99-101 OLD BURLEIGH ROAD,
BROADBEACH

PART 4 – SPECIALIST REPORTS



APPENDIX D TRAFFIC ASSESSMENT

Traffic Impact Assessment

101 Old Burleigh Road, Broadbeach

T0921032



Prepared for
Urbis Pty Ltd

10th November 2021

Cardno

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1 Introduction

1.1 Overview

Cardno Qld Pty Ltd (Cardno) has been engaged by Urbis Pty Ltd (Urbis) to provide traffic and transport engineering advice in support of the proposed development located at 99 – 101 Old Burleigh Road, Broadbeach.

The developments plans are included at **Appendix A**.

The purpose of this report is to assess the traffic and transport components of the proposed development against the requirements of the City of Gold Coast City Plan, and Australian Standards. Therefore, the report addresses the following:

- External traffic impacts
- Internal traffic arrangements, including:
  - Parking provisions
  - Site access design
  - Servicing provisions
- Active and public transport connections

1.2 References

The following resources were referred to in the preparation of the report:

- City of Gold Coast (Council) City Plan
- Australian Standards, *AS2890.1:2004 Parking Facilities Part 1: Off-street Car Parking,* 2004
- Queensland Department of Transport and Main Roads (TMR), Guide to Traffic Impact Assessments (GTIA), 2017

1.3 Limitations

Cardno has completed this traffic report in accordance with the usual care and thoroughness of the consulting profession. The assessment is based on accepted traffic engineering practises and standards applicable at the time of undertaking the assessment. The assessment was completed in July 2021, and is based upon the conditions encountered and project information available at the time. Cardno disclaims responsibility for any changes to project planning or road conditions that may occur after completion of the assessment.

2 Existing Conditions

2.1 Site Location

The development site is located at 99 – 101 Old Burleigh Road, Broadbeach, and is zoned as high density residential. It is bound by Old Burleigh Road to the east, Armrick Avenue to the south, and surrounding high density residential to the north and west.

Figure 2-1 illustrates the site location, as well as the surrounding key roads, with key road characteristics summarised in Table 2-1.

Figure 2-1 Site Location



Source: Metromap

Table 2-1 Key Road Characteristics

Road	Authority	Classification	Posted Speed	Typical Form
Old Burleigh Road	Council	Local Road*	50km/h	Two lane, two way, undivided, parking lanes
Armrick Avenue	Council	Local Road*	50km/h	Two lane, two way, undivided, parking lanes with formal perpendicular parking bays
Second Avenue	Council	Local Road*	50km/h	Two lane, two way, undivided, parking lanes
Surf Parade	Council	Local Road*	50km/h	Two lane, two way, undivided, parking lanes
Broadbeach Blvd.	Council	Local Road*	50km/h	Two lane, two way, undivided, parking lanes

*not identified in city plan mapping, so assumed to be local

2.2 Existing Land Uses

The site is currently occupied by a café, bottle shop, takeaway store and apartment building, with vehicular access onto both Old Burleigh Road and Armrick Avenue.

2.3 Public Transport Facilities

The development site is well serviced by the existing public transport network. The development is located within a 400m radius of seven bus stops with route services 700 and 705, as well as the G-Link (light rail) which caters a number of commuter transport routes. There is a distance of approximately 100m from the site to the nearest bus stop. The nearby bus stops and key characteristics have been shown on Table 2-2 and Figure 2-2.

Table 2-2 Bus Route Key Characteristics

Route	Destinations	Peak Frequency	Serviced Time
700	Tweed Heads to Broadbeach and Griffith University station via Burleigh Heads	15 minutes 7AM and 7PM	4:27AM – 4:25AM
705	Broadbeach to Sea World / Main Beach	10 minutes	4:07AM – 11:35PM
GLKN	Tweed Heads to Broadbeach and Griffith University station via Burleigh Heads	15 minutes 7AM and 7PM	5:05AM – 5:10AM

Figure 2-2 Public Transport Facilities



Source: Metromap

2.4 Active Transport Facilities

Pedestrian paths are generally located on each side of the roads surrounding the development. The subject site has footpaths along the road frontage Old Burleigh Road and Armrick Avenue, which provides connections to the broader active transport network. There is a dedicated cycle facility surrounding the site along Armrick Avenue. The pedestrian and cyclist facilities have been shown on Figure 2-3.

Figure 2-3 Pedestrian and Cyclist Facilities



Source: Nearmap

3 Proposed Development

3.1 Proposed Yield

The proposed development comprises of 59 residential units. A breakdown of the residential units is as follows:

- 36x three-bedroom units
- 22x four-bedroom units
- 1x five-bedroom unit

Additionally, the development includes 75m^2 GFA of retail land use.

A copy of the development plans can be found at **Appendix A**.

3.2 Design Considerations Overview

Cardno has undertaken a detailed review of the proposed site layout to ensure compliance with relevant standards and guidelines, including:

- Council's City Plan Transport Code
- Australian Standards: Parking Facilities Part 1 - Off-street Car Parking (AS2890.1) 2004

The review focused on site access, parking provision, carpark design, pedestrian connectivity and servicing arrangement.

3.3 Access

3.3.1 Crossover

Table 3-1 summarises the access requirements, in accordance with Council's Transport Code.

Table 3-1 Access Design Compliance

Location	Category	Number of Spaces	Design Criteria	Proposed Design	Compliant
Old Burleigh Rd	Category 2	88	6.0m width	6.1m	✓
Armrick Ave	Category 2	41	6.0m width	6.2m	✓

As shown in the table above, the proposed design widths exceed the design criteria. As the width exceeds the minimum requirement, this driveway is compliant. No changes are proposed to the existing crossover.

3.3.2 Location

In accordance with the City of Gold Coast City Plan Transport Code, reference is made to AS2890.1, which indicates that access driveways should not be located within 6m of the tangent points from adjacent intersections and driveways. There is greater than 6m spacing on either side of the proposed driveway, therefore satisfying the minimum requirements.

3.3.3 Sight Distance

In accordance with Council's Transport Code, reference is made to AS2890.1, which indicates the minimum sight distance requirement is 45m (for a posted speed limit of 50km/h), measured 2.5m back from the edge of frontage road.

As shown in Figure 3-1, there is sufficient sight distance in both directions to observe oncoming traffic from all suitable directions not impacted by the roundabout.

Figure 3-1 Sight Distance



3.4 Parking Provision

3.4.1 Car Parking Requirements

In accordance with Council's Transport Code, the car parking requirements have been summarised in Table 3-2. It is noted that the proposed development is within the Transport Hub area, and thus is subject to reduced required parking rates.

Table 3-2 Car Parking Requirements

Land use	Yield	Car Parking Rate	Car Parking Requirement
Residential	59 units	1 per unit and 1 per 10 units for visitors	59 residential spaces + 6 visitor spaces
Shop	75m^2 GFA	1 per 75m^2 of TUA	1 retail space
TOTAL	-	-	**66 spaces**

3.4.2 Adequacy of Car Parking

The proposed development has a parking provision of 120 residential car parking spaces plus 7 visitor spaces. As such, the proposed parking provision is compliant, as noted in Table 3-2, with a surplus of 61 spaces available on site.

3.4.3 Bicycle Parking Requirements

In accordance with Council's Transport Code, the bicycle parking requirements have been summarised in Table 3-3.

Table 3-3 Bicycle Parking Requirements

Land use	Yield	Bicycle Parking Rate	Bicycle Parking Requirement
Residential	59 units	1 per unit and 1 per 12 units for visitors	59 resident spaces + 5 visitor spaces
Shop	75m^2 GFA	1 per 50m^2 TUA	2 retail space
TOTAL	-	-	**66 spaces**

3.4.4 Adequacy of Bicycle Parking

The proposed development has a bicycle parking provision of 59 residential bicycle parking spaces plus 7 visitor spaces. As such, the proposed parking provision is compliant, as noted in Table 3-2.

3.4.5 Queuing Provision

In accordance with Table 3.3 of AS2890.1, it is indicated that for parking areas with less than 100 parking spaces (separated between two access points), there is a requirement of the following:

- 1st 100 cars: 3% of capacity
- 2nd 100 cars: 2% of capacity
- Additional cars: 1% of capacity
- A minimum queueing length of the 3 cars/lane.

Accordingly, this development requires a minimum of 3 vehicles' queuing length to be accommodated at each access. This requirement can be suitably provided for the Old Burleigh Road access, but a queueing length of only 1 vehicle is available for the Armrick Avenue access. Given the location of the site access is on a local road with low existing traffic generation and the traffic generation of the proposed development is relatively low (producing only 18vph as discussed below in Section 4) the minimum queuing provision is acceptable.

3.5 Carpark Design

Cardno has conducted a design review of the car park changes against the relevant design guidelines, and the compliance has been summarised in Table 3-4.

Table 3-4 Car Park Design Compliance

Design Criteria Description	AS2890.1 Standard	Proposed Design	Compliance
Bay length – standard	5.4m	5.4m	✓
Bay width – resident (class 1A)	2.4m	2.4m – 2.6m	✓
Bay width – visitors (class 3)	2.5m	2.5m	✓
Bay length – small car	5.0m	5.0m – 5.4m	✓
Bay width – small car	2.3m	2.3m	✓
Bay length – tandem	10.4m	10.4m – 10.8m	✓
Bay width – tandem	2.4m	2.4m	✓
Bay width – PWD (including shared zone)	2.4m plus 2.4m shared zone	2.4m plus 2.4m shared zone	✓
Aisle width (class 1A)	5.8m	5.9m – 8.0m	✓
Aisle width (class 3)	5.8m	6.2m – 7.4m	✓
Ramp width –two way	-	6.3m	See below
Ramp clearance	0.3m	0.3m	✓
Gradient – ramp	1 in 4 (25%)	1 in 4 (25%)	✓
Blind aisle	1m aisle extension	>1m	✓
SRV vertical clearance (servicing)	3.5m	Unrestricted	✓
SRV bay width (m)	3.5m	3.5m	✓
SRV bay length (m)	8.8m	8.8m	✓

As shown in Table 3-4, the proposed car park design generally satisfies the minimum requirements.

AS2890.1 states a separated median is required for curved ramp with an outer radius of less than 15m. As such, swept path assessments have been undertaken which demonstrate that a B85 & B99 can safely and efficiently pass each other at all points along the ramp. Therefore, this lack of median is not considered to have an adverse effect.

Cardno has undertaken a swept path to demonstrate the suitability of the proposed car park design, which indicates that vehicles can safely manoeuvre through the car park. The carpark swept paths can be found in **Appendix B**.

3.6 Servicing Arrangements

3.6.1 Design Vehicle

In accordance with Council's Transport Code, the minimum servicing requirements are as follows:

- Multiple dwelling if (a) an internal (private) circulation road way is proposed, (b) vertical built form (tower) is proposed:
  - Standing area for an MRV on-site
- Shop (GFA less than 400m^2):
  - SRV

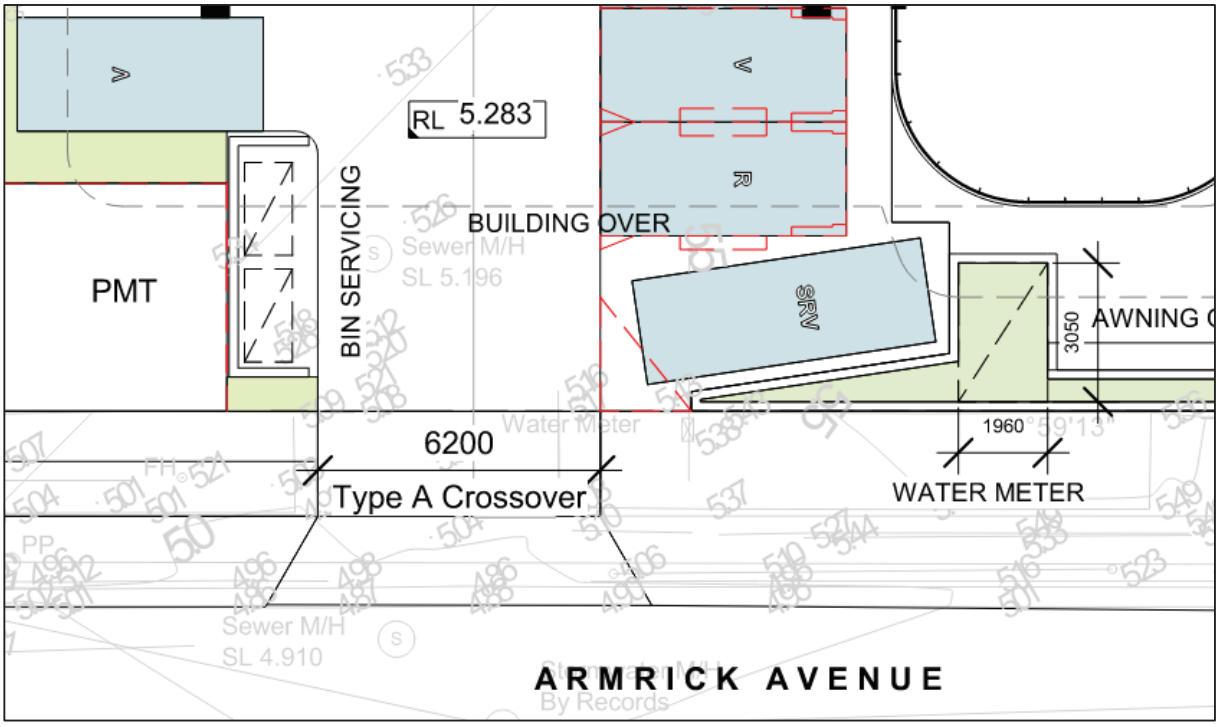
It is noted that there is a loading zone on Armrick Avenue adjacent to the site which is currently used by the existing development for servicing uses. It is expected that the MRV will be able to use this loading bay accordingly, and hence remove the need for an on site servicing bay for the MRV. Furthermore, the proposed refuse collection arrangement has been designed for kerbside refuse collection via Armick Avenue, also using the same loading zone. Given the infrequent and out-of-peak loading times for both the MRV and refuse collection, this arrangement is considered to be suitable from a traffic engineering perspective.

As such, the largest vehicle expected on site is an SRV to service the 'shop' land use.

3.6.2 Swept Path Assessment

A swept path assessment has been undertaken for the design vehicles anticipated on site (SRV). Swept path analysis indicates that an SRV can safely manoeuvre on/off the site to access the proposed standing bay. The SRV swept paths can be found at **Appendix B**.

Figure 3-2 Loading Bay



4 Traffic Impact

The proposed development comprises a total of 59 multiple dwelling units and 75m^2 GFA of 'shop' land use. Application of the adopted peak trip generation rates have been summarised in Table 4-1, which have been sourced from the *RTA Guide to Traffic Generating Developments*.

Table 4-1 Trip Generation

Land use	Yield	Peak Generation Rate	Peak Generation
High Density Residential	59 units	0.24vph / unit	14vph
Shop	75m^2 GFA	4.6 vph per 100m^2 GFA	4vph
TOTAL	-	-	**18vph**

As shown in Table 4-1, the proposed development is anticipated to generate a total of 18vph during the peak periods, which is considered to have a negligible traffic impact on the operation of the road network.

5 Conclusions and Recommendations

Cardno Qld Pty Ltd (Cardno) has been engaged by Urbis to provide traffic and transport engineering advice in support of the proposed development located at 99-101 Old Burleigh Road, Broadbeach.

Based on our assessment, Cardno has the following findings:

- The proposed development comprises of 59 residential units + 75m^2 GFA of shop land use.
- The development proposes two driveway crossovers, one on Old Burleigh Road and one on Armrick Avenue. Both crossovers have been designed with sufficient crossover widths to accommodate vehicles' entry and exit movements.
- There is sufficient sight distance to observe oncoming traffic from all directions for a posted speed limit of 50km/h.
- The Armrick Avenue crossover provides a queueing length of only one (1) vehicle. Given the location of the access is on a local road with low traffic generation, and the proposed development traffic generation is relatively low, producing only 18vph, the queueing provision is acceptable.
- The parking requirements indicate a minimum of 59 residential and 7 visitor parking spaces. Given the development provides 118 residential and 7 visitor car parking spaces, the minimum requirements are satisfied.
- The parking requirements indicate a minimum of 59 resident bicycle spaces plus 7 visitor bicycle spaces. Given the development provides 59 residential and 7 visitor bicycle parking spaces, the minimum requirements are satisfied.
- A swept path assessment has been undertaken for an SRV, showing it can safely and efficiently manoeuvre on and off the site. Swept paths can be found at **Appendix B**.
- The proposed development is anticipated to generate 18vph during the peak periods, which is considered to have a negligible traffic impact on the operation of the road network.

Based on the above, Cardno believe that the development is suitable from a traffic engineering perspective.

101 Old Burleigh Road, Broadbeach

APPENDIX A

DEVELOPMENT PLANS

DEVELOPMENT SUMMARY

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

46 STOREYS		
MIXED-USE DEVELOPMENT		
RPD	LOT 70 on B8383 & CP on BUP104138	
SITE AREA	1283 m^2	
DENSITY	1 per 6.415 m^2 (200 Beds)	
GBA (UNDER ROOF)	28972	m^2
NSA	15948	m^2

TOTAL UNITS

NUMBER OF UNITS	
3 Beds, 2.5 Baths + MPR	36
4 Beds, 3.5 Baths + MPR	22
4 Beds, 4.5 Baths + MPR	1
Total Units	**59**

PARKING

REQUIRED	
3 Beds (1 per 1 unit)	36
4 Beds (1 per 1 unit)	23
Visitors (1 per 10 units)	5.9
Food and Beverage (1 per 75m^2)	1
Total Required	**65.9**
PROVIDED	
Residential Parking	**120**
Visitor Parking	**6**
Food & Beverage Parking	**1**
SRV	**1**
Total Provided	**128**
Bicycles (1 per Unit)	59
Visitors	6
Retail	1
Total	**66**

COMMUNAL SPACE

PROVIDED	775.15 m^2

DRAWINGS LIST

SHEET NUMBER	NAME	REVISION
DA.001	DEVELOPMENT SUMMARY	C
DA.002	LOCATION PLAN	B
DA.097	BASEMENT 3	B
DA.098	BASEMENT 2	C
DA.099	BASEMENT 1	C
DA.100	GROUND LEVEL	C
DA.101	LEVEL 1	C
DA.102	LEVEL 2	C
DA.103	LEVEL 3	C
DA.104	LEVELS 4 - 21	C
DA.122	LEVEL 22	B
DA.123	LEVEL 23 - 43	B
DA.144	LEVEL 44	A
DA.145	LEVEL 45	A
DA.146	LEVEL 46	A
DA.401	BUILDING FORM	B
DA.402	BUILDING FORM	B
DA.403	BUILDING FORM	B
DA.411	MATERIALITY	A
DA.412	MATERIALITY	A
DA.413	MATERIALITY	A
DA.421	PERSPECTIVES	A
DA.422	PERSPECTIVES	A
DA.423	PERSPECTIVES	A
DA.424	PERSPECTIVES	A
DA.431	PERSPECTIVES	A
DA.432	PERSPECTIVES	A
DA.433	PERSPECTIVES	A
DA.434	PERSPECTIVES	A
DA.451	SHADOW ANALYSIS	A
DA.452	SHADOW ANALYSIS	A
DA.453	SHADOW ANALYSIS	A
DA.501	EAST ELEVATION	B
DA.502	NORTH ELEVATION	B
DA.503	SOUTH ELEVATION	B
DA.504	WEST ELEVATION	B
DA.601	SECTION A	C
DA.602	SECTION B	B

DA ISSUE

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MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

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A	17.09.2021	PRELIMINARY ISSUE
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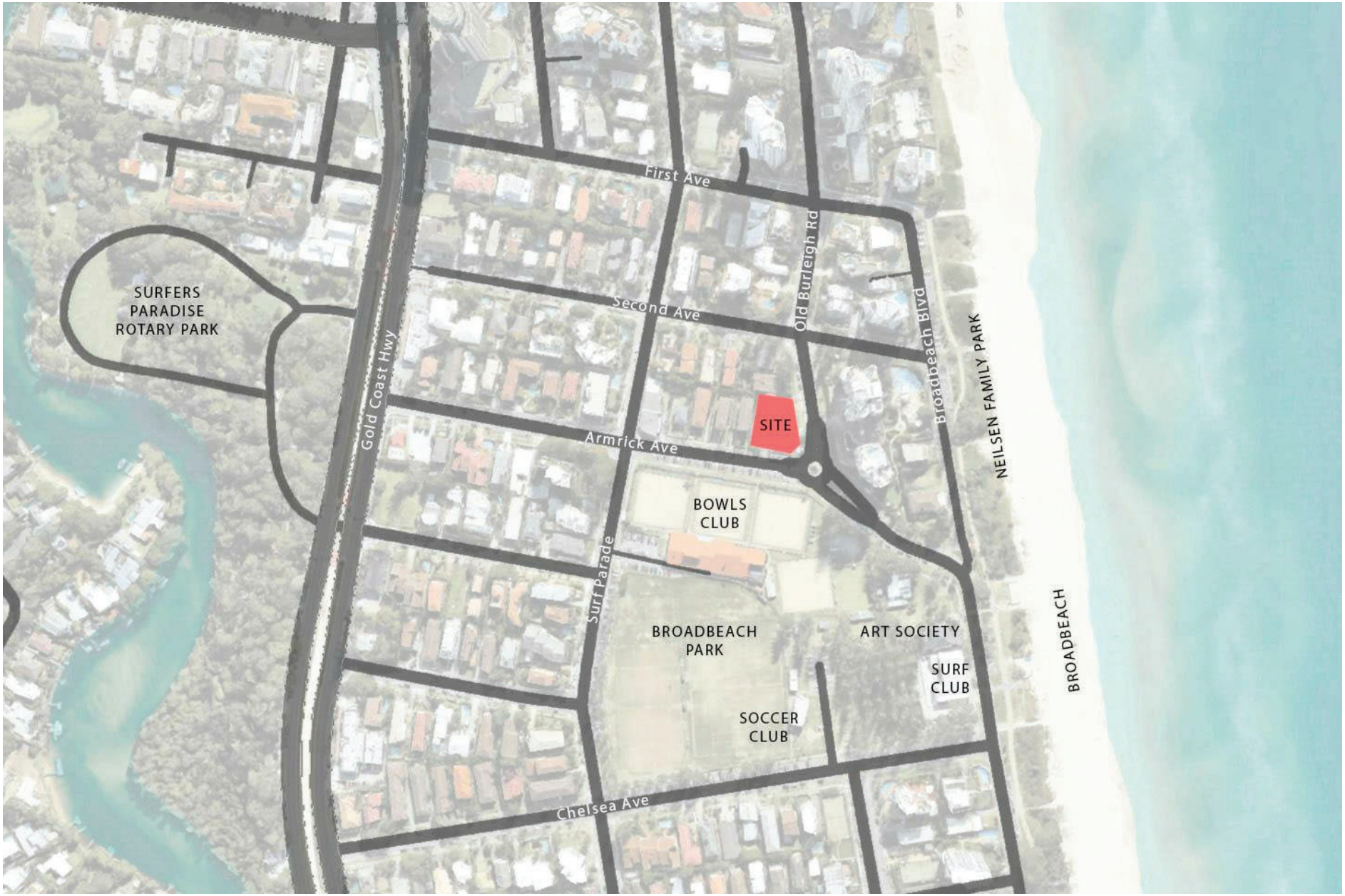
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DEVELOPMENT SUMMARY

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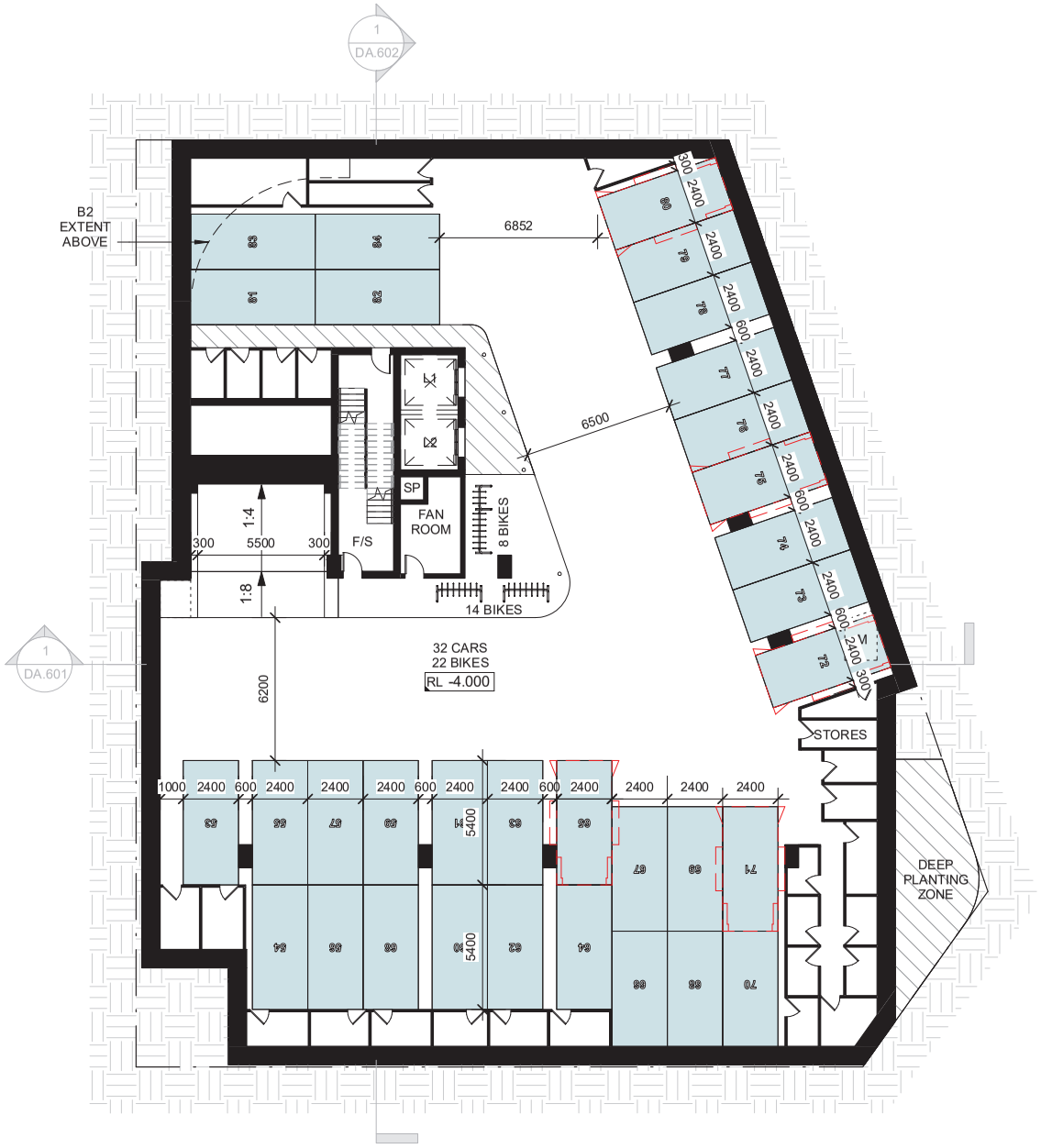
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LOCATION PLAN

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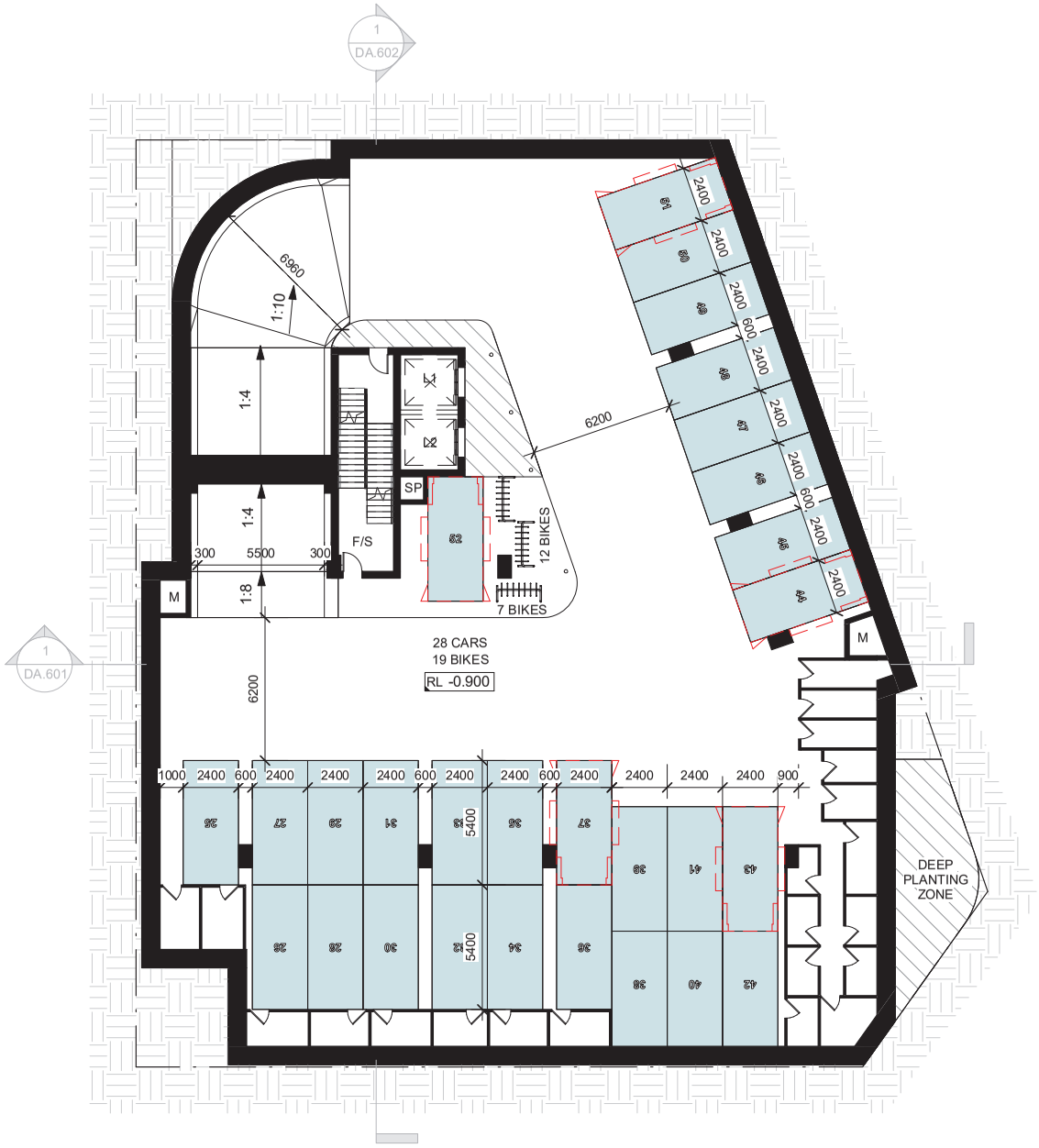
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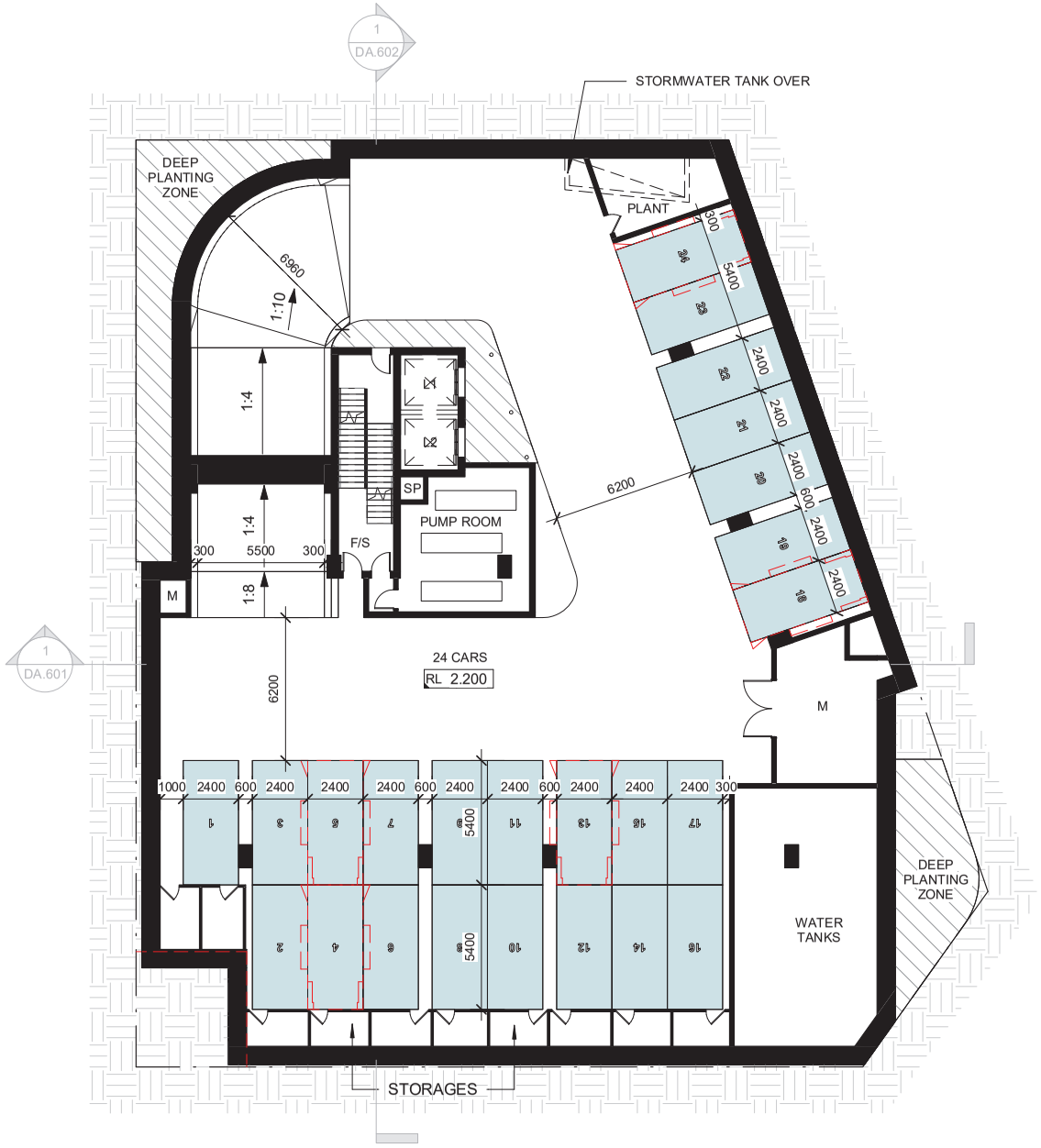
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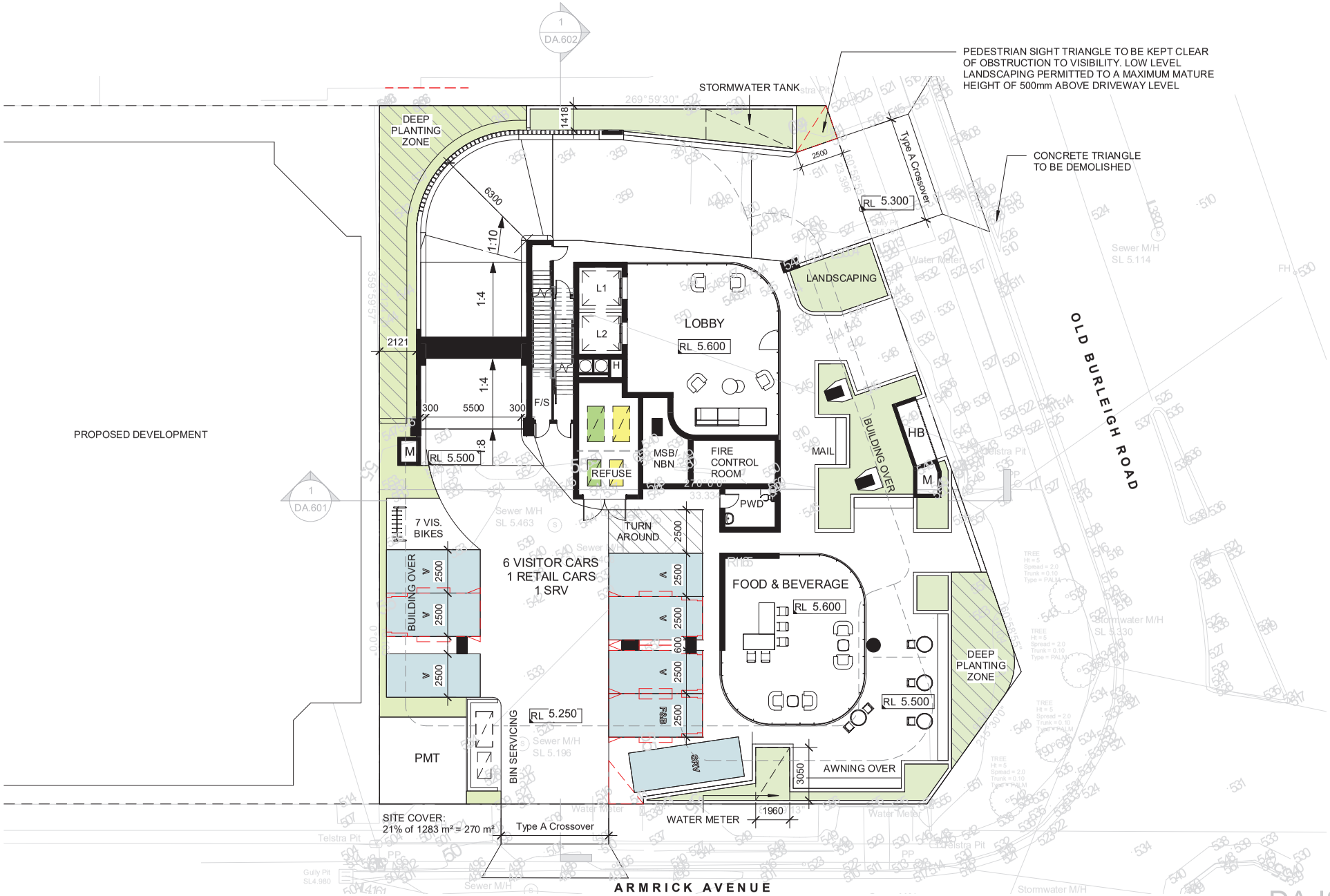
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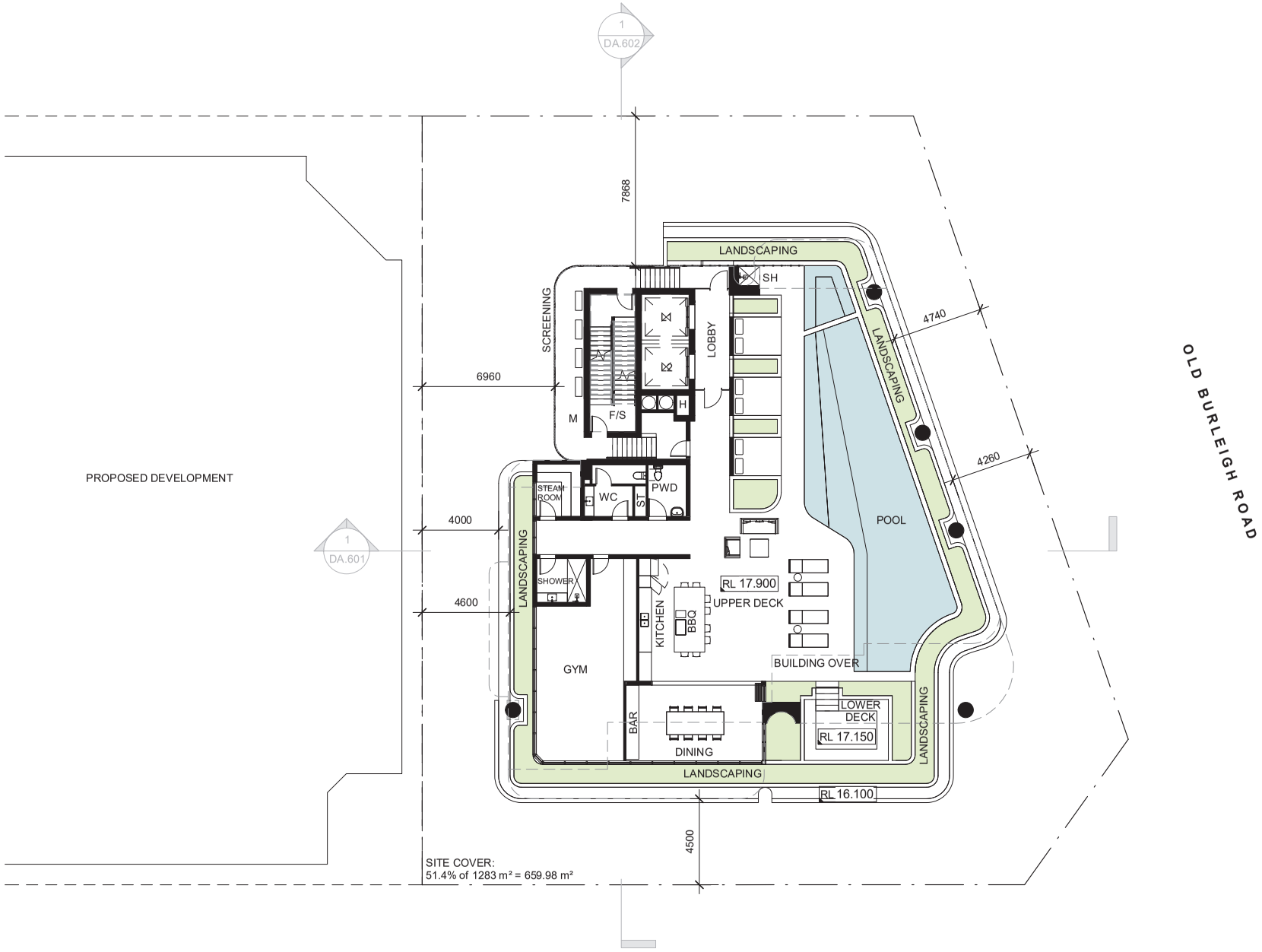
LEVEL 2

DRAWING NUMBER

DA.102

SCALE (A3) 1 : 200

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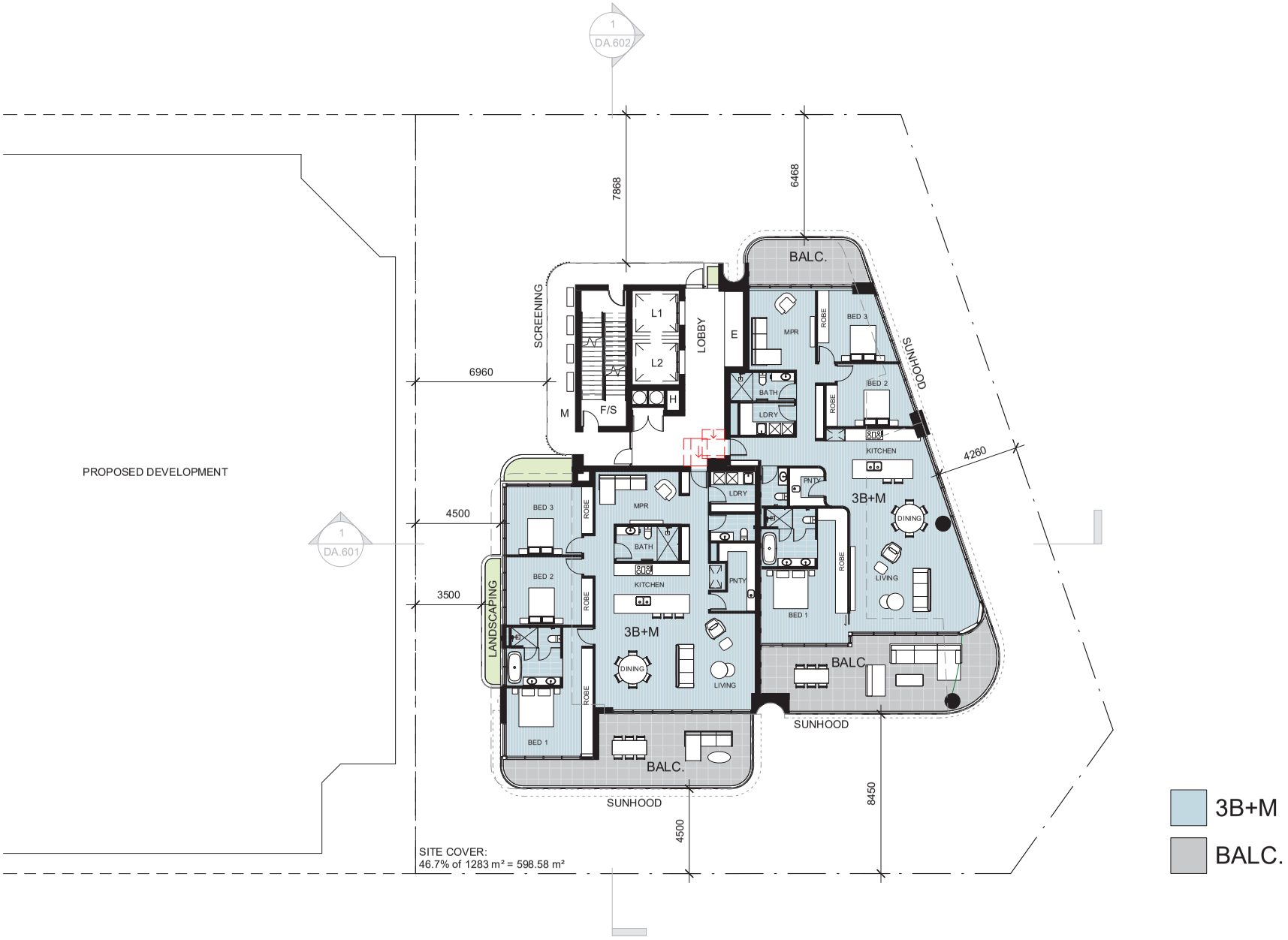
LEVEL 3

