. (%)	DENSITY (%)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE								
30/08/24 NFGWO whilst augering	0.14	CONCRETE: pale grey; mixed angular aggregate, up to 20mm, 5mm diameter steel reinforcement observed .		FILL	NA	NA	D																
	0.25																						
	1.0	FILL / Cobbly SAND: pale brown; fine to medium; 100mm sandstone cobbles.		FILL	(S)	w=PL	ES									0.50	SPT	4,25/80 (HB)					
	1	FILL / Sandy Gravelly CLAY: dark brown; medium plasticity; fine to medium sand; fine to medium, igneous and sandstone gravel.					ES									0.90							
	1.40	Continued as rock					SPT									1.00							
	5																						
	2																						
	3																						
	4																						
	5																						
	6																						
	7																						
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	9																						
10																							

NOTES: #Soil origin is "probable" unless otherwise stated. %Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio GEO305

OPERATOR: Ground Test (LC)

LOGGED: L.Lau

METHOD: AD/T to 1.4m, then NMLC to 6.8m

CASING: HWT to 1.4m

REMARKS: Core barrel dropped under own weight without rotation from 2.51m to 2.88m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 10.8 AHD
COORDINATE: E:331765.0, N:6249188.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 229796.00
DATE: 30/08/24
SHEET: 2 of 2

GROUNDWATER	CONDITIONS ENCOUNTERED										SAMPLE			TESTING					
	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
30/08/24 NFCWO whilst augering	10																		
	1		Continued from soil																
	1.55		SANDSTONE: brown, medium to coarse grained. Hawkesbury sandstone		SW	1.40					1.53m: B, 0°, PR, SN Fe, RF					PLT	PL(D)=0.81MPa PL(A)=1.1MPa		
	1.70					1.70					1.85m: B, 10°, SN Fe, RF					PLT	PL(D)=0.55MPa PL(A)=0.69MPa		
	2		CORE LOSS: 150 mm		SW														
	2.51		SANDSTONE: brown and pale brown, medium to coarse grained, indistinct, bedded, 0 to 10°; unbroken. Hawkesbury sandstone					78	74										
	2.88					2.88					3.03m: B, 10°, PR, SN Fe, RF					PLT	PL(D)=0.71MPa PL(A)=1.1MPa		
	3		CORE LOSS: 370 mm		SW						3.11m: B, 0°, PR, SN Fe, RF								
	3.83		SANDSTONE: pale yellow-brown and red-brown, medium to coarse grained, indistinct, bedded, 10°; slightly fractured to unbroken. Hawkesbury sandstone								3.44-354m: B x2, 10-20°, CU, SN Fe, RF					PLT	PL(D)=0.91MPa PL(A)=1.2MPa		
	3.96					3.96					3.63m: B, 10°, PR, CN, RF								
4		CORE LOSS: 130 mm		SW						3.76-3.83m: EW, SN Fe 70mm						PLT	PL(A)=0.86MPa PL(D)=0.63MPa		
5		SANDSTONE: pale yellow-brown, medium to coarse grained, indistinct, bedded, 10°; slightly fractured to unbroken. Hawkesbury sandstone								4.57m: B, 10°, PR, SN Fe, RF									
6										4.91m: B, 10°, PR, SN Fe, RF									
7		SANDSTONE: pale grey, fine to medium grained, indistinct, laminated, 0 to 10°; siltstone laminations; slightly fractured to unbroken. Hawkesbury sandstone		FR				95	93	5.18m CS, Clay 10mm						PLT	PL(A)=0.90MPa		
8										5.23m: B, 10°, PR, SN Fe, RF									
9										5.44m: B, 0°, PR, CN, RF						PLT	PL(D)=1.3MPa PL(A)=2.2MPa		
10										5.64m: B, 0-10°, IR, CN, RF						PLT	PL(A)=0.94MPa		
11										5.84m JT, 45°, PR, CN, RF						PLT	PL(D)=0.87MPa PL(A)=0.96MPa		
12		Borehole discontinued at 6.80m depth.																	
13																			
14																			
15																			
16																			
17																			
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NOTES: #Soil origin is "probable" unless otherwise stated.

NOTES: #Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio GEO305
METHOD: AD/T to 1.4m, then NMLC to 6.8m
REMARKS: Core barrel dropped under own weight without rotation from 2.51m to 2.88m

OPERATOR: Ground Test (LC)

LOGGED: L.Lau
CASING: HWT to 1.4m

Refer to explanatory notes for symbol and abbreviation definitions

CORE PHOTO LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 10.8 AHD
COORDINATE: E:331765.0, N:6249188.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 229796.00
DATE: 30/08/24
SHEET: 1 of 1



1.40-5.00 m depth



5.00-6.80 m depth

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 12.6 AHD
COORDINATE: E:331752.6, N:6249236.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 229796.01
DATE: 23/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED													SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS				
23/08/24 No free groundwater observed whilst drilling		0.06	ASPHALTIC CONCRETE		FILL	ND		D		*	ES	0.10	PID	<1ppm				
			0.20															
			0.40															
		DT																
Borehole discontinued at 0.50m depth. Refusal on inferred sandstone.																		
12																		
1																		
11																		
2																		
10																		
3																		
9																		
4																		
8																		

NOTES: ^(*)Soil origin is "probable" unless otherwise stated. ^(*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

NOTES: *Soil origin is "probable" unless otherwise stated. %Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Drillman GT10
METHOD: 250mm diameter SFA to 0.5m
REMARKS: *BD3/20240823 sample taken from 0.1-0.2m