DRAWING NUMBER

DA.103

SCALE (A3) 1 : 200

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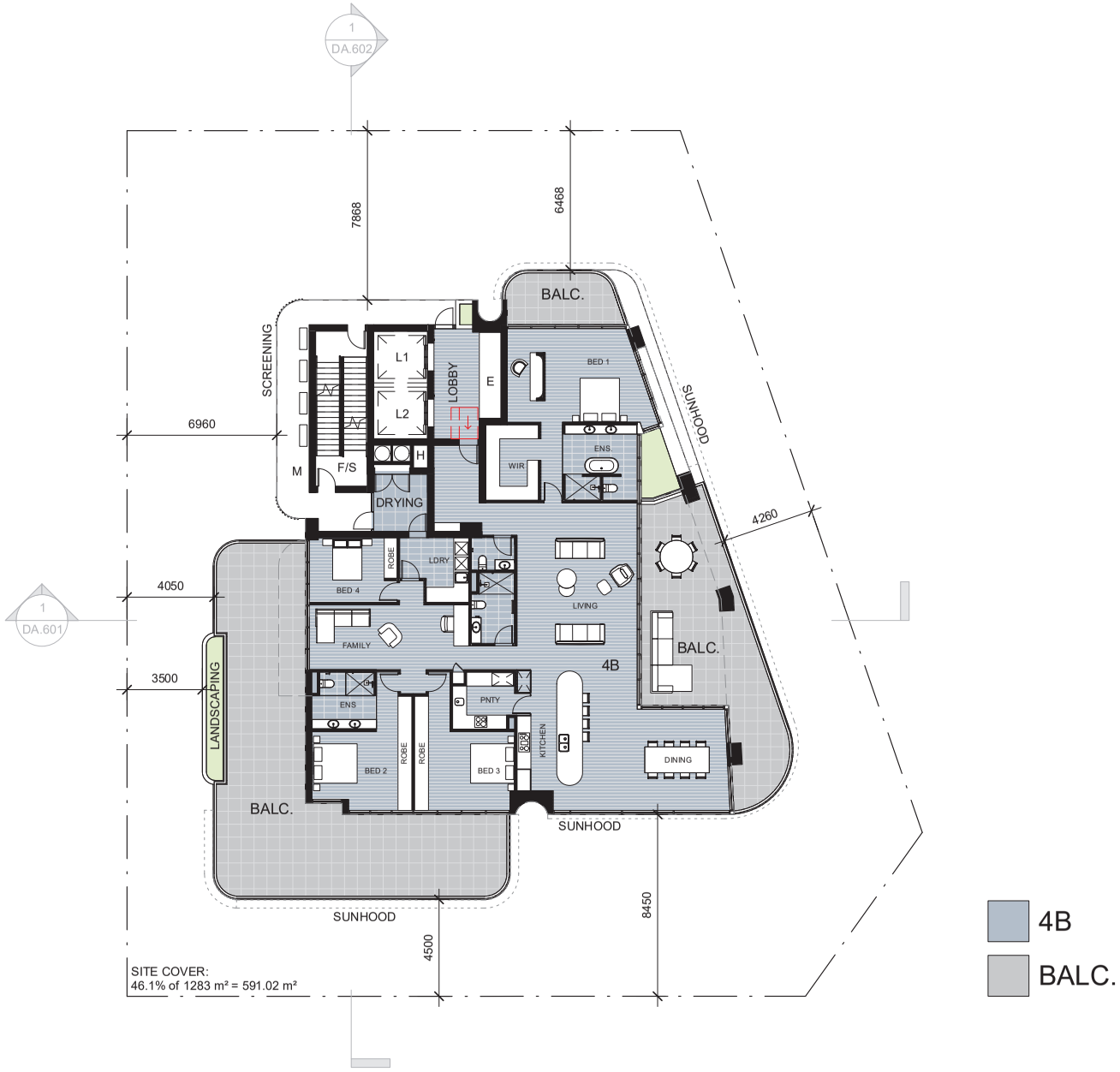
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LEVELS 4 - 21

DRAWING NUMBER
DA.104

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DA.122

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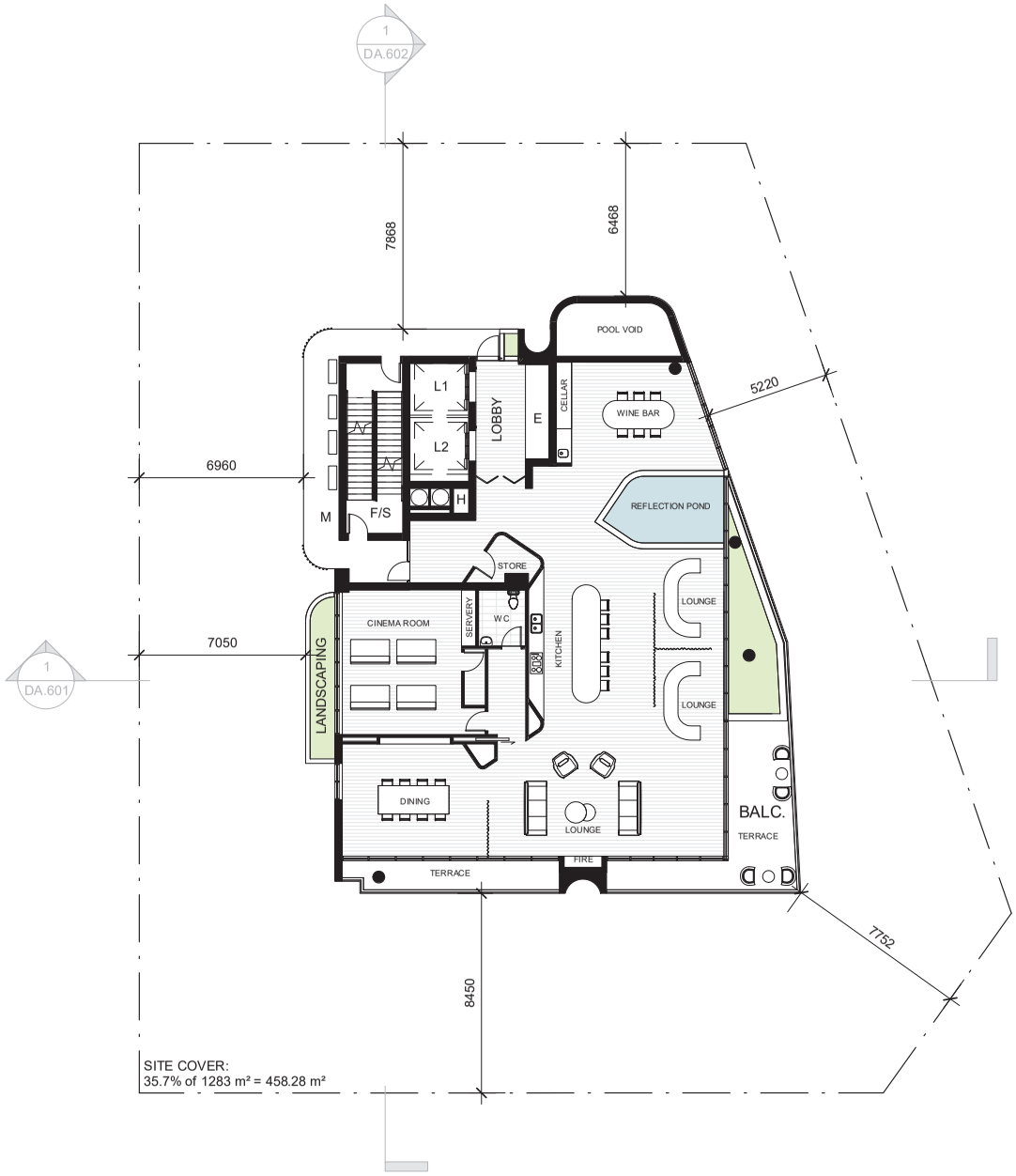
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LEVEL 23 - 43

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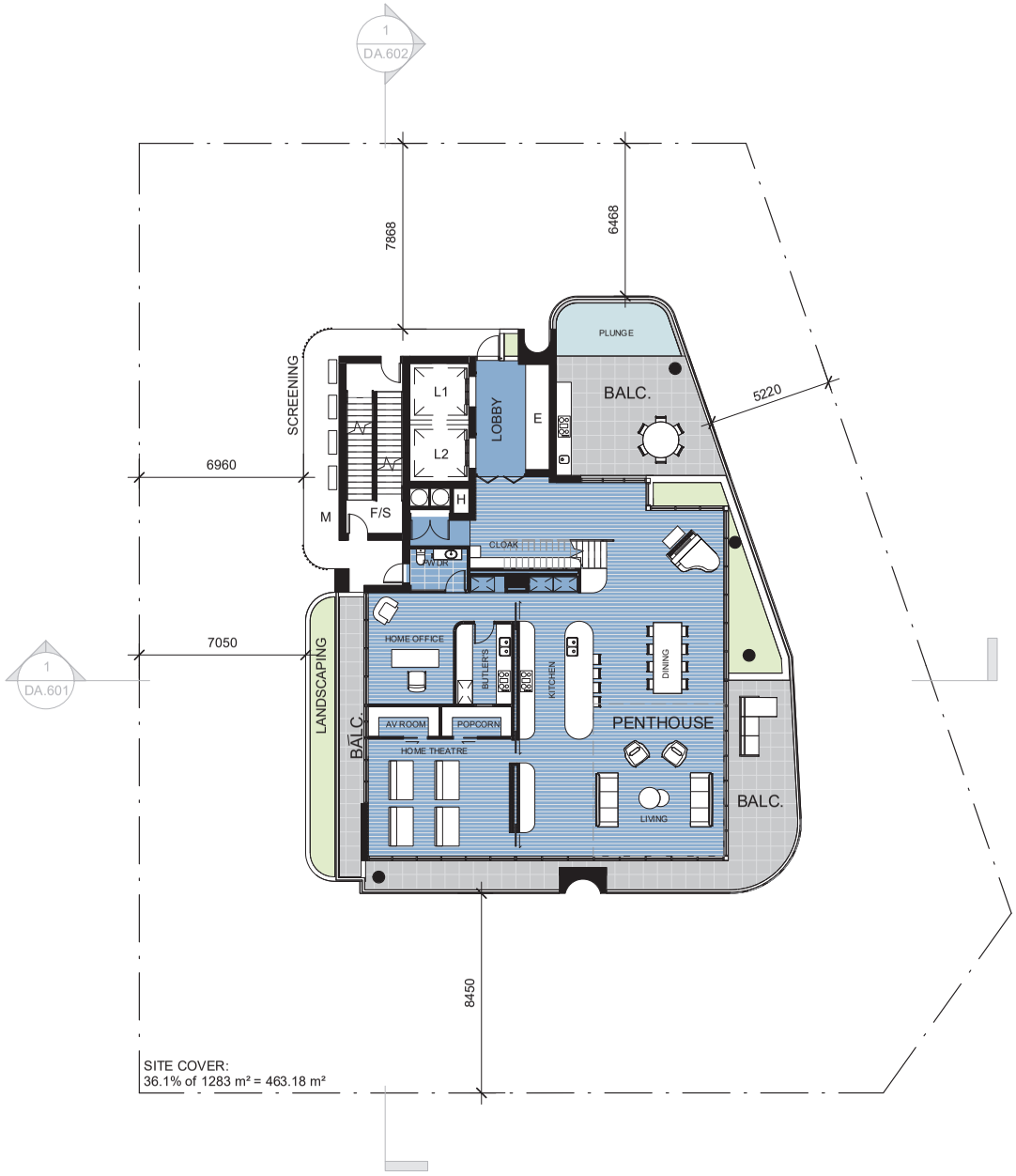
LEVEL 44

DRAWING NUMBER

DA.144

SCALE (A3) 1 : 200

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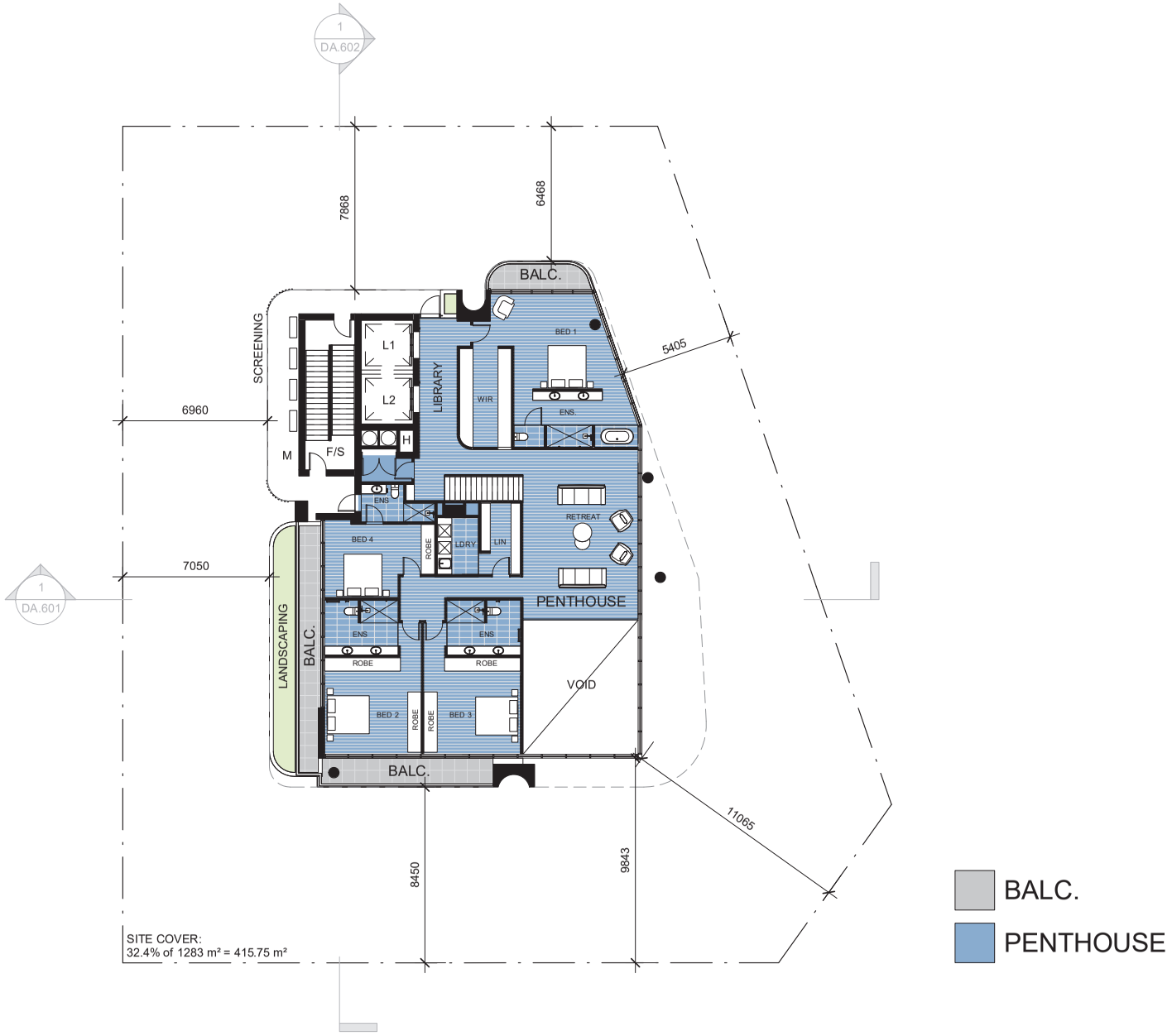
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LEVEL 45

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DA.145

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DA.146

SCALE (A3) 1 : 200

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BUILDING FORM

DRAWING NUMBER

DA.401

SCALE (A3)

REVISION B



SOUTH - EASTERN AERIAL VIEW



SOUTH - WESTERN AERIAL VIEW

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BUILDING FORM

DRAWING NUMBER

DA.402

SCALE (A3)

REVISION B



NORTH - EASTERN AERIAL VIEW



NORTH - WESTERN AERIAL VIEW

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BUILDING FORM

DRAWING NUMBER

DA.403

SCALE (A3)

REVISION B



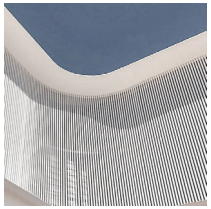
SOUTH - EASTERN PODIUM



SUNHOOD



GLASS BALUSTRADE



ALUMINIUM SCREEN



ALUMINIUM SCREEN



NATURAL STONE



NORTH - EASTERN PODIUM

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SCALE (A3)

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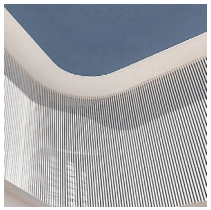
EASTERN FACADE



SUNHOOD



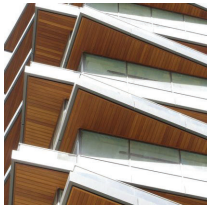
GLASS BALUSTRADE



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TIMBER LOOK SOFFIT



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DA.412

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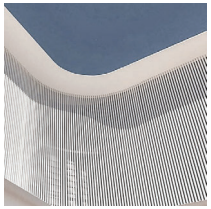
EASTERN FACADE



SUNHOOD



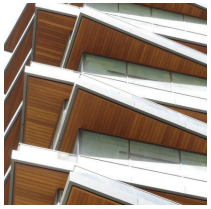
GLASS BALUSTRADE



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SCALE (A3)

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DRAWING NUMBER

DA.421

SCALE (A3)

REVISION A



SOUTHERN PODIUM



NORTH - EASTERN PODIUM



CORNER OF OLD BURLEIGH RD AND AMRICK AVE



RETAIL - PODIUM

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PERSPECTIVES

DRAWING NUMBER

DA.422

SCALE (A3)

REVISION A



POOL AREA - LEVEL 3



DINING AREA - LEVEL 3



POOL AREA - LEVEL 3



POOL AREA - LEVEL 3

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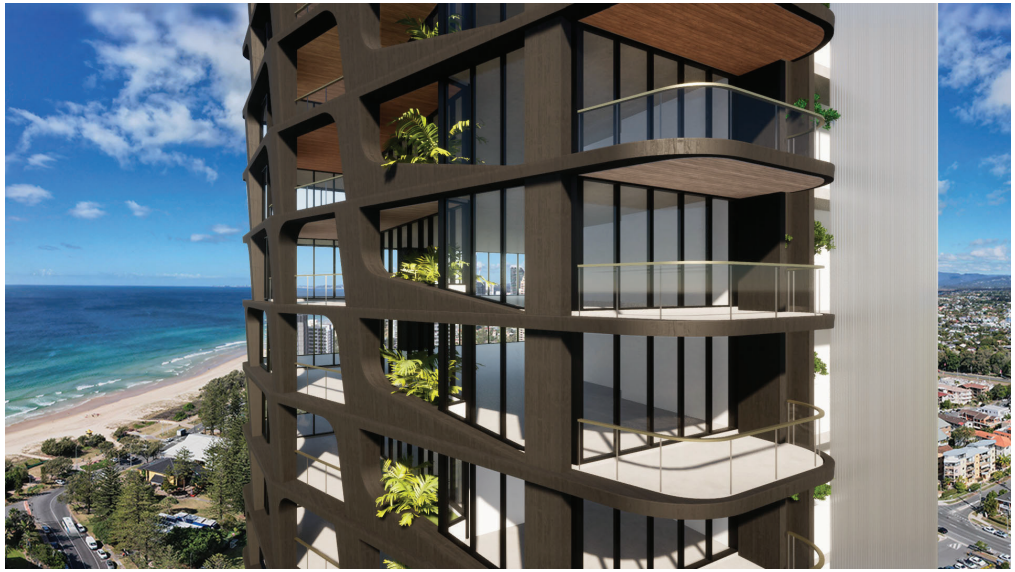
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DRAWING NUMBER

DA.423

SCALE (A3)

REVISION A



NORTH - EASTERN FACADE



EASTERN BALCONY



SOUTH - WESTERN FACADE



SOUTHERN BALCONY

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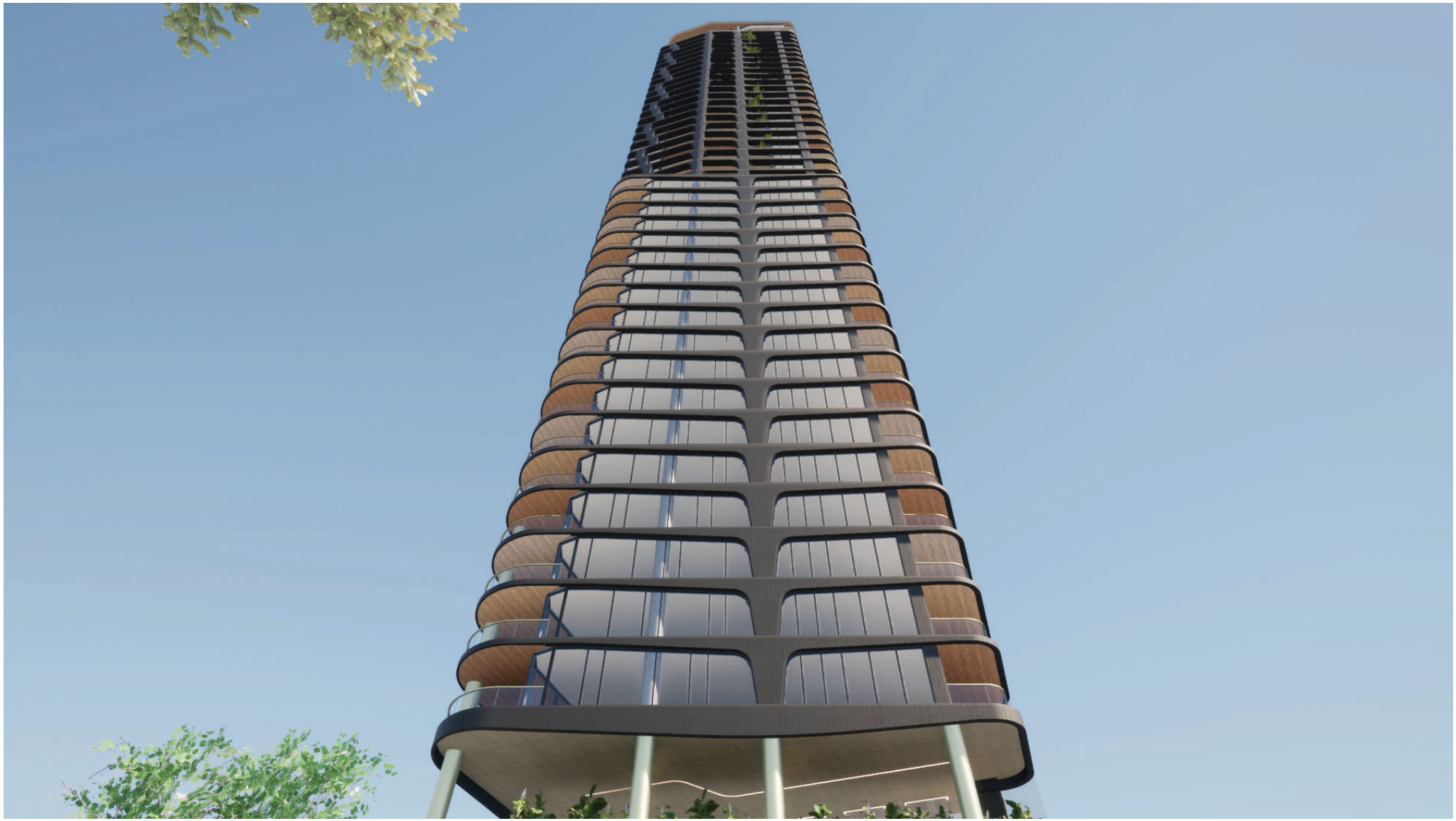
PERSPECTIVES

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DA.424

SCALE (A3)

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DA.432

SCALE (A3)

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PERSPECTIVES

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DA.433

SCALE (A3)

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PERSPECTIVES

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DA.434

SCALE (A3)

REVISION A



SUMMER SOLSTICE 9AM



SUMMER SOLSTICE 12PM



SUMMER SOLSTICE 3PM



SUMMER

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SHADOW ANALYSIS

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SCALE (A3)

REVISION A



WINTER SOLSTICE 9AM



WINTER SOLSTICE 12PM



WINTER SOLSTICE 3PM



WINTER

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SHADOW ANALYSIS

DRAWING NUMBER

DA.452

SCALE (A3)

REVISION A



SPRING EQUINOX 9AM



SPRING EQUINOX 12PM



SPRING EQUINOX 3PM



SPRING

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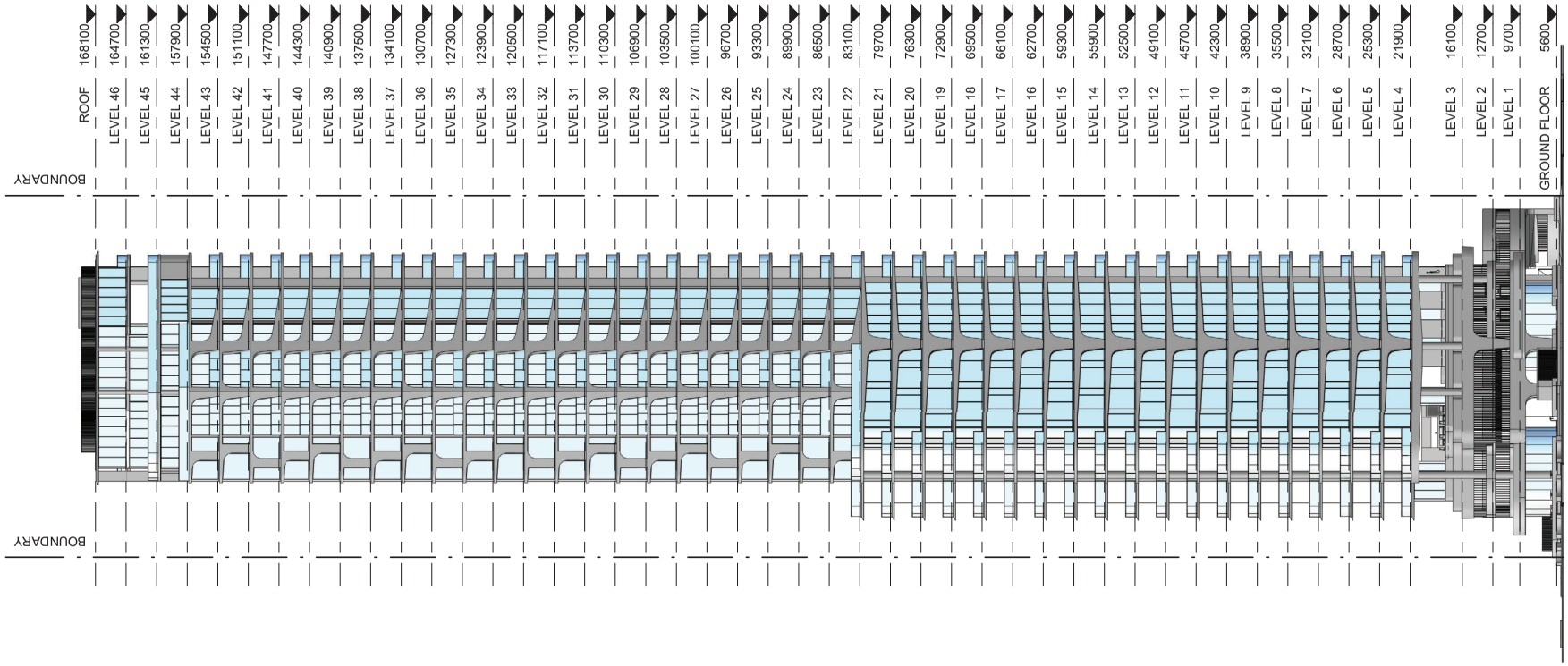
SHADOW ANALYSIS

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SCALE (A3)

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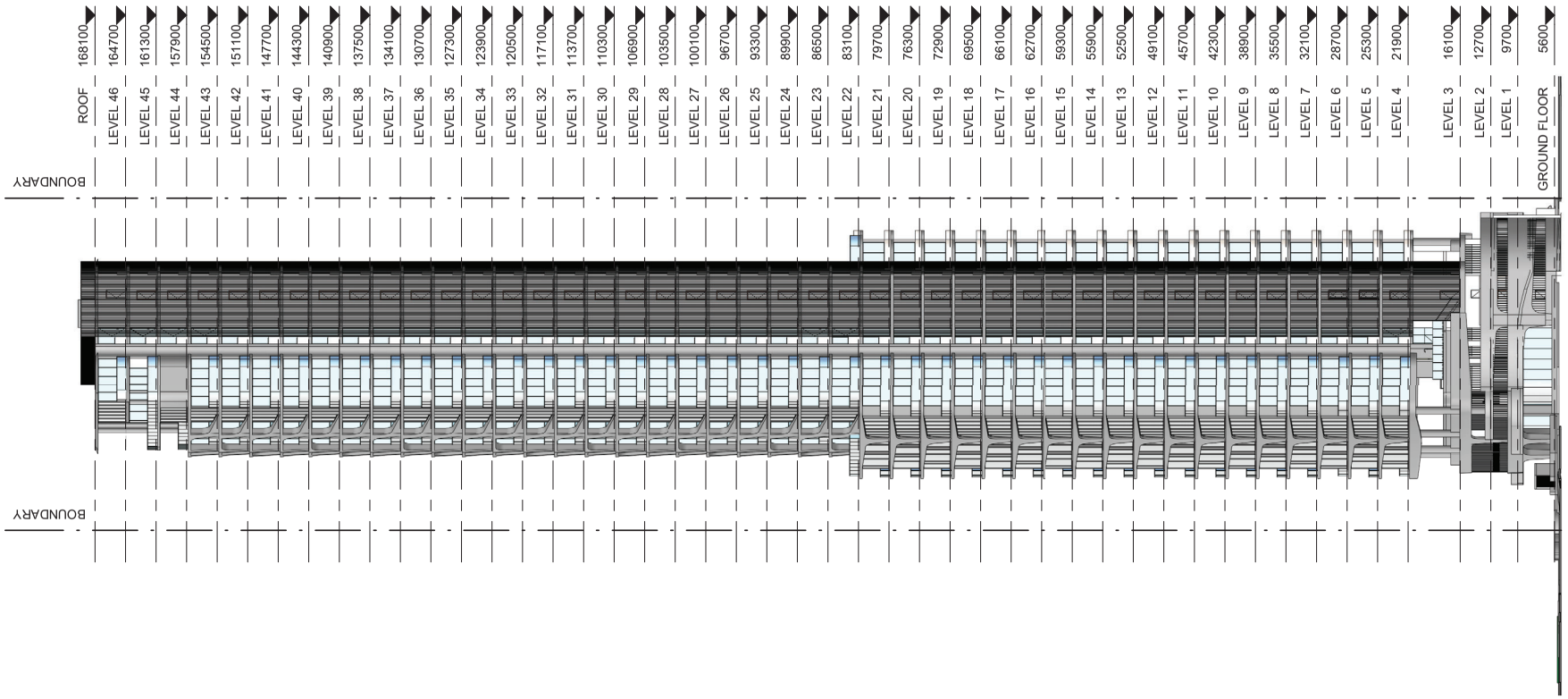
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EAST ELEVATION

DRAWING NUMBER
DA.501

SCALE (A3) 1 : 500

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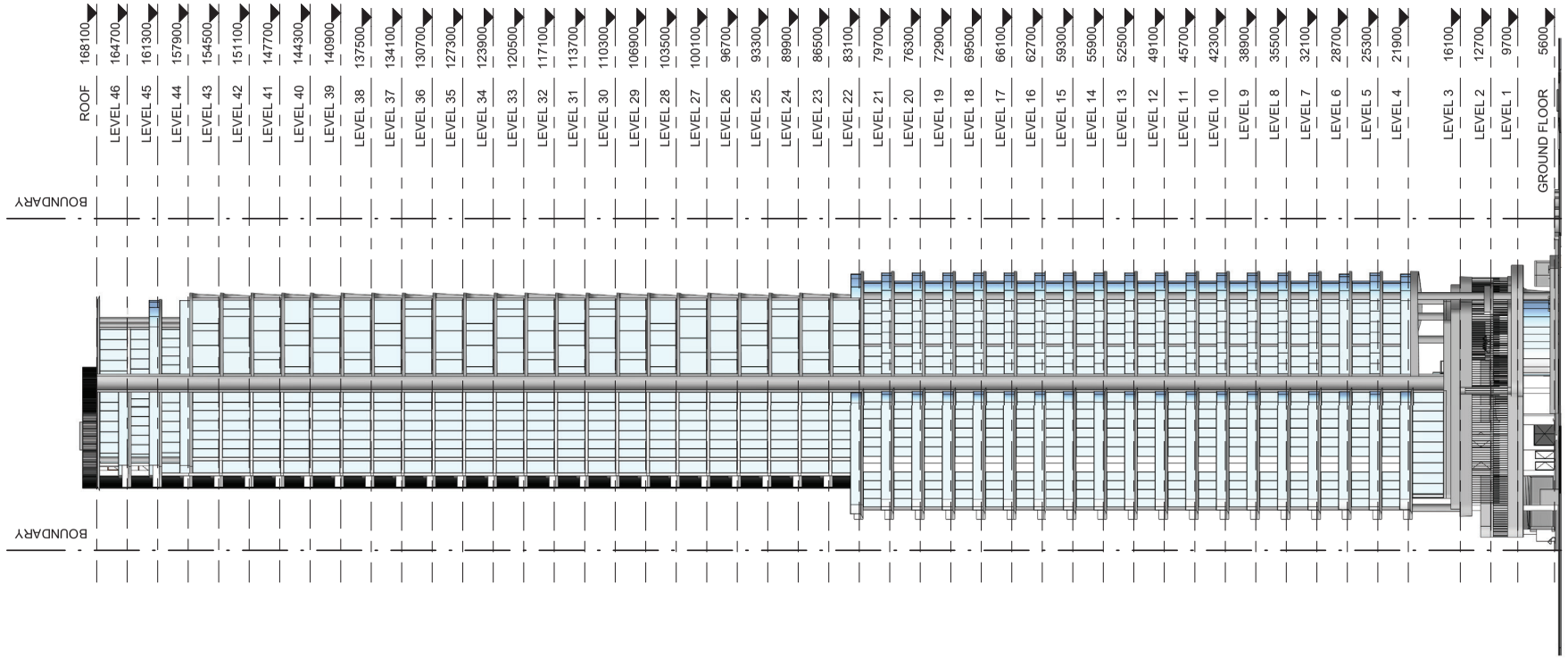
NORTH ELEVATION

DRAWING NUMBER

DA.502

SCALE (A3) 1 : 500

REVISION B



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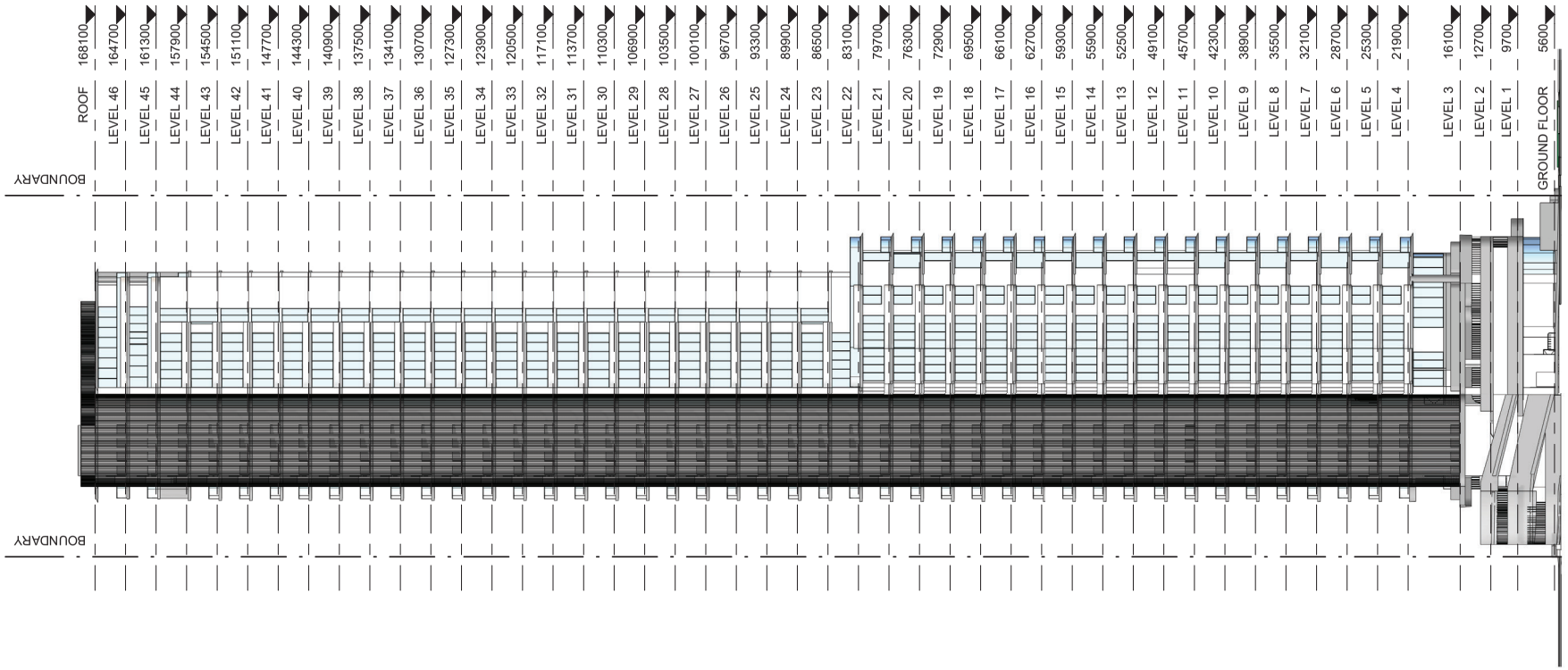
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DA.503

SCALE (A3) 1 : 500

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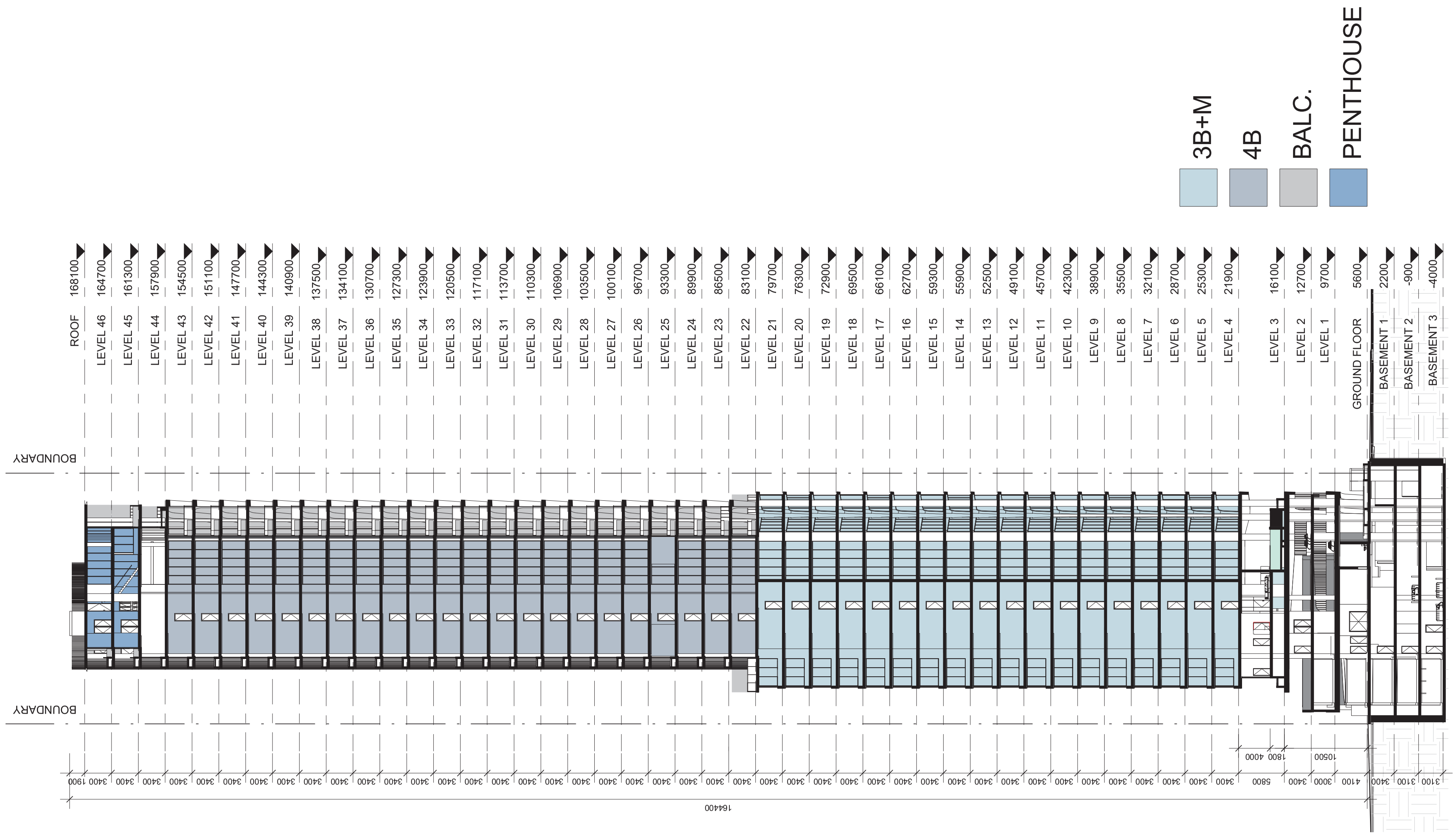
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SCALE (A3) 1 : 500

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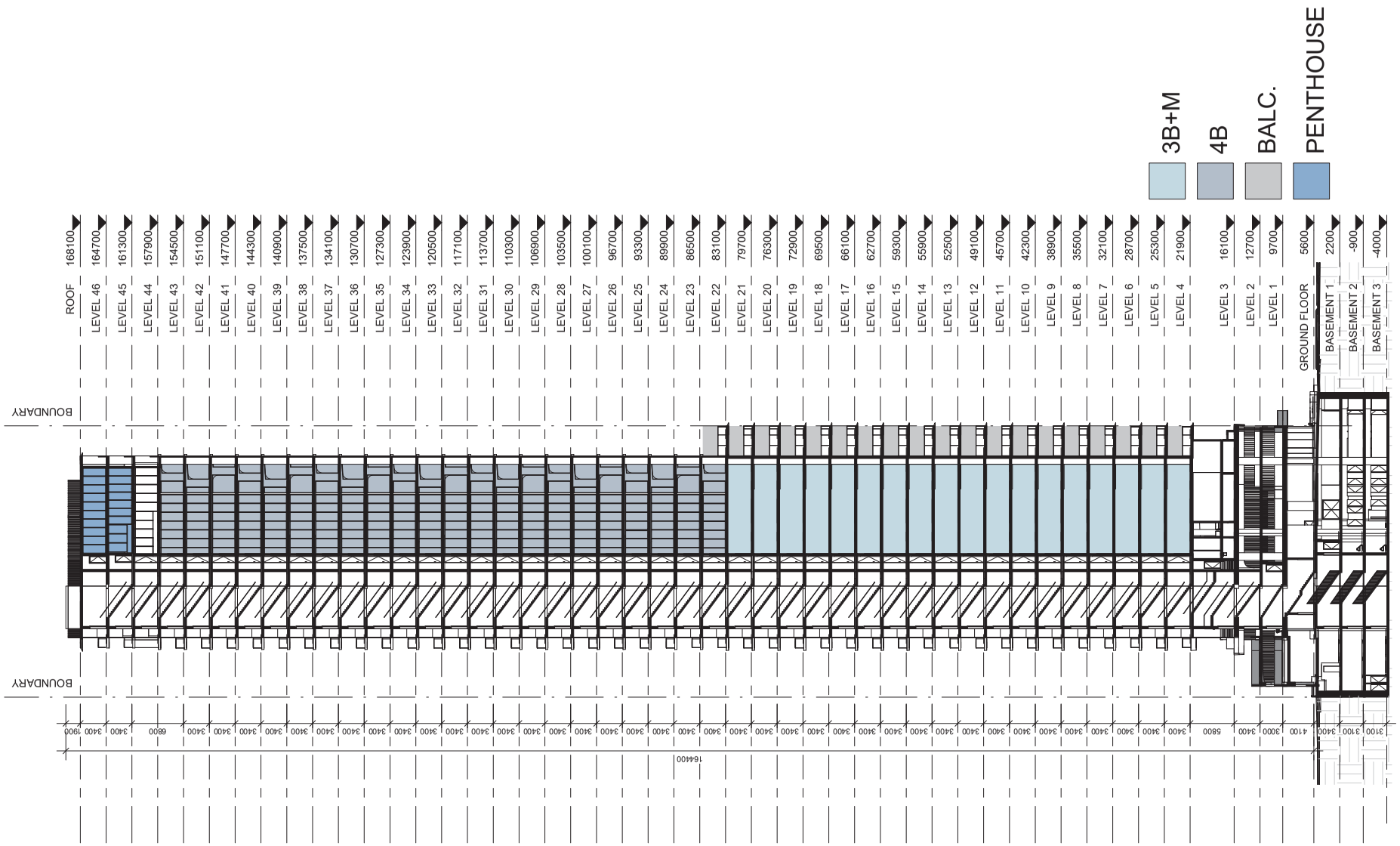
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DA.601

SCALE (A3) 1 : 500

REVISION **C**



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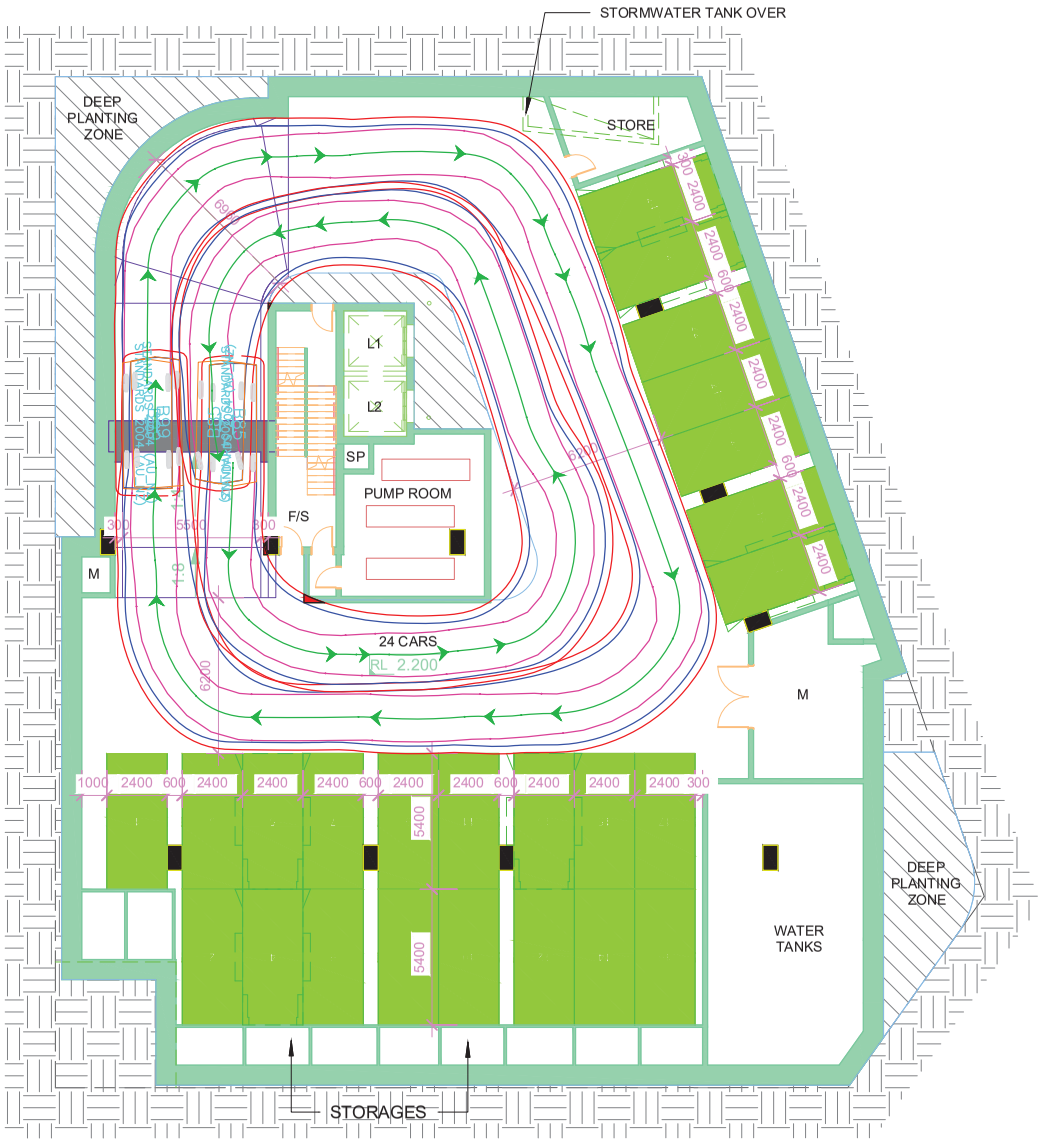
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REVISION B

101 Old Burleigh Road, Broadbeach

APPENDIX B

SWEPT PATH ASSESSMENT

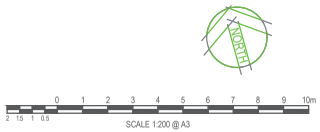


SWEPT PATH LEGEND

- VEHICLE BODY
- FRONT TIRES
- VEHICLE PATH
- VEHICLE CLEARANCE (300mm)
- VEHICLE



B99	meters	B85	meters
Width	: 1.94	Width	: 1.87
Track	: 1.84	Track	: 1.77
Lock to Lock Time	: 6.0	Lock to Lock Time	: 6.0
Steering Angle	: 33.9	Steering Angle	: 34.1