OPERATOR: Groundtest

LOGGED: SAF
CASING: Uncased

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 11.1 AHD
COORDINATE: E:331731.2, N:6249221.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH202
PROJECT No: 229796.01
DATE: 23/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED													SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS				
23/08/24 No free groundwater observed whilst drilling	11	0.06	ASPHALTIC CONCRETE					ND										
			FILL / Silty SAND: dark brown; fine to medium; low plasticity silt; trace sandstone and igneous gravel, trace brick gravel.		FILL	ND	D		ES		0.10	PID	<1ppm					
											0.20							
									ES		0.30	PID	<1ppm					
											0.40							
Borehole discontinued at 0.45m depth. Refusal on inferred sandstone.																		
		1																
		10																
		2																
		9																
		3																
		8																
		4																
		7																

NOTES: ^(*)Soil origin is "probable" unless otherwise stated. ^(*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

NOTES: *Soil origin is "probable" unless otherwise stated. *Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Drillman GT10
METHOD: 250mm diameter SFA to 0.45m
REMARKS:

OPERATOR: Groundtest

LOGGED: SAF
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 11.7 AHD
COORDINATE: E:331737.7, N:6249208.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH203
PROJECT No: 229796.01
DATE: 23/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS				
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. (%)	DENSITY, (g)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
23/08/24 No free groundwater observed whilst drilling	0.06	ASPHALTIC CONCRETE					ND						
	0.10	FILL / Gravelly SAND: dark grey; fine to coarse; igneous and sandstone gravel.							ES		0.10	PID	<1ppm
		FILL / Silty CLAY: brown with red mottling; medium to high plasticity.									0.20		
									ES		0.40	PID	<1ppm
											0.50		
	1.1												
	1								ES		0.90	PID	<1ppm
											1.00		
	1.30												
									ES		1.40	PID	<1ppm
		FILL / Gravelly SAND: dark grey; fine to coarse; fine to coarse, sub-rounded to sub-angular gravel; sandstone and brick gravel.									1.50		
	10												
	2								ES		1.90	PID	<1ppm
											2.00		
		From 1.80m: medium to high plasticity clay inclusions											
									ES		2.40	PID	<1ppm
											2.50		
	9												
									ES		2.80	PID	<1ppm
											2.90		
											3.00		
	3.00								ES		3.10	PID	<1ppm
		SANDSTONE: pale red-yellow; fine to medium grained, inferred low strength											

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 12.3 AHD
COORDINATE: E:331757.3, N:6249218.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH204
PROJECT No: 229796.01
DATE: 23/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS					
23/08/24 No free groundwater observed whilst drilling	12	0.06	ASPHALTIC CONCRETE		FILL	ND	D	ND		ES	0.10 0.20	PID	<1ppm						
Borehole discontinued at 0.30m depth. Refusal on inferred sandstone.																			

PLANT: Drillman GT10
METHOD: 250mm diameter SFA to 0.3m
REMARKS:

OPERATOR: Groundtest
LOGGED: SAF
CASING: Uncased

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 11.3 AHD
COORDINATE: E:331795.9, N:6249171.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH205
PROJECT No: 229796.01
DATE: 23/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS					
23/08/24 No free groundwater observed whilst drilling		0.06	ASPHALTIC CONCRETE					ND											
		11	FILL / Gravelly SAND: brown-dark brown; fine to coarse; fine to medium, sub-rounded to sub-angular gravel; igneous and concrete gravel.		FILL			D		ES		0.10 0.20	PID	<1ppm					
		0.40	FILL / Gravelly SAND: dark grey; fine to coarse; fine to medium, sub-rounded to sub-angular gravel; concrete and sandstone gravel.		FILL	ND		M		* ES		0.40 0.50	PID	<1ppm					
		0.80	SANDSTONE: red-brown; fine to medium grained, inferred low strength					ND		ES		0.70 0.80	PID	<1ppm					
		1	Borehole discontinued at 0.85m depth. Refusal on inferred sandstone.																
		10																	
		2																	
		9																	
		3																	
		8																	
		4																	
		7																	

NOTES: ^(*)Soil origin is "probable" unless otherwise stated. ^(*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

NOTES: *Soil origin is "probable" unless otherwise stated. *Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Drillman GT10
METHOD: 250mm diameter SFA to 0.85m
REMARKS: *BD1/20240823 sample taken from 0.4-0.5m

OPERATOR: Groundtest

LOGGED: SAF
CASING: Uncased

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 11.8 AHD
COORDINATE: E:331772.9, N:6249199.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH206
PROJECT No: 229796.01
DATE: 23/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS					
23/08/24 No free groundwater observed whilst drilling		0.06	ASPHALTIC CONCRETE					ND											
		0.20	FILL / Gravelly SAND: brown; fine to coarse; fine to medium, sub-rounded to sub-angular gravel; igneous and sandstone gravel.		FILL			D		ES		0.10 0.20	PID	<1ppm					
			FILL / Silty SAND: dark brown; fine to medium; low plasticity silt; trace sandstone gravel.							ES		0.30 0.40	PID	<1ppm					
		11																	
		1			FILL		ND												
								M											
										ES		0.90 1.00	PID	<1ppm					
		10																	
		2																	
Borehole discontinued at 1.10m depth. Refusal on inferred sandstone.																			
	9																		
	3																		
	8																		
	4																		
	7																		

NOTES: ^(*)Soil origin is "probable" unless otherwise stated. ^(*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

NOTES: #Soil origin is "probable" unless otherwise stated. %Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Drillman GT10
METHOD: 250mm diameter SFA to 1.1m
REMARKS:

OPERATOR: Groundtest

LOGGED: SAF
CASING: Uncased

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 12.4 AHD
COORDINATE: E:331800.7, N:6249184.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH207
PROJECT No: 229796.01
DATE: 23/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED										SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. ^(%)	DENSITY. ^(%)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	
23/08/24 No free groundwater observed whilst drilling		0.06	ASPHALTIC CONCRETE					ND							
		12	FILL / Gravelly SAND: brown; fine to coarse; fine to medium, sub-rounded to sub-angular gravel; igneous, concrete and sandstone gravel.		FILL	ND		D		*	ES	0.10 0.20	PID	<1ppm	
		0.60	FILL / Gravelly SAND: dark grey; fine to coarse; fine to medium, sub-rounded to sub-angular gravel; igneous, concrete, sandstone and brick gravel, trace tile, plastic, ballast, metal pipe.		FILL			M			ES	0.40 0.50	PID	<1ppm	
		1	Borehole discontinued at 0.80m depth. Refusal on inferred sandstone.								ES	0.60 0.70	PID	<1ppm	
		11													
		2													
		10													
		3													
		9													
		4													
		8													
	NOTES: ^(%) Soil origin is "probable" unless otherwise stated. ^(%) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.														

PLANT: Drillman GT10
METHOD: 250mm diameter SFA to 0.8m
REMARKS: *BD2/20240823 sample taken from 0.1-0.2m

OPERATOR: Groundtest

LOGGED: SAF
CASING: Uncased



BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 10.3 AHD
COORDINATE: E:331777.8, N:6249171.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH208
PROJECT No: 229796.01
DATE: 23/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS				
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. (%)	DENSITY, (g/cm³)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	0.06	ASPHALTIC CONCRETE					ND						
	10	FILL / Gravelly SAND: dark grey; fine to coarse; fine to medium, sub-rounded to sub-angular gravel; igneous, sandstone and concrete gravel, broken brick cobbles and fragments.		FILL			M		ES	0.10 - 0.20		PID	<1ppm
									ES	0.40 - 0.50		PID	<1ppm
	0.80	FILL / Gravelly CLAY: dark grey; low to medium plasticity; fine to coarse, sub-rounded to sub-angular gravel; brick and sandstone gravel.			ND		w=PL		ES	0.90 - 1.00		PID	<1ppm
	9			FILL					ES	1.40 - 1.50		PID	<1ppm
	2						w>PL		ES	1.90		PID	<1ppm
Borehole discontinued at 2.00m depth. Refusal on inferred sandstone bedrock.													
	8												
	3												
	7												
	4												
	6												

NOTES: *Soil origin is "probable" unless otherwise stated. †Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

NOTES: *Soil origin is "probable" unless otherwise stated. *Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Drillman GT10
METHOD: 250mm diameter SFA to 2m
REMARKS: Groundwater observed at 1.4 m

OPERATOR: Groundtest

LOGGED: SAF
CASING: Uncased

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 11.9 AHD
COORDINATE: E:331807.0, N:6249169.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH209
PROJECT No: 229796.01
DATE: 23/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED										SAMPLE			TESTING AND REMARKS	
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. (%)	DENSITY, (g/cm³)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	
23/08/24 No free groundwater observed whilst drilling	0.06	ASPHALTIC CONCRETE					ND							
	0.30	FILL / Gravelly SAND: dark brown-brown ; fine to coarse; fine to medium, sub-rounded to sub-angular gravel; igneous, sandstone and brick gravel.		FILL			D		ES	0.10 - 0.20		PID	<1ppm	
	0.60	FILL / Gravelly SAND: dark grey; fine to coarse; fine to medium, sub-rounded to sub-angular gravel; sandstone and brick gravel.		FILL					ES	0.40 - 0.50		PID	<1ppm	
	1.00	FILL / SAND: brown; fine to coarse; with sandstone and brick gravel.		FILL	ND		M		ES	0.70 - 0.80		PID	<1ppm	
	1.10	SANDSTONE: pale red-yellow; fine to medium grained, inferred low strength					ND		ES	1.00 - 1.10		PID	<1ppm	
	Borehole discontinued at 1.50m depth. Target depth reached.													

NOTES: ^(#)Soil origin is "probable" unless otherwise stated. ^(%)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

NOTES: *Soil origin is "probable" unless otherwise stated. *Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Drillman GT10
METHOD: 250mm diameter SFA to 1.5m
REMARKS:

OPERATOR: Groundtest

LOGGED: SAF
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 11.1 AHD
COORDINATE: E:331799.7, N:6249163.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH210
PROJECT No: 229796.01
DATE: 23/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED													SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS					
23/08/24 No free groundwater observed whilst drilling	11	0.06	ASPHALTIC CONCRETE				ND											
			FILL / Gravelly SAND: brown-dark brown; fine to coarse; fine to medium, sub-rounded to sub-angular gravel; igneous and concrete gravel.		FILL		D		ES		0.10 0.20	PID	<1ppm					
		0.30	FILL / Clayey Gravelly SAND: brown; fine to coarse; medium to high plasticity clay; fine to medium, sub-rounded to sub-angular gravel; sandstone and brick gravel, clayey zones.		FILL	ND	M		ES		0.40 0.50	PID	<1ppm					
			0.80m: becoming dark grey						ES		0.90	PID	<1ppm					
		1																
23/08/24	10		Borehole discontinued at 1.00m depth. Refusal on inferred sandstone .															