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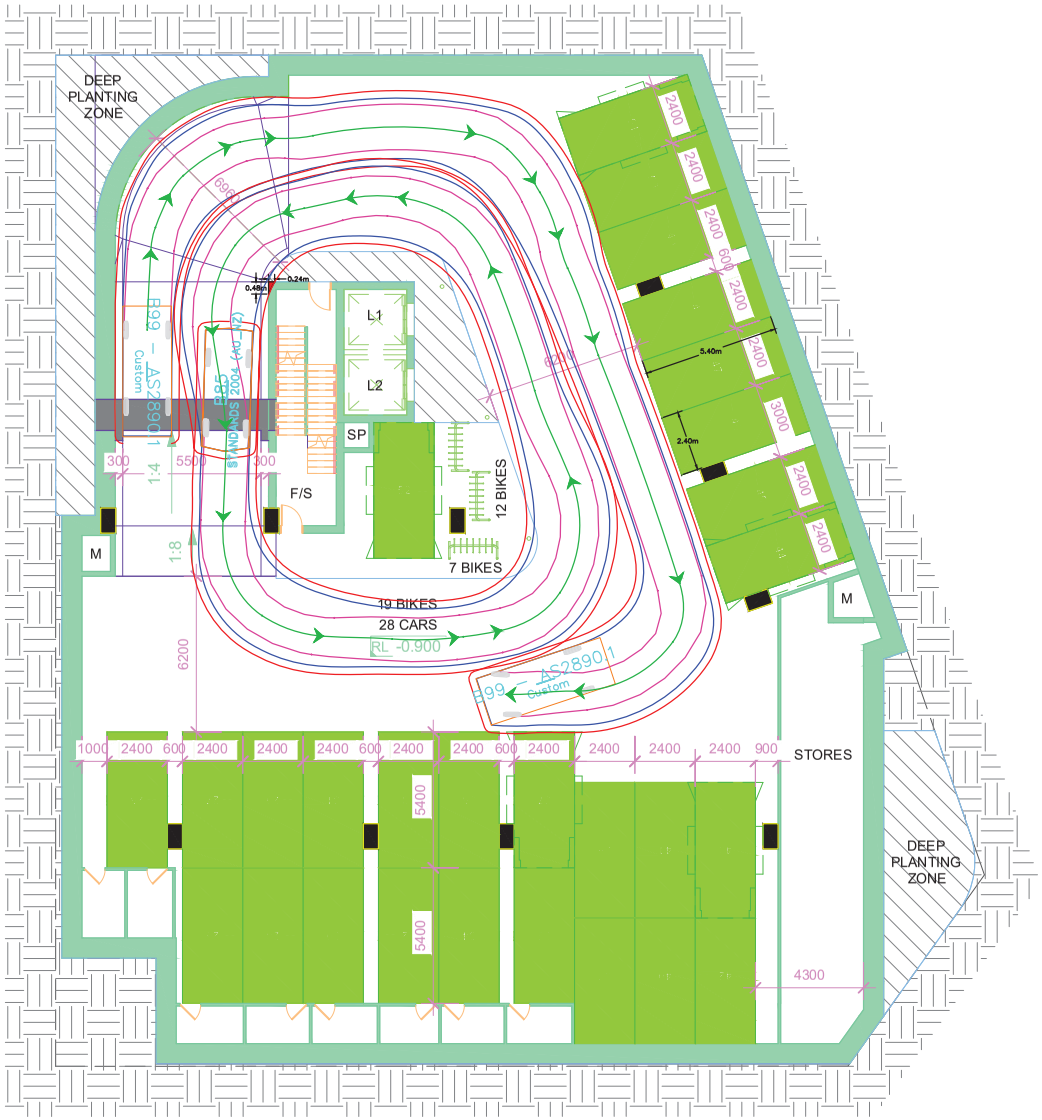
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Urbis
99-101 Old Burleigh Road, Broadbeach
Ramp Swept Paths
Basement 1

Drawn	Date	Scale	Size
R Bakon	10/11/2021	1:200	A3

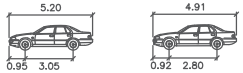
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Revision: A

CAD File: \\adonedfs05\wd5\Current Jobs\T0921032 - 101 Old Burleigh Rd, Broadbeach\5_ACAD\SK01_SK08 - A.dwg



SWEPT PATH LEGEND

- VEHICLE BODY
- FRONT TIRES
- VEHICLE PATH
- VEHICLE CLEARANCE (300mm)
- VEHICLE



B99	meters	B85	meters
Width	: 1.94	Width	: 1.87
Track	: 1.84	Track	: 1.77
Lock to Lock Time	: 6.0	Lock to Lock Time	: 6.0
Steering Angle	: 33.9	Steering Angle	: 34.1

NORTH

0 1 2 3 4 5 6 7 8 9 10m
2 1.5 1 0.5
SCALE 1:200 @ A3

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Urbis
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Ramp Swept Paths
Basement 2

Drawn	Date	Scale	Size
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Drawing Number: T0921032 - SK02
Revision: A

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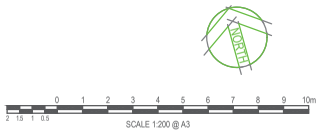
SWEPT PATH LEGEND

- VEHICLE BODY
- FRONT TIRES
- VEHICLE PATH
- VEHICLE CLEARANCE (300mm)
- VEHICLE



B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1



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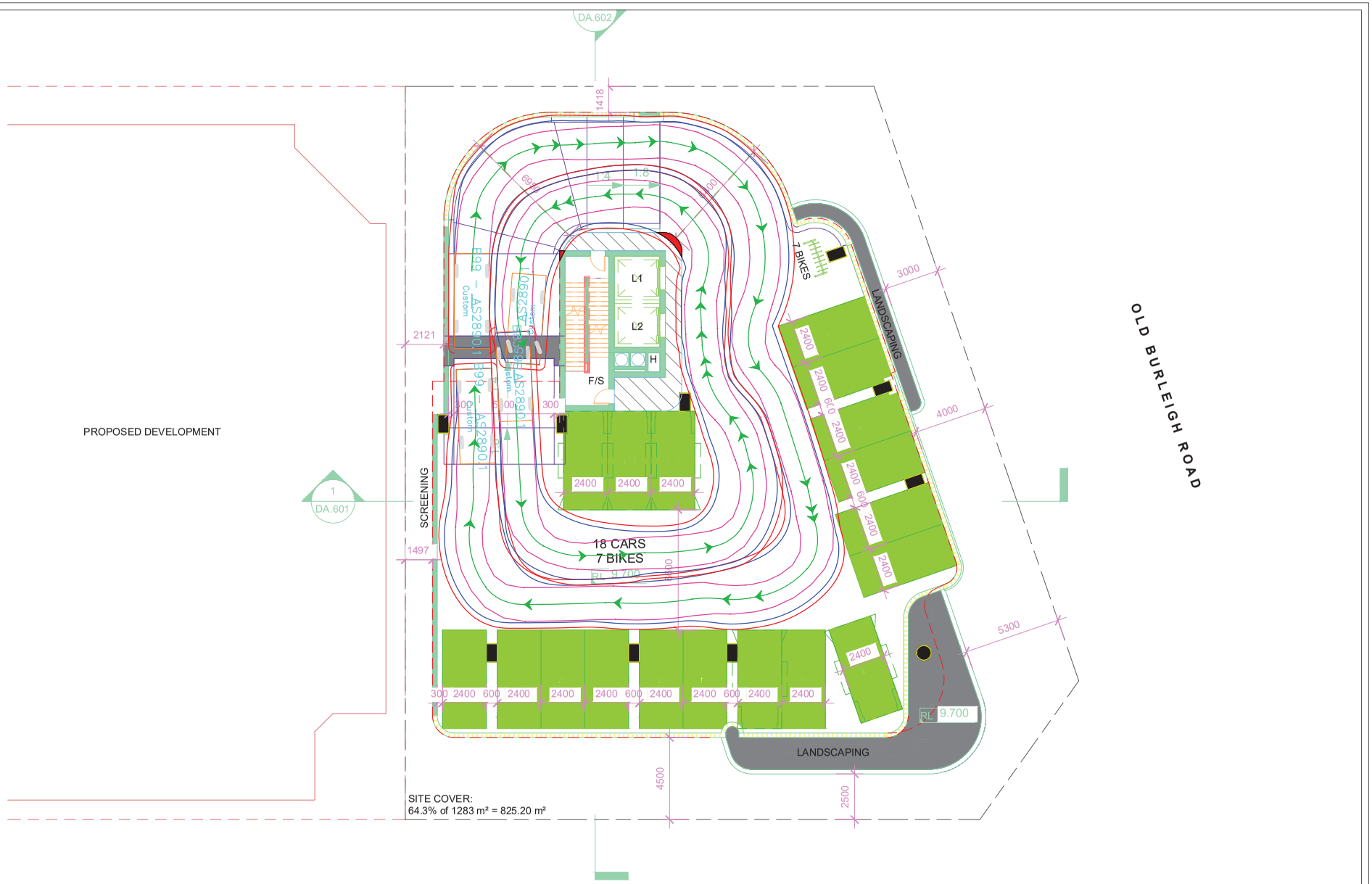
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Urbis
99-101 Old Burleigh Road, Broadbeach
Tandem Bay Swept Paths
Basement 3

Drawn	Date	Scale	Size
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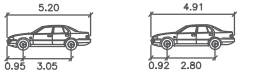
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Revision: A

CAD File: \\adonedfs05\wb$\Documents\Jobs\T0921032 - 101 Old Burleigh Rd, Broadbeach\5_ACAD\SK01_SK08 - A.dwg



SWEPT PATH LEGEND

- VEHICLE BODY
- FRONT TIRES
- VEHICLE PATH
- VEHICLE CLEARANCE (300mm)
- VEHICLE



B99	meters	B85	meters
Width	: 1.94	Width	: 1.87
Track	: 1.84	Track	: 1.77
Lock to Lock Time	: 6.0	Lock to Lock Time	: 6.0
Steering Angle	: 33.9	Steering Angle	: 34.1



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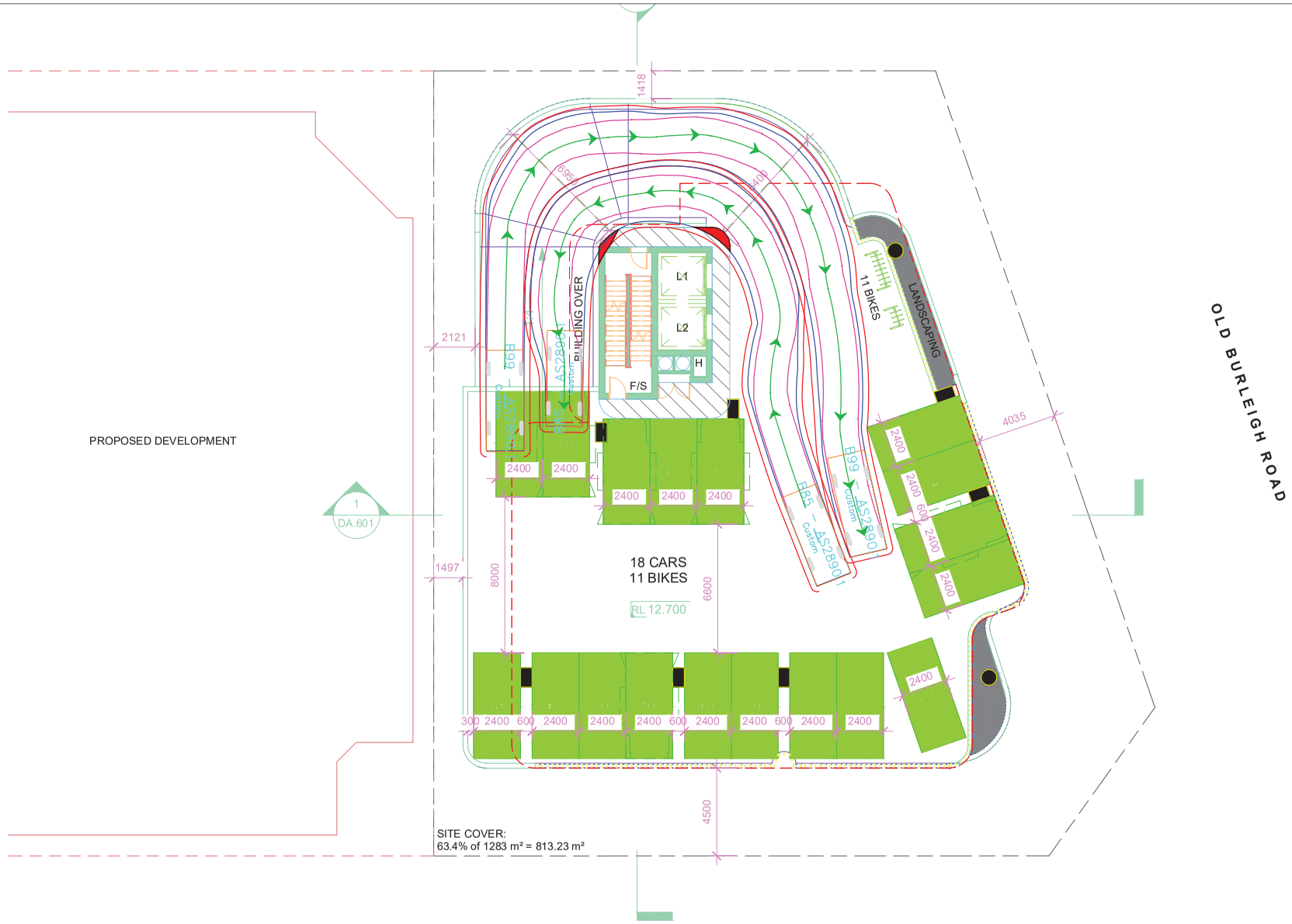
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Urbis
99-101 Old Burleigh Road, Broadbeach
Ramp Swept Paths
Level 1

Drawn	Date	Scale	Size
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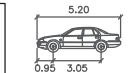
Drawing Number: T0921032 - SK04
Revision: A

CAD File: \\adroads05\wd5\Current Jobs\T0921032 - 101 Old Burleigh Rd, Broadbeach\5_ACAD\SK01_SK08 - A.dwg



SWEPT PATH LEGEND

- VEHICLE BODY
- FRONT TIRES
- VEHICLE PATH
- VEHICLE CLEARANCE (300mm)
- VEHICLE



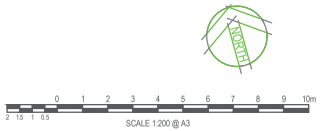
B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9



B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1



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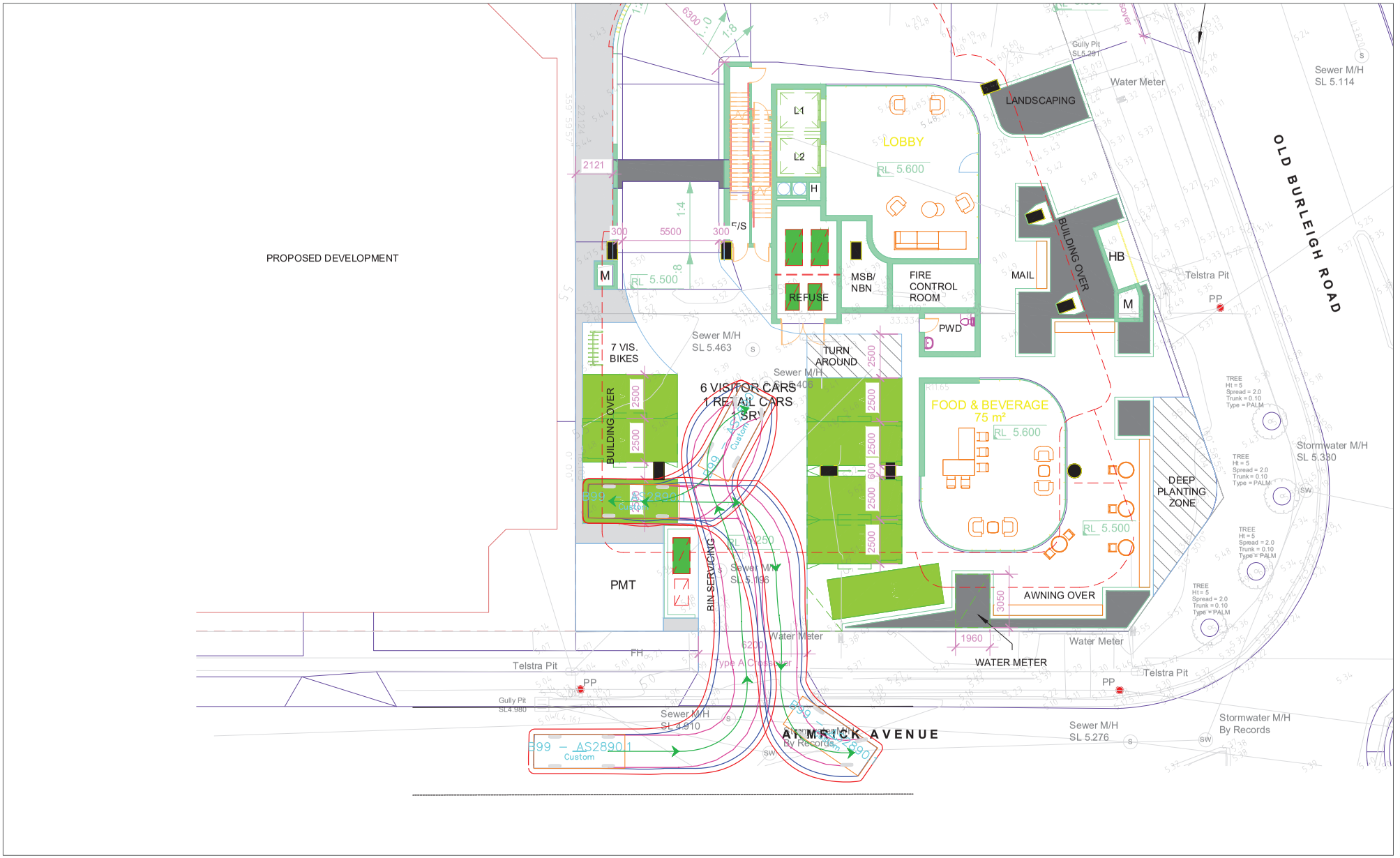
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Urbis
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Ramp Swept Paths
Level 2

Drawn	Date	Scale	Size
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Drawing Number: T0921032 - SK05
Revision: A

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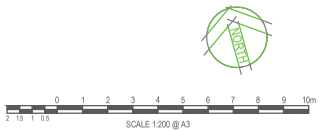


SWEPT PATH LEGEND

- VEHICLE BODY
- FRONT TIRES
- VEHICLE PATH
- VEHICLE CLEARANCE (300mm)
- VEHICLE



B99	meters	B85	meters
Width	: 1.94	Width	: 1.87
Track	: 1.84	Track	: 1.77
Lock to Lock Time	: 6.0	Lock to Lock Time	: 6.0
Steering Angle	: 33.9	Steering Angle	: 34.1



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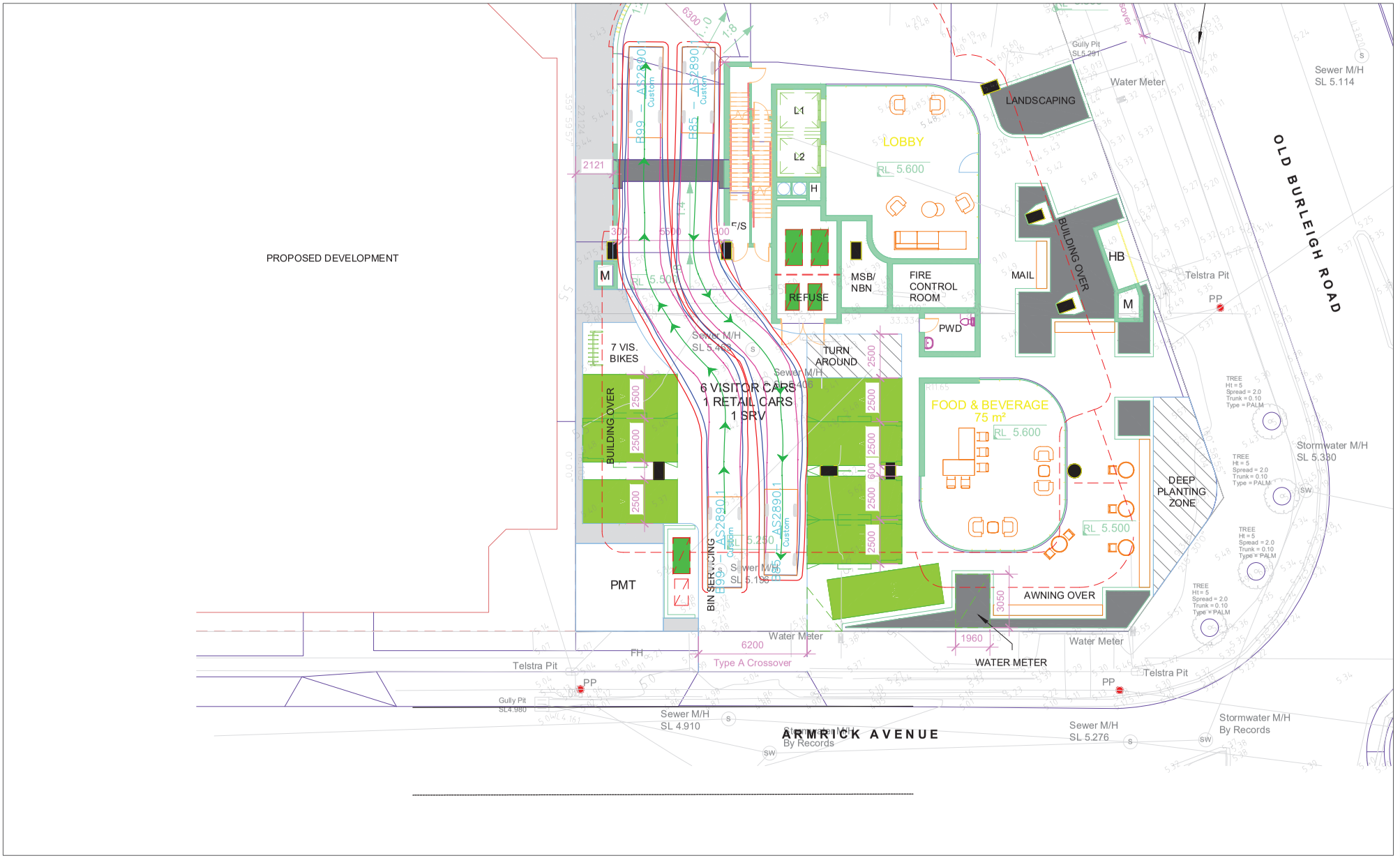
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Urbis
99-101 Old Burleigh Road, Broadbeach
Car Park Swept Paths
Ground Level

Drawn	Date	Scale	Size
R Bakon	10/11/2021	1:200	A3

Drawing Number: T0921032 - SK06
Revision: A

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SWEPT PATH LEGEND

- VEHICLE BODY
- FRONT TIRES
- VEHICLE PATH
- VEHICLE CLEARANCE (300mm)
- VEHICLE



B99	meters	B85	meters
Width	: 1.94	Width	: 1.87
Track	: 1.84	Track	: 1.77
Lock to Lock Time	: 6.0	Lock to Lock Time	: 6.0
Steering Angle	: 33.9	Steering Angle	: 34.1

SCALE 1:200 @ A3

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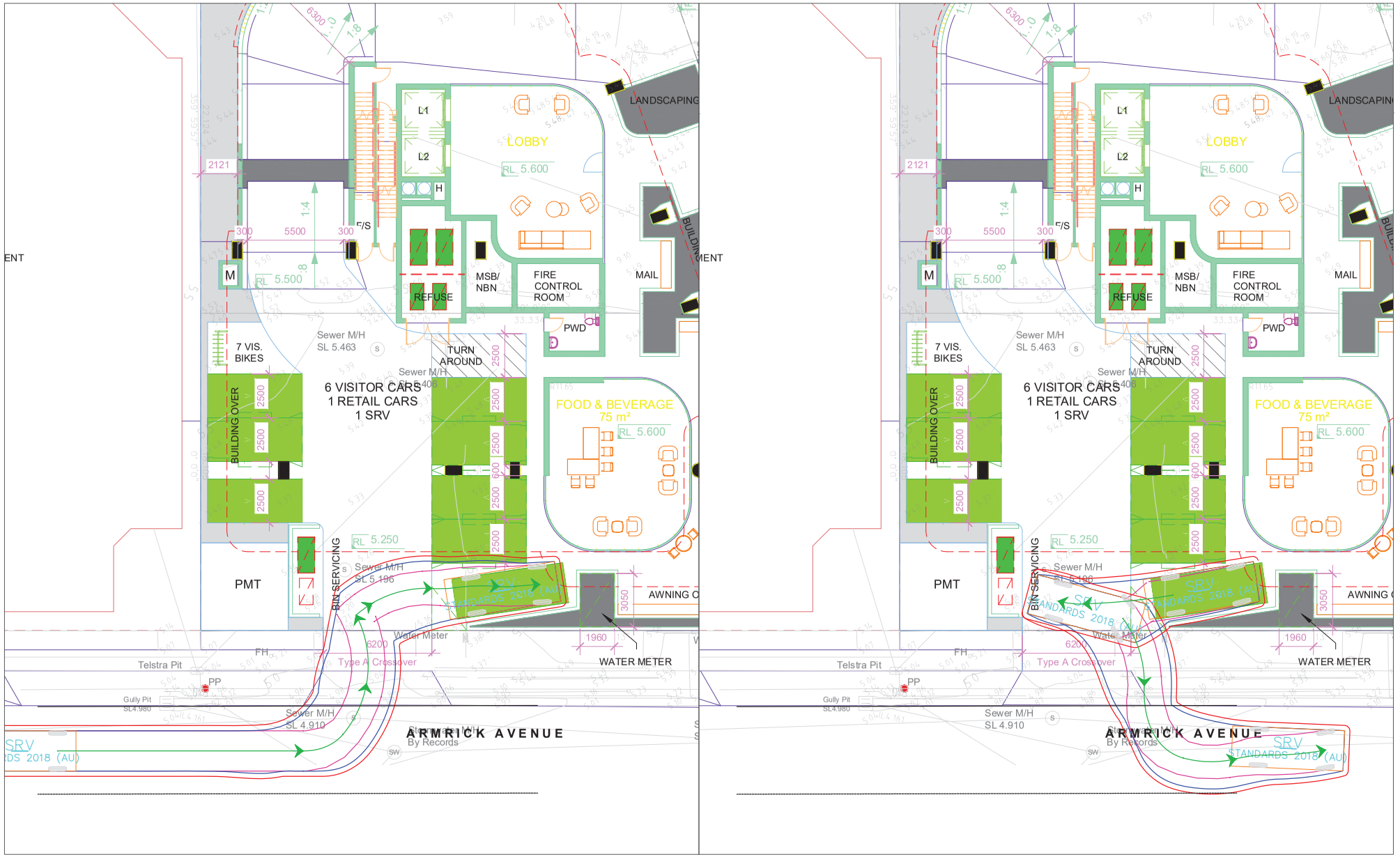
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Urbis
99-101 Old Burleigh Road, Broadbeach
Ramp Swept Paths
Ground Floor

Drawn	Date	Scale	Size
R Bakon	10/11/2021	1:200	A3

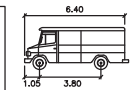
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Revision: A

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SWEPT PATH LEGEND

- VEHICLE BODY
- FRONT TIRES
- VEHICLE PATH
- VEHICLE CLEARANCE (300mm)
- VEHICLE



SRV

	meters
Width	: 2.30
Track	: 2.30
Lock to Lock Time	: 6.0
Steering Angle	: 38.1

SCALE 1:200 @ A3

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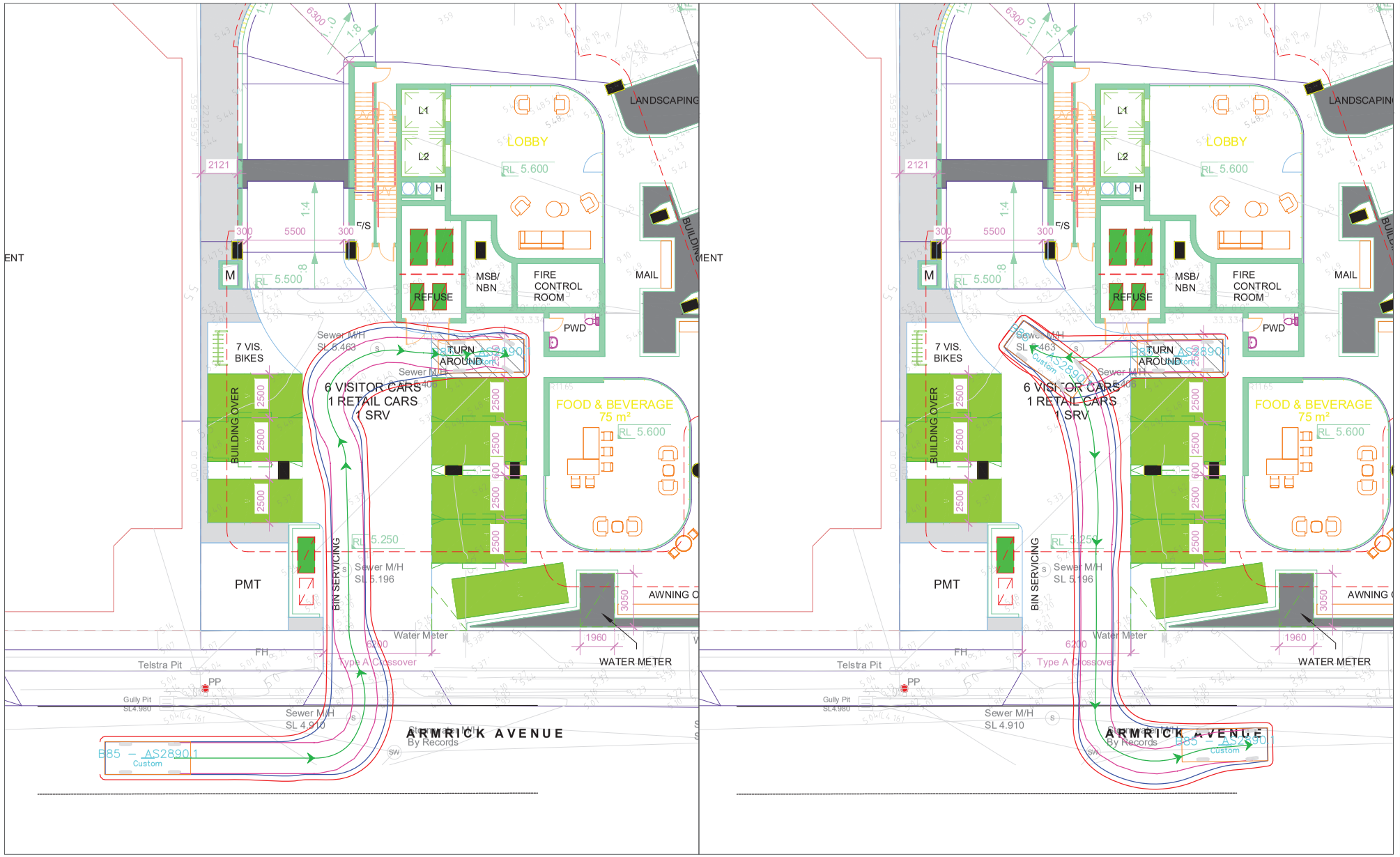
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Urbis
99-101 Old Burleigh Road, Broadbeach
SRV Swept Paths
Ground FLoor

Drawn	Date	Scale	Size
R Bakon	10/11/2021	1:200	A3

Drawing Number	Revision
T0921032 - SK08	A

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SWEPT PATH LEGEND

- VEHICLE BODY
- FRONT TIRES
- VEHICLE PATH
- VEHICLE CLEARANCE (300mm)
- VEHICLE



B99	meters	B85	meters
Width	: 1.94	Width	: 1.87
Track	: 1.84	Track	: 1.77
Lock to Lock Time	: 6.0	Lock to Lock Time	: 6.0
Steering Angle	: 33.9	Steering Angle	: 34.1

NORTH

0 1 2 3 4 5 6 7 8 9 10m
2 1.5 1 0.5
SCALE 1:200 @ A3

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Urbis
99-101 Old Burleigh Road, Broadbeach
Turnaround Bay Swept Paths
Ground Level

Drawn	Date	Scale	Size
R Bakon	10/11/2021	1:200	A3

Drawing Number: T0921032 - SK09
Revision: A

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APPENDIX E STORMWATER MANAGEMENT PLAN

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99 & 101 Old Burleigh Road, Broadbeach

Conceptual Stormwater Management Plan

Client: BAM Property Group
Project No: BE210274
Document No: BE210274-RP-CSMP-00

November 2021

Document Control Record

Prepared by:	Joshua Micallef
Position:	Civil & Stormwater Engineer
Signed:	
Date:	3/11/2021

Approved by:	Jonathan Cuell
Position:	Civil & Water Manager
Signed:	 RPEQ 21773
Date:	3/11/2021

Version No.	Description	Date	Prepared	Approved
00	Initial Issue	3/11/2021	JM	JC

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Executive Summary

This Conceptual Stormwater Management Plan (CSMP) has been prepared in accordance with the City of Gold Coast City Plan Version 8 and is to accompany the development application over this Multi-Unit Residential Highrise development. The CSMP has referenced relevant guidelines relating to stormwater management to form the conceptual basis of the stormwater plan. The following conclusions have been made as a result of this study.

Stormwater Quantity

- As a result of the proposed development, the magnitude of peak stormwater discharge exiting the site has decreased.
- In the existing case, there has been 1 Lawful Point of Discharge (LPD) prescribed for the site, the existing stormwater infrastructure within Old Burleigh Road to the east of the site (LPD A).
- In the development case, detention will not be required as peak runoff from the site will not increase in the developed scenario due to a reduction of impervious area. All flow from the post-developed catchment will be conveyed to an on-site stormwater treatment tank where it will be released to LPD A.
- The proposed stormwater system is to be owned and maintained by the body corporate.

Stormwater Quality

- To achieve City of Gold Coast's Water Quality Objectives, it is proposed to use Ocean Protect StormFilters to treat stormwater runoff.
- The treatment device configuration will be as follows:
- Catchment A
    - 12xStandard(460) PSorb cartridge StormFilter system within a treatment tank with the following dimensions:
        - Tank Area: 10 m^2
        - Tank Depth: 0.8 m
    - 1 OceanGuard with 200micron mesh bags (OG-200).

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Appendix B Time of Concentration and Rational Method Calculations
Appendix C XP-SWMM Input Parameters
Appendix D MUSIC Input Parameters
Appendix E Burchills Engineering Solutions Catchment Plans
Appendix F Burchills Engineering Solutions Operational Control Plan

1. Introduction

This Conceptual Stormwater Management Plan (CSMP) has been prepared for BAM Property Group, the proponent of this Development Application. The proponent is seeking a Development Application for the development of a Multi-Unit Residential Highrise and underground parking over 99 & 101 Old Burleigh Road properly described as Lot 0 on BUP104138 & Lot 70 on B8383 (the subject site).
The subject site is situated within the City of Gold Coast Local Government Area (LGA) and is zoned by the City of Gold Coast City Plan Version 8 as '*High Density Residential*'.

1.1 Background

1.1.1 Regulatory Requirements and Technical Guidelines

The strategies proposed in this CSMP have been developed to address the requirements of the City of Gold Coast City Plan Version 8, and have also been prepared in accordance with the following guidelines:

- SC6.9 City Plan Policy – Land Development Guidelines (GoGC,2021);
- *State Planning Policy July 2014* (DSPIP, 2014)*;*
- Queensland Urban Drainage Manual (QUDM) Fourth Edition (IPWEAQ, 2017);
- Australian Rainfall & Runoff: A Guide to Flood Estimation (Ball J, 2016);
- Australian Government – Bureau of Meteorology (Bureau of Meteorology, n.d.);
- MUSIC Modelling Guidelines (Water By Design, 2010);
- WSUD Technical Guidelines for South East Queensland – Version 1 (Healthy Waterways, BCC, MBWCP, 2006);
- Concept Design Guidelines for Water Sensitive Urban Design - Version 1 (Water By Design, 2009);
- Urban Stormwater Quality Planning Guidelines 2010 (DERM, 2010); and

1.2 Purpose

The main objectives of this CSMP have been established from the criteria set out in the City of Gold Coast City Plan Version 8 and are summarised as follows:

- Avoid the creation of nuisance flow or hazard problems;
- Protect the quality of surface and ground waters during construction and operation of new development;
- Maintain the natural hydraulic behaviour of catchments;
- Protect existing natural features and ecological processes; and
- Integrate stormwater management infrastructure carefully in the urban and natural landscape.

1.3 Scope

To achieve the above mentioned objectives, this CSMP details the following:

- Site description including:
  - Topography;
  - Land Use; and
  - Vegetation.
- Stormwater Quantity:
  - Control measures to ensure no net increase in peak discharge from the subject site (up to the 1% Average Exceedance Probability (AEP)).
- Stormwater Quality:
  - Methods to ensure quality objectives of the receiving waters are achieved.

To minimise the impact of the proposed development on the external environment and to avoid significant and / or sustained deterioration in downstream water quality the proponent shall implement this CSMP. This CSMP may be amended as required, in response to a monitoring and maintenance program.

2. Site Details

2.1 Location

The subject site is located at 99 & 101 Old Burleigh Road which is properly described as Lot 0 on BUP104138 & Lot 70 on B8383 and has a total site area of 1,283 m^2. The site is identified by the City of Gold Coast City Plan Version 8 as being located within a High Density Residential zone. Figure 2.1 below identifies the location of the subject site.

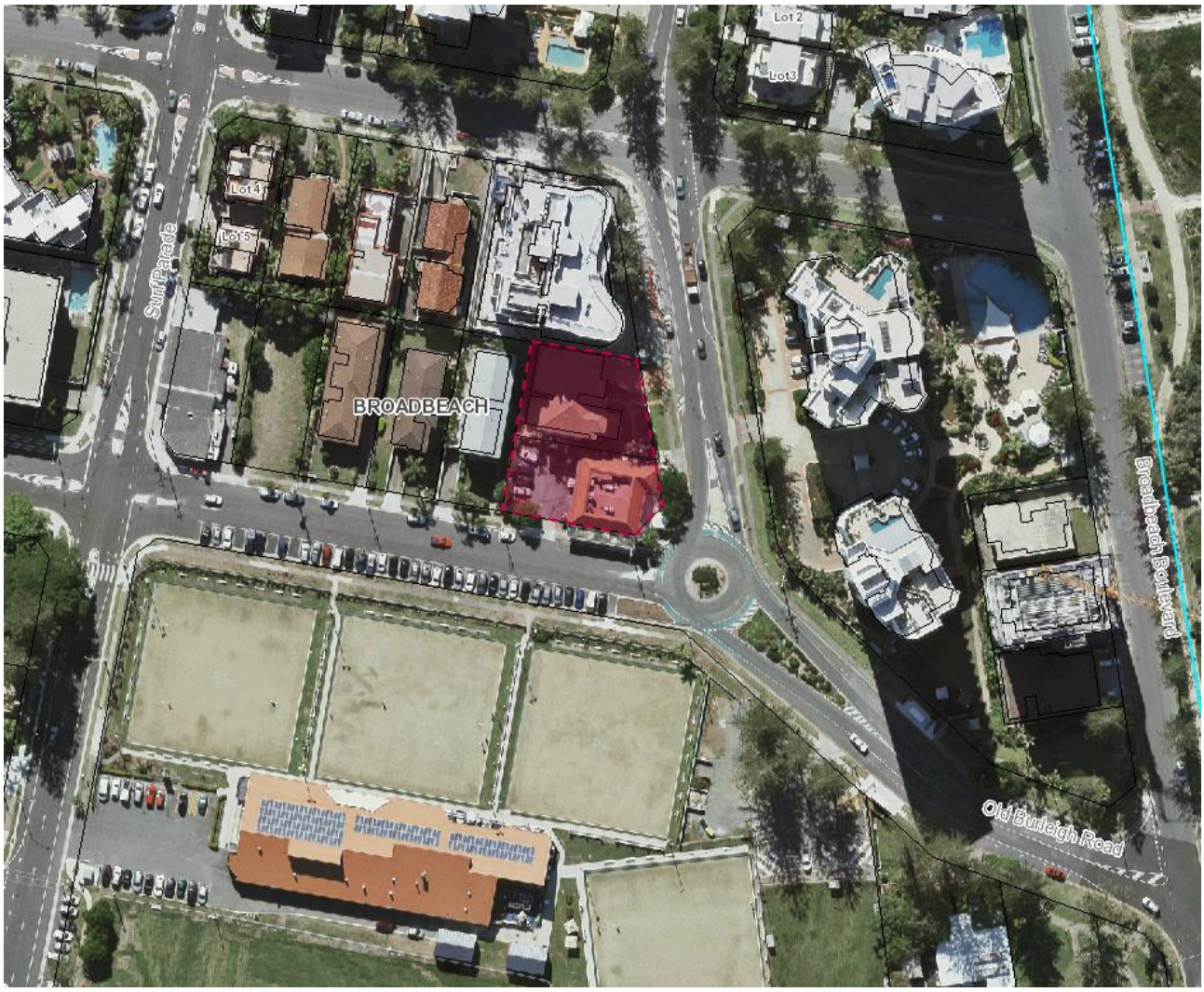


Figure 2.1 Site Locality Plan (City of Gold Coast, 2019)

2.2 Existing Land Uses and Vegetation

Currently located on 99 Old Burleigh road is a 3 storey apartment building which is bound to the east by Old Burleigh Road and surrounded by private property to the north south and west. Located on 101 Old Burleigh Road is a BWS Liquor store and *Lola's* which is a local café & restaurant. This site is bound by Old Burleigh Road to the east and Armrick Avenue to the south, the remaining property boundaries boarder private property. The existing site is being treated as 97% impervious.

2.3 Existing Topography

The site is approximately 1,283 m^2 with a portion of the site grading towards the south to Armrick Ave and the remainder grading towards the east to Old Burleigh Road.

2.4 Downstream Environment

Currently both 99 & 101 Old Burleigh road discharge to the road via kerb adapters, these flows are conveyed into existing stormwater drainage infrastructure (450 mm and 600 mm dia.) fronting the site. Flows are eventually discharged to the beach at First Ave.

2.5 Rainfall

The mean annual rainfall for the site has been estimated at 1,239 mm from the data set obtained from the nearest Bureau of Meteorology (BOM) station number 040764 at the Gold Coast Seaway station.

2.6 Proposed Development

The proposal seeks to develop a forty-five (45) level residential building containing fifty-eight (58) units. The development also allows for the construction of three (3) basement carparking levels.

Figure 2.2 below shows the proposed development elevation for further details regarding the proposed layout, please refer to the complete site layout plan attached within Appendix A.

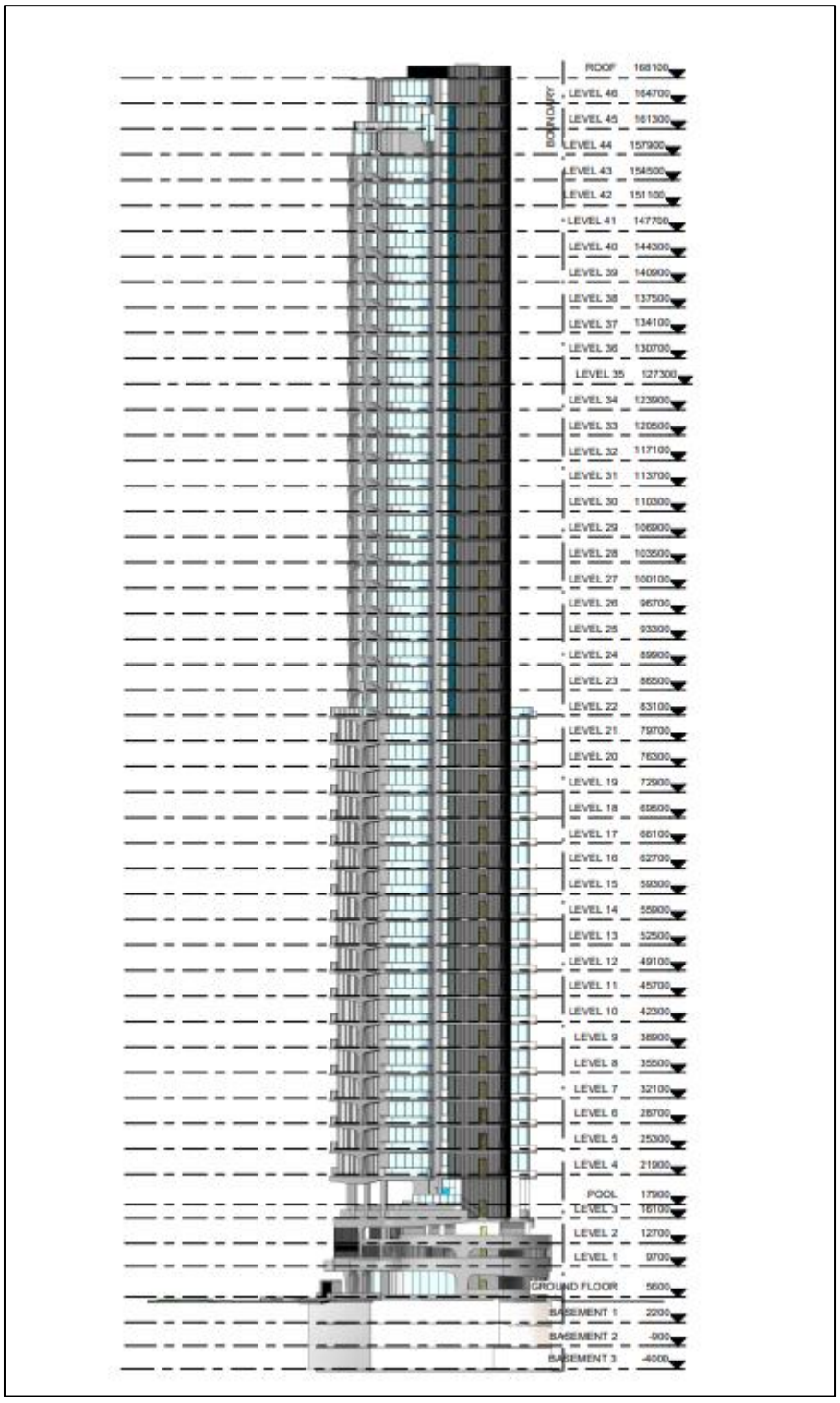


Figure 2.2 Proposed Site Elevation (ferrochow , 2021)

3. Stormwater Quantity Management Plan

3.1 Overview

The following section of this report outlines the measures required to meet the above mentioned objective in regard to stormwater quantity. In order to meet these objectives, it is necessary to ensure that post development discharge from the site will not create a worse situation for downstream property owners than that which existed prior to the development (i.e. non-worsening) (IPWEAQ, 2017).

The sites impervious area percentage has been reduced from 97% down to 81%, peak flow rates from the site are expected to decrease therefore the implementation of On-Site Detention will not be required for this development.

3.2 Drainage Catchment Parameters

Drainage catchments have been delineated using site survey, aerial imagery and development plans in the post developed scenario. Pre and post development catchment parameters are summarised in Table 3-1. Catchment plans are provided in 0.

Table 3-1 Catchment Parameters

Scenario	Catchment ID	Total Area (ha)	Impervious %
Pre-developed	A	0.128	97
Post Developed	A	0.128	81

3.2.1 Conveyance of Flows

Important information about the conveyance of flows for the pre-development and post-development scenarios are included in Table 3-2 below.

Table 3-2 Conveyance of Flows

Subject	Description
Lawful Points of Discharge (LPD)	One (1) Lawful Point of Discharges (LPD) is proposed for the development, defined as the existing stormwater drainage along Old Burleigh Rd, LPD A.
Pre-development	Flows from Catchment A are conveyed from the current apartment and commercial building to the kerb via kerb adapters and into stormwater drainage pits located along Armrick Ave and Old Burleigh Rd (LPD A). Existing stormwater pipe sizes are as follows: - Armrick Ave: 450 mm dia. - Old Burleigh Rd: 600mm dia. Flows are eventually discharged to the north at the beach at First Ave. Pre-development catchment plans are included in 0 (Drawing No. N200).

Post-development	Flows (up to the 1 in 100 AEP event) from the roofs of the development and from ground areas within Catchment A are conveyed through the proposed drainage system to a stormwater filtration system located within a stormwater treatment tank suspended from the roof of Basement Level 1 and then to LPD A. A post development catchment plan is shown in Drawing N201 in Appendix E.

3.3 Rational Method Analysis

The Rational Method has been used to gain an initial understanding of the relative impact of the proposed development on peak flow rates at the site's LPD. The Rational Method is a basic method for assessing peak flow rates and is considered suitable given the catchment area is less than 500 ha and the time of concentration within the contributing catchments is less than 30 minutes (IPWEAQ, 2017).

Please note the Coefficeint of discharges specified by City of Gold Coast in Table 4.4 in SC6.11- 4 of the City Plan were not used as the land use type has remained the same therefore causing no change to the rational method calculation.

Event (ARI)	Pre-Developed Catchment A (m^3/s)	Post-Developed Catchment A (m^3/s)	Difference (%)
2	0.041	0.040	- 2
100	0.11	0.11	0

3.4 XP-SWMM Analysis

XP-SWMM (version 2019) software was utilised to model the performance of the proposed stormwater quantity control measures. This modelling software is a link-node model capable of performing hydrology and hydraulics of stormwater drainage systems simultaneously.

Laurenson's Hydrology has been adopted as the runoff routing method within XP-SWMM. Sub-catchment routing in this method is carried out using the Muskingum procedure, which is a storage routing method based on the storage equation.

Details of the assumptions and input parameters used within the XP-SWMM model inputs are included in Appendix C.

3.4.1 Rational Method Comparison

The Rational Method has been used to gain an initial understanding of the relative impact of the proposed development on peak flow rates at the site's LPD. The Rational Method is a basic method for assessing peak flow rates and is considered suitable given the catchment area is less than 500 ha and the time of concentration within the contributing catchments is less than 30 minutes (IPWEAQ, 2017).

It should be noted that although the Rational Method has been used as an initial estimate of site peak flows, it has not been used for the design of any mitigation measures nor has been used for calibration of the runoff XP-SWMM model. A comparison between the peak discharge values obtained using the Rational Method and the XP-SWMM model for the 1% AEP event at the Lawful Point of Discharge is contained in Table 3-3 below.

Table 3-3 Rational Method vs XP-SWMM Generated Peak Discharges

Scenario	Catchment ID	Rational (m^3/s)	XP-SWMM (m^3/s)	Difference (%)
Pre-developed	A	0.11	0.10	-9
Post-developed	A	0.11	0.085	-23

The peak discharges generated by XP-SWMM and the Rational Method are similar in comparison and are considered acceptable for this assessment (within 30%).

3.5 XP-SWMM Results

3.5.1 Development Drainage Infrastructure

Due to a reduction in site impervious area the peak discharge from the site is not expected to increase. To confirm this the pre and post developed scenarios were modelled in XP SWMM to obtain peak discharges to the sites LPD.

A summary of the modelling results for different AEP events is contained in Table 3-4. Results of the modelling indicate the proposed development peak flows are less than the the pre-development peak discharges for the all storm events up to the 1% AEP event at LPD A.

Table 3-4 Pre-Development vs Post-Development (Mitigated) Peak Discharges at LPD A

AEP Event (%)	Pre-Development	Post-Development
	Peak Discharge (m3/sec)	Peak Discharge (m3/sec)
1	0.101	0.085
2	0.091	0.077
5	0.077	0.065
10	0.068	0.057
18	0.061	0.051
39	0.049	0.041

3.6 Treatment Tank Details

The proposed in-situ cast treatment tank its proposed to achieve Water Quality Objectives at LPD A.

Table 3-5 below contains the details of the proposed treatment systems within the subject site.

Table 3-5 Treatment Details

Tank ID	Outlet Structures		
	Orifice	Outlet Pipe	Weir
Tank A	100mm dia. @ RL 4.5 m AHD	300mm dia. @ RL 4.5 m AHD	0.6m x 0.6m Pit Crest @ RL 5.04 m AHD

3.6.1 Treatment Tank Configuration

Shown below in Figure 3.1 is Drawing N400 & N401 an operational control schematic in plan and section view.

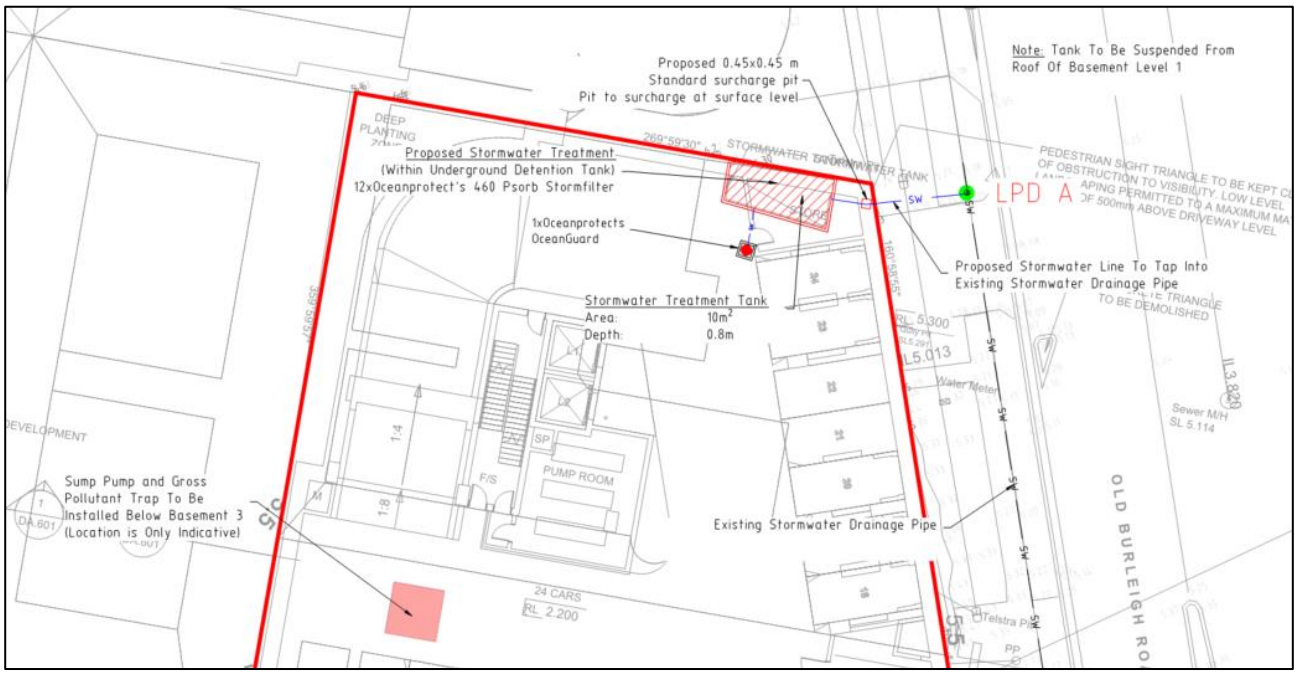


Figure 3.1 Operational Control Plan Details

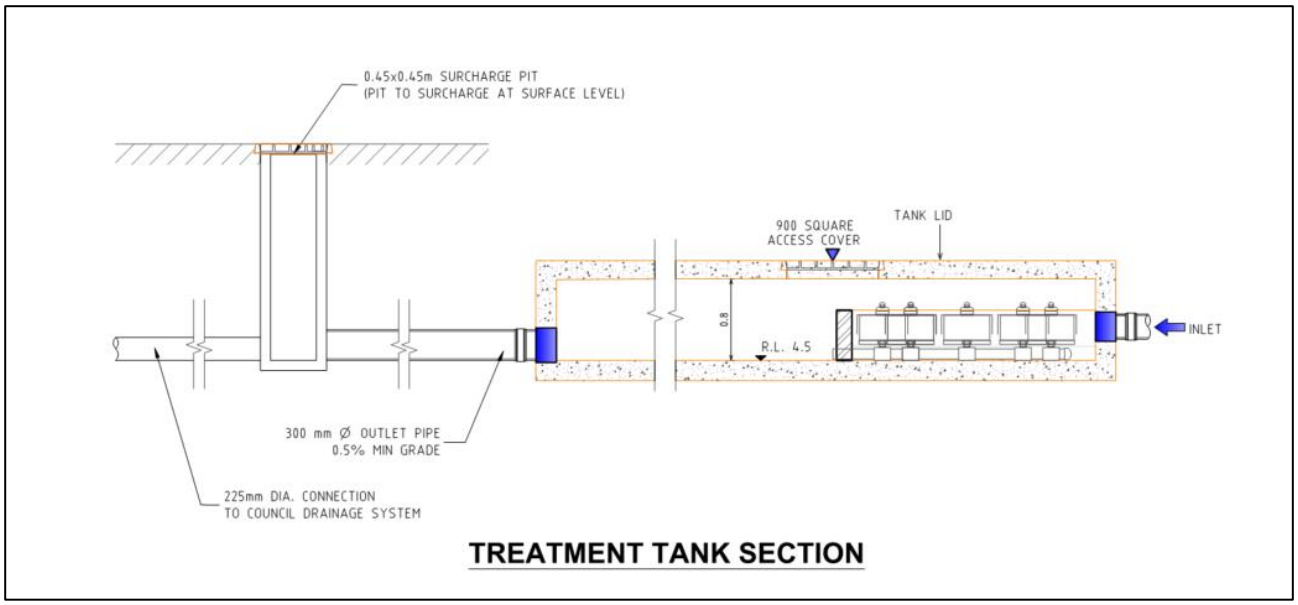


Figure 3.2 Treatment Tank Section Control Plan Section

4. Stormwater Quality Management Plan

4.1 Water Quality Objective (WQO)

In accordance with the City of Gold Coast City Plan Version 8, the total effect of permanent water quality control measures are to achieve reductions in the mean annual load generated by the development site at a minimum of:

- 90% for Gross Pollutants (>5mm);
- 80% for Total Suspended solids (TSS);
- 60% for Total Phosphorus (TP); and
- 45% for Total Nitrogen (TN).

This will ensure the environmental values of the downstream receiving waters are maintained and have been chosen as the WQO for the development.

4.2 Treatment Train

To ensure the above WQO's can be met at the site's LPD, a treatment train was proposed for the developed site and modelled using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software.

A stormwater treatment system is to be installed within the onsite treatment tank to treat frequent flows from catchment A1 where major flows from catchments A will bypass treatment in storm events greater than the 4EY

The conceptual parameters of the proposed Ocean Protect StormFilters are presented below, and further detail of the input parameters used within MUSIC are included in Appendix D. The location of the proposed treatment train elements is included in the Operational Control Plan within 0. The recommended filter configuration is as follows:

- Catchment A:
  - A 12xStandard(460) PSorb Cartridge StormFilter system within the treatment tank, 8 m^3
  - 1 OceanGuard with 200micron mesh bags (OG-200).

A typical sections of a Ocean Protect StormFilter has been included in Figure 4.1. The stormwater treatment system has been designed and will be installed by Ocean Protect.

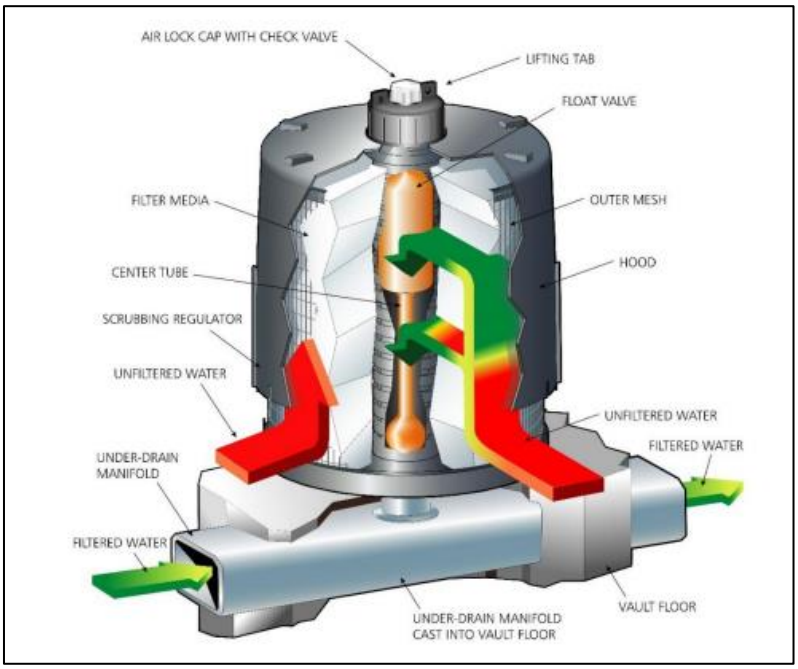


Figure 4.1 Typical StormFilter (Ocean Protect, 2020)

4.3 MUSIC Results

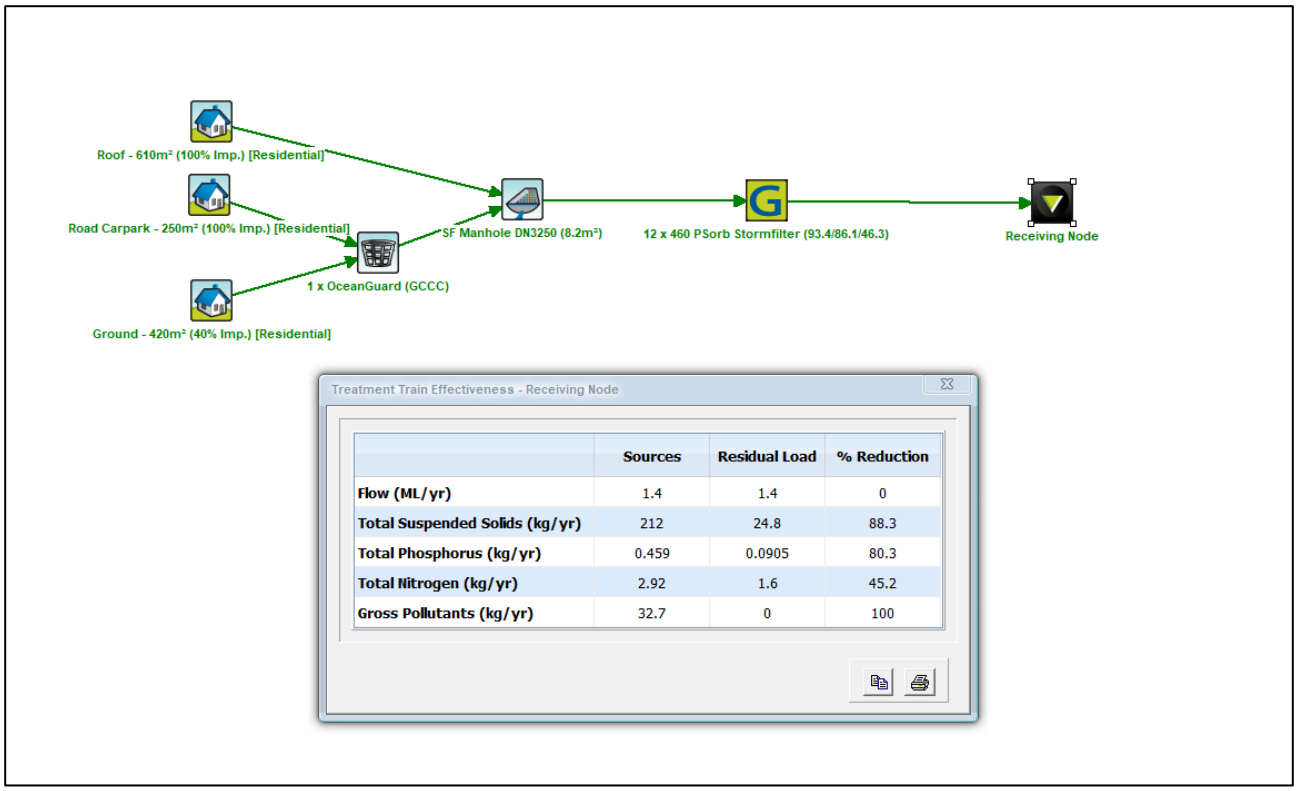
Results of the MUSIC modelling for the treatment train effectiveness are summarised in Table 4-1. The results indicate the 80%, 60%, 45% and 90% reduction target for TSS, TP, TN and gross pollutants respectively are achieved for the rainfall data set simulated.

Table 4-1 Treatment Train Effectiveness

Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction Achieved (%)	Water Quality Objective (%)
TSS	212	24.8	88.3	80
TP	0.459	0.0905	80.3	60
TN	2.92	1.6	45.2	45
GP	32.7	0	100	90

NOTE: All simulations have been run with pollutant export estimation set to “stochastic generation”.

A screen capture of the MUSIC model and treatment train effectiveness results is presented in Figure 4.2.



	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.4	1.4	0
Total Suspended Solids (kg/yr)	212	24.8	88.3
Total Phosphorus (kg/yr)	0.459	0.0905	80.3
Total Nitrogen (kg/yr)	2.92	1.6	45.2
Gross Pollutants (kg/yr)	32.7	0	100

Figure 4.2 Treatment Train Layout & MUSIC Results

5. Conclusion

The stormwater management outlined in this report has addressed the objectives set by the City of Gold Coast with respect to the control of runoff quantity and quality. Peak runoff at the proposed development's LPD has been maintained in all AEP events through reduction of total impervious area onsite.

All stormwater infrastructure associated with the development is to be owned and maintained by the body corporate.

Runoff from frequent events that discharges the subject site are filtered by Ocean Protect stormwater filter systems. The proposed treatment train was modelled using MUSIC in order to determine if Water Quality Objectives were met. The quality of site runoff meets the WQOs of the City of Gold Coast.

Appendix A Proposed Plans of Development



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MIXED-USE DEVELOPMENT

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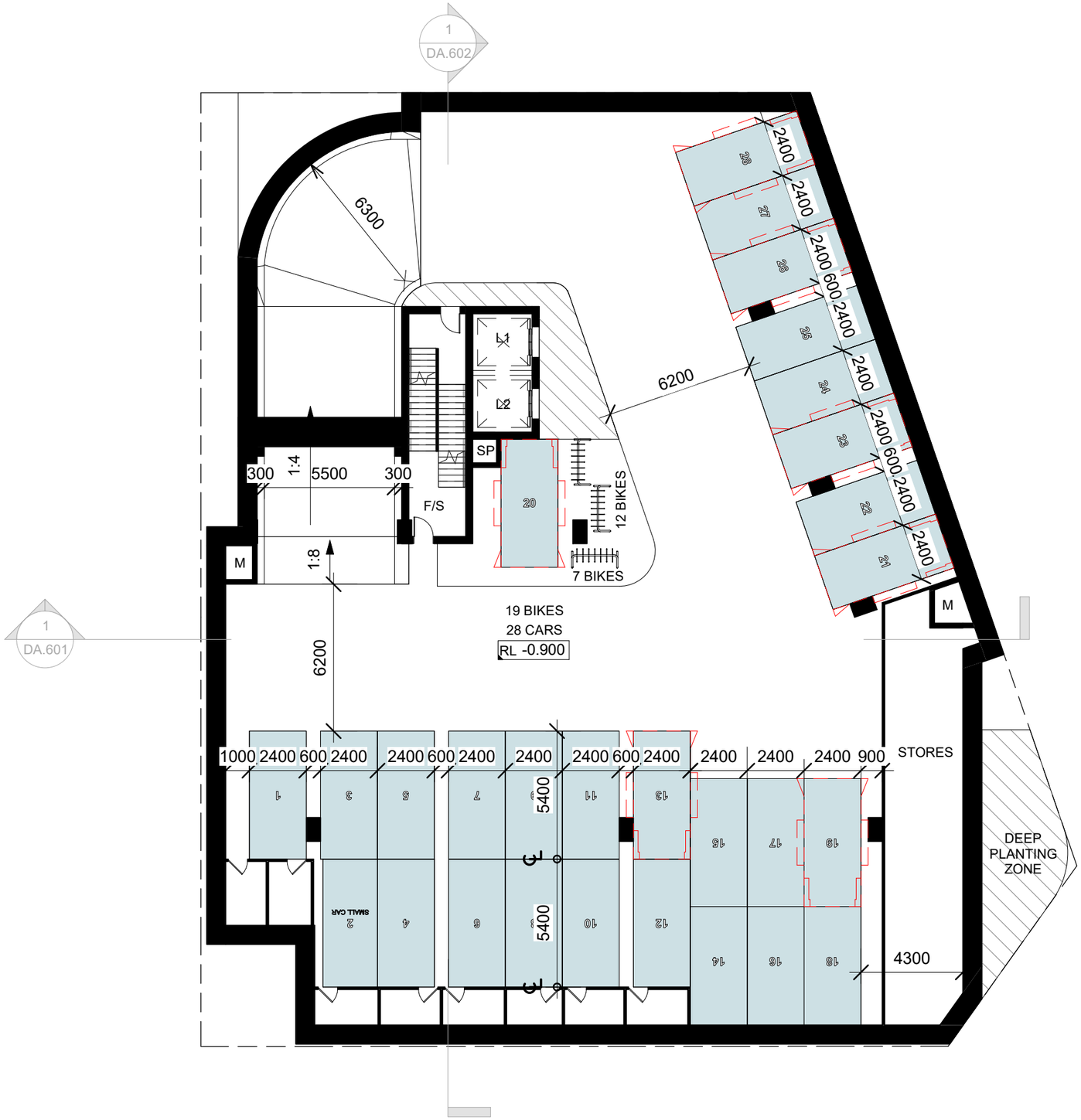
BASEMENT 3

DRAWING NUMBER

DA.097

SCALE (A1) 1 : 200

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BASEMENT 1

DRAWING NUMBER

DA.099

SCALE (A3) 1 : 200

REVISION B

PEDESTRIAN SIGHT TRIANGLE TO BE KEPT CLEAR OF OBSTRUCTION TO VISIBILITY. LOW LEVEL LANDSCAPING PERMITTED TO A MAXIMUM MATURE HEIGHT OF 500mm ABOVE DRIVEWAY LEVEL

CONCRETE TRIANGLE TO BE DEMOLISHED

STORMWATER TANK

BUILDING OVER

1418

LANDSCAPING

1:20

6300

1:10

1:8

1

DA.602

2500

Type A Crossover

6100

RL 5.30

LANDSCAPING

Water Meter

Sewer M/H
SL 5.114

FH

OLD BURLEIGH ROAD

LOBBY
80 m²
RL 5.600

M1

M2

H

2121

300

5500

300 F/S

1:4

1:8

M

RL 5.500

REFUSE

MSB/
NBN

FIRE
CONTROL
ROOM

MAIL

BUILDING OVER

HB

M

PWD

Telstra Pit

PP

PROPOSED DEVELOPMENT

1

DA.601

7 VIS.
BIKES

Sewer M/H
SL 5.463

TURN AROUND

6 VISITOR CARS
1 RETAIL CARS
1 SRV

RL 5.5

RETAIL
75 m²

RL 5.600

DEEP
PLANTING
ZONE

RL 5.500

BUILDING OVER

RL 5.283

BIN SERVICING

PMT

Sewer M/H
SL 5.196

SRV

3050

AWNING OVER

1960

WATER METER

6200

Type A Crossover

Water Meter

Telstra Pit

PP

Gully Pit
SL4.980

Sewer M/H
SL 4.910

ARMRICK AVENUE

Sewer M/H
By Records

Sewer M/H
SL 5.276

Stormwater M/H
By Records

Stormwater M/H
SL 5.330

TREE
Ht = 5
Spread = 2.0
Trunk = 0.10
Type = PALM

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GROUND LEVEL

DRAWING NUMBER

DA.100

SCALE (A1) 1 : 200

REVISION B

DA.602

1668

6300

1:4

1:8

7 BIKES

4000

3000

2121

M1

M2

H

H/S

WAITING ZONE

1:4

1:8

300

5500

300

PROPOSED DEVELOPMENT

SCREENING

16

17

18

2400

2400

2400

SMALL

4

5

6

2400

600

2400

2400

1

DA.601

16 CARS
7 BIKES
RL 9.700

1504

6611

OLD BURLEIGH ROAD

2932400 600 2400 2400 600 2400 2400 2400 600 2400 2400

16 15 14 13 12 11 10 9 8

2400

L

5340

RL 9.700

LANDSCAPING

2427

4500

2467

ARMRICK AVENUE

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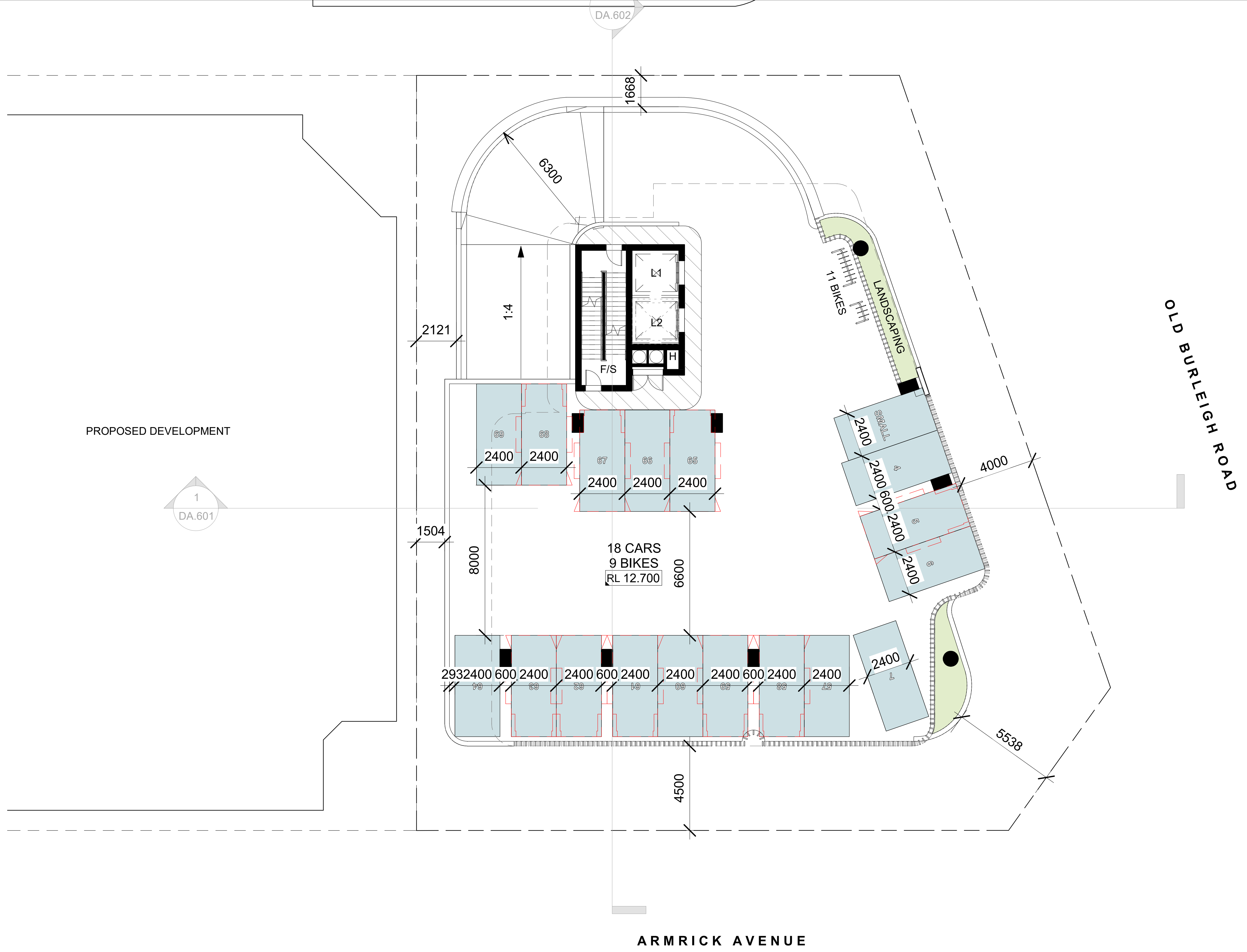
LEVEL 1

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DA.101

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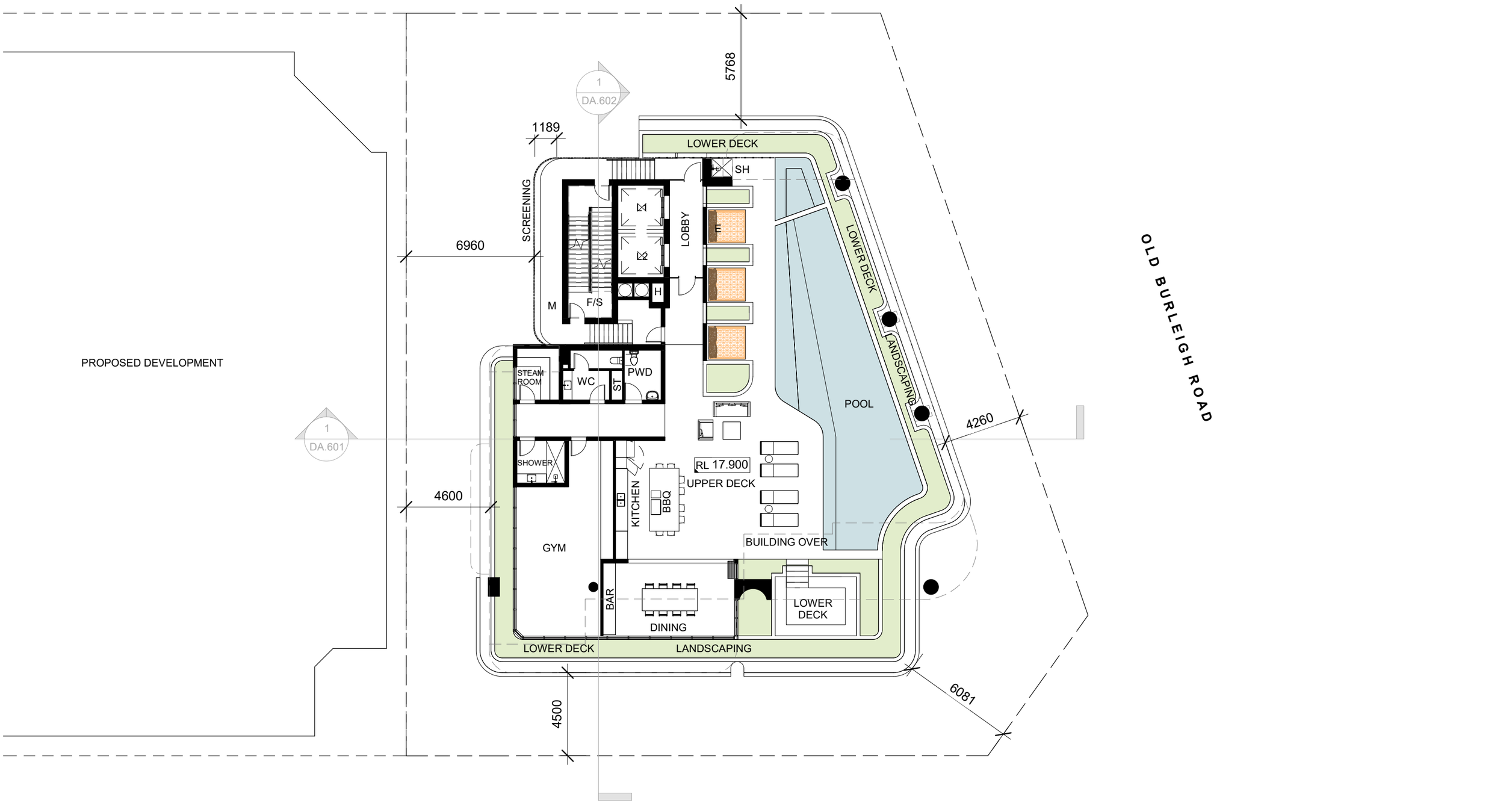
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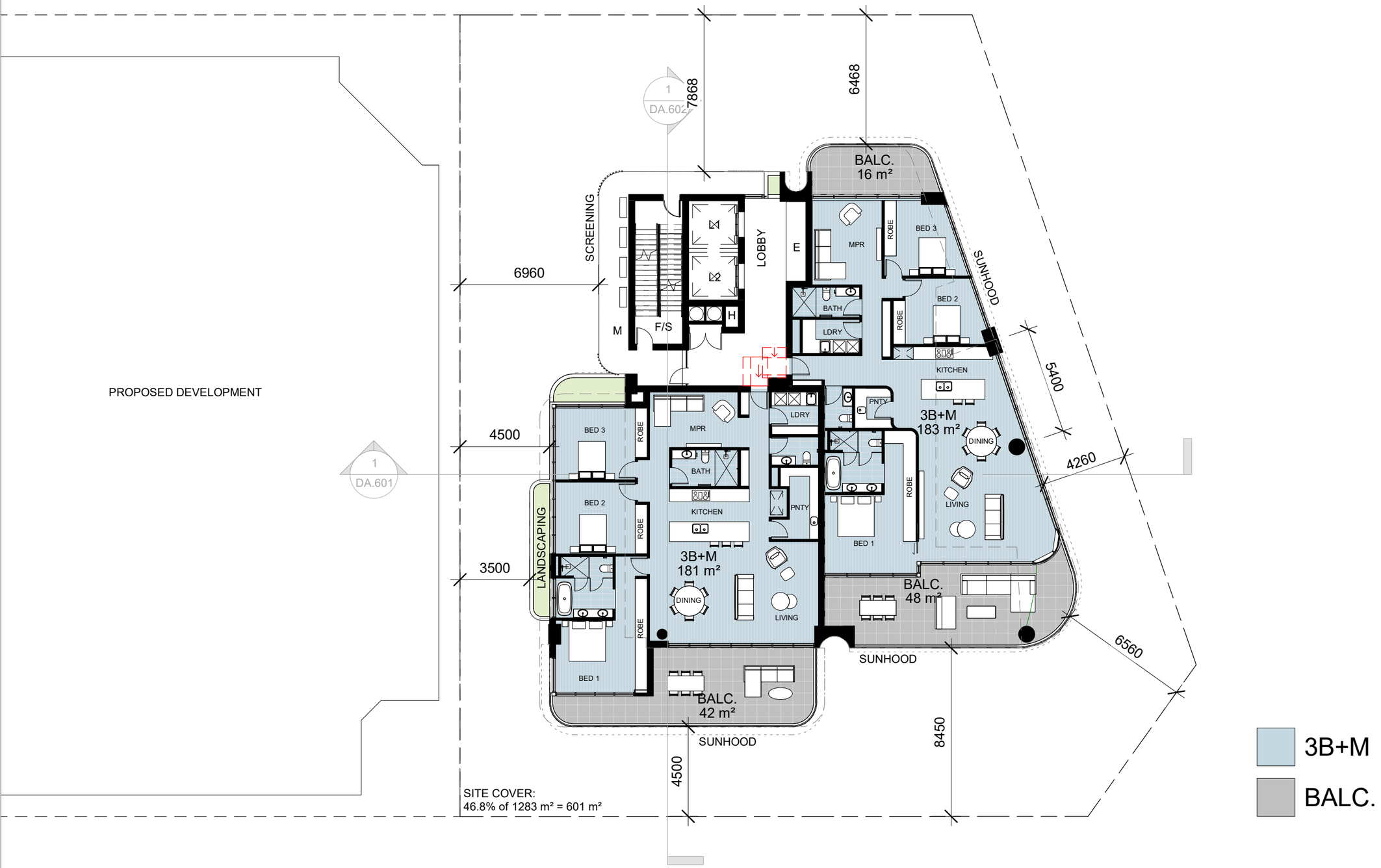
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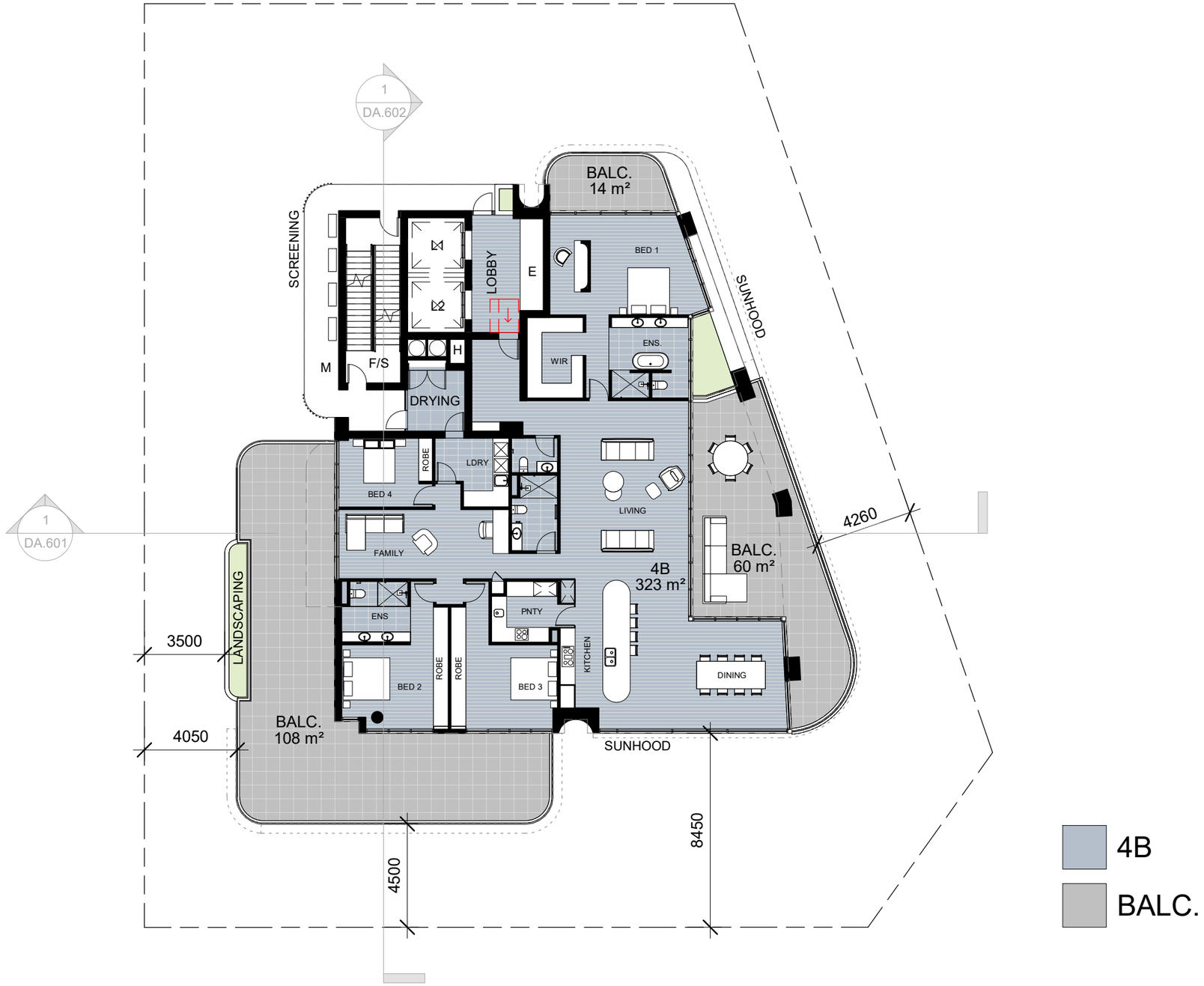
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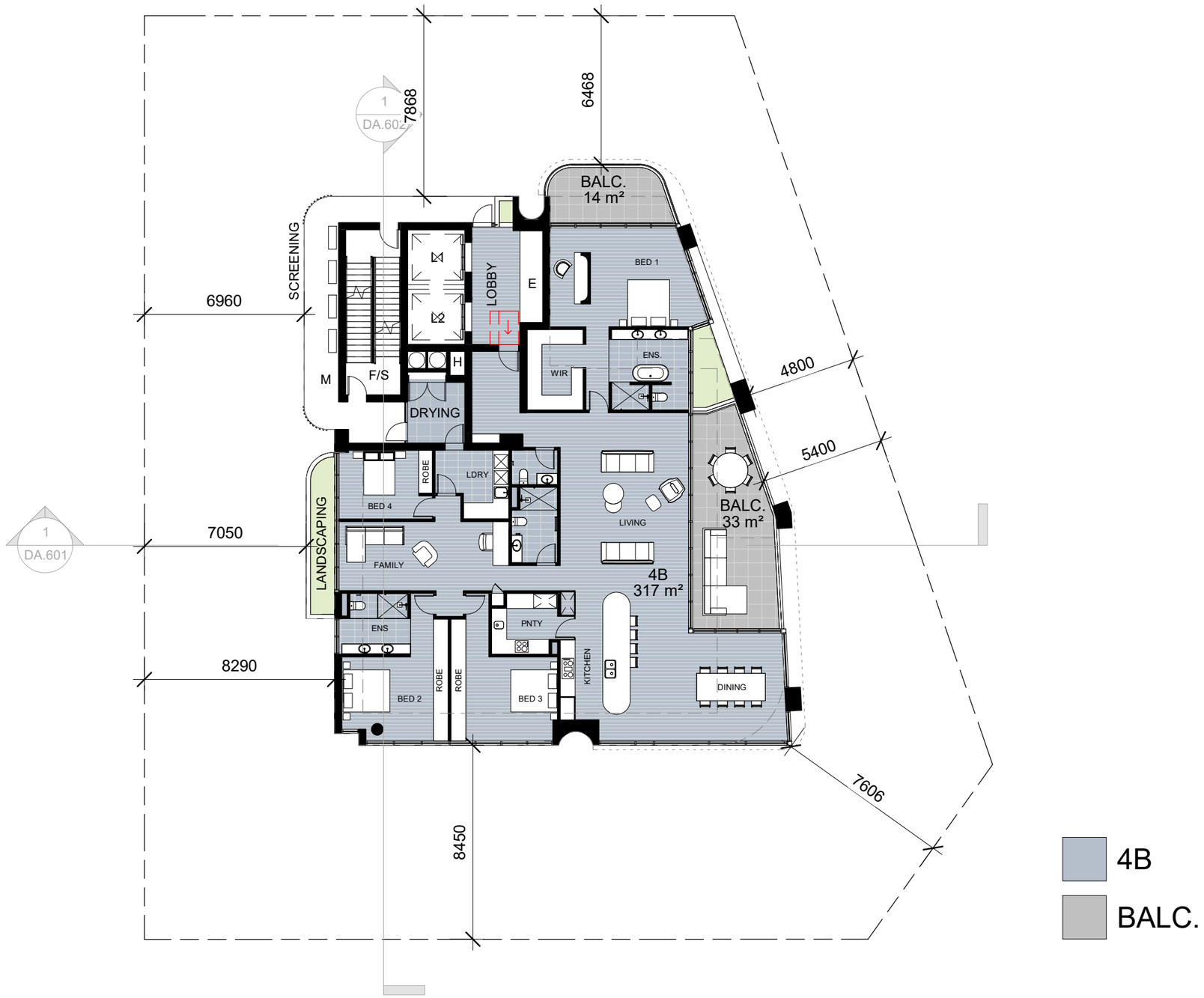
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REVISION A

Appendix B Time of Concentration and Rational Method Calculations

Pre-Development Hydrology

The natural hydrology of the site has been assessed in accordance with QUDM (IPWEAQ, 2017) Section 4.1. The time of concentration for all catchments has been determined using Friend's Equation as per QUDM Section 4.6.6, combined with a channel time flow calculation.

$$Friend's\ Equation\ tc = (107nL^{0.333})/S^{0.2}$$

Table B.5-1 presents a summary of the catchment parameters used within Friend's Equation and the calculated time of concentration for the pre-development scenario.

Table B.5-1 Time of Concentration for Pre-Development Scenario

Catchment ID	Pre A	Pre B
Standard Inlet Time	5	5
TOTAL tc (minutes)	5	5

Post-Development Hydrology – Unmitigated

Table B.5-2 presents a summary of the catchment parameters used for the calculated time of concentration for the post-development scenario. The time of concentration for the external catchment is presented in Table B.5-1 above.

Table B.5-2 Time of Concentration for Post-Development Scenario

Catchment ID	Post A
Standard Inlet Time	5
TOTAL tc (minutes)	5

Design storm event flows across the site were derived using the Rational Method as per the above-mentioned manuals. This involved:

- Determination of a C10 value (derived in accordance with QUDM Table 4.05.3(b) and Council guidelines). A value of 0.7 was applied to the pre-development catchment and 0.83 was applied to the post-development catchment;
- Adoption of design rainfall using BoM IFD data; and
- Calculation of design flows through the site for Q100, Q50, Q20, Q10, Q5, Q2, Q1 and $Q3_{month}$, where $Q3_{month}$ is deemed to be 50% of Q1.

Summaries of the hydrologic calculations are contained in Table B.5-3 and Table B.5-4 for pre and post-development (un-mitigated) scenarios respectively.

Table B.5-3 Pre-Development Hydrology

Catch.	Area (ha)	tc (min)	I_{100} (mm/hr)	C	Q_{100} (m^3/s)	I_{50} (mm/hr)	C	Q_{50} (m^3/s)	I_{20} (mm/hr)	C	Q_{20} (m^3/s)	I_{10} (mm/hr)	C	Q_{10} (m^3/s)	I_5 (mm/hr)	C	Q_5 (m^3/s)	I_2 (mm/hr)	C	Q_2 (m^3/s)	I_1 (mm/hr)	C	Q_{3month} (m^3/s)
Pre A	0.13	5.00	336.00	1.00	**0.12**	300.00	1.00	**0.11**	254.00	0.93	**0.09**	221.00	0.89	**0.07**	191.00	0.85	**0.06**	152.00	0.76	**0.041**	122.00	0.71	**0.03**

Table B.5-4 Un-Mitigated Post-Development Hydrology

Catch.	Area (ha)	tc (min)	I_{100} (mm/hr)	C	Q_{100} (m^3/s)	I_{50} (mm/hr)	C	Q_{50} (m^3/s)	I_{20} (mm/hr)	C	Q_{20} (m^3/s)	I_{10} (mm/hr)	C	Q_{10} (m^3/s)	I_5 (mm/hr)	C	Q_5 (m^3/s)	I_2 (mm/hr)	C	Q_2 (m^3/s)	I_1 (mm/hr)	C	Q_{3month} (m^3/s)
Post A	0.13	5.00	336.00	1.00	**0.12**	300.00	0.99	**0.11**	254.00	0.90	**0.08**	221.00	0.86	**0.07**	191.00	0.82	**0.06**	152.00	0.73	**0.040**	122.00	0.69	**0.03**

Appendix C XP-SWMM Input Parameters

Laurenson Routing Parameters

In this study, the “Laurenson” routing method was applied to XP-SWMM for hydrograph generation. To enable this method to be used, each catchment must be split into pervious (undeveloped) and impervious (developed) portions. Adopted parameters for the Laurenson routing method included:

The fraction impervious has been determined by analysis of aerial photographs and the proposed development layout;

- Manning Roughness coefficient (n):
  - Pervious portion: 0.035; and
  - Impervious portion: 0.015.

Initial Loss (IL) and Continuing Losses (CL) have been applied to the hydrologic model. Details of IL and CL parameters applied in the XP-SWMM model are presented in Table C.5-1.