NOTES: ^(*)Soil origin is "probable" unless otherwise stated. ^(*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

NOTES: *Soil origin is "probable" unless otherwise stated. *Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Drillman GT10
METHOD: 250mm diameter SFA to 0.8m, 100mm SFA to 1.0m
REMARKS:

OPERATOR: Groundtest

LOGGED: SAF
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Corio Projects Pty Ltd
PROJECT: Proposed Seniors Housing
LOCATION: 2-32 Junction Street, Forest Lodge, NSW 2037

SURFACE LEVEL: 11.1 AHD
COORDINATE: E:331720.8, N:6249210.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH211
PROJECT No: 229796.01
DATE: 23/08/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE			TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS				
23/08/24 No free groundwater observed whilst drilling	11	0.06	ASPHALTIC CONCRETE					ND										
			FILL / Gravelly SAND: dark brown; fine to coarse; fine to medium, sub-rounded to sub-angular gravel; igneous, concrete and sandstone gravel.		FILL	ND		D		ES		0.10	PID	<1ppm				
												0.20						
										ES		0.40	PID	<1ppm				
Borehole discontinued at 0.50m depth. Target depth reached.																		

NOTES: *Soil origin is "probable" unless otherwise stated. *Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Drillman GT10 and hand tools
METHOD: 250mm diameter SFA to 0.1m, hand auger to 0.5m
REMARKS:

OPERATOR: Groundtest

LOGGED: SAF
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style **XW**. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example providing a description of the strength of a concrete pavement	NA

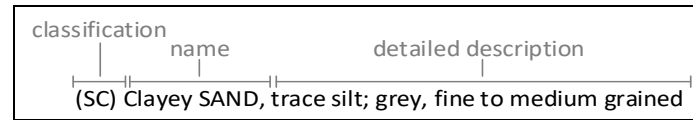
Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

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Introduction

All materials which are not considered to be “in-situ rock” are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:



The “classification” comprises a two character “group symbol” providing a general summary of dominant soil characteristics. The “name” summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either “fine grained” (also known as “cohesive” behaviour) or “coarse grained” (“non cohesive” behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as “oversize”	
Cobble	63 - 200		
Gravel ¹	2.36 - 63	Coarse	>65%
Sand ¹	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

¹ – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer “component proportions” below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a “Sandy CLAY”, this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a “primary”, “secondary”, or “minor” component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition ¹	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor ²	Present in the soil, but not significant to its engineering properties	All other components	All other components

¹ As defined in AS1726-2017 6.1.4.4

² In the detailed material description, minor components are split into two further sub-categories. Refer “identification of minor components” below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, “INTERBEDDED Silty CLAY AND SAND”.

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component ¹	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

¹ – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

Type	Particle size (mm)	
	Gravel	Sand
Gravel	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 - 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code **NDF**, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example (VS).

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as “extremely weathered material” in reports and by the abbreviation code **XWM** on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than ‘very low’ as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Fluvial	Deposited by channel fill and overbank (natural levee, crevasse splay or flood basin)	FLV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be “oversize” may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with “MIXTURE OF”.

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Rock Strength

Rock strength is defined by the unconfined compressive strength, and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $I_{s(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Unconfined Compressive Strength (MPa)	Point Load Index ¹ $I_{s(50)}$ MPa	Abbreviation Code
Very low	0.6 - 2	0.03 - 0.1	VL
Low	2 - 6	0.1 - 0.3	L
Medium	6 - 20	0.3 - 1.0	M
High	20 - 60	1 - 3	H
Very high	60 - 200	3 - 10	VH
Extremely high	>200	>10	EH

¹ Rock strength classification is based on UCS. The UCS to $I_{s(50)}$ ratio varies significantly for different rock types and specific ratios may be required for each site. The point load Index ranges shown above are as suggested in AS1726 and should not be relied upon without supporting evidence.

The following abbreviation codes are used for soil layers or seams of material “within rock” but for which the equivalent UCS strength is less than 0.6 MPa.

Scenario	Abbreviation Code
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The properties of the material encountered over this interval are described in the “Description of Strata” and soil properties columns.	SOIL
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The prominence of the material is such that it can be considered to be a seam (as defined in Table 22 of AS1726-2017) and the properties of the material are described in the defect column.	SEAM

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil ¹	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.	RS
Extremely weathered ¹	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible	XW
Highly weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores.	HW
Moderately weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.	DW

¹ The parent rock type, of which the residual/extremely weathered material is a derivative, will be stated in the description (where discernible).

Degree of Alteration

The degree of alteration of the rock material (physical or chemical changes caused by hot gasses or liquids at depth) is classified as follows:

Term	Description	Abbreviation Code
Extremely altered	Material is altered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.	XA
Highly altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be increased by leaching or may be decreased due to precipitation of secondary materials in pores.	HA
Moderately altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MA
Slightly altered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	SA
Note: If HA and MA cannot be differentiated use DA (see below)		
Distinctly altered	Rock strength usually changed by alteration. The rock may be highly discoloured, usually by staining or bleaching. Porosity may be increased by leaching or may be decreased due to precipitation of secondary minerals in pores.	DA

Degree of Fracturing

The following descriptive classification apply to the spacing of natural occurring fractures in the rock mass. It includes bedding plane partings, joints and other defects, but excludes drilling breaks. These terms are generally not required on investigation logs where fracture spacing is presented as a histogram, and where used are presented in an unabbreviated format.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$RQD \% = \frac{\text{cumulative length of 'sound' core sections} > 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e., drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

These terms may be used to describe the spacing of bedding partings in sedimentary rocks. Where used, these terms are generally presented in an unabbreviated format

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Rock Descriptions

Terminology
Symbols
Abbreviations

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Cleavage	CL
Crushed seam	CS
Crushed zone	CZ
Drilling break	DB
Decomposed seam	DS
Drill lift	DL
Extremely Weathered seam	EW
Fault	F
Fracture	FC
Fragmented	FG
Handling break	HB
Infilled seam	IS
Joint	JT
Lamination	LAM
Shear seam	SS
Shear zone	SZ
Vein	VN
Mechanical break	MB
Parting	P
Sheared Surface	S