Table C.5-1 Adopted Initial & Continuing Losses

Impervious Area		Pervious Area	
IL (mm)	**CL (mm/hr)**	**IL (mm)**	**CL (mm/hr)**
0	0	42	3.9

Analysis of the catchment has been undertaken to determine the average slope, with the results of this being applied to the model.

Table C.5-2 Pre-Development Catchment Parameters

Catchment	Impervious Area			Pervious Area		
	Area (ha)	**Fraction Impervious (%)**	**Slope (%)**	**Area (ha)**	**Fraction Impervious (%)**	**Slope (%)**
Pre A	0.124	100	5	0.005	0	10

Table C.5-3 Post-Development Catchment Parameters

Catchment	Impervious Area			Pervious Area		
	Area (ha)	**Fraction Impervious (%)**	**Slope (%)**	**Area (ha)**	**Fraction Impervious (%)**	**Slope (%)**
Post A	0.104	100	5	0.025	0	1

Appendix D MUSIC Input Parameters

Rainfall and Evapotranspiration Parameters

MUSIC modelling was based on 6-minute interval data obtained from the Bureau of Meteorology (BOM) for rainfall station 40584 HINZE, as summarised in Table D.5-1.

Table D.5-1 Meteorological and Rainfall Runoff Data Reporting Table

Input	Data Used in Modelling
Rainfall station	40584 HINZE
Time step	6 minute
Modelling period	1-01-1976 to 31-12-1985 (10 years)
Mean annual rainfall (mm)	1371
Evapotranspiration	1445
Rainfall runoff parameters	Residential
Pollutant export parameters	Residential

Catchment Parameters

Based on the proposed land uses within the development, the subject site has been modelled as commercial land use as detailed in Table D.5-2. The site has been divided into roof and ground level source nodes as per the architectural drawings included in Appendix A.

Table D.5-2 Land Use Parameters

Catchment ID	Area (ha)	Land use	Total Impervious (%)
A - Roof	0.061	Mixed	100
A- Ground	0.042	Mixed	40
A - Road & Carpark	0.025	Mixed	100

The MUSIC catchment plan with full breakdown of roof and ground areas is presented in 0. The pollutant loads and runoff parameters for each source node have been based on the data from the Water by Design MUSIC Modelling Guidelines (Water By Design, 2010), as summarised in Table D.5-3 and Table D.5-4.

Table D.5-3 Rainfall Runoff Parameters

Parameter	All Nodes
Landuse	Residential
Rainfall threshold (mm)	1
Soil storage capacity (mm)	500
Initial storage (% capacity)	10
Field capacity (mm)	200
Infiltration capacity coefficient a	211
Infiltration capacity exponent b	5
Initial depth (mm)	50
Daily recharge rate (%)	28
Daily baseflow rate (%)	27
Daily deep seepage rate (%)	0

Table D.5-4 Pollutant Load Parameters

Urban Residential	Total Suspended Solids (log mg/L)		Total Phosphorous (log mg/L)		Total Nitrogen (log mg/L)	
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Storm Flow Concentration	1.30(1) 2.43(2) 2.18(3)	0.39	-0.89(1) -0.30(2) -0.47(3)	0.31	0.26	0.23
Base Flow Concentration	0(1) 1(2,3)	0(1) 0.34(2,3)	0(1) -0.97(2,3)	0(1) 0.31	0(1) 0.20(2,3)	0(1) 0.20(2,3)

NOTE: (1) Values applied to “Roof” areas
(2) Values applied to “Road” areas
(3) Values applied to “Ground” areas

Treatment Node Parameters

The following sections describe the modelling parameters applied to MUSIC for each of the treatment nodes included as part of the water quality assessment.

Catchment A1

1 x OceanGuard System

The input parameters for the OceanGuard system are summarised in Table D.5-5.

Table D.5-5 OceanGuard Parameters

Parameter	Value
Low-Flow Bypass (m3/s)	0.00
High Flow Bypass(m3/s)	0.02
Target Element	Gross Pollutants (kg/ML)
Gross Pollutant Transfer Function	Concentration Based Capture Efficiency
Concentration Based Capture Efficiency	Input: 0.00 – 14.78 Output:0.00 – 0.00

DN3250 8.2m^2 SF Chamber

TableD 5-6 - SF Chamber Parameters

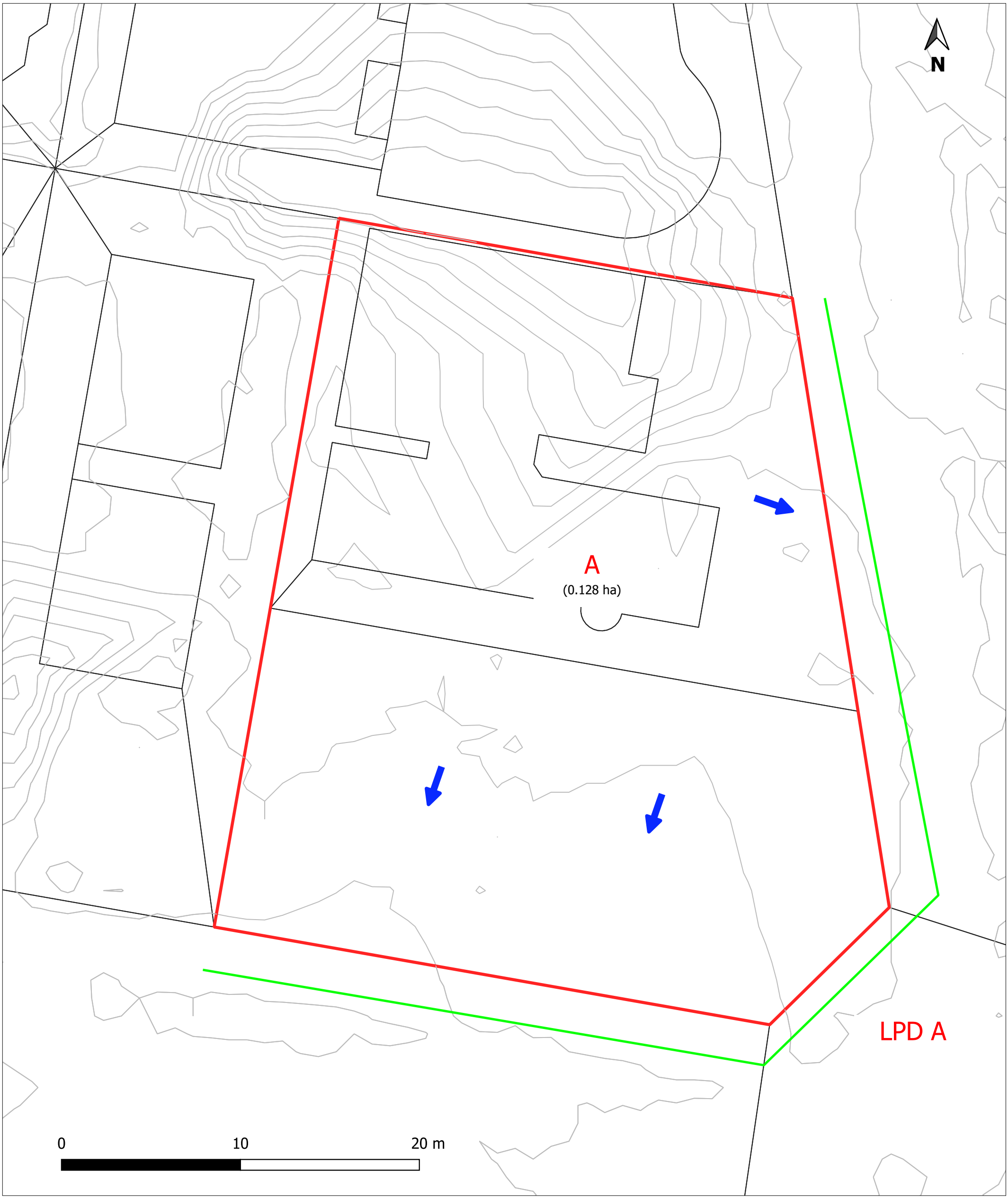
Parameter	Value
Low-Flow Bypass (m3/s)	0
High-Flow Bypass (m3/s)	100
Surface Area (m^2)	6
Extended Detention Depth (m)	0.54
Outlet Properties	
Equivalent Pipe Diameter (mm)	64
Overflow Weir Width (m)	2
Notional Detention Time (hrs)	0.128

460 PSorb Stormfilter

TableD 5-7 - PSorb Stormfilter

Parameter	Value
Low-Flow Bypass (m3/s)	0.00
High Flow Bypass(m3/s)	0.00552
Target Element	Flow (m3/s)
Gross Pollutant Transfer Function	Concentration Based Capture Efficiency
Concentration Based Capture Efficiency	Inflow: 0.00 – 10 Outflow: 0.00 – 10

Appendix E Burchills Engineering Solutions Catchment Plans



99 & 101 Old Burliegh Road, Broadbeach

Pre-Development Catchment Plan

Project: BE210274	Date:18/10/2021
Scale: 1:200 at A3	Projection:
Data Sources:	

Legend

- Catchment
- Pre-Development LPD
- Flow_path

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N

LPD A

A
(0.128 ha)

0 10 20 m

99 & 101 Old Burliegh Road, Broadbeach

Post-Development Catchment Plan

Project: BE210274	Date:1/11/2021
Scale: 1:200 at A3	Projection:
Data Sources:	

Legend

- Catchment
- Pre-Development LPD
- Flow_path
- Strormwater Treatment Tank

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N

Catchment A

Roof: 0.061 ha
Ground: 0.042 ha
Road & Carpark: 0.025 ha

Total Area: 0.128 ha

A
(0.128 ha)

0 10 20 m

99 & 101 Old Burliegh Road, Broadbeach

Music Catchment Plan

Project: BE210274	Date:01/11/2021
Scale: 1:200 at A3	Projection:
Data Sources:	

Legend

Music Catchments

- Roof
- Road
- Ground

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Appendix F Burchills Engineering Solutions Operational Control Plan

Proposed 0.45x0.45 m
Standard surcharge pit
Pit to surcharge at surface level

Note: Tank To Be Suspended From
Roof Of Basement Level 1

Proposed Stormwater Treatment
(Within Underground Detention Tank)
12xOceanprotect's 460 Psorb Stormfilter

1xOceanprotects
OceanGuard

Stormwater Treatment Tank
Area: 10m²
Depth: 0.8m

Proposed Stormwater Line To Tap Into
Existing Stormwater Drainage Pipe

Existing Stormwater Drainage Pipe

Sump Pump and Gross
Pollutant Trap To Be
Installed Below Basement 3
(Location is Only Indicative)

PROPOSED DEVELOPMENT

DEEP PLANTING ZONE

STORMWATER TANK

PEDESTRIAN SIGHT TRIANGLE TO BE KEPT CLE
OF OBSTRUCTION TO VISIBILITY. LOW LEVEL
APING PERMITTED TO A MAXIMUM MATU
OF 500mm ABOVE DRIVEWAY LEVEL

PEDESTRIAN SIGHT TRIANGLE
TO BE DEMOLISHED

PUMP ROOM

F/S

24 CARS
RL 2.200

WATER TANKS

DEEP PLANTING ZONE

OLD BURLEIGH ROAD

ARMRICK AVENUE

Telstra Pit

Water Meter

Sewer M/H
SL 5.114

Stormwater M/H
SL 5.330

Sewer M/H
SL 4.910

Stormwater M/H
By Records

TREE
Ht = 5
Spread = 2.0
Trunk = 0.10
Type = PALM

LEGEND

- POST-DEVELOPMENT CATCHMENT
- SW — PIPE DRAINAGE
- ON-SITE TREATMENT TANK

SCALE 2 0 2 4 6 8 10 (metres)
1 : 200 (FULL SIZE)

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

FOR

BAM PROPERTY GROUP

ORIGINAL SCALE BEFORE REDUCTION
A3 0 10 20 30 40mm.

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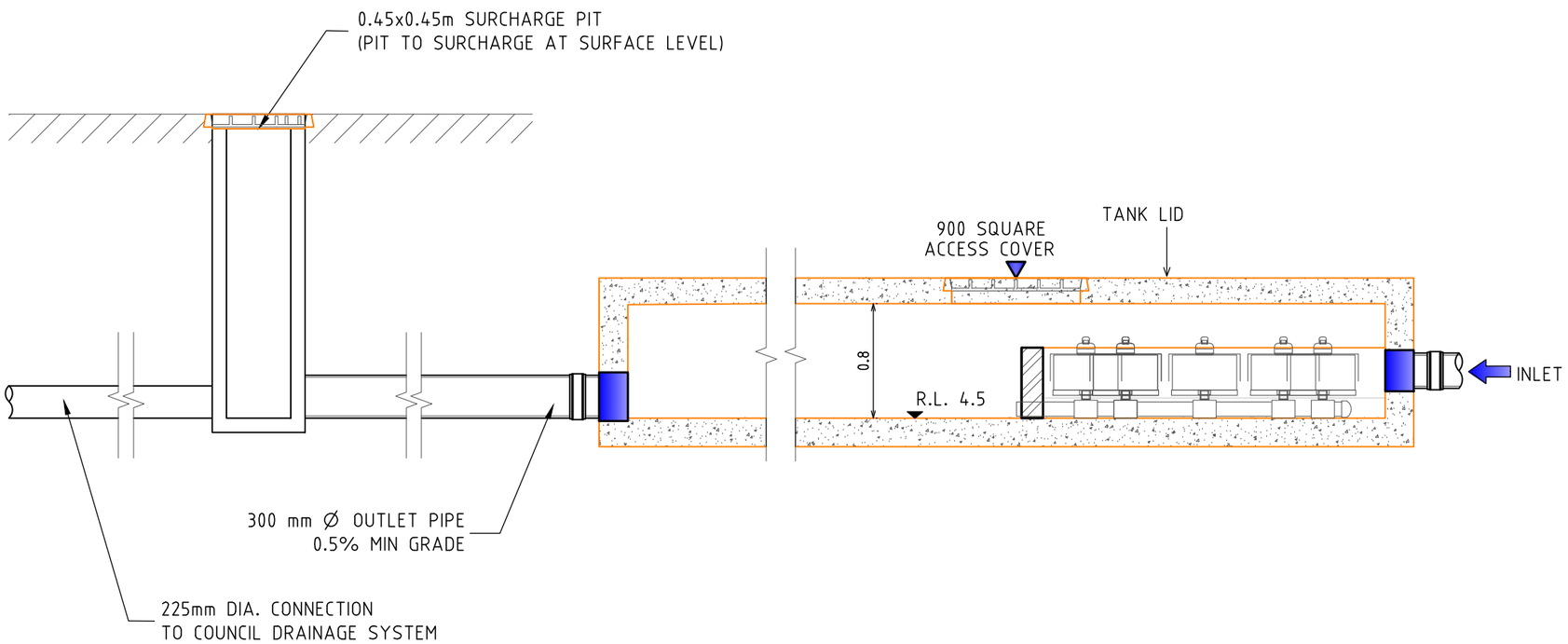
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DRAWING TITLE :

OPERATIONAL CONTROL PLAN

DEVEL. APPLIC. No. :	DATE : 01.11.21
PROJECT LEADER : Joshua Micallef	
DESIGNER : Joshua Micallef	
DRAFTSPERSON : TP /	
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RPEQ No. : 21773	
SCALE : 1:200	DATUM : / FULL SIZE : A3
PROJECT No.: BE210274	DRAWING No. : N400 / VERSION: A



TREATMENT TANK SECTION

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

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ORIGINAL SCALE BEFORE REDUCTION

A3 0 10 20 30 40mm.

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DRAWING TITLE :

OPERATIONAL CONTROL PLAN
TYPICAL CROSS SECTION

DEVEL. APPLIC. No. :	DATE : 01.11.21
PROJECT LEADER : Joshua Micallef	
DESIGNER : Joshua Micallef	
DRAFTSPERSON : TP /	
CHECKED : Jonathan Cuell	
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365 RPEQ No. : 21773	
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PROJECT No.: BE210274	DRAWING No. : N401 / VERSION: A

APPENDIX F WASTE MANAGEMENT PLAN

Enviro

DELIVERING ENVIRONMENTAL SOLUTIONS

WASTE MANAGEMENT PLAN

99 & 101 Old Burleigh Road
Broadbeach

Prepared for
BAM PROPERTY GROUP
C/- Urbis

Prepared By
GGENVIRO

Revision A
November 2021

Commercial in Confidence

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File Name:	WMP 99 & 101 Old Burleigh Rd Nov2021 RevA

REVISION

Date	Status	Type	Reviewer	Approver(s)
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2/11/2021	RevA	WMP	RHenry	LRose

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Figure 2: Ground layout and bin storage areas. 13

ATTACHMENTS

Attachment A: *9.4.12 Solid Waste Management Code (v.8)*, City of Gold Coast.

1.0 DEFINITIONS

Bin carting route – the proposed route to move bins between the storage point and the servicing point.

Bulk bins – bins fitted with lids and side pockets to allow them to be serviced by a front-lift truck.

Clinical or related waste – waste that has the potential to cause disease, including, for example: animal waste, discarded sharps, human tissue waste, or laboratory waste.

Commercial accommodation – for the purposes of this report means commercial development that includes a domestic or residential component, such as Retirement facility, Community care centre, Rooming accommodation, Short term accommodation or Resort complex.

Commercial premises – for the purpose of this report means any of the following types of premises: a Hotel, Short term accommodation, Tourist park, Food and drink outlet, an assembly building, institutional building, Child care centre, Educational establishment, premises where a sport or game is ordinarily played in public, an exhibition ground, show ground or racecourse; or an Office, Shop or other premises where business or work other than a manufacturing process is carried out.

Commercial waste – means waste, other than green waste, recyclable waste, and interceptor waste or waste discharged to a sewer, produced as a result of the ordinary use or occupation of commercial developments.

Common servicing point – a common area where more than two dwellings/tenancies stand their bins for servicing.

Common storage point – a common area where more than two dwellings/tenancies store their bins.

Constructed hardstand area – a hardstand area, for example a concrete pad which has been constructed for bin storage.

Digesters and dehydrators - machines specifically designed to reduce food waste volumes to allow for efficient disposal. Digesters typically process the material into sludge while dehydrators remove liquid from food waste generating a fertiliser as the end product. Disposal of end product can be used on either internal gardens or on external gardens/farms.

Drive-on service – where the waste collection vehicle services bulk bins on site, bins are to be positioned for direct access/servicing without the need for manual handling by the waste vehicle driver or other person.

General waste – waste, other than domestic clean-up waste, green waste, recyclable waste, interceptor waste or waste discharged to a sewer, produced as a result of the ordinary use or occupation of domestic or commercial premises.

Glass crushers - machines that can reduce the volume of glass waste by up to 75%, saving valuable space.

Hazardous waste - solid waste that is or contains toxic material, for example light bulbs, fluorescence lights, batteries.

Internal servicing roadway – is a driveway, private roadway or other path intended for use by vehicles, in which the waste collection vehicle is required to use to service a bin.

Mixed-use development – for the purpose of this report, any building or development complex used, or intended to be used, for residential purposes in combination with other commercial uses (e.g. Offices, Food and drink outlets etc.).

Non-serviced area – an area within the boundaries of City of Gold Coast which is not serviced by Council's waste collection contractor.

Organic waste - is waste that comes from plants or animal that is biodegradable for example green waste and food waste.

Recycling chute - a duct in which recycling descends from one point to another.

Recyclable waste – for a local government's area, means clean and inoffensive waste that is declared by the local government to be recyclable waste for the area. In the City of Gold Coast the following wastes are deemed recyclable: all household plastics, bottles and containers; aluminium and steel cans and aerosols; bottles and jars made only of glass; clean cardboard, newspaper, loose paper, junk mail, magazines and cartons.

Related waste – means waste that constitutes, or is contaminated with, chemicals, cytotoxic drugs, human body parts, pharmaceutical products or radioactive substances.

Ro-Ro bin – roll-on roll-off bin.

Roll-on roll-off bin – large steel open top skip bins or enclosed bins. Bins are collected by a hook-lift truck.

Solid waste – any general or recyclable waste, be it commercial or domestic. Solid waste does not include waste discharges to sewer/water or the atmosphere.

Servicing point – the designated area allocated to the temporary storage of waste bins for the period of servicing only. The point may be within or external to a development.

Storage point – the area allocated to the permanent storage of waste bins. This is the normal location of the waste bins and excludes the period where the bin is serviced. A storage point may be a common storage point or an individual bin storage point.

Waste – includes any thing, other than a resource that is: left over, or an unwanted by-product from an industrial, commercial, domestic or other activity; or surplus to the industrial, commercial, domestic or other activity generating the waste.

Waste carting distance – the distance required for a person to transport their waste from the nearest point of exit of their dwelling/tenancy to a storage point (or in the case of a multi-level building, to the nearest waste disposal point).

Waste chute – a duct in which waste descends from one point/level to a collection bin.

Waste disposal point – the point where waste is disposed of into the chute, also known as waste hopper. It consists of a fixed frame and hood unit, covered with a hinged or pivoted door.

Waste storage room – the room at the base of the chute used for the storage of waste bins.

Wheelie bin – two wheeled mobile garbage bins, made from high density polyethylene (HDPE). Wheelie bins are collected by a side-lift truck.

2.0 INTRODUCTION

2.1 DEVELOPMENT BACKGROUND

The applicant, FMF Property Trust ATF BAM Property Group (Australia) Pty Ltd proposes to construct a mixed-use, high-rise development at 99 & 101 Old Burleigh Road, Broadbeach. GG Enviro has been commissioned to prepare this Waste Management Plan (WMP) to be submitted to City of Gold Coast (Council) as a component of the Development Application for the site. This WMP ensures that the waste storage and collection activities for the operational phase of the development are in accordance with *SC6.15 City Plan Policy v.8 - Solid Waste Management* (City of Gold Coast, 2020).

2.2 SITE DETAILS

The development site is located at 99 & 101 Old Burleigh Road, Broadbeach across a 1,283m^2 parcel of land described as Lot 70 on B8383 and CP on BUP104138 (refer **Figure 1**). The site is bound by Old Burleigh Road to the east of the site, Armrick Avenue to the south of the site and existing developments to the west and north of the site.

The development is proposed to include a 45 storey, mixed-use high rise building across the extent of the site. The development will include three levels of basement car parking with additional parking provided at ground level and levels 1 & 2. A 75m^2 café will be provided at ground level along with supporting communal facilities. Communal facilities including a pool and gym will also be provided at level 3. Residential dwellings are proposed from level 4 to level 45 in the tower above consisting of 36 x 3 bedroom units, 22 x 4 bedroom units and 1 x 5 bedroom unit (i.e. 59 dwellings in total).

2.3 PURPOSE AND SCOPE

This report represents a Waste Management Plan for the operational phase of the development which includes:

- Details on the anticipated type and quantity of waste (**Section 3.0**);
- Details of the waste storage room requirements and waste storage bins (**Section 4.0**); and
- Details of the proposed waste collection arrangements (**Section 5.0**).

Council's Solid Waste Management Code (v.8) has also been addressed and is included in **Attachment A**.

This report presents conceptual information on the above dot points, rather than involving detailed designs and calculations. At the current phase of the proposal, the development of detailed engineering designs in regards to waste storage and collection is not practical.

3.0 WASTE AND RECYCLING GENERATION

3.1 TYPE OF WASTE

The residential component of the development and the commercial component (café) are both expected to generate general waste and recycling material only.

3.2 WASTE VOLUMES

Calculations of the anticipated waste quantities from the development were performed using typical waste generation rates as provided by Council in *SC6.15 City Plan Policy v.8 - Solid Waste Management* (City of Gold Coast, 2020).

Table 1 below displays the anticipated volume of general waste, while **Table 2** displays the anticipated volume of recycling material expected to be generated from the residential components of the development.

Table 1: Anticipated general waste quantities for the residential components of the development.

Dwelling type	No.	Waste Generation Rate (L/wk/dwelling)	Estimated Waste Generation (L/week)	Estimated Waste Generation (m^3/week)	Estimated Waste Generation (m^3/day)
3 bedroom	36	120	4,320	4.32	0.62
4 bedroom	22	120	2,640	2.64	0.38
5 bedroom	1	120	120	0.12	0.02
TOTAL	**59**	**NA**	**7,080**	**7.08**	**1.01**

Table 2: Anticipated recycling quantities for the residential components of the development.

Dwelling type	No.	Waste Generation Rate (L/wk/dwelling)	Estimated Waste Generation (L/week)	Estimated Waste Generation (m^3/week)	Estimated Waste Generation (m^3/day)
3 bedroom	36	120	2,880	2.88	0.41
4 bedroom	22	120	1,760	1.76	0.25
5 bedroom	1	120	80	0.08	0.01
TOTAL	**59**	**NA**	**4,720**	**4.72**	**0.67**

Table 3 below displays the anticipated volume of general waste and recycling material that is expected to be generated from the café.

Table 3: Anticipated general waste and recycling quantities for the café.

Use	Approximate Floor Space (m^2)	Waste Type	Waste Generation Rate (L/100m2/day)	Estimated Waste Generation (L/week)	Estimated Waste Generation (m^3/week)	Estimated Waste Generation (m^3/day)
Café	75	General Waste	300	225	1.58	0.23
		Recycling	200	150	1.05	0.15

The entire development is expected to generate approximately 8.66m^3 per week of general waste, and 5.77m^3 per week of recycling material.

4.0 WASTE AND RECYCLING STORAGE

Section 4 outlines the general design criteria of the waste storage and servicing areas as required by *SC6.15 City Plan Policy v.8 - Solid Waste Management* (City of Gold Coast, 2020) along with a description of the proposed bins to be used. Should the proposed development be unable to meet any of the following requirements, alternative arrangements may be negotiated with Council at the appropriate time.

4.1 BIN STORAGE ROOM

The development is proposed to include a single bulk bin storage room at ground level below a dual waste chute system for the collection of all waste generated by the residential dwellings and the café (**Figure 2**). Importantly, for health and safety purposes, this room will be divided to separate the café bin storage area from the waste chute area where the residential bulk bins will be stored. Any waste generated from communal facilities will be collected by site management staff and emptied into the appropriate bulk bins in the bin storage room. The waste chute area will only be accessible to site management.

A temporary bin storage point will also be provided adjacent to the site entry for the temporary storage of bulk bins prior to servicing. It will be the responsibility of site management to cart the bulk bins from the bin storage room to the temporary bin storage point for servicing.

The bin storage room will be sized to cater for the general and recycling bulk bins provided for the residential components and the café and will include dual waste chutes as a pest practice waste management solution for all residential waste disposal.

The bulk bin storage room will be designed and constructed to meet the requirements listed below. The bulk bin storage room will be:

1. Designed to allow the bins to be easily transported to a separate servicing point (no steps or lips on bin-carting route).
2. Waste-carting distance will not exceed 60 metres and in any case be reasonable to ensure ease of use.
3. Located at least five (5) metres from any door, window or fresh air intake within the development or any adjoining site.
4. Screened to ensure bins are not visible from a public place or sensitive land use.
5. Provided with safe access to the disposal area.
6. Of sufficient size to accommodate the required number of bins.
7. Designed to allow for at least an additional 0.5 metre clearance surrounding each bin.
8. Provided with adequate storage for recyclable waste that all users can safely and easily access via the provision of suitably located bulk bins.
9. Constructed hardstand area with a solid concrete base or acceptable equivalent.
10. Roofed and designed to prevent rainwater entry.
11. Graded to fall to a drainage point within the storage room.
12. Drainage point will be connected to sewer in accordance with trade waste requirements.
13. Provided with a hosecock for cleaning bins and the room (i.e. the bin storage room will be utilised as the bin wash facility).
14. Located in a in a purpose-built storage area which is air locked (under negative pressure), fly and vermin proofed, and used solely for the storage of waste.

15. Fire rated and ventilated in accordance with the National Construction Code – Building Code of Australia.
16. Doors will be wide enough to allow for the easy removal of the largest container to be stored.
17. The walls, ceiling, floor and equipment of each waste storage room will be designed and constructed of impervious material with a smooth finish to allow for easy cleaning.
18. Provided with adequate artificial lighting.
19. Not located adjacent to or within any habitable portion of a building or place used in connection with food preparation (including food storage).
20. Permit unobstructed access for removal of the bins to the service point and for positioning of the bins correctly in relation to the waste chutes.

Note that it will be the responsibility of site management to wash bins and to maintain the cleanliness of the bins and waste storage areas.

4.2 WASTE CHUTES

General waste and recycling material will be delivered to the waste storage room at ground level via a dual waste chute system. Importantly, for health and safety purposes, the waste storage room containing the residential bulk bins will only be accessible to site management. This area will be partitioned from the café bin storage area within the bin storage room. The waste chutes will be constructed to meet the requirements listed below:

1. Adequate strength for their purpose, including additional reinforcing where necessary at joins, bends and hopper intersections.
2. Insect and vermin proof.
3. Constructed and installed to prevent the following during use and operation of the system:
   - transmission of vibration to the structure of the premises;
   - excessive odour – there must not be a noticeable odour beyond the waste disposal and storage points;
   - excessive noise to the occupants of the building.
4. Installed in a 'fire rated' duct and ventilated in compliance with building requirements of the National Construction Code – Building Code of Australia.
5. Comply with the waste chute manufacturer's technical specifications and/or operational limitations, including installation design features and ancillary equipment required to prevent blockages and noise disturbances, to achieve compliance with the section.
6. Fitted with a shutter at the base of the chutes for closing off the chutes manually during bin exchange and automatically in the case of fire.

4.3 WASTE DISPOSAL POINT

A waste disposal point will be provided for residents on each level of the building and will be designed and constructed to meet the following requirements. The waste disposal points will be:

1. Located on each floor in a position which is:
   - freely ventilated in the open air (sheltered balconies), or in a dedicated room or compartment;
   - easily accessible by the occupants of each apartment;
   - separated from any habitable portion of a building or place used in connection with food preparation or storage.
2. Located to ensure the handle of the hopper is at least 1,200 millimetres above finished floor level.
3. Hopper door automatically returns to the closed position after use.
4. Designed to permit free flow of waste into the chute.
5. The general waste chute will be constructed so that the diameter or largest dimension of the service opening (the diagonal of a rectangular opening) does not exceed three quarters (3/4) of the diameter of the chute with which the hopper is connected.
6. The recycling chute will be constructed so that the diameter (or largest dimension of opening) of the chute hopper does not exceed one half (1⁄2) of the recyclable chute diameter.
7. The floor adjacent to the hopper is to be constructed of a durable impervious material with a smooth finished surface.
8. On-going education and signage will be provided to ensure residents continue to use the facilities as intended. Signage will be installed at disposal points to promote the importance of recycling and the appropriate waste types for each chute.

4.4 PROPOSED WASTE BINS

To ensure that the bulk bin storage area provided for the development is sufficiently sized, details of the type and quantity of waste and number of bins to be stored are provided in **Table 4** below.

Table 4: Details of waste and bins required for the proposed development.

Use	Waste Type	Waste Quantity (m^3/week)	Proposed Bins	Servicing frequency*	Comments
Residential	General waste	7.08	1 x $2m^3$ bulk bin	Four per week	Bins to be carted by site management to the temporary bin storage point and serviced on Armrick Avenue by the contracted service provider.
	Recycling	4.72	1 x $2m^3$ bulk bin	Three per week	
Café	General waste	1.58	1 x 660L bulk bin	Three per week	
	Recycling	1.05	1 x 660L bulk bin	Two per week	

*Once the development is operational, the collection frequency should be reviewed to ensure that it is sufficient but not excessive for the development. It is unlikely that the development will operate at 100% occupancy at all times, however the above calculations are based on this assumption as a conservative approach.

4.5 BIN DIMENSIONS

Table 4 below provides dimensions of the bins to be used on-site.

Table 5: Dimensions of proposed waste storage containers.

Bin Type	Volume	Length (mm)	Width (mm)	Height (mm)	Collection Vehicle Type
Bulk bin	660L	1,510	780	1,330	Front lift truck
Bulk bin	$2m^3$	2,050	965	1,553	Front lift truck

5.0 SERVICING

5.1 TEMPORARY BIN STORAGE POINT

The bulk bins will be carted by site management to a 'temporary bin storage point' within the site and adjacent to the site entry driveway (refer to **Figure 2**). The contracted service provider will service the bins on Armrick Avenue and return the empty bins to the temporary bin storage point following servicing. It will be the responsibility of site management to return the bins to the waste storage room at ground level following servicing.

Given that the development will require four bulk bins (two for general waste and two for recycling material) the temporary bin storage point will be designed to cater for two bulk bins only, as the general and recycling bins will be collected on alternating days by the service provider.

The temporary bin storage point will be designed and constructed to meet the requirements listed below. The temporary bin storage point will be:

1. Provided with sufficient access and clearance for the waste and recycling collection vehicles to service the bins, including adequate unobstructed overhead space for the swinging arm action of the waste collection vehicle.
2. Bins serviced safely while minimising the impediment of traffic flow during servicing.
3. Clearly separated from car parking bays, loading bays, footpaths and pedestrian access, and any other similar areas.
4. Clear of speed control devices or similar provisions which inhibit direct access to the bins for servicing.
5. Bin carting route will allow bins to be easily manoeuvred and be devoid of steps or steep rises.
6. Bin carting route will not extend through habitable parts of a building, or a food premises, and only occur through common property or publicly accessible locations.
7. Located over five metres from any door, window or fresh air intake within the development or any adjoining site.
8. Bins will be removed from and returned to the storage point by the service provider.
9. Constructed hardstand with a solid concrete base or acceptable equivalent.
10. Positioned on a level pad within the site, not more than five (5) metres from the property boundary, level with the kerbside and adjacent to a driveway or other approved crossover on the public roadway.
11. Connected to the crossover by a paved path so that the bin can be manoeuvred for servicing without lifting the bin over raised surfaces (pram ramp).
12. Not be situated within twenty (20) metres of an intersection (including opposite a T-intersection) or roundabout.
13. Designed with at least an additional 0.3 metre clearance surrounding each bin.
14. The height of the temporary bin storage point will allow for waste bin lids to be opened and closed.
15. Screened to minimise the view of bins from neighbouring properties, or passing vehicles and pedestrian traffic external to the site.

16. Bin carting will be via hard stand pathways or internal roads, and will be easily moved to the temporary storage point to the east of the property entry point, and not stored on a section of the driveway that falls away (e.g. to the basement).
17. The proposed bin carting route does not include pedestrian footpaths and carting occurs within the property boundary.
18. Positioned away from entrances to shops or residential premises.

5.2 COLLECTION VEHICLES

Table 6 details the dimensions of the waste collection vehicles that will service the development. Front lift service vehicles will empty the bulk bins on Armrick Avenue in a clear area with no overhead obstructions.

Table 6: Front lift service vehicle dimensions.

Vehicle type	Travelling Height	Width	Length	Servicing Height	Total Tonnage (maximum)	Min Turning Circle (wall to wall)	Min Turning Circle (kerb to kerb)
Front lift truck	4.3m	2.5m	10.2m	6.4m	27.5 tn	13.2m	12.3m

Suitable clearance is available at the proposed servicing point ensuring safe access and unimpeded operation of the vehicles when servicing the bins (noting that suitable clearance = servicing height of 6.4m + 100mm).

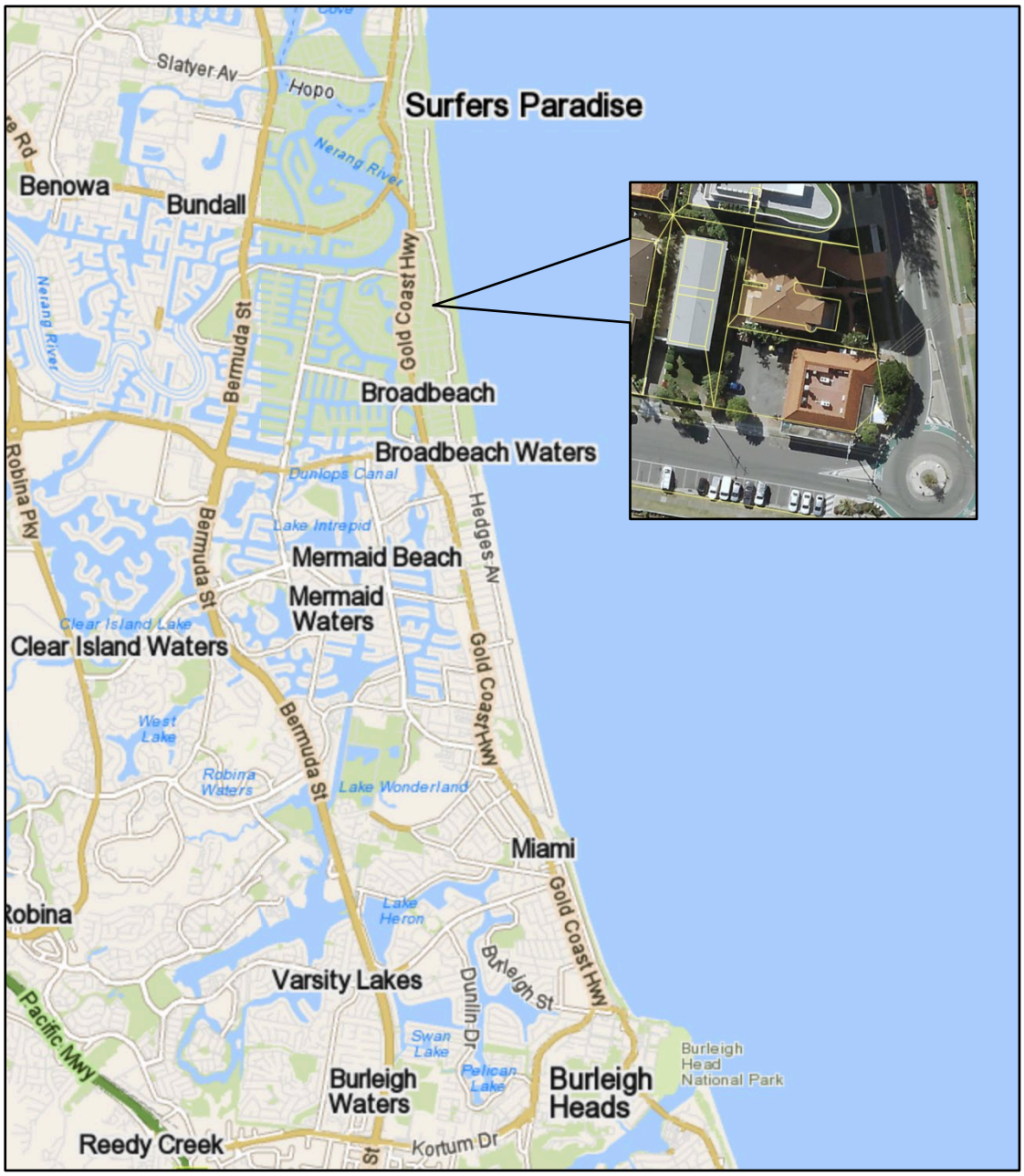
6.0 CONCLUSION

This Waste Management Plan has been prepared in order to provide conceptual details for an efficient and compliant waste management system in the operational phase of the development. Further detail on the engineering specifics regarding waste area design and drainage will be completed by others.

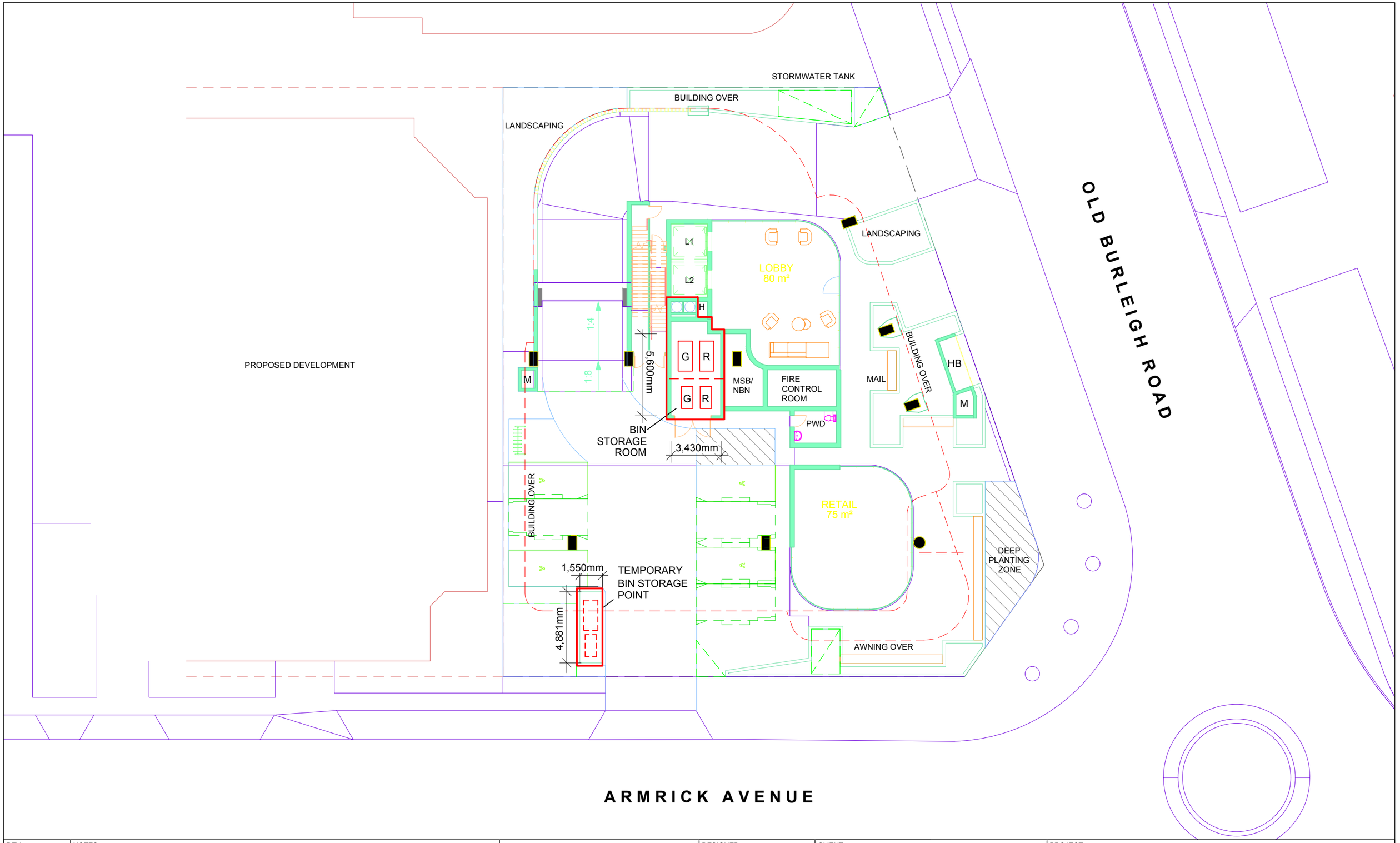
The following details provide a summary of the proposed development and the related waste management requirements:

- The proposed development is for a 45 storey, mixed-use high-rise tower across a 1,283m^2 parcel of land at 99 & 101 Old Burleigh Road, Broadbeach;
- The development will include three levels of basement car parking with additional parking at ground level and levels 1 & 2;
- A 75m^2 café and supporting facilities will be provided at ground level. Communal facilities including a pool and gym will also be provided at level 3;
- Residential dwellings will in the high-rise tower above will consist of 36 x 3 bedroom units, 22 x 4 bedroom units and 1 x 5 bedroom unit (i.e. 59 dwellings in total);
- Waste from the development is expected to consist of general waste and recycling material only;
- The development is expected to generate approximately 8.66m^3 per week of general waste, and 5.77m^3 per week of recycling material;
- Residents will be provided with a waste hoppers on each level for disposal of general waste and recycling material via dual waste chutes;
- The waste chutes will deliver segregated waste into the appropriate bulk bins stored in a dedicated bin room at ground level;
- Any waste generated from the communal areas of the site will be collected by site management and disposed of in the provided bulk bins at ground level;
- The bulk bin storage room at ground level will be partitioned with the café bulk bins stored in an area that is separated from the waste chute room for health and safety purposes;
- Site management will cart the bulk bins from the bin storage room to a temporary bin storage point adjacent to the site entry driveway;
- The bin storage areas will be designed and constructed in accordance with Council's Solid Waste Management Policy requirements;
- Bin wash facilities will be provided in the bin storage room and it will be the responsibility of site management staff to maintain the amenity of the bins and bin storage areas;
- The general waste bulk bins will require servicing up to four times per week, while the recycling bulk bins will require servicing up to three times per week;
- Servicing will be conducted by a front lift service vehicle on Armrick Avenue.

Figure 1: Site location map.



Proposed development site at 99 & 101 Old Burleigh Road, Broadbeach.



REV	NOTES		DESIGNED	CLIENT	PROJECT
	Adapted from original prepared by Ferro Arch Pty Ltd.	Enviro DELIVERING ENVIRONMENTAL SOLUTIONS	LR	BAM PROPERTY GROUP, C/- URBIS	WASTE MANAGEMENT PLAN 99 & 101 OLD BURLEIGH ROAD, BROADBEACH
			APPROVED LR	JOB NO. GGA21-0107 / DATE NOVEMBER 2021	TITLE GROUND LEVEL LAYOUT AND BIN STORAGE AREAS
				SHEET SIZE A3 / AHD NA	SCALE NTS / REVISION FINAL / FIGURE FIGURE 2

ATTACHMENT A

9.4.12 Solid Waste Management Code (v.8), City of Gold Coast.

Performance Outcomes	Acceptable Outcomes	Confirmed	Comments
Waste and recycling storage and bin wash-down facilities			
PO1 Development provides waste and recycling storage facilities that are appropriate and adequate for the type and volume of waste generated.	**AO1.1** Development includes waste storage points of sufficient size to accommodate the required number of waste and recyclable bins consistent with **SC6.15 City Plan policy – Solid waste management**.	Y	The development includes waste storage points of sufficient size to accommodate the required number of waste and recyclable bins consistent with **SC6.15 City Plan policy – Solid waste management**.
	AO1.2 Waste and recycling storage points are located, designed and sized consistent with **SC6.15 City Plan policy – Solid waste management**.	Y	The development includes waste and recycling storage points that are located, designed and sized consistent with **SC6.15 City Plan policy – Solid waste management**.
	AO1.3 Development with a dwelling above the third storey include appropriate waste removal systems which incorporate: (a) waste chutes; (b) hoppers; and (c) separate waste storage rooms. **Note: Waste removal system design is to be consistent with SC6.15 City Plan policy – Solid waste management.**	Y	The development includes dwellings above the third storey and therefore includes appropriate waste removal systems which incorporate: (a) waste chutes; (b) hoppers; and (c) separate waste storage rooms. The waste removal system design is consistent with **SC6.15 City Plan policy – Solid waste management**.
	AO1.4 Developments that include a commercial kitchen or generate clinical or related waste incorporate additional waste facilities consistent with **SC6.15 City Plan policy – Solid waste management**.	na	The development does not include a commercial kitchen or generate clinical or related waste.
PO2 Development provides a bin wash-down facility that maintains appropriate environmental health and amenity standards.	**AO2** Development includes appropriately sized and located bin wash-down facilities consistent with **SC6.15 City Plan policy –Solid waste management**.	Y	The development includes appropriately sized and located bin wash-down facilities consistent with **SC6.15 City Plan policy – Solid waste management**.
Amenity			
PO3 Waste and recycling storage and servicing points are appropriately located and designed for convenient and safe access by all users and to minimise the potential for nuisance to occupants of the development or adjoining properties.	**AO3.1** Direct unobstructed paths exist between waste and recycling storage and servicing points and road frontages.	Y	Direct unobstructed paths exist between waste and recycling storage and servicing points and road frontages.
	AO3.2 Waste and recycle storage points are screened by solid fencing or vegetation to ensure they are not visible from a public place or sensitive land use.	Y	Waste and recycling storage points are screened by solid fencing to ensure they are not visible from a public place or sensitive land use.

Waste servicing			
PO4 Waste and recycling servicing points are appropriately located and designed to facilitate safe, unobstructed and efficient servicing of waste containers.	**AO4** Waste and recycling servicing points are located, designed and sufficiently sized consistent with **SC6.15 City Plan policy –Solid waste management**. **Note: Regulation of the access, stopping and manoeuvring of refuse collection vehicles are subject to meeting, Part 9.4.13 Transport code and associated City Plan guidelines.**	Y	The waste and recycling servicing points are designed and sufficiently sized in accordance with **SC6.15 City Plan policy – Solid waste management.**
Non-serviced areas			
PO5 Developments in non-serviced areas have appropriate solid waste management measures to adequately service the development. **Note: For Commercial developments a Waste management plan, prepared in accordance with SC6.15 City Plan policy – Solid waste management, is Council's preferred method of addressing the above outcome.**	**AO5** No acceptable outcome provided.	na	The development is located in a serviced area.

APPENDIX G ACOUSTIC REPORT

acousticworks

Proposed Mixed Use Development
99 & 101 Old Burleigh Road
Broadbeach

ACOUSTIC REPORT






Client:
Urbis

Reference:
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1. Introduction

This report is in response to a request by Urbis for an environmental and road traffic noise assessment of a proposed mixed use development located at 99 and 101 Old Burleigh Road, Broadbeach. To facilitate the assessment, unattended noise monitoring was conducted to establish road traffic noise levels in the vicinity of the site and to determine the criteria for onsite activities. Based on the outcomes of the assessment, recommendations for acoustic treatments are specified.

2. Site Description

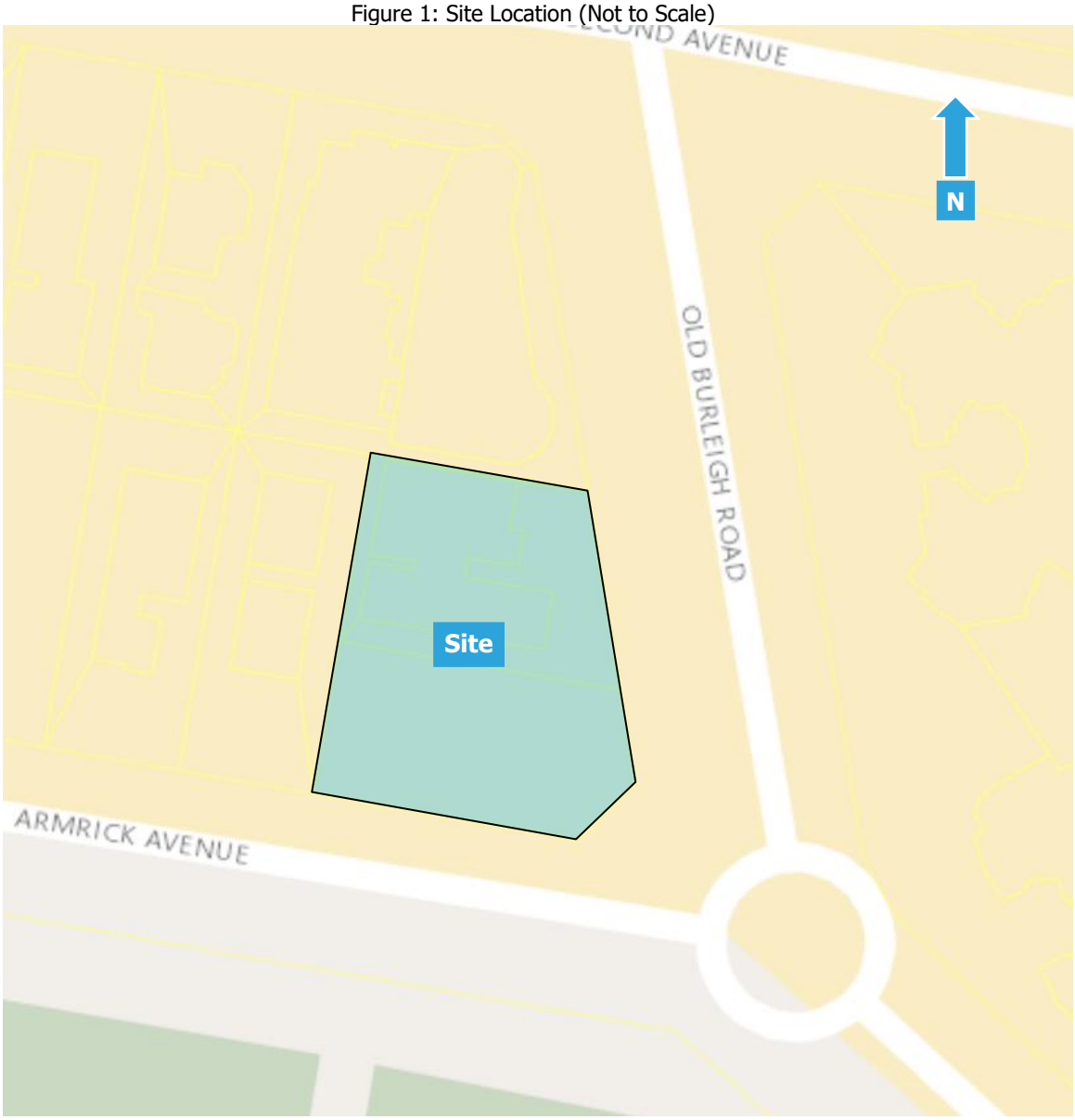
2.1 Site Location

The site is described by the following:

99 & 101 Old Burleigh Road, Broadbeach
Lot 70 on B8383 and CP on BUP104138

Refer to Figure 1 for site location.

Figure 1: Site Location (Not to Scale)



A comprehensive site survey was conducted on 15th September 2021 and identified the following:

a) Single storey commercial premises and a three storey apartment building currently occupy the site and shall be demolished to make way for the proposed development.
b) A three storey apartment building is located adjacent the western site boundary.
c) A ten storey apartment building is located adjacent the northern site boundary.
d) Old Burleigh Road separates the site from a high rise apartment building to the east.
e) Armrick Avenue separates the site from a lawn bowls club to the south of the site.

2.2 Proposal

The proposal is to construct a forty six storey mixed use building comprised of the following:

- Site area of 1,283m^2.
- Parking for 128 cars over three basement levels including ground floor and levels 1 and 2.
- Ground floor food and beverage space and lobby.
- Level 3 - gym, steam room, powder rooms, pool and communal area.
- 55 3 and 4 bedroom units from level 4 to 43.
- Level 44 lounge, kitchen, cinema, dining area and wine bar.
- 4 bedroom penthouse on levels 45 and 46.
- Site access via Armrick Avenue and Old Burleigh Road.

Refer to the Appendices for development plans.

2.3 Zoning

Review of City of Gold Coast zoning indicates that the area of the proposed development is zoned High Density Residential. The surrounding residential receivers are also zoned High Density Residential.

2.4 Acoustic Environment

The surrounding area is primarily affected by noise from the surrounding road network and surf.

3. Equipment

The following equipment was used to record noise levels:

- Rion NL42 Environmental Noise Monitor
- Pulsar Model 106 Ltd Sound Calibrator

The Environmental Noise Monitor holds current NATA Laboratory Certification and was field calibrated before and after the monitoring period, with no significant drift from the reference signal recorded.

4. Receivers and Noise Monitoring

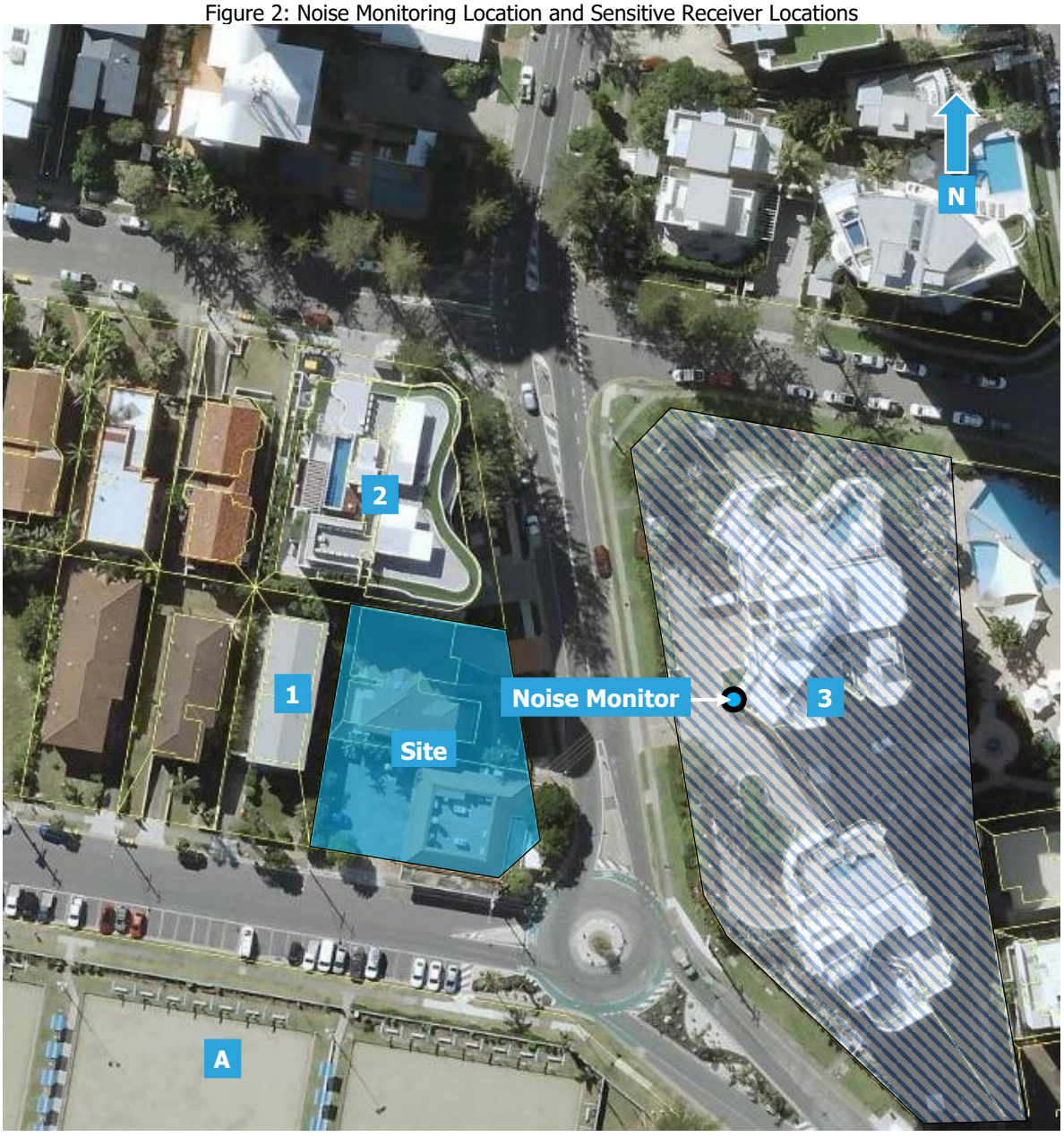
4.1 Receiver Locations

The nearest sensitive receiver locations were identified as follows;

1. A three storey apartment building located adjacent the western site boundary at 9 Armrick Avenue.
2. A ten storey apartment building located adjacent the northern site boundary at 95-97 Old Burleigh Road.
3. Old Burleigh Road separates the site from a high rise apartment buildings to the east of the site at 100 Old Burleigh Road.

These locations were chosen as being representative of the nearest sensitive receivers to the proposed development. Refer to Figure 2 for these locations.

Figure 2: Noise Monitoring Location and Sensitive Receiver Locations



4.2 Offsite Sources

The nearest offsite source with the potential to impact the proposal was identified as follows:

A. Broadbeach Bowls Club located on the southern side of Armrick Avenue at 169 Surf Parade. The operating hours are limited to 8am to 10pm Monday, Tuesday, Wednesday, 8am to 11:30pm Thursdays, 8am to 12am Friday, 9am to 12am Saturday and 9am to 10pm Sunday.

Refer to Figure 2 for offsite source location.

4.3 Road Traffic & Ambient Noise Monitoring

A Rion NL42 environmental noise monitor was placed at 100 Old Burleigh Road approximately 18m from the nearest lane of Old Burleigh Road to measure existing road traffic and ambient noise levels. This location was selected as it was considered representative of the nearest sensitive receivers. The monitor was located in a free field position with the microphone approximately 2.4 metres above ground surface level. The noise monitor was set to record noise levels between the 15th and 23rd of September 2021.

The noise monitor was set to record noise levels in "A" Weighting, Fast response using 15 minute statistical intervals. Ambient noise monitoring was conducted generally in accordance with Australian Standard AS1055:2018 *Acoustics – Description and measurement of environmental noise*. Road traffic noise monitoring was conducted in accordance with Australian Standard *AS2702:1984 'Acoustics – Methods for the measurement of road traffic noise'.*

Refer to Figure 2 for noise monitoring location.

5. Measured Noise Levels

The following tables present the measured existing road traffic and ambient noise levels from the unattended noise survey and meteorological conditions. Any periods of inclement weather or extraneous noise are excluded from the measured data prior to determining the results.

5.1 Meteorological Conditions

Meteorological observations during the unattended noise monitoring survey were obtained from the Bureau of Meteorology website (http://www.bom.gov.au/climate/data), shown in Table 1 below.

Table 1: Meteorological Conditions – Gold Coast

Day	Date	Rainfall (mm)	Wind			
			9am		3pm	
			Speed (km/h)	Direction	Speed (km/h)	Direction
Wednesday	15/09/21	0	22	S	41	SE
Thursday	16/09/21	0	19	SSE	37	SE
Friday	17/09/21	0	13	SSE	17	ENE
Saturday	18/09/21	0	17	NW	15	N
Sunday	19/09/21	0	7	E	19	SE
Monday	20/09/21	0	15	NW	19	NNE
Tuesday	21/09/21	0	15	WSW	28	W
Wednesday	22/09/21	0	17	SSW	46	SE

5.2 Road Traffic Noise Levels

The measured road traffic noise levels at the monitoring location are as follows:

Table 2: Measured Road Traffic Noise Levels

Day	Date	L10 (18h)	Leq(1h) Day	Leq(1h) Night	L90 (8h)	L90 (18h)
Thursday	16/09/21	61.4	65.7	60.7	48.7	53.2
Friday	17/09/21	63.3	65.4	63.7	49.1	51.6
Saturday	18/09/21	63.8	69.4	64.0	48.1	51.6
Sunday	19/09/21	61.6	63.7	56.7	46.7	50.6
Monday	20/09/21	61.5	64.2	61.4	46.1	50.5
Tuesday	21/09/21	63.3	66.6	62.8	46.1	51.7
Wednesday	22/09/21	61.9	65.3	61.4	46.9	51.6
Overall		62.3	65.7	62.8	47.4	51.8

Road traffic data from the weekend was not utilised as it is not considered relevant to the assessment. Refer to the appendix for graphical representation.

5.3 Ambient Noise Levels

The ambient noise levels measured at the monitoring location are as follows:

Table 3: Measured Ambient Noise Levels

Day	Date	L90 dB(A)		
		Day	Evening	Night
Wednesday	15/09/21	55	50	48
Thursday	16/09/21	55	51	49
Friday	17/09/21	53	50	49
Saturday	18/09/21	53	51	48
Sunday	19/09/21	52	49	47
Monday	20/09/21	52	49	47
Tuesday	21/09/21	54	48	47
Wednesday	22/09/21	53	50	47
Overall		53	50	48

Refer to the appendix for graphical representation.

6. Noise Criteria

6.1 Road Traffic Noise Criteria

The noise criteria are applied by City of Gold Coast under the City Plan Version 7 (commenced 1st July 2019) Regional Infrastructure Overlay Code. The applicable criteria for the development in the year 2030 (ten year planning horizon) requires road traffic noise to be assessed as follows:

Table 4: City of Gold Coast Road Traffic Noise Criteria

Design level road noise criteria	
1m in front of the most exposed part of a proposed sensitive land use	60 dB (A) L10 (18 hour) or less, where existing levels measured at the setback for the zone are greater than 40 dB (A) L90 (8 hour) between 10pm and 6am. (L10 (18 hour) is the arithmetic average of 18 hourly L10 levels measured in dB (A) between the hours of 6am and midnight). 57 dB (A) L10 (18 hour) or less, where existing levels measured at the setback for the zone are less than or equal to 40 dB (A) L90 (8 hour) between 10pm and 6am. Where the above criteria cannot be met, internal maximum design criterion levels specified in Table 1 AS2107-2016 apply, particularly for buildings greater than 1 storey high.
Balconies and formal external open space	60 dB (A) L10 (18 hour) or less, where existing levels measured at the setback for the zone are greater than 45 dB (A) L90 (18 hour). 57 dB (A) L10 (18 hour) or less, where existing levels measured at the setback for the zone are less than or equal to 45 dB (A) L90 (18 hour).
Internal Criteria – AS2107:2016	
Living Areas	Leq 45 dB(A)
Sleeping Areas	Leq 40 dB(A)

6.2 Environmental Noise Criteria

The noise criteria as applied by the City of Gold Coast are as follows:

6.2.1 Acoustic Quality Objectives

Table 5 below presents the acoustic quality objectives at noise sensitive receptors as detailed in Schedule 1 of the Environmental Protection (Noise) Policy 2008 and 2019.

Table 5: Acoustic Quality Objectives at Noise Sensitive Properties

Sensitive Receptor	Time of Day	Acoustic Quality Objectives, dB(A)		
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$
Dwelling (outdoors)	Day and Evening (7am – 10pm)	50	55	65
Dwelling (Indoors)	Day and Evening (7am – 10pm)	35	40	45
	Night (10pm - 7am)	30	35	40

6.2.2 Background Creep

The Background Creep criteria are as follows:

Time-varying noise:

$$L_{Aeq,adj,T,} \leq \text{Ambient } L_{A90,T} + 5\text{dB(A)}$$

Steady-state noise:

$$L_{A90,T} \leq \text{Ambient } L_{A90,T}$$

The time period (T) is a time interval of at least 15 minutes, or if the noise continues for less than 15 minutes, the duration of the noise source.

Based on the results of ambient noise monitoring, the project specific background creep noise limits are shown in Table 6.

Table 6: Background Creep Noise Limits

Time Period	Noise Level Limits SPL dB(A)	
	$L_{Aeq,T}$	$L_{A90,T}$
Day 7am – 6pm	58	53
Evening 6pm – 10pm	55	50
Night 10pm – 7am	53	48

7. Road Traffic Assessment

Road traffic noise associated with Old Burleigh Road for a ten year planning horizon was assessed at the development to determine compliance with City of Gold Coast criteria.

7.1 Traffic Volumes

Traffic volumes are presented below, with a 1% growth rate used to predict future volumes.

Table 7: Traffic Volumes

Location	2016 AADT	2021 AADT	2031 Predicted AADT	Percentage of Heavy Vehicles
Old Burleigh Road	12,625	13,269	14,657	2%

7.2 Road Traffic Noise Verification

To ensure the CoRTN noise model is accurate, a verification model of the predicted $L_{A10(18hr)}$ was created and compared to the measured noise level. The CoRTN method allows a ±2dB(A) variation from the predicted and measured level, if the variation exceeds 2dB(A) a correction to the predicted level is required.

Table 8: Comparison of measured and predicted noise levels

Location	Measured $L_{A10(18hr)}$ dB(A)	Predicted $L_{A10(18hr)}$ dB(A)	Correction
Old Burleigh Road	62.3	63.1	0

7.3 Predicted Road Traffic Noise Levels - 2031

Road traffic noise modelling for the proposed development was based on the following information:

- Site layout and floor plans as provided by Ferro Chow Architecture, drawings DA.001 and DA.002, DA.097 to DA.104, DA.122 and DA.123, DA.144 to DA.156, DA.401 to DA.403, DA.411 to DA.413, DA.421 to DA.424, DA.431 to DA.434, DA.451 to DA.453, DA.501 to DA.504, DA.601 and DA.602 dated 15/10/2021.
- Old Burleigh Road speed limit of 50km/h.
- +2.5dB(A) façade correction.
- Receiver heights were set to 1.5m above finished floor level.

Table 9 presents the predicted road traffic noise impacts for the development.

Table 9: Predicted Road Traffic Noise Impacts

Level	Unit	Location	$L_{A10(18hr)}$ dB(A)	Complies CoGC Criteria ($L_{A10(18hr)} \leq 60$ dB(A))	Leq1hr Day dB(A)	Leq1hr Night dB(A)
4	1	Bed 1	62.3	No	65.5	62.8
		Bed 2	67.3	No	70.5	67.8
		Bed 3	67.2	No	70.4	67.7
		Living/Kitchen/Dining	67.2	No	70.4	67.7
		Multi-Purpose Room	64.1	No	67.3	64.6
4	2	Bed 1	57.7	Yes	60.9	58.2
		Bed 2	42.3	Yes	45.5	42.8
		Bed 3	42.4	Yes	45.6	42.9

Level	Unit	Location	$L_{A10(18hr)}$ dB(A)	Complies CoGC Criteria ($L_{A10(18hr)} \leq 60$ dB(A))	Leq1hr Day dB(A)	Leq1hr Night dB(A)
		Living/Kitchen/Dining	60.2	Yes	63.4	60.7
5	1	Bed 1	62.0	No	65.2	62.5
		Bed 2	66.9	No	70.1	67.4
		Bed 3	66.8	No	70.0	67.3
		Living/Kitchen/Dining	66.9	No	70.1	67.4
		Multi-Purpose Room	63.8	No	67.0	64.3
5	2	Bed 1	57.6	Yes	60.8	58.1
		Bed 2	42.1	Yes	45.3	42.6
		Bed 3	42.3	Yes	45.5	42.8
		Living/Kitchen/Dining	60.0	Yes	63.2	60.5
6	1	Bed 1	61.8	No	65.0	62.3
		Bed 2	66.5	No	69.7	67.0
		Bed 3	66.4	No	69.6	66.9
		Living/Kitchen/Dining	66.4	No	69.6	66.9
		Multi-Purpose Room	63.5	No	66.7	64.0
6	2	Bed 1	57.5	Yes	60.7	58.0
		Bed 2	42.0	Yes	45.2	42.5
		Bed 3	42.1	Yes	45.3	42.6
		Living/Kitchen/Dining	59.8	Yes	63.0	60.3
7	1	Bed 1	61.5	No	64.7	62.0
		Bed 2	66.2	No	69.4	66.7
		Bed 3	66.1	No	69.3	66.6
		Living/Kitchen/Dining	66.1	No	69.3	66.6
		Multi-Purpose Room	63.2	No	66.4	63.7
7	2	Bed 1	57.3	Yes	60.5	57.8
		Bed 2	41.8	Yes	45.0	42.3
		Bed 3	42.0	Yes	45.2	42.5
		Living/Kitchen/Dining	59.6	Yes	62.8	60.1
8	1	Bed 1	61.2	No	64.4	61.7
		Bed 2	65.8	No	69.0	66.3
		Bed 3	65.7	No	68.9	66.2
		Living/Kitchen/Dining	65.7	No	68.9	66.2
		Multi-Purpose Room	62.8	No	66.0	63.3
8	2	Bed 1	57.1	Yes	60.3	57.6
		Bed 2	41.7	Yes	44.9	42.2
		Bed 3	41.8	Yes	45.0	42.3
		Living/Kitchen/Dining	59.3	Yes	62.5	59.8
9	1	Bed 1	61.0	No	64.2	61.5
		Bed 2	65.4	No	68.6	65.9
		Bed 3	65.3	No	68.5	65.8
		Living/Kitchen/Dining	65.4	No	68.6	65.9
		Multi-Purpose Room	62.5	No	65.7	63.0
9	2	Bed 1	57.0	Yes	60.2	57.5
		Bed 2	41.5	Yes	44.7	42.0
		Bed 3	41.6	Yes	44.8	42.1
		Living/Kitchen/Dining	59.1	Yes	62.3	59.6
10	1	Bed 1	60.7	No	63.9	61.2
		Bed 2	65.1	No	68.3	65.6
		Bed 3	65.0	No	68.2	65.5
		Living/Kitchen/Dining	65.1	No	68.3	65.6
		Multi-Purpose Room	62.2	No	65.4	62.7
10	2	Bed 1	56.8	Yes	60.0	57.3
		Bed 2	41.4	Yes	44.6	41.9
		Bed 3	41.4	Yes	44.6	41.9
		Living/Kitchen/Dining	58.9	Yes	62.1	59.4

Level	Unit	Location	$L_{A10(18hr)}$ dB(A)	Complies CoGC Criteria ($L_{A10(18hr)} \leq 60$ dB(A))	Leq1hr Day dB(A)	Leq1hr Night dB(A)
11	1	Bed 1	60.4	Yes	63.6	60.9
		Bed 2	64.7	No	67.9	65.2
		Bed 3	64.6	No	67.8	65.1
		Living/Kitchen/Dining	64.7	No	67.9	65.2
		Multi-Purpose Room	61.9	No	65.1	62.4
11	2	Bed 1	56.6	Yes	59.8	57.1
		Bed 2	41.2	Yes	44.4	41.7
		Bed 3	41.2	Yes	44.4	41.7
		Living/Kitchen/Dining	58.7	Yes	61.9	59.2
12	1	Bed 1	60.1	Yes	63.3	60.6
		Bed 2	64.3	No	67.5	64.8
		Bed 3	64.2	No	67.4	64.7
		Living/Kitchen/Dining	64.3	No	67.5	64.8
		Multi-Purpose Room	61.6	No	64.8	62.1
12	2	Bed 1	56.4	Yes	59.6	56.9
		Bed 2	41.0	Yes	44.2	41.5
		Bed 3	41.0	Yes	44.2	41.5
		Living/Kitchen/Dining	58.5	Yes	61.7	59.0
13	1	Bed 1	59.8	Yes	63.0	60.3
		Bed 2	63.9	No	67.1	64.4
		Bed 3	63.8	No	67.0	64.3
		Living/Kitchen/Dining	63.9	No	67.1	64.4
		Multi-Purpose Room	61.3	No	64.5	61.8
13	2	Bed 1	56.2	Yes	59.4	56.7
		Bed 2	40.8	Yes	44.0	41.3
		Bed 3	40.8	Yes	44.0	41.3
		Living/Kitchen/Dining	58.3	Yes	61.5	58.8
14	1	Bed 1	59.5	Yes	62.7	60.0
		Bed 2	63.5	No	66.7	64.0
		Bed 3	63.4	No	66.6	63.9
		Living/Kitchen/Dining	63.5	No	66.7	64.0
		Multi-Purpose Room	61.0	No	64.2	61.5
14	2	Bed 1	56.0	Yes	59.2	56.5
		Bed 2	40.6	Yes	43.8	41.1
		Bed 3	40.6	Yes	43.8	41.1
		Living/Kitchen/Dining	58.1	Yes	61.3	58.6
15	1	Bed 1	59.2	Yes	62.4	59.7
		Bed 2	63.1	No	66.3	63.6
		Bed 3	63.0	No	66.2	63.5
		Living/Kitchen/Dining	63.1	No	66.3	63.6
		Multi-Purpose Room	60.7	No	63.9	61.2
15	2	Bed 1	55.8	Yes	59.0	56.3
		Bed 2	40.4	Yes	43.6	40.9
		Bed 3	40.4	Yes	43.6	40.9
		Living/Kitchen/Dining	57.9	Yes	61.1	58.4
16	1	Bed 1	58.9	Yes	62.1	59.4
		Bed 2	62.7	No	65.9	63.2
		Bed 3	62.6	No	65.8	63.1
		Living/Kitchen/Dining	62.7	No	65.9	63.2
		Multi-Purpose Room	60.4	Yes	63.6	60.9
16	2	Bed 1	55.6	Yes	58.8	56.1
		Bed 2	40.2	Yes	43.4	40.7
		Bed 3	40.2	Yes	43.4	40.7
		Living/Kitchen/Dining	57.7	Yes	60.9	58.2
17	1	Bed 1	58.6	Yes	61.8	59.1

Level	Unit	Location	$L_{A10(18hr)}$ dB(A)	Complies CoGC Criteria ($L_{A10(18hr)} \leq 60$ dB(A))	Leq1hr Day dB(A)	Leq1hr Night dB(A)
		Bed 2	62.3	No	65.5	62.8
		Bed 3	62.2	No	65.4	62.7
		Living/Kitchen/Dining	62.3	No	65.5	62.8
		Multi-Purpose Room	60.1	Yes	63.3	60.6
17	2	Bed 1	55.4	Yes	58.6	55.9
		Bed 2	40.0	Yes	43.2	40.5
		Bed 3	40.0	Yes	43.2	40.5
		Living/Kitchen/Dining	57.5	Yes	60.7	58.0
18	1	Bed 1	58.3	Yes	61.5	58.8
		Bed 2	61.9	No	65.1	62.4
		Bed 3	61.8	No	65.0	62.3
		Living/Kitchen/Dining	61.9	No	65.1	62.4
		Multi-Purpose Room	59.8	Yes	63.0	60.3
18	2	Bed 1	55.2	Yes	58.4	55.7
		Bed 2	39.8	Yes	43.0	40.3
		Bed 3	39.8	Yes	43.0	40.3
		Living/Kitchen/Dining	57.3	Yes	60.5	57.8
19	1	Bed 1	58.0	Yes	61.2	58.5
		Bed 2	61.5	No	64.7	62.0
		Bed 3	61.4	No	64.6	61.9
		Living/Kitchen/Dining	61.5	No	64.7	62.0
		Multi-Purpose Room	59.5	Yes	62.7	60.0
19	2	Bed 1	55.0	Yes	58.2	55.5
		Bed 2	39.6	Yes	42.8	40.1
		Bed 3	39.6	Yes	42.8	40.1
		Living/Kitchen/Dining	57.1	Yes	60.3	57.6
20	1	Bed 1	57.7	Yes	60.9	58.2
		Bed 2	61.1	No	64.3	61.6
		Bed 3	61.0	No	64.2	61.5
		Living/Kitchen/Dining	61.1	No	64.3	61.6
		Multi-Purpose Room	59.2	Yes	62.4	59.7
20	2	Bed 1	54.8	Yes	58.0	55.3
		Bed 2	39.4	Yes	42.6	39.9
		Bed 3	39.4	Yes	42.6	39.9
		Living/Kitchen/Dining	56.9	Yes	60.1	57.4
21	1	Bed 1	57.4	Yes	60.6	57.9
		Bed 2	60.7	No	63.9	61.2
		Bed 3	60.6	No	63.8	61.1
		Living/Kitchen/Dining	60.7	No	63.9	61.2
		Multi-Purpose Room	58.9	Yes	62.1	59.4
21	2	Bed 1	54.6	Yes	57.8	55.1
		Bed 2	39.2	Yes	42.4	39.7
		Bed 3	39.2	Yes	42.4	39.7
		Living/Kitchen/Dining	56.7	Yes	59.9	57.2
22	1	Bed 1	61.9	No	65.1	62.4
		Bed 2	56.1	Yes	59.3	56.6
		Bed 3	56.6	Yes	59.8	57.1
		Bed 4	39.5	Yes	42.7	40.0
		Living/Kitchen/Dining	62.3	No	65.5	62.8
		Family	39.5	Yes	42.7	40.0
23	1	Bed 1	61.8	No	65.0	62.3
		Bed 2	56.0	Yes	59.2	56.5
		Bed 3	56.5	Yes	59.7	57.0
		Bed 4	39.4	Yes	42.6	39.9
		Living/Kitchen/Dining	62.2	No	65.4	62.7

Level	Unit	Location	$L_{A10(18hr)}$ dB(A)	Complies CoGC Criteria ($L_{A10(18hr)} \leq 60$ dB(A))	Leq1hr Day dB(A)	Leq1hr Night dB(A)
		Family	39.4	Yes	42.6	39.9
24	1	Bed 1	61.6	No	64.8	62.1
		Bed 2	55.8	Yes	59.0	56.3
		Bed 3	56.3	Yes	59.5	56.8
		Bed 4	39.2	Yes	42.4	39.7
		Living/Kitchen/Dining	62.0	No	65.2	62.5
		Family	39.2	Yes	42.4	39.7
25	1	Bed 1	61.4	No	64.6	61.9
		Bed 2	55.7	Yes	58.9	56.2
		Bed 3	56.2	Yes	59.4	56.7
		Bed 4	39.1	Yes	42.3	39.6
		Living/Kitchen/Dining	61.8	No	65.0	62.3
		Family	39.1	Yes	42.3	39.6
26	1	Bed 1	61.3	No	64.5	61.8
		Bed 2	55.6	Yes	58.8	56.1
		Bed 3	56.0	Yes	59.2	56.5
		Bed 4	39.0	Yes	42.2	39.5
		Living/Kitchen/Dining	61.7	No	64.9	62.2
		Family	38.9	Yes	42.1	39.4
27	1	Bed 1	61.1	No	64.3	61.6
		Bed 2	55.4	Yes	58.6	55.9
		Bed 3	55.9	Yes	59.1	56.4
		Bed 4	38.8	Yes	42.0	39.3
		Living/Kitchen/Dining	61.5	No	64.7	62.0
		Family	38.8	Yes	42.0	39.3
28	1	Bed 1	60.9	No	64.1	61.4
		Bed 2	55.3	Yes	58.5	55.8
		Bed 3	55.8	Yes	59.0	56.3
		Bed 4	38.7	Yes	41.9	39.2
		Living/Kitchen/Dining	61.3	No	64.5	61.8
		Family	38.7	Yes	41.9	39.2
29	1	Bed 1	60.7	No	63.9	61.2
		Bed 2	55.2	Yes	58.4	55.7
		Bed 3	55.7	Yes	58.9	56.2
		Bed 4	38.6	Yes	41.8	39.1
		Living/Kitchen/Dining	61.1	No	64.3	61.6
		Family	38.6	Yes	41.8	39.1
30	1	Bed 1	60.5	No	63.7	61.0
		Bed 2	55.1	Yes	58.3	55.6
		Bed 3	55.6	Yes	58.8	56.1
		Bed 4	38.5	Yes	41.7	39.0
		Living/Kitchen/Dining	60.9	No	64.1	61.4
		Family	38.5	Yes	41.7	39.0
31	1	Bed 1	60.3	Yes	63.5	60.8
		Bed 2	55.0	Yes	58.2	55.5
		Bed 3	55.5	Yes	58.7	56.0
		Bed 4	38.4	Yes	41.6	38.9
		Living/Kitchen/Dining	60.7	No	63.9	61.2
		Family	38.4	Yes	41.6	38.9
32	1	Bed 1	60.1	Yes	63.3	60.6
		Bed 2	54.9	Yes	58.1	55.4
		Bed 3	55.4	Yes	58.6	55.9
		Bed 4	38.3	Yes	41.5	38.8
		Living/Kitchen/Dining	60.5	No	63.7	61.0
		Family	38.3	Yes	41.5	38.8

Level	Unit	Location	$L_{A10(18hr)}$ dB(A)	Complies CoGC Criteria ($L_{A10(18hr)} \leq 60$ dB(A))	Leq1hr Day dB(A)	Leq1hr Night dB(A)
33	1	Bed 1	59.9	Yes	63.1	60.4
		Bed 2	54.8	Yes	58.0	55.3
		Bed 3	55.3	Yes	58.5	55.8
		Bed 4	38.2	Yes	41.4	38.7
		Living/Kitchen/Dining	60.3	Yes	63.5	60.8
		Family	38.2	Yes	41.4	38.7
34	1	Bed 1	59.7	Yes	62.9	60.2
		Bed 2	54.7	Yes	57.9	55.2
		Bed 3	55.2	Yes	58.4	55.7
		Bed 4	38.1	Yes	41.3	38.6
		Living/Kitchen/Dining	60.1	Yes	63.3	60.6
		Family	38.1	Yes	41.3	38.6
35	1	Bed 1	59.5	Yes	62.7	60.0
		Bed 2	54.6	Yes	57.8	55.1
		Bed 3	55.1	Yes	58.3	55.6
		Bed 4	38.0	Yes	41.2	38.5
		Living/Kitchen/Dining	59.9	Yes	63.1	60.4
		Family	38.0	Yes	41.2	38.5
36	1	Bed 1	59.3	Yes	62.5	59.8
		Bed 2	54.5	Yes	57.7	55.0
		Bed 3	55.0	Yes	58.2	55.5
		Bed 4	37.9	Yes	41.1	38.4
		Living/Kitchen/Dining	59.7	Yes	62.9	60.2
		Family	37.9	Yes	41.1	38.4
37	1	Bed 1	59.1	Yes	62.3	59.6
		Bed 2	54.4	Yes	57.6	54.9
		Bed 3	54.9	Yes	58.1	55.4
		Bed 4	37.8	Yes	41.0	38.3
		Living/Kitchen/Dining	59.5	Yes	62.7	60.0
		Family	37.8	Yes	41.0	38.3
38	1	Bed 1	58.9	Yes	62.1	59.4
		Bed 2	54.3	Yes	57.5	54.8
		Bed 3	54.8	Yes	58.0	55.3
		Bed 4	37.7	Yes	40.9	38.2
		Living/Kitchen/Dining	59.3	Yes	62.5	59.8
		Family	37.7	Yes	40.9	38.2
39	1	Bed 1	58.7	Yes	61.9	59.2
		Bed 2	54.2	Yes	57.4	54.7
		Bed 3	54.7	Yes	57.9	55.2
		Bed 4	37.6	Yes	40.8	38.1
		Living/Kitchen/Dining	59.1	Yes	62.3	59.6
		Family	37.6	Yes	40.8	38.1
40	1	Bed 1	58.5	Yes	61.7	59.0
		Bed 2	54.1	Yes	57.3	54.6
		Bed 3	54.6	Yes	57.8	55.1
		Bed 4	37.5	Yes	40.7	38.0
		Living/Kitchen/Dining	58.9	Yes	62.1	59.4
		Family	37.5	Yes	40.7	38.0
41	1	Bed 1	58.3	Yes	61.5	58.8
		Bed 2	54.0	Yes	57.2	54.5
		Bed 3	54.5	Yes	57.7	55.0
		Bed 4	37.4	Yes	40.6	37.9
		Living/Kitchen/Dining	58.7	Yes	61.9	59.2
		Family	37.4	Yes	40.6	37.9
42	1	Bed 1	58.1	Yes	61.3	58.6

Level	Unit	Location	$L_{A10(18hr)}$ dB(A)	Complies CoGC Criteria ($L_{A10(18hr)} \leq 60$ dB(A))	Leq1hr Day dB(A)	Leq1hr Night dB(A)
		Bed 2	53.9	Yes	57.1	54.4
		Bed 3	54.4	Yes	57.6	54.9
		Bed 4	37.3	Yes	40.5	37.8
		Living/Kitchen/Dining	58.5	Yes	61.7	59.0
		Family	37.3	Yes	40.5	37.8
43	1	Bed 1	57.9	Yes	61.1	58.4
		Bed 2	53.8	Yes	57.0	54.3
		Bed 3	54.3	Yes	57.5	54.8
		Bed 4	37.2	Yes	40.4	37.7
		Living/Kitchen/Dining	58.3	Yes	61.5	58.8
		Family	37.2	Yes	40.4	37.7
44	-	East Façade	58.1	Yes	61.3	58.6
		South Façade	54.2	Yes	57.4	54.7
45	Penthouse	Living/Kitchen/Dining	57.5	Yes	60.7	58.0
		Home Theatre	53.6	Yes	56.8	54.1
		Home Office	37.0	Yes	40.2	37.5
46	Penthouse	Retreat	57.7	Yes	60.9	58.2
		Bed 1	57.3	Yes	60.5	57.8
		Bed 2	53.5	Yes	56.7	54.0
		Bed 3	54.0	Yes	57.2	54.5
		Bed 4	36.9	Yes	40.1	37.4

Based on the predicted noise impacts, additional treatments are required to ensure compliance for all internal areas with City of Gold Coast assessment requirements. Refer to Section 9 for recommendations.

Road traffic noise impacts to the worst affected passive recreation areas are presented in Table 10.

Table 10: Recreation Area Noise Impacts

Location			External Predicted $L_{A10(18hr)}$ (free field) dB(A)	Complies External Criteria ($L_{A10(18hr)} \leq 60$ dB(A))
Level	Unit	Location		
3	-	Pool Area	48.5	Yes
4	1	North Balcony	62.5	No
		South Balcony	60.2	Yes
4	2	Balcony	56.1	Yes
5	1	North Balcony	62.1	No
		South Balcony	59.9	Yes
5	2	Balcony	56.0	Yes
6	1	North Balcony	61.8	No
		South Balcony	59.6	Yes
6	2	Balcony	55.8	Yes
7	1	North Balcony	61.5	No
		South Balcony	59.3	Yes

Exceedance of the Council criteria for passive recreation areas is exceeded in some cases.

8. Environmental Assessment

8.1 Onsite Activities

Noise associated with the development was assessed based on previous measurements of similar activities. The calculations assume that the nominated activities are located at the closest representative point within the development site to each receiver location. Any relevant shielding or building transmission loss is taken into account for these activities.

8.1.1 Acoustic Quality Objectives

The average maximum noise source levels and predicted impacts at the receiver locations are shown in Table 11 as follows. Note: L_{A10} and L_{A1} results are not shown in cases where the total duration of the events is less than the minimum time required e.g. $L_{A10(1hr)}$ requires noise events to occur for at least 360 seconds of an hour long period. L_{Aeq} results are not shown where the calculated total is less than 0dBA.

Table 11: Acoustic Quality Objective Noise Levels, 1 hour

Receiver	Receivers 1. 9 Armrick Avenue (W) 2. 95-97 Old Burleigh Road (N) 3. 100 Old Burleigh Road (E) Description	Source Leq@1m dB(A)	Correction dB(A)*	Corrected Leq@1m dB(A)	No. of events per 1hr Day	No. of events per 1hr Eve	No. of events per 1hr Night	Duration per event	Distance (m)	Barrier (height (m)) No	Barrier screening dB	Building Screening dB	Building Transmission Loss dB	Dist atten. @-6dB/dd	LAeq adj.,1hr ext. dB(A) Day	LAeq adj.,1hr int. dB(A) Day	LAeq adj.,1hr ext. dB(A) Eve	LAeq adj.,1hr int. dB(A) Eve	LAeq adj.,1hr ext. dB(A) Night	LAeq adj.,1hr int. dB(A) Night	LA10 adj.,1hr ext. dB(A) Day	LA10 adj.,1hr int. dB(A) Day	LA10 adj.,1hr ext. dB(A) Eve	LA10 adj.,1hr int. dB(A) Eve	LA10 adj.,1hr ext. dB(A) Night	LA10 adj.,1hr int. dB(A) Night	LA1 adj.,1hr ext. dB(A) Day	LA1 adj.,1hr int. dB(A) Day	LA1 adj.,1hr ext. dB(A) Eve	LA1 adj.,1hr int. dB(A) Eve	LA1 adj.,1hr ext. dB(A) Night	LA1 adj.,1hr int. dB(A) Night	Amenity LAeq Compliance			LA10 Compliance			LA1 Compliance		
																																			Day / eve	Day / eve indoor	Night indoor	Day / eve	Day / eve indoor	Night indoor	Day / eve	Day / eve indoor	Night indoor
	Criteria																																	50	35	30	55	40	35	65	45	40
	Car passby	69		69	20	12	8	15	8	1	-4			-19	35	25	33	23	31	21							40	30	40	30	40	30	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1	Car door closure	75	2	77	20	12	8	2	8	1	-4			-18	35	25	33	23	31	21							41	31					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car start	74	2	76	20	12	8	2	8	1	-4			-18	33	23	31	21	29	19							39	29					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Background music (ground floor food & beverage)	70		70	4	4	4	900	23				-10	-27	32	22	32	22	32	22	35	25	35	25	35	25	37	27	37	27	37	27	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation (ground floor food & beverage)	70		70	4	4	4	900	23				-10	-27	32	22	32	22	32	22	34	24	34	24	34	24	36	26	36	26	36	26	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation (level 3 communal area)	70		70	4	4	0	900	22			-24		-27	19	9	19	9			21	11	21	11			23	13	23	13			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Gym	79	2	81	4	4	4	900	10				-25	-20	36	26	36	26	36	26	38	28	38	28	38	28	40	30	40	30	40	30	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Total														42	32	41	31	40	30	41	31	41	31	41	31	47	37	45	35	45	35	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
	Criteria																																	50	35	30	55	40	35	65	45	40
	Car passby	69		69	20	12	8	15	9	1	-4			-20	34	24	32	22	30	20							39	29	39	29	39	29	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Car door closure	75	2	77	20	12	8	2	23					-27	30	20	28	18	26	16							36	26					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car start	74	2	76	20	12	8	2	23					-27	29	19	27	17	25	15							35	25					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Background music (ground floor food & beverage)	70		70	4	4	4	900	31				-10	-30	30	20	30	20	30	20	33	23	33	23	33	23	35	25	35	25	35	25	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation (ground floor food & beverage)	70		70	4	4	4	900	31				-10	-30	30	20	30	20	30	20	32	22	32	22	32	22	34	24	34	24	34	24	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation (level 3 communal area)	70		70	4	4		900	21					-26	44	34	44	34			46	36	46	36			48	38	48	38			Yes	Yes	n/a	Yes	Yes	n/a	Yes	Yes	n/a
	Gym	79	2	81	4	4	4	900	33				-25	-30	26	16	26	16	26	16	28	18	28	18	28	18	30	20	30	20	30	20	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Total														45	35	44	34	36	26	46	36	46	36	36	26	49	39	49	39	42	32	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
	Criteria																																	50	35	30	55	40	35	65	45	40
	Car passby	69		69	20	12	8	15	41					-33	25	15	23	13	21	11							30	20	30	20	30	20	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Car door closure	75	2	77	20	12	8	2	41					-32	25	15	23	13	21	11							31	21					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car start	74	2	76	20	12	8	2	41					-32	24	14	22	12	20	10							30	20					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Background music (ground floor food & beverage)	70		70	4	4	4	900	44				-10	-33	27	17	27	17	27	17	30	20	30	20	30	20	32	22	32	22	32	22	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation (ground floor food & beverage)	70		70	4	4	4	900	44				-10	-33	27	17	27	17	27	17	29	19	29	19	29	19	31	21	31	21	31	21	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation (level 3 communal area)	70		70	4	4		900	46					-33	37	27	37	27			39	29	39	29			41	31	41	31			Yes	Yes	n/a	Yes	Yes	n/a	Yes	Yes	n/a
	Gym	79	2	81	4	4	4	900	63				-25	-36	20	10	20	10	20	10	22	12	22	12	22	12	24	14	24	14	24	14	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Total														38	28	38	28	32	22	40	30	40	30	33	23	43	33	42	32	36	26	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

*Correction due to tonality and impulsiveness as per AS1055:2018.

Compliance is predicted for onsite activities on the condition the recommendations presented in Section 10 are implemented.