Rock Defect Orientation

Term	Abbreviation Code
Horizontal	H
Vertical	V
Sub-horizontal	SH
Sub-vertical	SV

Rock Defect Coating

Term	Abbreviation Code
Clean	CN
Coating	CT
Healed	HE
Infilled	INF
Stained	SN
Tight	TI
Veneer	VNR

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN
Pyrite	Py
Secondary material	MS
Silt	M
Quartz	Qz
Unidentified material	MU

Rock Defect Shape/Planarity

Term	Abbreviation Code
Curved	CU
Discontinuous	DIS
Irregular	IR
Planar	PR
Stepped	ST
Undulating	UN

Rock Defect Roughness

Term	Abbreviation Code
Polished	PO
Rough	RF
Smooth	SM
Slickensided	SL
Very rough	VR

Defect Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

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Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:

SAMPLE			DEPTH (m)	TESTING	
SAMPLE REMARKS	TYPE	INTERVAL		TEST TYPE	RESULTS AND REMARKS
	SPT		1.0 1.45	SPT	4,9,11 N=20

Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid Sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Environmental sample	ES
Gas sample	G
Piston sample	P
Sample from SPT test	SPT
Undisturbed tube sample	U ¹
Water sample	W
Material Sample	MT
Core sample for unconfined compressive strength testing	UCS

¹ – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y = x blows for y mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS

Field and laboratory testing (continued)

Test Type	Code
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(L)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150

Groundwater Observations

▷	seepage/inflow
▽	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD ¹
Air Track	AT
Diatube	DT ¹
Hand auger	HA ¹
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA ¹
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT ¹
Ripping tyne/ripper	R
Rock roller	RR ¹
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON ¹
Mud/blade bucket	MB ¹
Toothed bucket	TB ¹
Vibrocure	VC ¹
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB ¹

¹ – numeric suffixes indicate tool diameter/width in mm

Appendix C

Acid Sulfate Soil Formation, Action Criteria and
Treatment Verification

1. Introduction

This appendix provides background information on acid sulfate soil formation. Details the acid sulfate soil action criteria, acid sulfate soil treatment verification criteria, equations for net acidity and waste classification criteria are also included. The action criteria are based on Sullivan, et. al. (2018).

2. Formation of acid sulfate soils

The key features of landscapes where ASS occurs include:

- Coastal lowlands below 5 m AHD i.e. tidal flats, estuaries, mangroves, and salt marshes;
- Estuarine and marine sediments;
- Floodplains and wetlands i.e. depositional environments where waterlogging persists;
- Backswamps and lagoons i.e. areas of poor drainage where organic-rich sediments accumulate; and
- Certain man-made disturbed areas where land reclamation, dredging, or drainage exposes sulfide-rich sediments to oxygen, leading to acidification.

Reduced inorganic sulfur (RIS) forms readily in landscapes under waterlogged, anoxic conditions where there is a ready supply of organic matter, sulfate and iron. Under such conditions, the formation of RIS occurs via microbially-mediated processes. The occurrence of ASS is associated with areas or regions that have previously been or are currently estuarine environments. Due to changes in sea level or geomorphologic changes to coastal systems, these sediments are often overlain by terrestrial sediments.

When ASS are exposed to air (e.g. due to bulk excavation or dewatering), the oxygen reacts with RIS in the sediment, producing sulfuric acid. This acid can be produced in large quantities and is highly mobile in water. The acid can result in severe acidification of soil and groundwater and mobilise metals (for example arsenic, iron, aluminium, copper, cobalt, zinc), nutrients (for example phosphate) and rare earth elements. The sulfuric acid generated from the site has the potential to impact site soils, groundwater and structures, and can drain into waterways causing severe short and long term socio-economic and environmental impacts, including damage to man-made structures and natural ecosystems (for example fish kills).

The factor common to all ASS materials is that RIS components have either had, or may have, a major influence on the properties or behaviour of these soil materials.

3. Action criteria

The following section provides the action criteria used to assess whether the soil is classified as PASS/ASS.

3.1 Field screening

Field screening indicators do not form part of the action criteria but can be used to provide an indication of the ASS status and to assist in selecting samples for laboratory testing. Indicators of ASS from field screening include:

- Field pH is less than or equal to pH 4;
- pH_{fox} is less than 3;
- A decrease of 1 pH unit or more from the field pH to the pH_{fox} ;
- Bubbling, production of heat or release of sulphur odours during pH_{fox} testing; and
- Change in colour from grey to brown tones during oxidation.

3.2 Laboratory analysis

The following Table 1 provides the action criteria. As per Sullivan, et. al. (2018).

Table 1: Action criteria

Type of material		Net acidity #	
		1-1000 t materials disturbed	>1000 t materials disturbed
Texture range	Approx. clay (%)	% S-equiv	% S-equiv
Fine: light medium to heavy clay	>40	≥ 0.1	≥ 0.03
Medium: clayey sand to light clays	5-40	≥ 0.06	≥ 0.03
Coarse and Peats: sands to loamy sands	<5	≥ 0.03	≥ 0.03

Notes:

Net acidity can only include a soil material measured acid neutralising capacity (ANC) where this measure has been corroborated by other data

Equation 1 is used to calculate the net acidity when the effectiveness of a soil's measured acid neutralising capacity has not been corroborated by other data.

Net acidity = potential sulfidic acidity + actual acidity + retained acidity

Net acidity = S_{cr} + S-TAA at pH 6.5 + SNAS

4. Verification of treatment

The following section provides the equations and methods of verifying that the neutralisation treatment has been successful / completed.

4.1 Field screening

Field screening results will be considered to be acceptable when the results meet the adopted criteria. When soils do meet the following criteria, confirmatory laboratory testing should be undertaken.