8.1.2 Background Creep

Based on assessment of all time periods, the noise source levels and predicted levels at the receiver locations are shown as follows:

Table 12: Onsite Background Creep Noise Levels, 15 minute

Receiver	Receivers 1. 9 Armrick Avenue (W) 2. 95-97 Old Burleigh Road (N) 3. 100 Old Burleigh Road (E) Description	Source Leq@1m dB(A)	Correction dB(A)*	Corrected Leq@1m dB(A)	No. of events per 15min Day	No. of events per 15min Eve	No. of events per 15min Night	Duration per event	Distance (m)	Barrier (height (m)) No	Barrier screening dB	Building Screening dB	Building Transmission Loss dB	Dist atten. @-6dB/dd	LAeq adj,T ext. dB(A) Day	LAeq adj,T ext. dB(A) Eve	LAeq adj,T ext. dB(A) Night	LAeq 15 min Compliance Day	Eve	Night
	Criteria																	58	55	53
	Car passby	69		69	5	3	2	15	8	1	-4			-19	35	33	31	Yes	Yes	Yes
1	Car door closure	75	2	77	5	3	2	2	8	1	-4			-18	35	33	31	Yes	Yes	Yes
	Car start	74	2	76	5	3	2	2	8	1	-4			-19	33	31	29	Yes	Yes	Yes
	Background music (ground floor food & beverage)	70		70	1	1	1	900	23				-10	-28	32	32	32	Yes	Yes	Yes
	Voice conversation (ground floor food & beverage)	70		70	1	1	1	900	23				-10	-28	32	32	32	Yes	Yes	Yes
	Voice conversation (level 3 communal area)	70		70	1	1		900	22			-24		-27	19	19		Yes	Yes	n/a
	Gym	79	2	81	1	1	1	900	10				-25	-20	36	36	36	Yes	Yes	Yes
	Total														42	41	40	**Yes**	**Yes**	**Yes**
	Criteria																	58	55	53
	Car passby	69		69	5	3	2	15	9	1	-4			-20	34	32	30	Yes	Yes	Yes
2	Car door closure	75	2	77	5	3	2	2	23					-27	30	28	26	Yes	Yes	Yes
	Car start	74	2	76	5	3	2	2	23					-27	29	27	25	Yes	Yes	Yes
	Background music (ground floor food & beverage)	70		70	1	1	1	900	31				-10	-30	30	30	30	Yes	Yes	Yes
	Voice conversation (ground floor food & beverage)	70		70	1	1	1	900	31				-10	-30	30	30	30	Yes	Yes	Yes
	Voice conversation (level 3 communal area)	70		70	1	1		900	21					-26	44	44		Yes	Yes	n/a
	Gym	79	2	81	1	1	1	900	33				-25	-30	26	26	26	Yes	Yes	Yes
	Total														45	44	36	**Yes**	**Yes**	**Yes**
	Criteria																	58	55	53
	Car passby	69		69	5	3	2	15	41					-33	25	23	21	Yes	Yes	Yes
3	Car door closure	75	2	77	5	3	2	2	41					-32	25	23	21	Yes	Yes	Yes
	Car start	74	2	76	5	3	2	2	41					-32	24	22	20	Yes	Yes	Yes
	Background music (ground floor food & beverage)	70		70	1	1	1	900	44				-10	-33	27	27	27	Yes	Yes	Yes
	Voice conversation (ground floor food & beverage)	70		70	1	1	1	900	44				-10	-33	27	27	27	Yes	Yes	Yes
	Voice conversation (level 3 communal area)	70		70	1	1		900	46					-33	37	37		Yes	Yes	n/a
	Gym	79	2	81	1	1	1	900	63				-25	-36	20	20	20	Yes	Yes	Yes
	Total														38	38	32	**Yes**	**Yes**	**Yes**

*Correction due to tonality and impulsiveness as per AS1055:2018.

Compliance is predicted for onsite activities on the condition the recommendations presented in Section 10 are implemented.

Carpark activity is calculated to a time period of 15 seconds in Table 13.

Table 13: Onsite Background Creep Noise Levels, 15 second

Receiver	Receivers 1. 9 Armrick Avenue (W) 2. 95-97 Old Burleigh Road (N) 3. 100 Old Burleigh Road (E) Description	Source Leq@1m dB(A)	Correction dB(A)*	Corrected Leq@1m dB(A)	No. of events per 15sec Day	No. of events per 15sec Eve	No. of events per 15sec Night	Duration per event	Distance (m)	Barrier (height (m)) No	Barrier screening dB	Building Screening dB	Building Transmission Loss dB	Dist atten. @-6dB/dd	LAeq adj,T ext. dB(A) Day	LAeq adj,T ext. dB(A) Eve	LAeq adj,T ext. dB(A) Night	LAeq 15 sec Compliance Day	Eve	Night
	Criteria																	58	55	53
1	Car start	74	2	76	1	1	1	2	8	1	-4			-19	44	44	44	Yes	Yes	Yes
	Car door closure	75	2	77	1	1	1	2	8	1	-4			-19	45	45	45	Yes	Yes	Yes
	Car passby	69		69	1	1	1	5	8	1	-4			-19	41	41	41	Yes	Yes	Yes
	Total														49	49	49	**Yes**	**Yes**	**Yes**
	Criteria																	58	55	53
2	Car start	74	2	76	1	1	1	2	9	1	-4			-20	43	43	43	Yes	Yes	Yes
	Car door closure	75	2	77	1	1	1	2	23					-28	40	40	40	Yes	Yes	Yes
	Car passby	69		69	1	1	1	5	23					-28	36	36	36	Yes	Yes	Yes
	Total														46	46	46	**Yes**	**Yes**	**Yes**
	Criteria																	58	55	53
3	Car start	74	2	76	1	1	1	2	41					-33	34	34	34	Yes	Yes	Yes
	Car door closure	75	2	77	1	1	1	2	41					-33	35	35	35	Yes	Yes	Yes
	Car passby	69		69	1	1	1	5	41					-33	31	31	31	Yes	Yes	Yes
	Total														38	39	39	**Yes**	**Yes**	**Yes**

*Correction due to tonality and impulsiveness as per AS1055:2018.

Compliance is predicted for onsite activities on the condition the recommendations presented in Section 10 are implemented.

9. Offsite Sources

Assessment of typical noise impacts from the offsite source indicated in Figure 2 to the site was conducted utilising previous measurements of similar activities. The calculations assume nominated activities are located at a representative distance to each receiver location. Any relevant shielding or building transmission loss is taken into account.

9.1 Acoustic Quality Objectives

The average maximum noise source levels and predicted offsite levels at the onsite receiver locations are shown in Table 14. Note: L_{A10} and L_{A1} results are not shown in cases where the total duration of the events is less than the minimum time required e.g. $L_{A10(1hr)}$ requires noise events to occur for at least 360 seconds of an hour long period. L_{Aeq} results are not shown where the calculated total is less than 0dBA.

Table 14: Offsite Activities to Onsite Receivers - Acoustic Quality Objectives

Receivers																																						
Receiver	1. Onsite receivers (southern façade) 2. Onsite receivers (western façade) Description	Source Leq@1m dB(A)	Correction dB(A)*	Corrected Leq@1m dB(A)	No. of events per 1hr Day	No. of events per 1hr Eve	No. of events per 1hr Night	Duration per event	Distance (m)	Barrier (height (m)) No	Barrier screening dB	Building Screening dB	Building Transmission Loss dB	Dist atten. @-6dB/dd	LAeq adj.,1hr ext. dB(A) Day	LAeq adj.,1hr int. dB(A) Day	LAeq adj.,1hr ext. dB(A) Eve	LAeq adj.,1hr int. dB(A) Eve	LAeq adj.,1hr ext. dB(A) Night	LAeq adj.,1hr int. dB(A) Night	LA10 adj.,1hr ext. dB(A) Day	LA10 adj.,1hr int. dB(A) Day	LA10 adj.,1hr ext. dB(A) Eve	LA10 adj.,1hr int. dB(A) Eve	LA10 adj.,1hr ext. dB(A) Night	LA10 adj.,1hr int. dB(A) Night	LA1 adj.,1hr ext. dB(A) Day	LA1 adj.,1hr int. dB(A) Day	LA1 adj.,1hr ext. dB(A) Eve	LA1 adj.,1hr int. dB(A) Eve	LA1 adj.,1hr ext. dB(A) Night	LA1 adj.,1hr int. dB(A) Night	Amenity LAeq Compliance			LA10 Compliance			LA1 Compliance		
																																			Day / eve	Day / eve indoor	Night indoor	Day / eve	Day / eve indoor	Night indoor	Day / eve	Day / eve indoor	Night indoor
	Criteria																																		50	35	30	55	40	35	65	45	40
	Car passby	69		69	44	32	16	15	27					-29	33	23	31	21	28	18	36	26	36	26			38	28	38	28	38	28	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1	Car door closure	75	2	77	44	32	16	2	27					-29	32	22	31	21	28	18							38	28	38	28			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car start	74	2	76	44	32	16	2	27					-29	31	21	29	19	26	16							37	27	37	27			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Amplified Music	90		90	4	4	4	900	79				-16	-38	36	26	36	26	36	26	38	28	38	28	38	28	40	30	40	30	40	30	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation	70		70	4	4	4	900	40					-32	37	27	37	27	37	27	39	29	39	29	39	29	41	31	41	31	41	31	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Outdoor dining	75		75	4	4	4	900	85					-39	36	26	36	26	36	26	38	28	38	28	38	28	40	30	40	30	40	30	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice crowd (bowling green)	83		83	4	4	0	900	45					-33	49	39	49	39			51	41	51	41			53	43	53	43			Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes
	Total														50	40	50	40	42	32	52	42	52	42	43	33	54	44	54	44	46	36	**Yes**	**No**	**No**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
	Criteria																																		50	35	30	55	40	35	65	45	40
	Car passby	69		69	44	32	16	15	34					-31	31	21	29	19	26	16	34	24	34	24			36	26	36	26	36	26	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Car door closure	75	2	77	44	32	16	2	34					-31	30	20	29	19	26	16							36	26	36	26			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car start	74	2	76	44	32	16	2	34					-31	29	19	28	18	25	15							35	25	35	25			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Amplified Music	90		90	4	4	4	900	87				-16	-39	35	25	35	25	35	25	37	27	37	27	37	27	39	29	39	29	39	29	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation	70		70	4	4	4	900	47					-33	37	27	37	27	37	27	39	29	39	29	39	29	41	31	41	31	41	31	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Outdoor dining	75		75	4	4	4	900	90					-39	36	26	36	26	36	26	38	28	38	28	38	28	40	30	40	30	40	30	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice crowd (bowling green)	83		83	4	4		900	50					-34	49	39	49	39			51	41	51	41			53	43	53	43			Yes	No	n/a	Yes	No	n/a	Yes	Yes	n/a
	Total														50	40	50	40	41	31	52	42	52	42	43	33	54	44	54	44	45	35	**Yes**	**No**	**No**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**

*Correction due to tonality and impulsiveness as per AS1055:2018.

General compliance is predicted with exceedances of the Internal Acoustic Quality criteria predicted at receivers 1 and 2. Based on the existing ambient noise levels (refer to section 5.3) and compliance with the Background Creep Criteria, the exceedances are not predicted to be a cause of annoyance.

9.2 Background Creep

The noise source levels and predicted offsite levels at the onsite receiver locations are shown as follows;

Table 15: Offsite Activities to Onsite Receivers – Background Creep

Receiver	Receivers 1. Onsite receivers (southern façade) 2. Onsite receivers (western façade) Description	Source Leq@1m dB(A)	Correction dB(A)*	Corrected Leq@1m dB(A)	No. of events per 15min Day	No. of events per 15min Eve	No. of events per 15min Night	Duration per event	Distance (m)	Barrier (height (m)) No	Barrier screening dB	Building Screening dB	Building Transmission Loss dB	Dist atten. @-6dB/dd	LAeq adj,T ext. dB(A) Day	LAeq adj,T ext. dB(A) Eve	LAeq adj,T ext. dB(A) Night	LAeq 15 min Compliance Day	Eve	Night
	Criteria																	58	55	53
	Car passby	69		69	11	8	4	15	27					-29	33	31	28	Yes	Yes	Yes
1	Car door closure	75	2	77	11	8	4	2	27					-29	32	31	28	Yes	Yes	Yes
	Car start	74	2	76	11	8	4	2	27					-29	31	29	26	Yes	Yes	Yes
	Amplified Music	90		90	1	1	1	900	79				-16	-38	36	36	36	Yes	Yes	Yes
	Voice conversation	70		70	1	1	1	900	40					-33	37	37	37	Yes	Yes	Yes
	Outdoor dining	75		75	1	1	1	900	85					-39	36	36	36	Yes	Yes	Yes
	Voice crowd (bowling green)	83		83	1	1		900	45					-34	49	49		Yes	Yes	n/a
	Total														50	50	42	**Yes**	**Yes**	**Yes**
	Criteria																	58	55	53
	Car passby	69		69	11	8	4	15	34					-31	31	29	26	Yes	Yes	Yes
2	Car door closure	75	2	77	11	8	4	2	34					-31	30	29	26	Yes	Yes	Yes
	Car start	74	2	76	11	8	4	2	34					-31	29	28	25	Yes	Yes	Yes
	Amplified Music	90		90	1	1	1	900	87				-16	-39	35	35	35	Yes	Yes	Yes
	Voice conversation	70		70	1	1	1	900	47					-33	37	37	37	Yes	Yes	Yes
	Outdoor dining	75		75	1	1	1	900	90					-39	36	36	36	Yes	Yes	Yes
	Voice crowd (bowling green)	83		83	1	1		900	50					-34	49	49		Yes	Yes	n/a
	Total														50	50	41	**Yes**	**Yes**	**Yes**

*Correction due to tonality and impulsiveness as per AS1055:2018.

Compliance is predicted for offsite activities without the need for further acoustic treatments.

10. Recommendations

10.1 Road Traffic Noise

All building treatments were calculated using Australian Standard *AS3671:1989 'Road Traffic Noise Intrusion – Building Siting and Construction'*.

10.1.1 Building Façade Treatments

The minimum construction requirements are presented in Table 16, with the installed glazing system to comply with the following:

- The minimum glass thickness specified shall not be reduced regardless of the R_w performance of the glass unless the glazier can provide a specific (non generic) NATA Test report proving the proposed glazing system complies (the test report must be based on the same configuration proposed for the development). Note an estimation or calculated performance will not accepted.
- If compliance cannot be achieved with the minimum R_w ratings for the glass thickness nominated, then the glazing system shall be upgraded until compliance is achieved.
- Glazing specified with acoustic seals requires a seal that has been tested with a glazing system or door to achieve an Rw in accordance with AS/NZS ISO 717.1, mohair seals are not acceptable.
- The glazier shall provide NATA test reports on request to verify compliance with the minimum R_w ratings. Generic reports are not acceptable.

Table 16: Minimum acoustic treatments

Level	Unit	Location	Rw Ratings				Glazing	Sliding Doors	Acoustic Seals
			Wall	Roof	Glazing	Sliding Doors			
4	1	Bed 1	45	-	28	28	5mm tough	5mm tough	yes
		Bed 2	45	-	32	-	10mm float	-	yes
		Bed 3	45	-	35	35	10.38 lam	10.38 lam	yes
		Living/Kitchen/Dining	45	-	32	31	10mm float	6.38 lam	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
4	2	Bed 1	45	-	28	28	5mm tough	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
5	1	Bed 1	45	-	28	28	5mm tough	5mm tough	yes
		Bed 2	45	-	31	-	6.38 lam	-	yes
		Bed 3	45	-	35	35	10.38 lam	10.38 lam	yes
		Living/Kitchen/Dining	45	-	32	31	10mm float	6.38 lam	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
5	2	Bed 1	45	-	22	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
6	1	Bed 1	45	-	28	28	5mm tough	5mm tough	yes
		Bed 2	45	-	31	-	6.38 lam	-	yes
		Bed 3	45	-	35	32	10.38 lam	10mm float	yes
		Living/Kitchen/Dining	45	-	31	31	6.38 lam	6.38 lam	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
6	2	Bed 1	45	-	22	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no

Level	Unit	Location	Rw Ratings				Glazing	Sliding Doors	Acoustic Seals
			Wall	Roof	Glazing	Sliding Doors			
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
7	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	31	-	6.38 lam	-	yes
		Bed 3	45	-	35	32	10.38 lam	10mm float	yes
		Living/Kitchen/Dining	45	-	31	30	6.38 lam	6mm float	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
7	2	Bed 1	45	-	22	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
8	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	30	-	6mm float	-	yes
		Bed 3	45	-	35	31	10.38 lam	6.38 lam	yes
		Living/Kitchen/Dining	45	-	30	31	6mm float	6.38 lam	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
8	2	Bed 1	45	-	22	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
9	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	30	-	6mm float	-	yes
		Bed 3	45	-	35	30	10.38 lam	6mm float	yes
		Living/Kitchen/Dining	45	-	30	30	6mm float	6mm float	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
9	2	Bed 1	45	-	22	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
10	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	30	-	6mm float	-	yes
		Bed 3	45	-	35	30	10.38 lam	6mm float	yes
		Living/Kitchen/Dining	45	-	30	30	6mm float	6mm float	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
10	2	Bed 1	45	-	22	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
11	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	30	-	6mm float	-	yes
		Bed 3	45	-	35	30	10.38 lam	6mm float	yes
		Living/Kitchen/Dining	45	-	30	28	6mm float	5mm tough	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
11	2	Bed 1	45	-	22	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
12	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	30	-	6mm float	-	yes
		Bed 3	45	-	32	31	10mm float	6.38 lam	yes
		Living/Kitchen/Dining	45	-	30	28	6mm float	5mm tough	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
12	2	Bed 1	45	-	27	23	4mm float	4mm tough	yes

Level	Unit	Location	Rw Ratings				Glazing	Sliding Doors	Acoustic Seals
			Wall	Roof	Glazing	Sliding Doors			
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
13	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	28	-	5mm tough	-	yes
		Bed 3	45	-	32	30	10mm float	6mm float	yes
		Living/Kitchen/Dining	45	-	30	28	6mm float	5mm tough	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
13	2	Bed 1	45	-	27	23	4mm float	4mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
14	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	28	-	5mm tough	-	yes
		Bed 3	45	-	31	31	6.38 lam	6.38 lam	yes
		Living/Kitchen/Dining	45	-	28	28	5mm tough	5mm tough	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
14	2	Bed 1	45	-	27	23	4mm float	4mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
15	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	28	-	5mm tough	-	yes
		Bed 3	45	-	31	30	6.38 lam	6mm float	yes
		Living/Kitchen/Dining	45	-	28	28	5mm tough	5mm tough	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
15	2	Bed 1	45	-	22	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
16	1	Bed 1	45	-	27	23	4mm float	4mm tough	yes
		Bed 2	45	-	27	-	4mm float	-	yes
		Bed 3	45	-	30	30	6mm float	6mm float	yes
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
16	2	Bed 1	45	-	22	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
17	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	27	-	4mm float	-	yes
		Bed 3	45	-	30	30	6mm float	6mm float	yes
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
17	2	Bed 1	45	-	22	23	4mm float	4mm tough	no
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
18	1	Bed 1	45	-	27	23	4mm float	4mm tough	yes
		Bed 2	45	-	27	-	4mm float	-	yes
		Bed 3	45	-	30	28	6mm float	5mm tough	yes
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes

Level	Unit	Location	Rw Ratings				Glazing	Sliding Doors	Acoustic Seals
			Wall	Roof	Glazing	Sliding Doors			
18	2	Bed 1	45	-	22	23	4mm float	4mm tough	no
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
19	1	Bed 1	45	-	27	23	4mm float	4mm tough	yes
		Bed 2	45	-	27	-	4mm float	-	yes
		Bed 3	45	-	30	28	6mm float	5mm tough	yes
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Multi-Purpose Room	45	-	-	28	-	5mm tough	yes
19	2	Bed 1	45	-	22	23	4mm float	4mm tough	no
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
20	1	Bed 1	45	-	27	23	4mm float	4mm tough	yes
		Bed 2	45	-	27	-	4mm float	-	yes
		Bed 3	45	-	30	28	6mm float	5mm tough	yes
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Multi-Purpose Room	45	-	-	23	-	4mm tough	no
20	2	Bed 1	45	-	22	23	4mm float	4mm tough	no
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
21	1	Bed 1	45	-	27	23	4mm float	4mm tough	yes
		Bed 2	45	-	27	-	4mm float	-	yes
		Bed 3	45	-	28	28	5mm tough	5mm tough	yes
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Multi-Purpose Room	45	-	-	23	-	4mm tough	no
21	2	Bed 1	45	-	22	23	4mm float	4mm tough	no
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	-	23	-	4mm tough	no
22	1	Bed 1	45	-	30	28	6mm float	5mm tough	yes
		Bed 2	45	-	-	23	-	4mm tough	no
		Bed 3	45	-	-	23	-	4mm tough	no
		Bed 4	45	-	-	23	-	4mm tough	no
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Family	45	-	-	23	-	4mm tough	no
23	1	Bed 1	45	-	30	28	6mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Family	45	-	22	-	4mm float	-	no
24	1	Bed 1	45	-	30	28	6mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Family	45	-	22	-	4mm float	-	no
25	1	Bed 1	45	-	30	28	6mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no

Level	Unit	Location	Rw Ratings				Glazing	Sliding Doors	Acoustic Seals
			Wall	Roof	Glazing	Sliding Doors			
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Family	45	-	22	-	4mm float	-	no
26	1	Bed 1	45	-	28	28	5mm tough	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Family	45	-	22	-	4mm float	-	no
27	1	Bed 1	45	-	28	28	5mm tough	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Family	45	-	22	-	4mm float	-	no
28	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Family	45	-	22	-	4mm float	-	no
29	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Family	45	-	22	-	4mm float	-	no
30	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22		4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	28	4mm float	5mm tough	yes
		Family	45	-	22	-	4mm float	-	no
31	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Family	45	-	22	-	4mm float	-	no
32	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Family	45	-	22	-	4mm float	-	no
33	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Family	45	-	22	-	4mm float	-	no
34	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no

Level	Unit	Location	Rw Ratings				Glazing	Sliding Doors	Acoustic Seals
			Wall	Roof	Glazing	Sliding Doors			
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Family	45	-	22	-	4mm float	-	no
35	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Family	45	-	22	-	4mm float	-	no
36	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Family	45	-	22	-	4mm float	-	no
37	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Family	45	-	22	-	4mm float	-	no
38	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Family	45	-	22	-	4mm float	-	no
39	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Family	45	-	22	-	4mm float	-	no
40	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Family	45	-	22	-	4mm float	-	no
41	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	27	23	4mm float	4mm tough	yes
		Family	45	-	22	-	4mm float	-	no
42	1	Bed 1	45	-	27	28	4mm float	5mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	23	23	4mm tough	4mm tough	no
		Family	45	-	22	-	4mm float	-	no
43	1	Bed 1	45	-	28	23	5mm tough	4mm tough	yes
		Bed 2	45	-	22	-	4mm float	-	no

Level	Unit	Location	Rw Ratings				Glazing	Sliding Doors	Acoustic Seals
			Wall	Roof	Glazing	Sliding Doors			
		Bed 3	45	-	22	-	4mm float	-	no
		Bed 4	45	-	22	-	4mm float	-	no
		Living/Kitchen/Dining	45	-	23	23	4mm tough	4mm tough	no
		Family	45	-	22	-	4mm float	-	no
44	-	East Façade	45	-	22	23	4mm float	4mm tough	no
		South Facade	45	-	22	23	4mm float	4mm tough	no
45	Pent	Living/Kitchen/Dining	45	-	22	23	4mm float	4mm tough	no
		Home Theatre	45	-	22	23	4mm float	4mm tough	no
		Home Office	45	-	22	23	4mm float	4mm tough	no
46	Pent	Retreat	45	39	27	-	4mm float	-	yes
		Bed 1	45	39	27	23	4mm float	4mm tough	yes
		Bed 2	45	39	22	23	4mm float	4mm tough	no
		Bed 3	45	39	22	23	4mm float	4mm tough	no
		Bed 4	45	39	-	23	-	4mm tough	no

10.1.2 Alternative Ventilation

To achieve the required internal noise levels for the development, all locations nominated in Table 16 as requiring acoustic seals will require the provision for an alternative ventilation system similar to air-conditioning or mechanical ventilation to allow doors and windows to be closed.

10.1.3 Wall Construction

The proposed façade blockwork wall systems will comply with minimum Rw 45 rating.

Penetrations through the external walls shall not reduce the overall acoustic performance of the installed wall system. More detailed information for external wall systems may be provided on request.

10.1.4 Roof/Ceiling Construction

The proposed concrete slab will comply with the minimum R_w 39 rating.

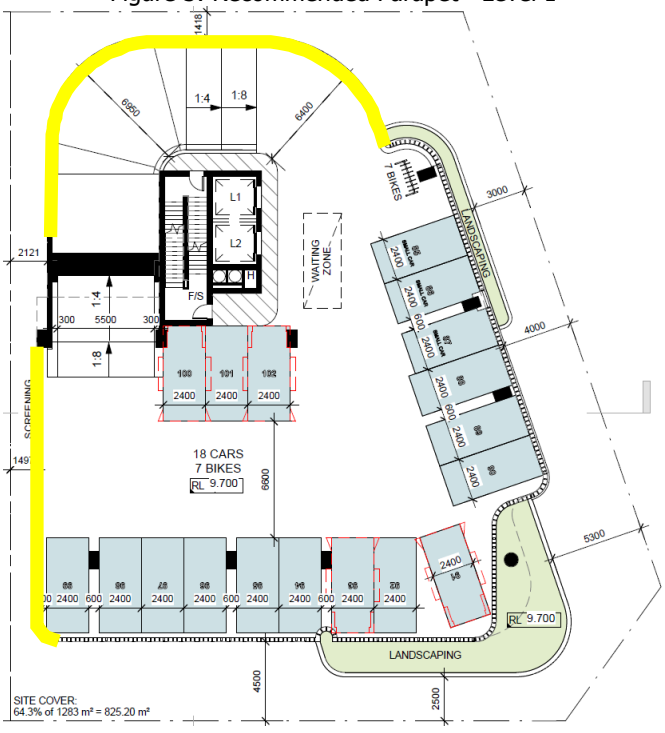
Penetrations through the roof/ceiling shall not reduce the overall acoustic performance of the installed roof/ceiling system. More detailed information for roof/ceiling systems may be provided on request.

10.2 Onsite Activities

Based on the predicted noise levels and subjective assessment of the site and surrounds for all time periods, noise impacts at the residential receiver locations are predicted to comply on the condition the following acoustic treatments are implemented:

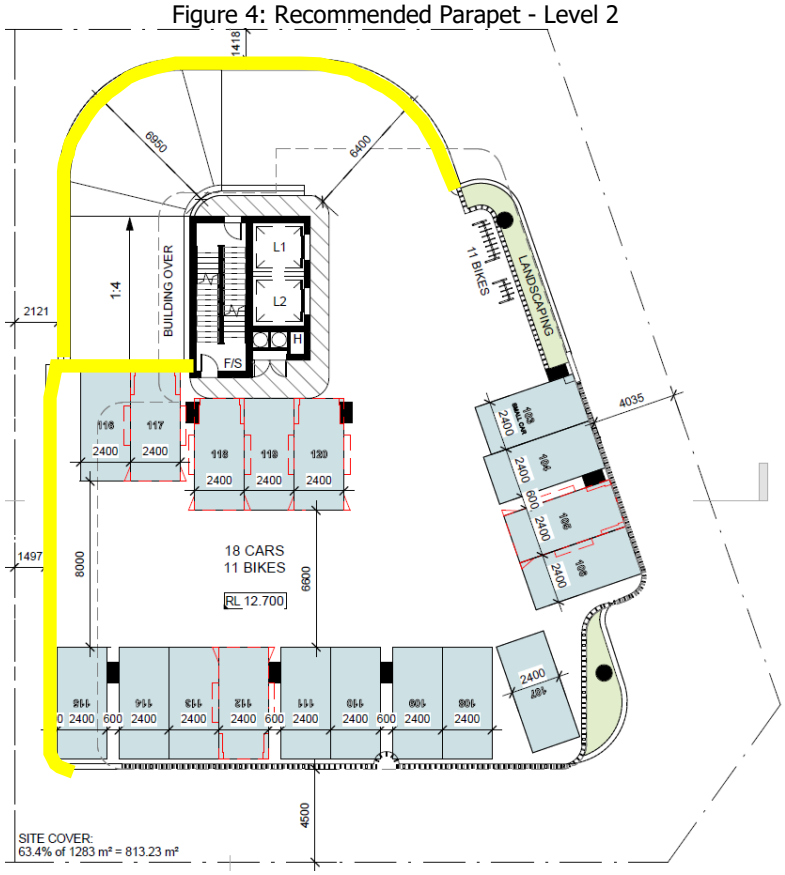
- We recommend that waste collection is conducted in accordance with existing residential collections in the area to reduce the potential for disturbance.
- Carpark finished surfaces should consist of materials which provide low tyre squeal characteristics. Any traversable drainage grates must be securely fastened.
- Use of the pool and communal area shall be limited to the day and evening periods (7am to 10pm) only.
- The gym shall have external windows and doors shut during use with windows constructed using 6.38mm laminate glass with acoustic seals to achieve a minimum Rw 31. We recommend the gym have provision for an alternative ventilation system similar to air-conditioning or mechanical ventilation to allow windows and doors to be closed during operation.
- Parapets are recommended to be constructed to the height and extent shown in Figures 3 and 4. The parapets shall be constructed using materials that achieve a minimum surface density of 9kg/m². Suitable materials may include, masonry, 9mm fibre cement sheeting, Hebel, or other material which satisfy the minimum surface density requirement. The parapets shall be free of gaps and holes.

Figure 3: Recommended Parapet - Level 1



1m high parapet above finished carpark level

Figure 4: Recommended Parapet - Level 2



10.2.1 Onsite Mechanical Plant

No information regarding mechanical services was available at the time of the assessment. We recommend that any new mechanical plant is designed to comply with the criteria stated in Section 6.2.2 with an assessment by a qualified acoustic consultant to be conducted prior to installation.

10.3 Offsite Activities

Based on the predicted noise levels presented in Section 9, compliance is predicted for offsite activities without the need for further acoustic treatments.

11. Conclusion

An environmental and road traffic noise assessment was conducted for the proposed mixed use development located at 99 and 101 Old Burleigh Road, Broadbeach. On the condition the recommendations detailed in Section 9 are implemented, compliance is predicted with City of Gold Coast assessment criteria.

If you should have any queries, please do not hesitate to contact us.

Report Prepared By



Andrew Hiscox
Acoustic Consultant
acousticworks)))

12. Appendices

12.1 Development Plans

DEVELOPMENT SUMMARY		
99 & 101 OLD BURLEIGH ROAD, BROADBEACH		
46 STOREYS		
MIXED-USE DEVELOPMENT		
RPD	LOT 70 on B8383 & CP on BUP104138	
SITE AREA	1283 m^2	
DENSITY	1 per 6.415 m^2 (200 Beds)	
GBA (UNDER ROOF)	28972	m^2
NSA	15948	m^2
TOTAL UNITS		
NUMBER OF UNITS		
3 Beds, 2.5 Baths + MPR	36	
4 Beds, 3.5 Baths + MPR	22	
4 Beds, 4.5 Baths + MPR	1	
Total Units	**59**	
PARKING		
REQUIRED		
3 Beds (1 per 1 unit)	36	
4 Beds (1 per 1 unit)	23	
Visitors (1 per 10 units)	5.9	
Food and Beverage (1 per 75m^2)	1	
Total Required	**65.9**	
PROVIDED		
Residential Parking	**120**	
Visitor Parking	**6**	
Food & Beverage Parking	**1**	
SRV	**1**	
Total Provided	**128**	
Bicycles (1 per Unit)	59	
Visitors	6	
Retail	1	
Total	**66**	
COMMUNAL SPACE		
PROVIDED	775.15 m^2	

DRAWINGS LIST

SHEET NUMBER	NAME	REVISION
DA.001	DEVELOPMENT SUMMARY	C
DA.002	LOCATION PLAN	B
DA.097	BASEMENT 3	B
DA.098	BASEMENT 2	C
DA.099	BASEMENT 1	C
DA.100	GROUND LEVEL	C
DA.101	LEVEL 1	C
DA.102	LEVEL 2	C
DA.103	LEVEL 3	C
DA.104	LEVELS 4 - 21	C
DA.122	LEVEL 22	B
DA.123	LEVEL 23 - 43	B
DA.144	LEVEL 44	A
DA.145	LEVEL 45	A
DA.146	LEVEL 46	A
DA.401	BUILDING FORM	B
DA.402	BUILDING FORM	B
DA.403	BUILDING FORM	B
DA.411	MATERIALITY	A
DA.412	MATERIALITY	A
DA.413	MATERIALITY	A
DA.421	PERSPECTIVES	A
DA.422	PERSPECTIVES	A
DA.423	PERSPECTIVES	A
DA.424	PERSPECTIVES	A
DA.431	PERSPECTIVES	A
DA.432	PERSPECTIVES	A
DA.433	PERSPECTIVES	A
DA.434	PERSPECTIVES	A
DA.451	SHADOW ANALYSIS	A
DA.452	SHADOW ANALYSIS	A
DA.453	SHADOW ANALYSIS	A
DA.501	EAST ELEVATION	B
DA.502	NORTH ELEVATION	B
DA.503	SOUTH ELEVATION	B
DA.504	WEST ELEVATION	B
DA.601	SECTION A	C
DA.602	SECTION B	B

DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

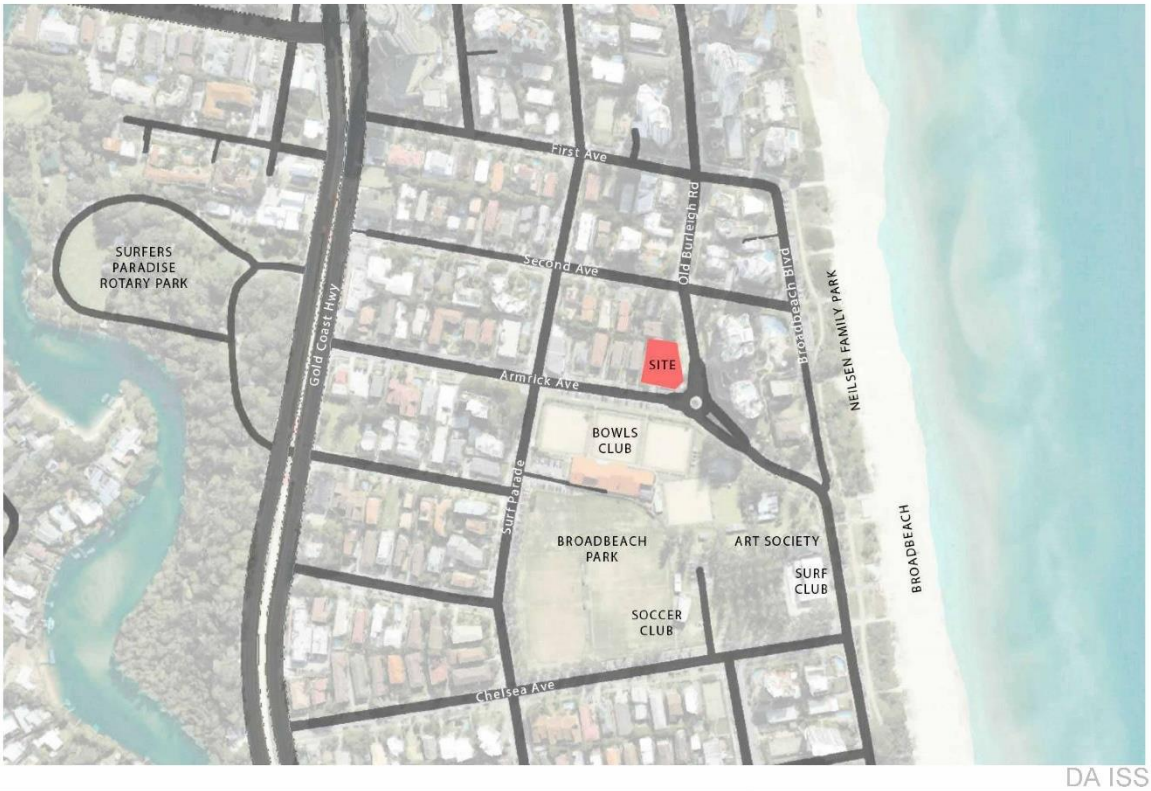
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	17.09.2021	PRELIMINARY ISSUE
B	15.10.2021	PRELIMINARY ISSUE
C	09.11.2021	DA ISSUE

DEVELOPMENT SUMMARY

DA.001

C



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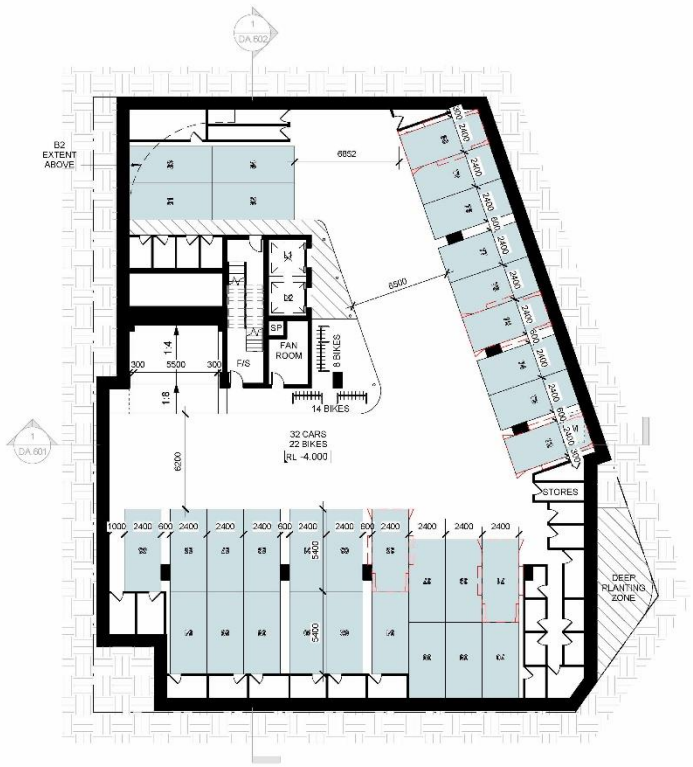
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	17.09.2021	PRELIMINARY ISSUE
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LOCATION PLAN

DA.002

B



DA ISSUE

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MIXED-USE DEVELOPMENT

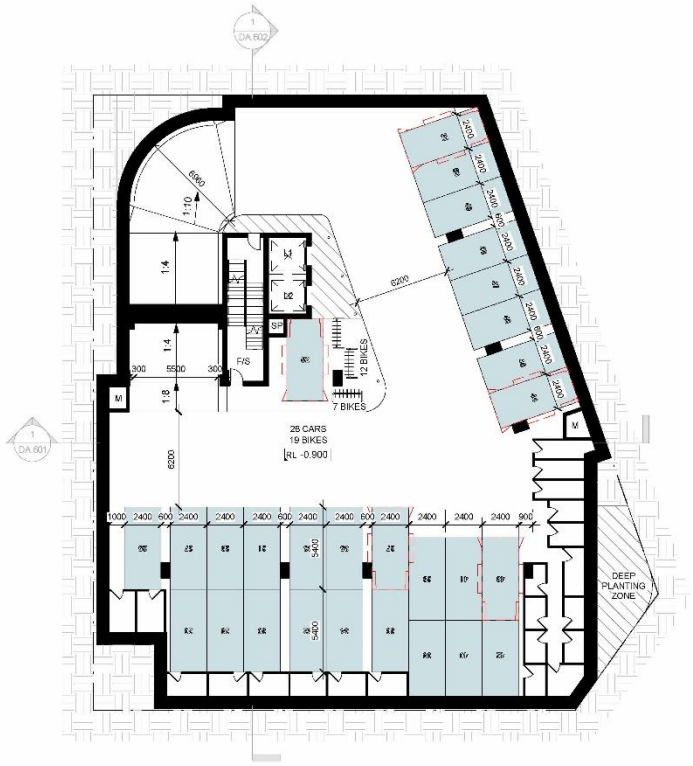
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	15.10.2021	PRELIMINARY ISSUE
B	09.11.2021	DA ISSUE

BASEMENT 3

DA.097

B



DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

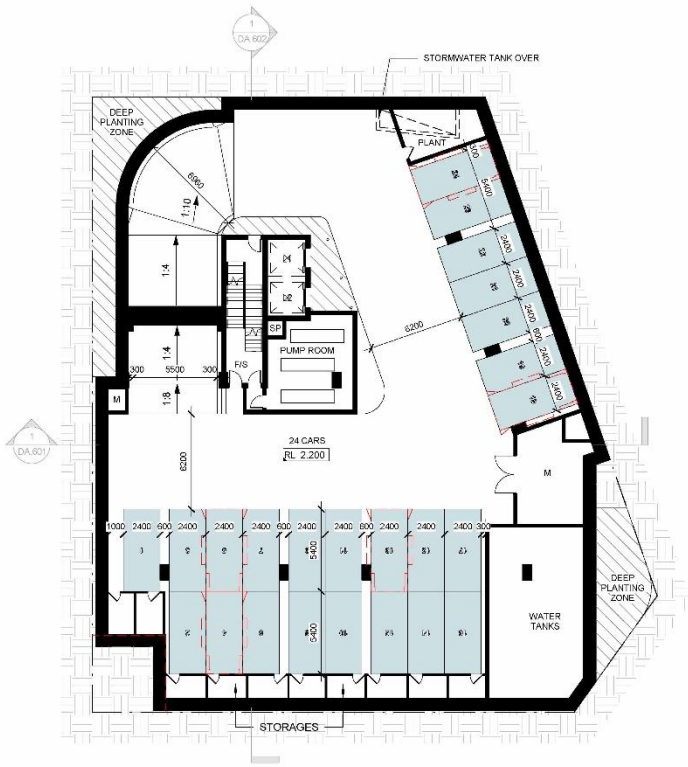
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	17.09.2021	PRELIMINARY ISSUE
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C	09.11.2021	DA ISSUE

BASEMENT 2

DA.098

C



DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

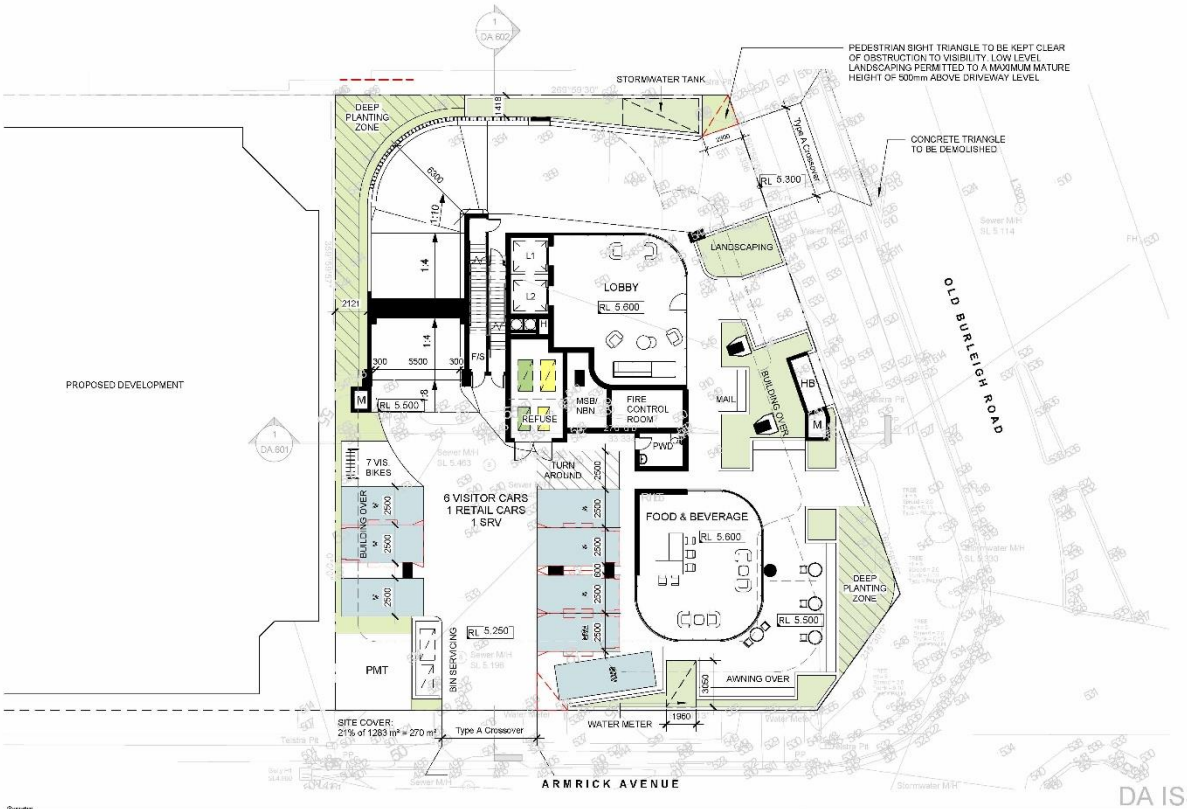
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
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B	15.10.2021	PRELIMINARY ISSUE
C	09.11.2021	DA ISSUE

BASEMENT 1

DA.099

C



DA ISSUE

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MIXED-USE DEVELOPMENT

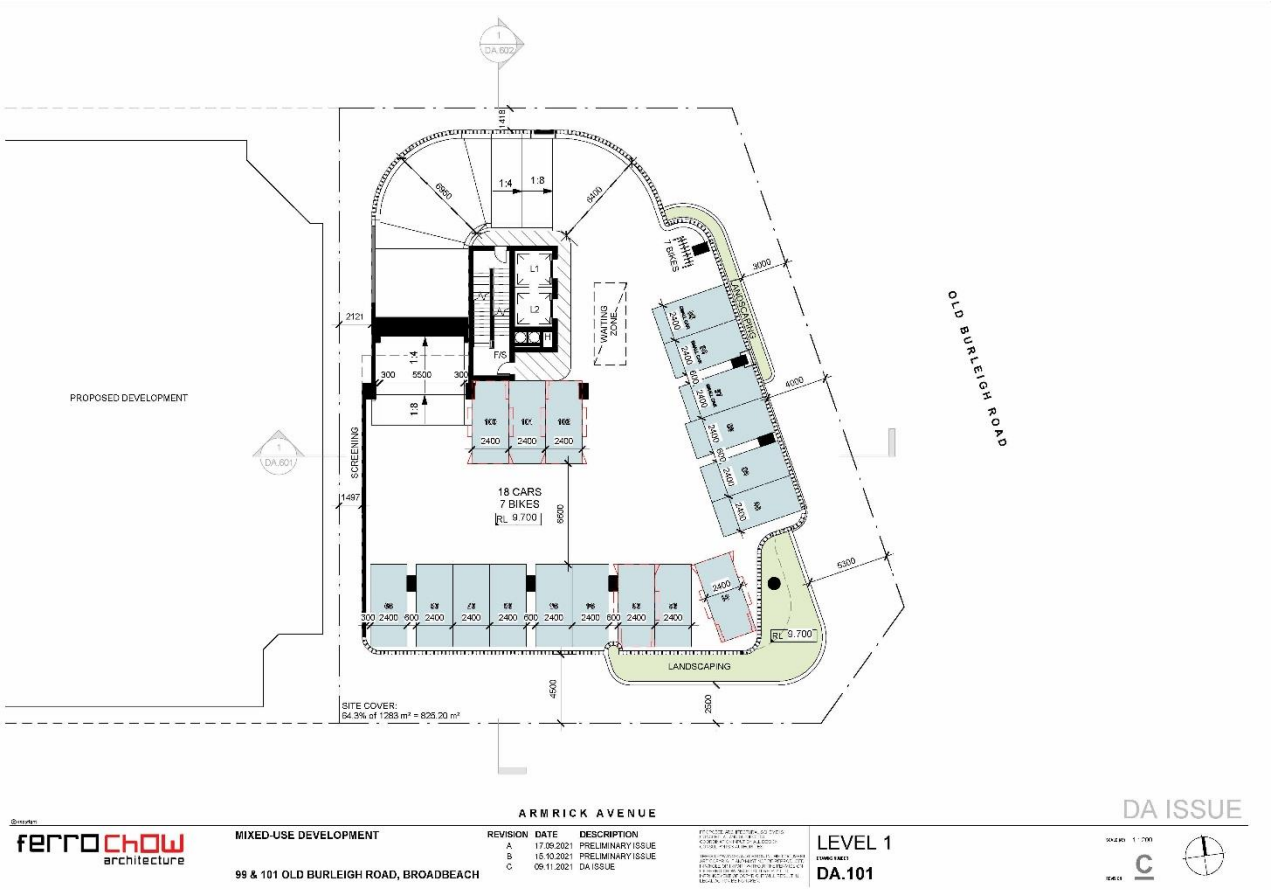
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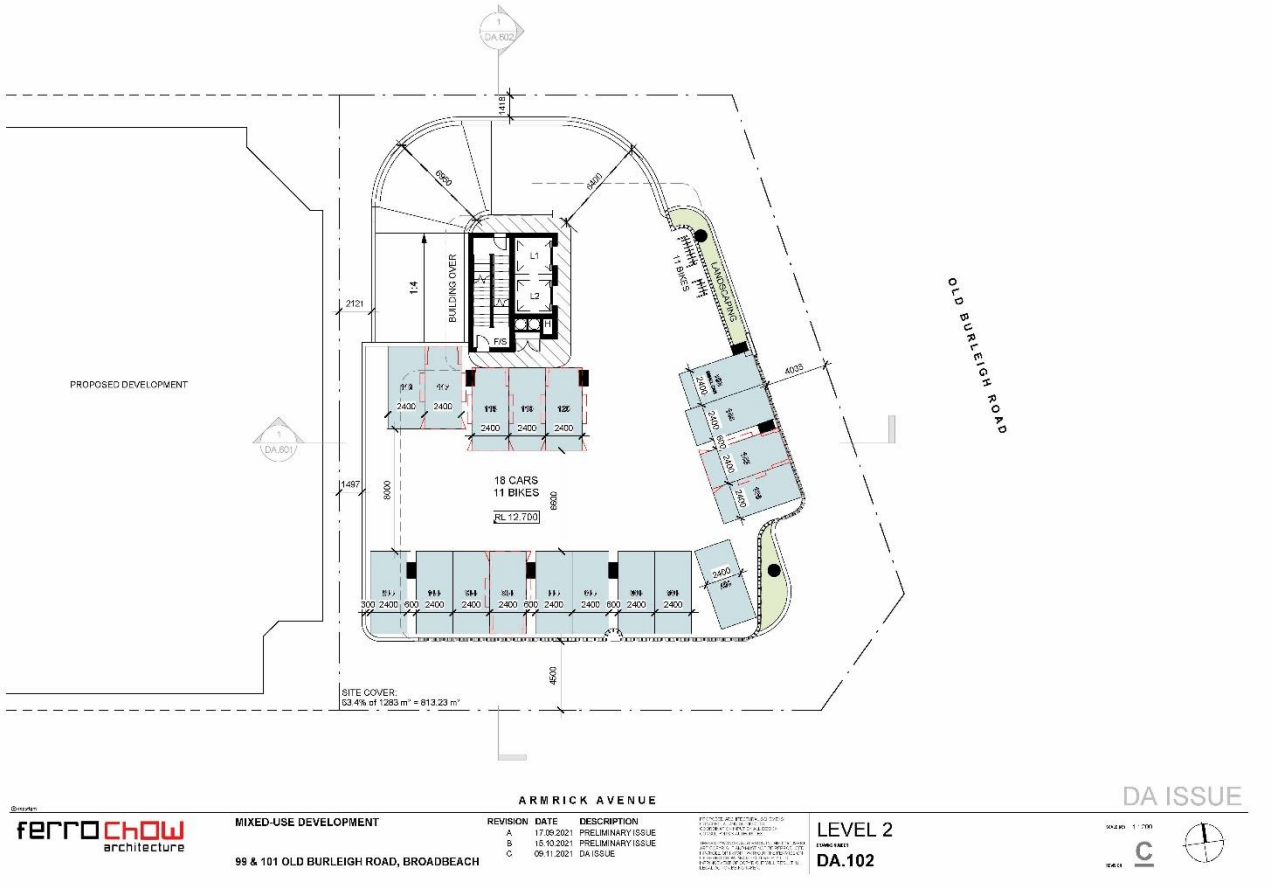
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C	09.11.2021	DA ISSUE