- Field pH is ≥ 5.5 (but ideally between pH 6.5 and 8.5); and
- $\text{pH}_{\text{fox}} \geq 6.5$.

4.2 Laboratory testing

The soil will be considered successfully treated where:

- pH_{KCL} is ≥ 6.5 ;
- (total actual acidity) TAA = 0; and
- Net acidity ≤ 0 . Net acidity must be determined by Equation 2, below.

Equation 2 is used to calculate the verification of post-treatment net acidity.

Verification net acidity = potential sulfidic acidity + actual acidity + retained acidity – (post neutralised acid neutralising capacity – pre neutralised acid neutralising capacity)

Verification net acidity = $\text{Scr} + \text{S-TAA at pH 6.5} + \text{SNAS} - (\text{ANCBT of treated material} - \text{ANCBT of untreated material})$

5. Off-site disposal requirements

Prior to disposal off-site the soil must be classified in accordance with relevant guidelines.

PASS / ASS and treated PASS / ASS cannot be classified as virgin excavated natural material (VENM). A 'specific exemption' for treated PASS can be sought from NSW EPA under relevant waste regulations for beneficial reuse on a defined receiving site willing to accept the material, however, the application can take some time to process and may not be appropriate due to contaminant levels recorded in the fill.

If soil is proposed to be disposed to landfill (post-treatment), it must be classified in accordance with the POEO Act, including the current guidelines, namely:

- NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste* (NSW EPA, 2014a).
- NSW EPA *Waste Classification Guidelines, Part 4: Acid Sulfate Soils* (NSW EPA, 2014b).

6. Disposal as untreated potential acid sulfate soil

Further guidance for the disposal of untreated soil as PASS is provided in Appendix E.

7. References

NSW EPA. (2014a). *Waste Classification Guidelines, Part 1: Classifying Waste*. NSW Environment Protection Authority.

NSW EPA. (2014b). *Waste Classification Guidelines, Part 4: Acid Sulfate Soils*. NSW Environment Protection Authority.

Sullivan, L., Ward, N., Toppler, N., & Lancaster, G. (2018). *National Acid Sulfate Soils Guidance: National Acid Sulfate Soils Sampling and Identification Methods Manual*. Canberra ACT CC BY 4.0: Department of Agriculture and Water Resources.

Appendix D

Liming Rate Calculation

1. Introduction

This Appendix provides background information on selection of liming material and the equations for the calculation of liming rates.

2. Neutralising materials

Agricultural lime (aglime) is the preferred neutralisation material for the management of ASS, as this material is usually the cheapest and most readily available product for acid neutralisation. Furthermore, aglime is slightly alkaline (pH of 8.5 to 9), non-corrosive, of low solubility and does not present handling problems or generate high pH leachate and it only liberates alkalinity in the presence of acid.

Dolomite and calcined magnesias also have low solubility, however, they produce magnesium sulfate during neutralisation reactions which is quite soluble and may degrade water quality in waterways if large quantities are produced. Aglime on the other hand hydrates to gypsum which is less soluble and therefore less likely to affect water quality and also has other beneficial impacts on soil properties particularly soil structure:

- Aglime comprises calcium carbonate (CaCO_3), typically made from limestone that has been finely ground and sieved to a fine powder. Aglime with the following properties are the preferred neutralising agent;
- Purity of at least 98% or better (i.e. $\text{NV} > 98$, where NV is the neutralising value, a term used to rate the neutralising power of different forms of materials relative to pure, fine calcium carbonate which is designated $\text{NV} = 100$);

NOTE: There could be economic justification for using a less pure grade of aglime, however, under these circumstances, the individual lime dosing rates described in Section 3 would need to be carefully considered, as the cost savings from using less pure material may be offset by the corresponding increase in the required dosing rates (lime volumes required), and the transport and disposal costs; and

- Fine ground (at least <0.5 mm) and dry, as texture and moisture can decrease the effective NV.

Aglime requires no specialised handling, however, use of safe work practices and good hygiene practices are recommended to avoid eye or skin contact and inhalation. Aglime should be stored in a cool, dry, well-ventilated area inaccessible to the general public (refer to aglime safety data sheets (SDS) for further details). Any aglime stockpiles (where relevant) should be covered by a tarpaulin both to minimise wind erosion and wetting, as the material is more difficult to spread when wet.

Due to its low solubility in water, aglime is not suitable for the neutralisation of leachate, which requires a product with a very quick reaction and high solubility. The most suitable neutralising agent for leachate and retained drainage water / groundwater is slaked lime or hydrated lime (calcium hydroxide ($\text{Ca}(\text{OH})_2$)). This is made by treating burnt lime (calcium oxide (CaO)) with water (slaking) and comes as a fine white powder. It has a typical NV of about 135. Due to its very strong alkalinity (pH of about 12.5 to 13.5), slaked lime or hydrated lime should not be allowed to come into contact with the skin or be inhaled and care must be taken to not overshoot pH

adjustment with such alkaline agents. Hydrated lime is not recommended for soil neutralisation. Hydrated lime should be stored in cool protected place (e.g. locked store inaccessible to the general public) away from moisture, strong oxidants or acids and to minimise dust emissions and (refer to hydrated lime SDS for further details).

3. Liming rates

The required liming rate can be calculated from the following formula (per tonne or per m³).

Table 1: Liming rate equations

Equation 1 for kg lime /m ³ PASS	Equation 2 for kg lime /tonne PASS
$\left(\frac{\% S \times 623.7}{19.98} \right) \times \frac{100}{ENV(\%)} \times D \times FOS$	$\left(\frac{\% S \times 623.7}{19.98} \right) \times \frac{100}{ENV(\%)} \times FOS$

Notes:

Net acidity (%S) is derived using the maximum net acidity (%S) using the methods in Appendix C

623.7 = % S to mol H⁺ / t

19.98 converts mol H⁺ / t to kg CaCO₃/tonne

FOS = (factor of safety) = a minimum value of 1.5 needs to be adopted, although values of up to 2 can be suitable

ENV = Effective Neutralising Value (e.g. Approx. 98% for fine (0.3 mm grain size) aglime with an NV of 98%)

D = Bulk density, site specific results can be used, or the bulk densities in ASSMAC (1998)

The ENV is calculated based on the molecular weight, particle size and purity of the neutralising agent and should be assessed for proposed materials in accordance with ASSMAC (1998)

An initial liming rate (kg CaCO₃/t) is to be calculated based on the laboratory result calculation (excluding ANC) is considered appropriate based on it including a safety factor of 1.5 and the use of aglime with an NV of at least 98% and a grain size of less than 0.3 mm. The laboratory result must be multiplied by the soils bulk density (D) to convert to lime rate per volume of soil (kg CaCO₃/m³).

Depending upon the source of the aglime and ultimately the representative ENV of the aglime selected, the minimum lime dosing rate may be increased or decreased. Prior to the commencement of works, the minimum lime dosing rate should be finalised following review of the ENV of the selected aglime.

The liming rate to be calculated from the analytical results should therefore be considered as a 'starting point', and pH monitoring should be done during treatment to assess the progress of the neutralisation and the need for additional mixing and/or addition of aglime. Soil will only be considered to have been successfully treated when all soil has been verified in accordance with Section 10 of the ASSMP and Appendix C.

4. References

Stone, Y., Ahern, C. R., & Blunden, B. (1998). *Acid Sulfate Soil Manual*. Acid Sulfate Soil Management Committee (ASSMAC).

Appendix E

Contingency Options to On-site Treatment

1. Introduction

This Appendix provides a contingency option to the selected management options.

2. Off-site treatment and disposal

Where on site treatment of PASS is not possible and/or practical then off-site treatment at a facility appropriately licenced to accept and treat such soil can be considered. The following general procedure is recommended for off-site treatment:

The below works will be undertaken:

- Prior agreement with the facility to accept the material, and a suitable schedule for transportation of the PASS to the facility;
- Loading the soil into trucks. If the soils are wet, they will be heavier than soils as normally transported at field moisture. This should be taken into consideration when loading trucks to ensure that trucks are not overloaded;
- Transport must be conducted in a sealed truck which prevents water leaking from the truck during transport;
- Completion of site records of the above and all information required by the treatment facility, and provision of copies of these records to the treatment facility;
- Transporting of soil to the treatment facility;
- Once the ASS has been accepted by the treatment facility they will treat and manage it in accordance with their EPL conditions, subject to the verification procedures documented herein. The liming rate will be based on the liming rate specified in this ASSMP;
- Verification of the treatment of the ASS and classification of the soil by the facility in accordance with their internal procedures, or otherwise by a suitably qualified Environmental Consultant; and
- Transport of the treated, classified ASS to the final receiving site / disposal facility.

3. References

Dear, S. E., Williams, K. M., McElnea, A. E., Ahern, C. R., Dobos, S. K., Moore, N. G., & O'Brien, L. E. (2024). *Queensland acid sulfate soil technical manual : soil management guidelines version 5.1*. Department of Environment, Science and Innovation.

NSW EPA. (2014). *Waste Classification Guidelines, Part 4: Acid Sulfate Soils*. NSW Environment Protection Authority.

Appendix F

Water and Groundwater Management

1. Introduction

Water is the main mechanism by which acid and metals from oxidised ASS are mobilised and transported. Careful management of water is therefore important to the effective management of potential adverse impacts from ASS disturbance. Management is required to provide control of treated waters for discharge and provide some margin for heavy rain periods.

The below sections provide potential strategies for management, assessment and disposal of water leaching from ASS, surface water and water from groundwater dewatering.

2. Leachate and surface water collection

All water that has been in contact with ASS / assumed ASS must be managed, assessed, treated and appropriately disposed of in accordance with the ASSMP.

3. Dewatering and extracted groundwater

In general, risks associated with dewatering in areas underlain by ASS include:

- Acidification of *in situ* soils drained within the dewatering cone of depression and difficulties associated with neutralising these *in situ* soils (this can also impact the possible PASS classification of some soils);
- Acidification of groundwater remaining within the dewatering cone of depression after the system has re-flooded;
- Iron / aluminium (other metals) contamination of groundwater arising from mobilisation of these compounds under low pH conditions; and
- Acidification and contamination of surface water bodies which receive groundwater.

It is considered that there is the potential to expose soils within the proposed excavation areas to air which will allow some acidification to take place. However, the water and ASS from within these areas will be removed and treated, mitigating associated potential risks.

The dewatering should be designed to not significantly affect groundwater levels outside of the areas of excavation, and therefore the potential for oxidation of ASS outside of the excavation areas is expected to be limited.

The following dewatering risk management methods are recommended for the project:

- Drawdown outside of the excavation areas should be minimised;
- Drawdown as close as practical to the invert excavation depth;
- Minimise the time and volume of exposed ASS (i.e. stage excavation and dewatering); and
- Monitoring and treatment prior to disposal of the dewatering effluent.

4. Water storage and treatment

Water from dewatering and the ASS leachate should either be pumped directly to an on-site treatment plant for treatment or should be stored in a tank or lined drains / detention basin prior to assessment / treatment.

At a minimum, the combined storage should be designed to store enough water to contain leachate and extracted water from a 1 in 10-year (1 hour) storm event.

5. Water assessment for disposal

Water which has come into contact with ASS requires assessment (monitoring) and if necessary, treatment. The consent authority in the local jurisdiction should be consulted for specific approvals and target levels for disposal. It is further recommended that pre-disposal water assessment of groundwater and receiving bodies is done to ensure the target levels in Table 1 are suitable (i.e. adjustment of these target levels may be appropriate, subject to approval by the consent authority, where background concentrations for the receiving environment differ from the target levels in Table 1). The minimum monitoring requirements are outlined in Table 1, below.

Table 1: Water monitoring analytes and frequency

Test	Parameters	Comments
Groundwater		
Physical parameters	Water level, discharge rate	Monitored daily during discharge.
Field parameters	pH, EC, Eh (redox), DO, smell of noxious gases (qualitative)	Monitored daily during discharge, reducing over time. The pH of should be 6.5 to 8.5 or one pH unit from the background pH of the receiving surface water body.
Major cations, anions and nutrients	Major cations, anions and nutrients	Monitored monthly initially to characterise groundwater facies (types), and if field parameters indicate a risk, for example decreasing pH.
Metals	Total and dissolved metals (including Al and Fe)	Monitored monthly initially and if field parameters indicate a risk, for example decreasing pH.
Soil materials within dewatered zone(s)	Net Acidity, peroxide pH	This may be useful if acidic conditions are formed to assess the loss and continued existing hazard in the area of dewatering, which may improve the CSM and understanding of the site. May or may not be necessary depending on degree of risk. The risk will depend on the expected extent and duration of drawdown outside of the excavation and the results of groundwater monitoring.

Test	Parameters	Comments
Soil materials within dewatered zone(s)	Visual observations	The formation of easily identifiable minerals such as straw-yellow jarosite occurs at an advanced stage of acidification. Once formed, these sparingly soluble minerals are difficult to remove and may prolong remediation efforts.
Surface water		
Field parameters	pH, EC, DO	Monitored daily during discharge, reducing frequency over time.
Metals	Total and dissolved metals (including Al and Fe)	Monitored monthly initially and if field parameters indicate a risk, for example decreasing pH..

6. Treatment

6.1 General

The potential impacts of ASS on water generally comprise a decrease in pH, possible elevated TSS / turbidity, iron, aluminium and other metals.

Treatment of water from construction sites is commonly required for pH and TSS. Aeration and removal of TSS also generally decreases metal concentrations in the water. Therefore, an on-site water treatment plant is considered likely to be suitable for treatment of ASS impacted water that has not been oxidised.

An alternative treatment method for pH is provided in Section F1.5.2 in case treatment of excess water above the capacity of the treatment plant is required.

If a suitable treatment method for man-made contaminants in the water (e.g. PFAS, VOC, PAH, TPH, BTEX, OCP, metals etc) cannot be implemented, an alternative disposal method may be required (e.g. trucking off-site to a liquid waste disposal facility or disposal to sewer in accordance with a specific Trade Waste Agreement which would need to be obtained from the relevant water / wastewater authority).

6.2 Alternative pH treatment method

It is noted that aglime is generally not suitable for the treatment of leachate / dewatering effluent due to its low solubility in water. A commercial pH adjustment product can be used, or else slaked lime (hydrated lime) as discussed below.

Alternative neutralisation materials include calcined magnesite (magnesium hydroxide, burnt magnesite, or magnesite) and calcium hydroxide (commonly called slaked or hydrated lime).

Calcined magnesite (magnesium hydroxide, burnt magnesite, or magnesite) produces a two-step reaction, which proceeds rapidly at acidic pH and slows down as higher pH is approached, and hence reduces the potential for over-neutralisation. It should be added to the leachate as a slurry and mixing achieved via use of an agitator.

A calcium hydroxide (commonly called slaked or hydrated lime) solution can be produced by stirring calcium oxide (commonly called quicklime) into water, in a container of sufficient volume (for example, a plastic 200 litre drum). The slurry should be allowed to settle, and the clear solution (which will be caustic, with a pH of approximately 12.5 to 13) can be pumped or sprayed into the standing water in small amounts, with some agitation and monitoring. This procedure should be continued until the pH is adjusted to acceptable levels. Adequate care should be taken not to 'overshoot' the desired pH with calcium hydroxide.

Quicklime is very reactive, and relatively corrosive (due to its caustic nature). When quicklime is mixed with water, the resulting reaction generates heat. Therefore, if used, the material should be added in increments to a large amount of water to control the reaction. Slaked or quicklime should not be allowed to come into contact with the skin or be inhaled during use.

As a guide, the approximate quantities of slaked lime required to neutralise acidic water (i.e. to raise the existing pH to approximately pH 7 / neutral) are provided in Table 2.

Table 2: Approximate liming rates for water for slaked lime (kg slaked lime)

Water pH	Volume of water		
	10 m ³	50 m ³	100 m ³
2	3.7	18.5	37
3	0.37	1.85	3.7
4	0.037	0.185	0.37
5	0.0037	0.0185	0.037
6	0.00037	0.00185	0.0037

7. Water discharge

Following treatment (if required) the water should be assessed to determine if it meets the discharge criteria. Water meeting the conditions can then be disposed in accordance with the consent conditions.

If assessment results indicate that outlet concentrations exceed target levels as per Table 1, the cause of the exceedance is to be investigated, and contingency strategies must be considered. Depending on the nature and degree of the exceedance, it may be necessary to halt discharge to stormwater until such time that the situation is rectified and contingencies are implemented.

Depending on site conditions, alternative options for water disposal include off-site disposal to a suitably licenced liquid waste facility.