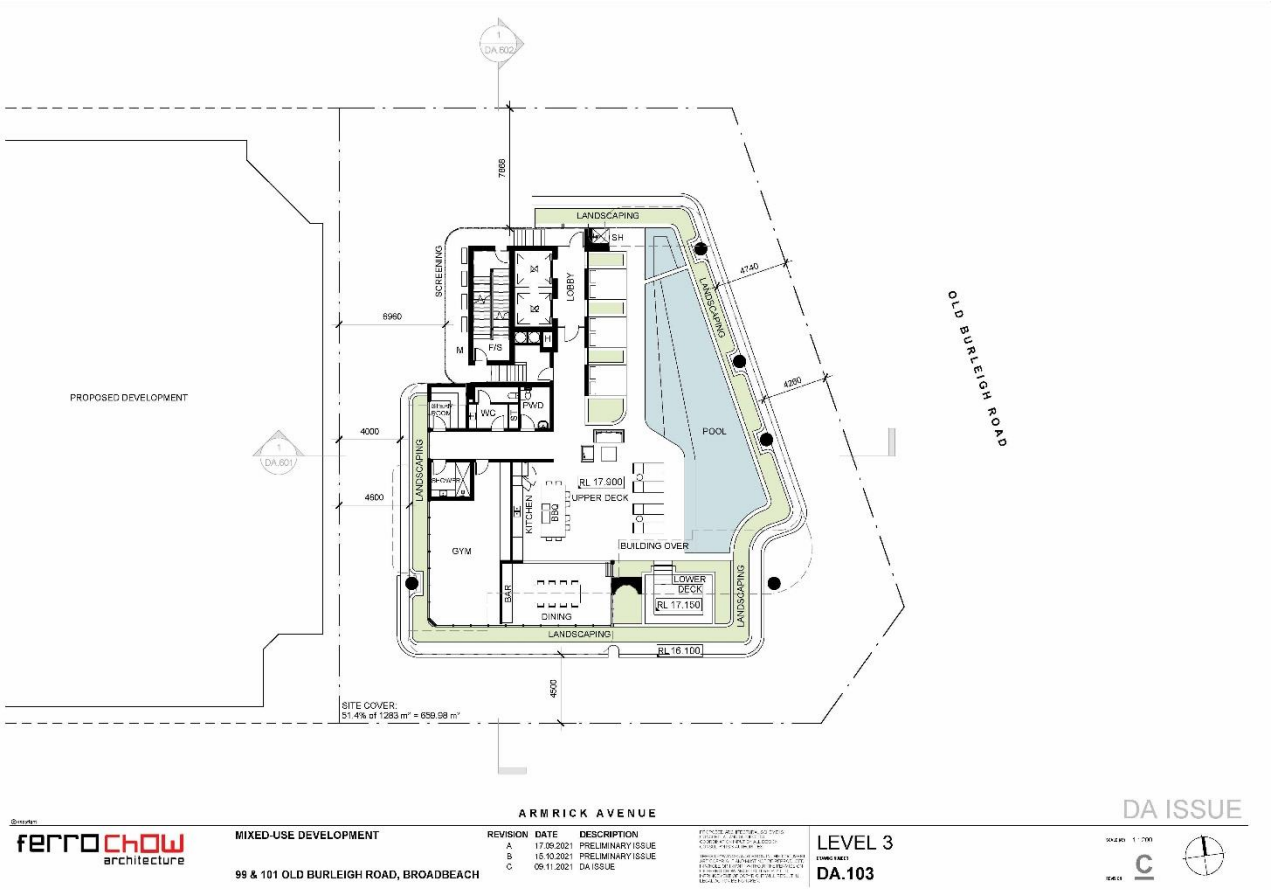
GROUND LEVEL

DA.100

C


PROPOSED DEVELOPMENT
OLD BURLEIGH ROAD
ARMRICK AVENUE
18 CARS
7 BIKES
RL 9.700
WAITING ZONE
LANDSCAPING
SCREENING
SITE COVER:
64.3% of 1283 m² = 826.20 m²
DA ISSUE
ferro CHOW architecture
MIXED-USE DEVELOPMENT
99 & 101 OLD BURLEIGH ROAD, BROADBEACH
REVISION DATE DESCRIPTION
A 17.09.2021 PRELIMINARY ISSUE
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C 09.11.2021 DA ISSUE
LEVEL 1
DA.101
C


PROPOSED DEVELOPMENT
OLD BURLEIGH ROAD
ARMRICK AVENUE
18 CARS
11 BIKES
RL 12.700
BUILDING OVER
LANDSCAPING
SITE COVER:
53.4% of 1283 m² = 813.23 m²
DA ISSUE
ferro CHOW architecture
MIXED-USE DEVELOPMENT
99 & 101 OLD BURLEIGH ROAD, BROADBEACH
REVISION DATE DESCRIPTION
A 17.09.2021 PRELIMINARY ISSUE
B 15.10.2021 PRELIMINARY ISSUE
C 09.11.2021 DA ISSUE
LEVEL 2
DA.102
C



DA ISSUE

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MIXED-USE DEVELOPMENT

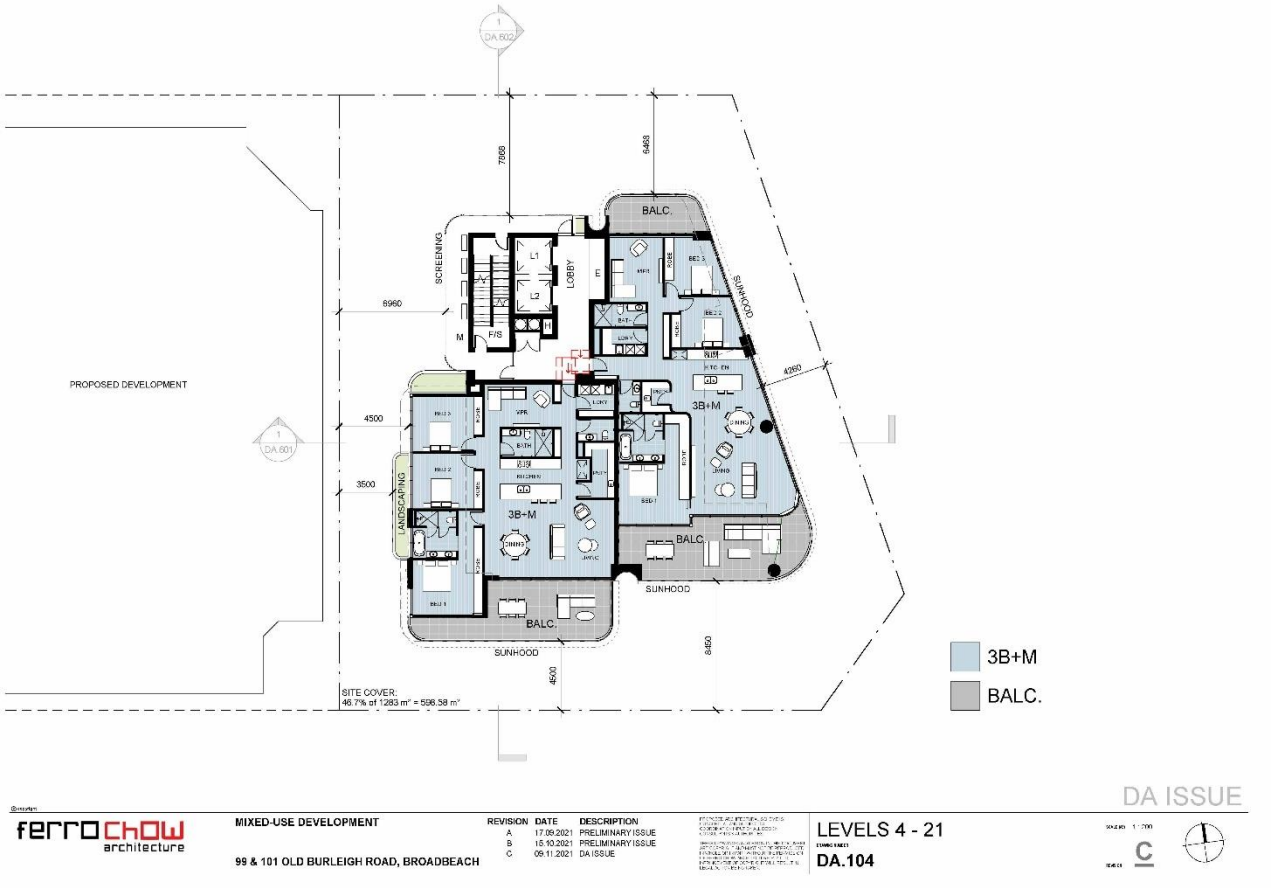
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

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LEVEL 3

DA.103

C



DA ISSUE

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MIXED-USE DEVELOPMENT

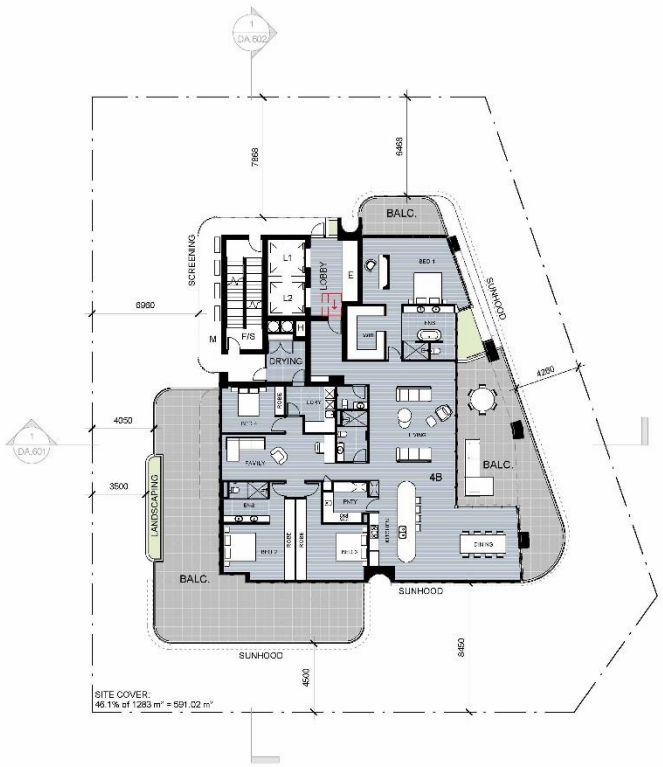
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

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C	09.11.2021	DA ISSUE

LEVELS 4 - 21

DA.104

C



DA ISSUE

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MIXED-USE DEVELOPMENT

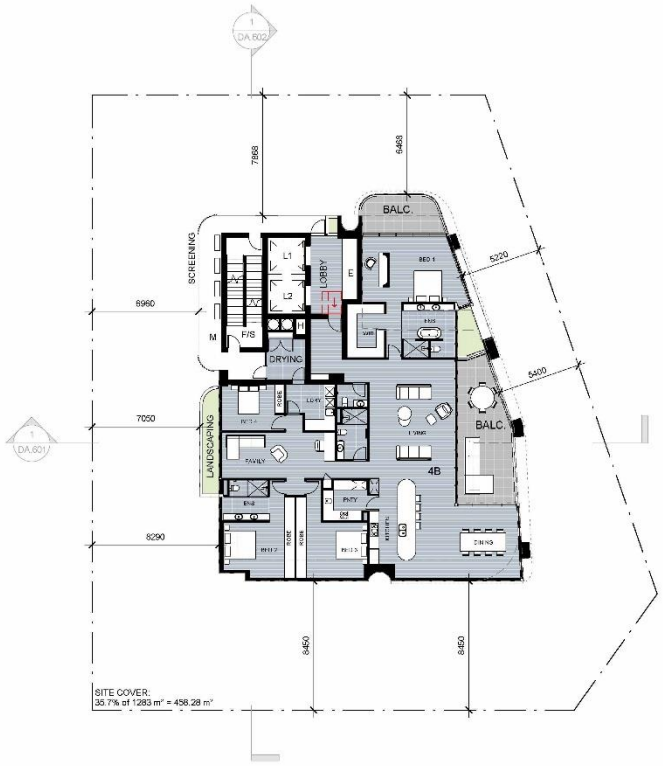
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
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LEVEL 22

DRAWING NUMBER
DA.122

SCALE @ A1: 1:200
B



DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

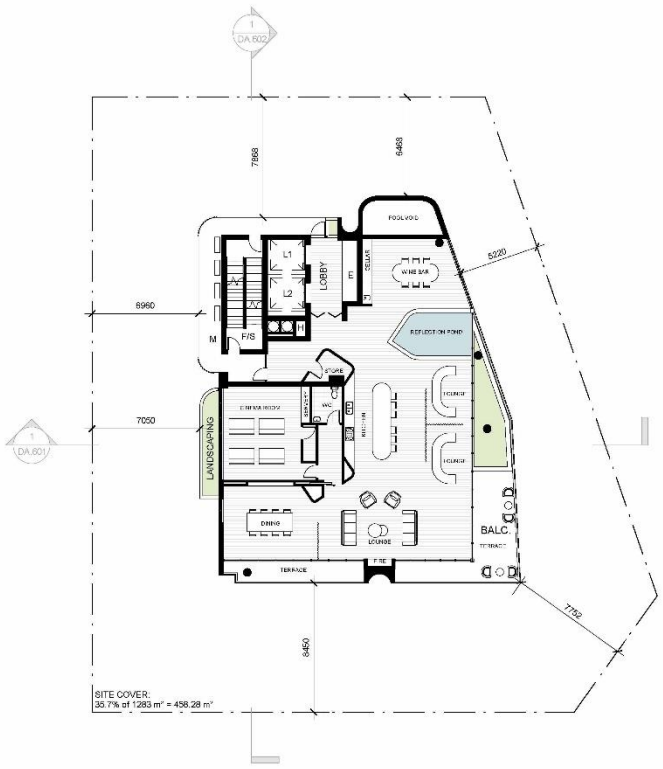
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
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B	09.11.2021	DA ISSUE

LEVEL 23 - 43

DRAWING NUMBER
DA.123

SCALE @ A1: 1:200
B



DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

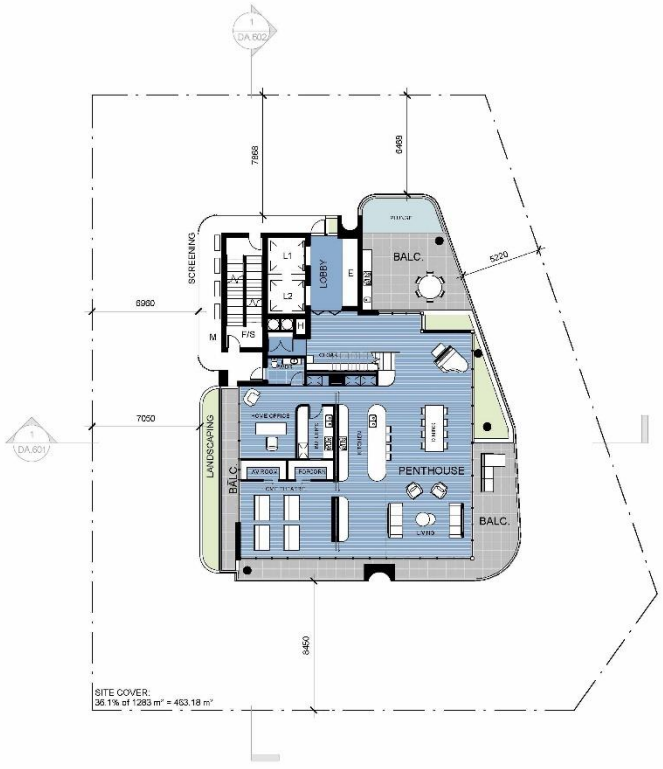
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

LEVEL 44

DRAWING NUMBER DA.144

SCALE 1:200 @ A



BALC.

PENTHOUSE

DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

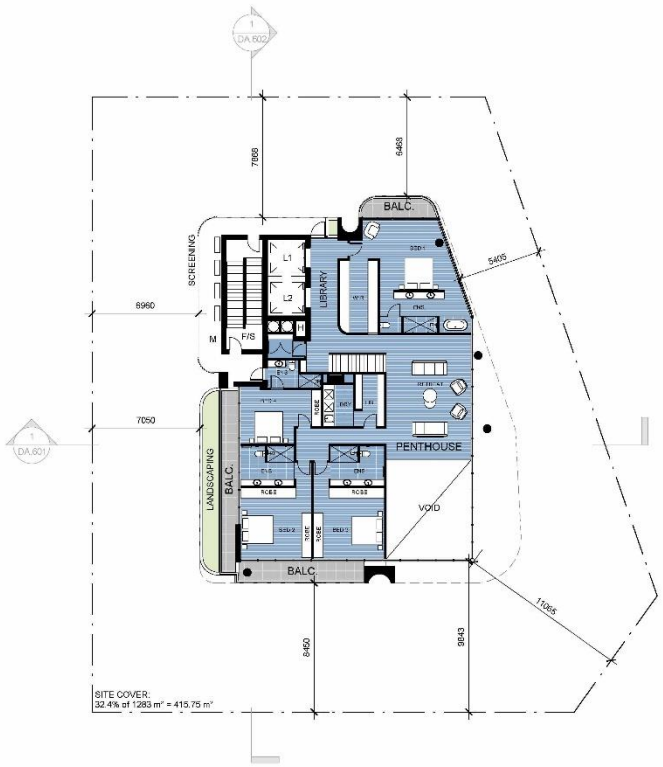
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

LEVEL 45

DRAWING NUMBER DA.145

SCALE 1:200 @ A



DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

LEVEL 46

DRAWING NUMBER
DA.146

SCALE @ A1: 1:200

A



DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	15.10.2021	PRELIMINARY ISSUE
B	09.11.2021	DA ISSUE

BUILDING FORM

DRAWING NUMBER
DA.401

SCALE @ A1:

B



SOUTH - EASTERN AERIAL VIEW



SOUTH - WESTERN AERIAL VIEW

DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	15.10.2021	PRELIMINARY ISSUE
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BUILDING FORM

DRAWING NUMBER

DA.402

B



NORTH - EASTERN AERIAL VIEW



NORTH - WESTERN AERIAL VIEW

DA ISSUE

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BUILDING FORM

DRAWING NUMBER

DA.403

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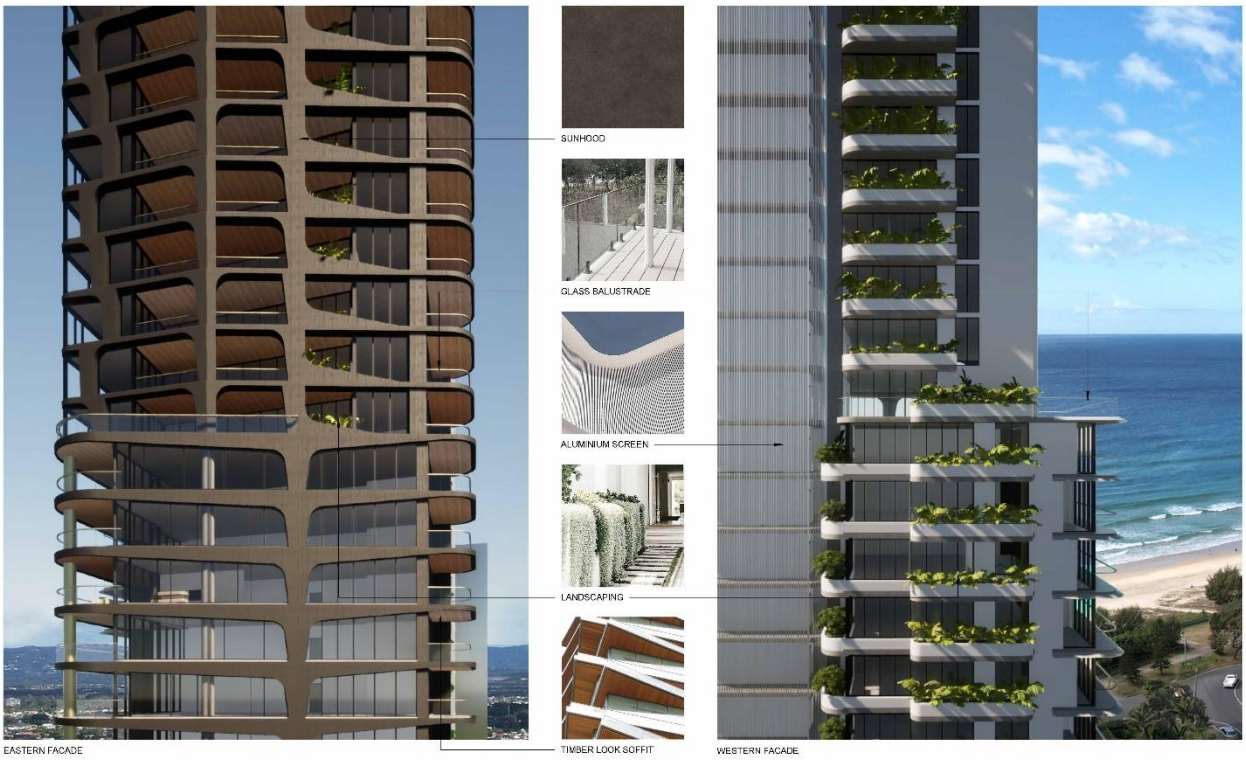
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

MATERIALITY

DA.411

A



DA ISSUE

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99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

MATERIALITY

DA.412

A



DA ISSUE

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99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

MATERIALITY

DRAWING NUMBER
DA.413

SCALE @ A1
A



EASTERN PODIUM

DA ISSUE

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MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

PERSPECTIVES

DRAWING NUMBER
DA.421

SCALE @ A1
A



SOUTHERN PODIUM



NORTH - EASTERN PODIUM



CORNER OF OLD BURLEIGH RD AND AMRICK AVE



RETAIL - PODIUM

DA ISSUE

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MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

PERSPECTIVES

DA.422

A



POOL AREA - LEVEL 3



DINING AREA - LEVEL 3



POOL AREA - LEVEL 3



POOL AREA - LEVEL 3

DA ISSUE

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MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

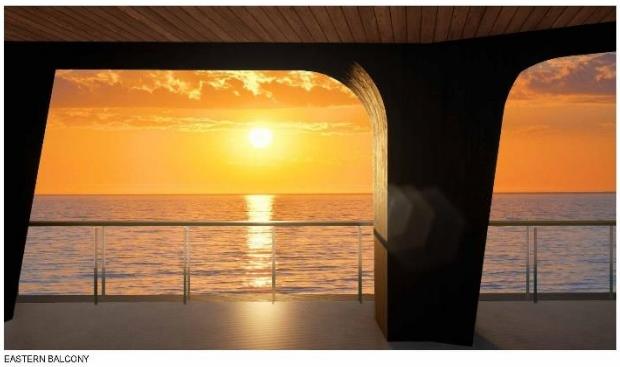
PERSPECTIVES

DA.423

A



NORTH - EASTERN FACADE



EASTERN BALCONY



SOUTH - WESTERN FACADE



SOUTHERN BALCONY

DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

PERSPECTIVES

DRAWING NUMBER

DA.424

SCALE @ A1

A



EASTERN FACADE

DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

PERSPECTIVES

DRAWING NUMBER

DA.431

SCALE @ A1

A



NORTH - EASTERN FACADE

DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

PERSPECTIVES

DRAWING NUMBER
DA.432

SCALE @ A3
A



SOUTH - EASTERN FACADE

DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

PERSPECTIVES

DRAWING NUMBER
DA.433

SCALE @ A3
A



SOUTH - WESTERN FACADE

DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

PERSPECTIVES

DRAWING NUMBER: DA.434

SCALE: A



SUMMER SOLSTICE 9AM



SUMMER SOLSTICE 12PM



SUMMER SOLSTICE 3PM



SUMMER

DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

SHADOW ANALYSIS

DRAWING NUMBER: DA.451

SCALE: A



WINTER SOLSTICE 9AM



WINTER SOLSTICE 12PM



WINTER SOLSTICE 3PM



WINTER

DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

SHADOW ANALYSIS

DRAWING NUMBER
DA.452

SCALE @ A1
A



SPRING EQUINOX 9AM



SPRING EQUINOX 12PM



SPRING EQUINOX 3PM



SPRING

DA ISSUE

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MIXED-USE DEVELOPMENT

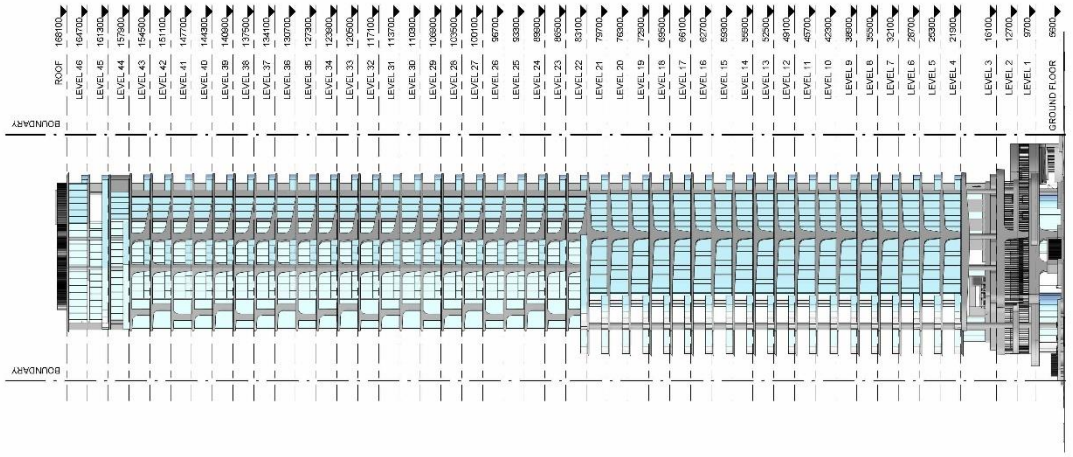
99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	09.11.2021	DA ISSUE

SHADOW ANALYSIS

DRAWING NUMBER
DA.453

SCALE @ A1
A



DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

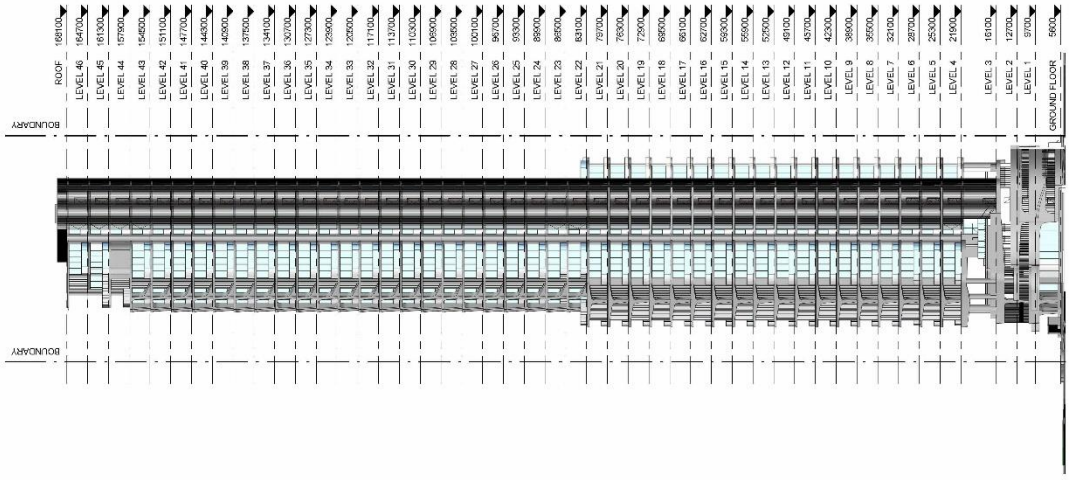
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EAST ELEVATION

DRAWING NUMBER
DA.501

SCALE 1 : 500

B



DA ISSUE

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MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

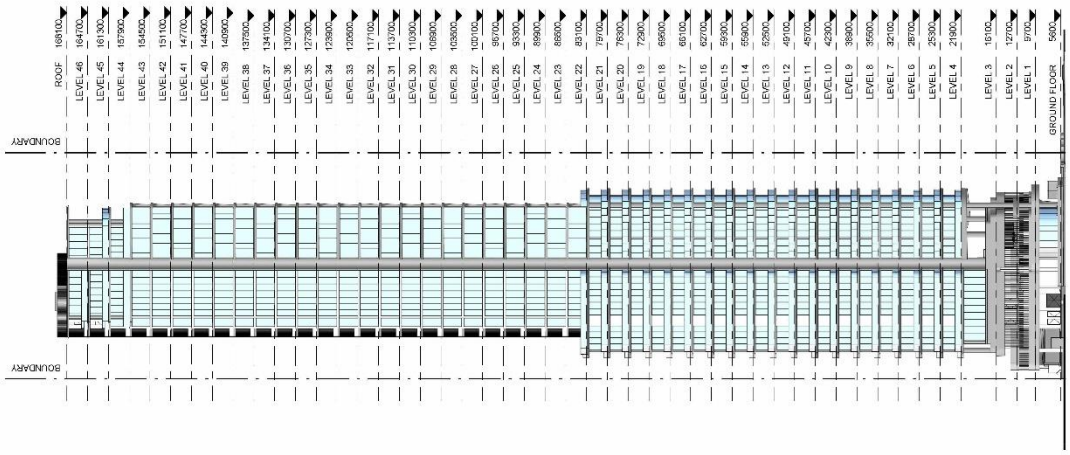
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B	09.11.2021	DA ISSUE

NORTH ELEVATION

DRAWING NUMBER
DA.502

SCALE 1 : 500

B



DA ISSUE

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MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

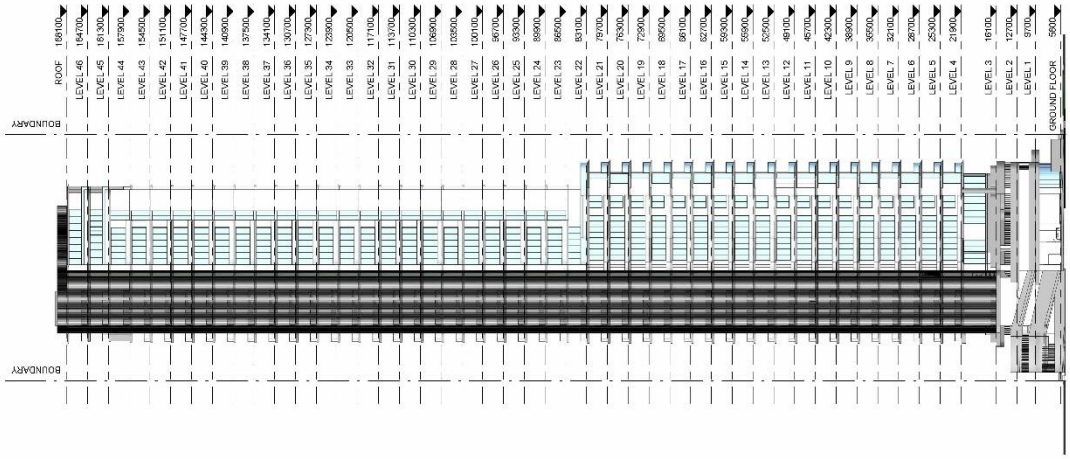
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SOUTH ELEVATION

DRAWING NUMBER
DA.503

SCALE 1 : 500

B



DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

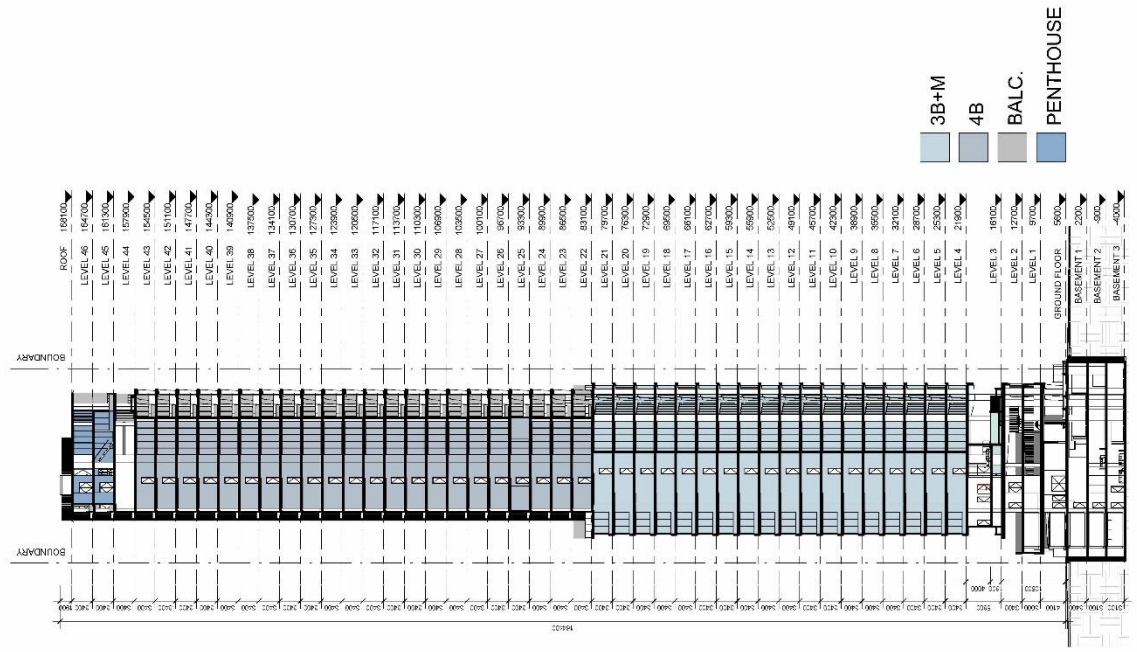
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A	15.10.2021	PRELIMINARY ISSUE
B	09.11.2021	DA ISSUE

WEST ELEVATION

DRAWING NUMBER
DA.504

SCALE 1 : 500

B



DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

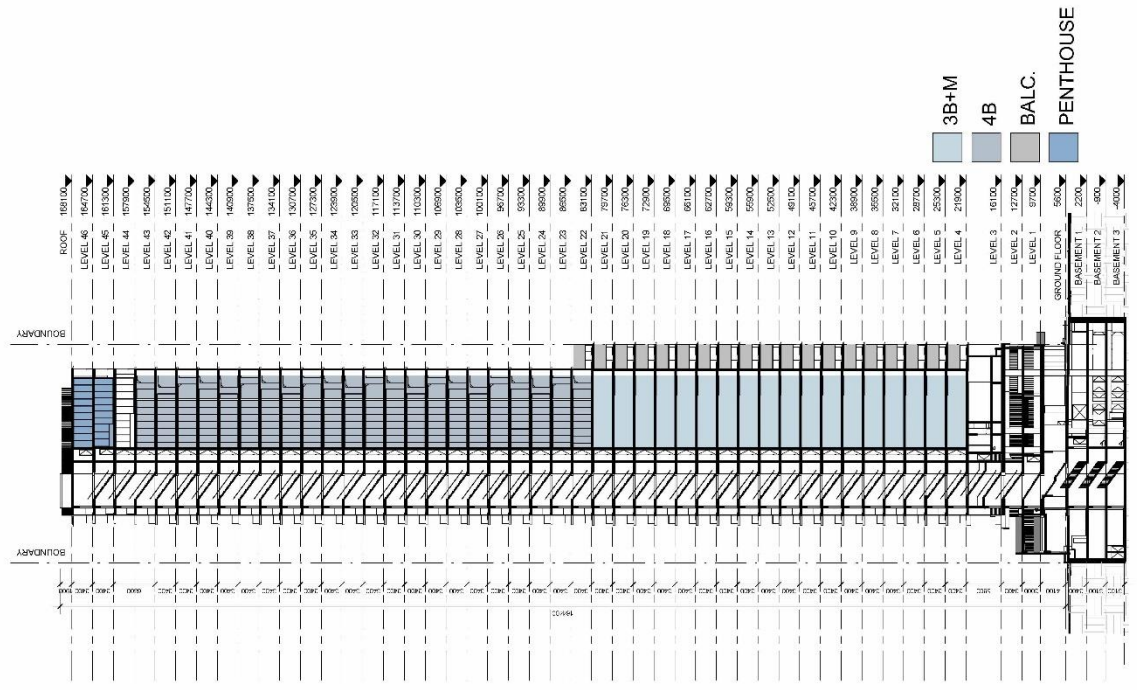
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A	17.09.2021	PRELIMINARY ISSUE
B	15.10.2021	PRELIMINARY ISSUE
C	09.11.2021	DA ISSUE

SECTION A

DRAWING NUMBER
DA.601

SCALE 1 : 500

C



DA ISSUE

ferro CHOW architecture

MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	15.10.2021	PRELIMINARY ISSUE
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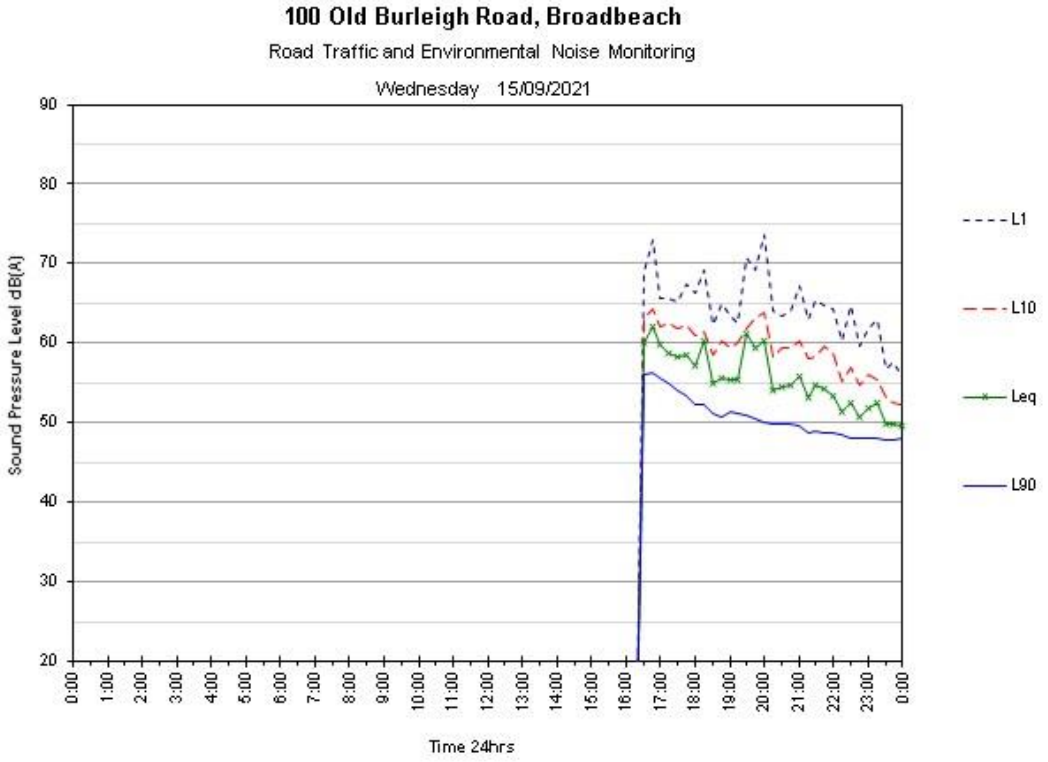
SECTION B

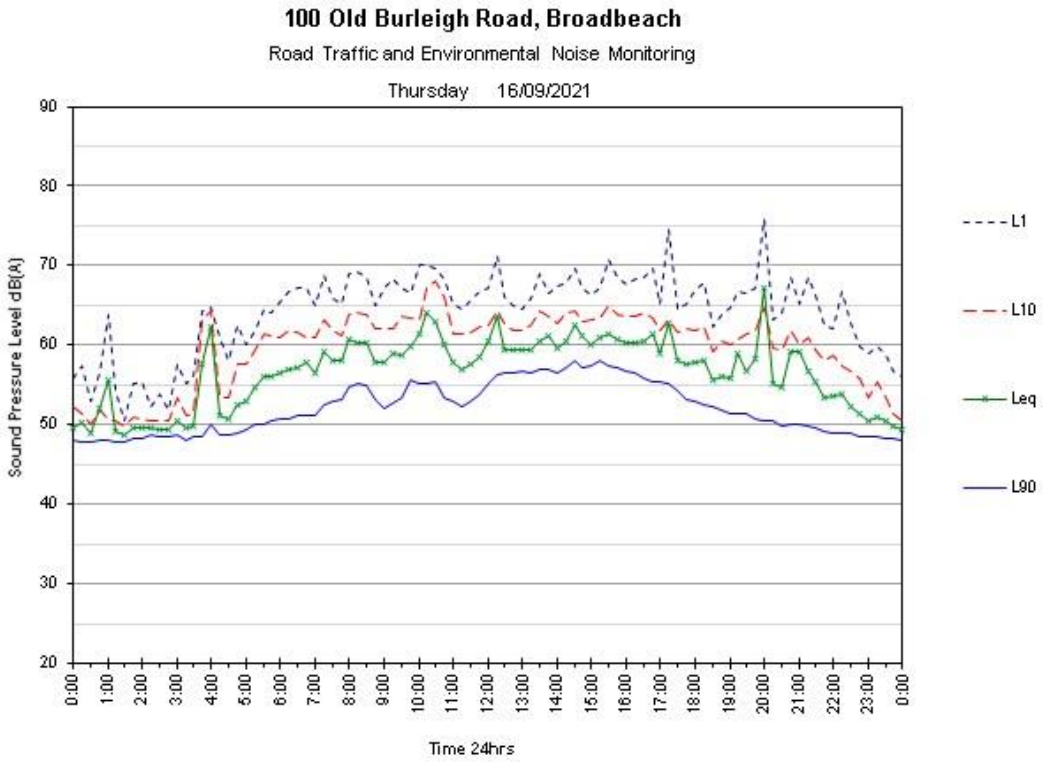
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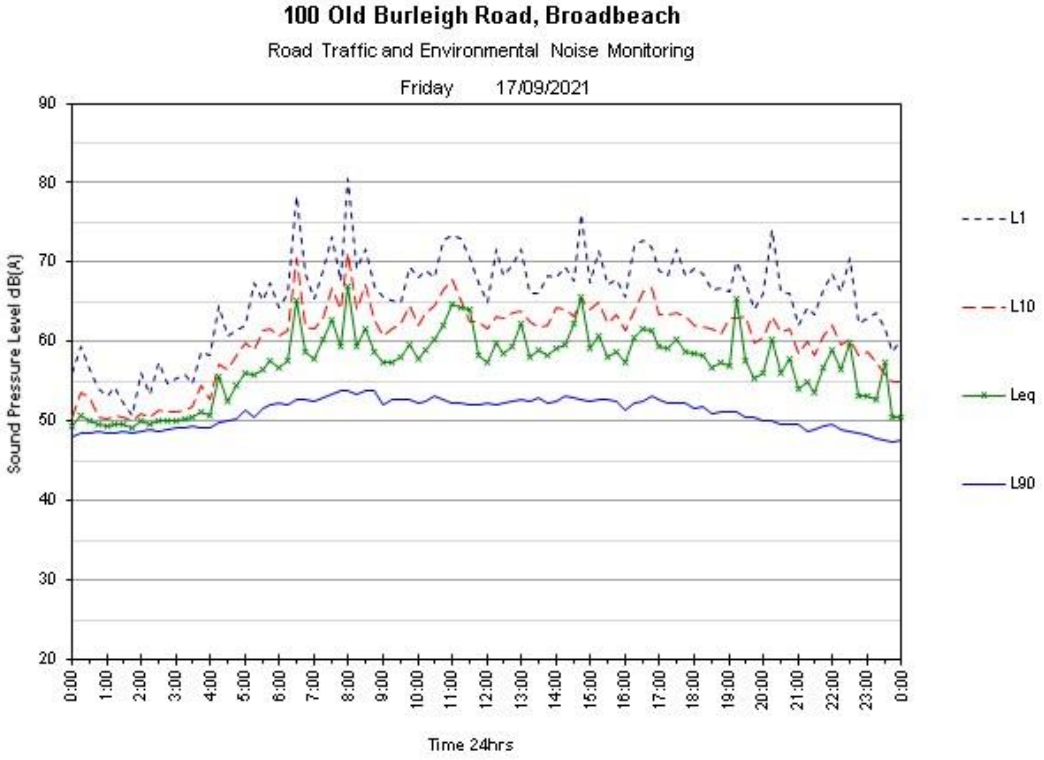
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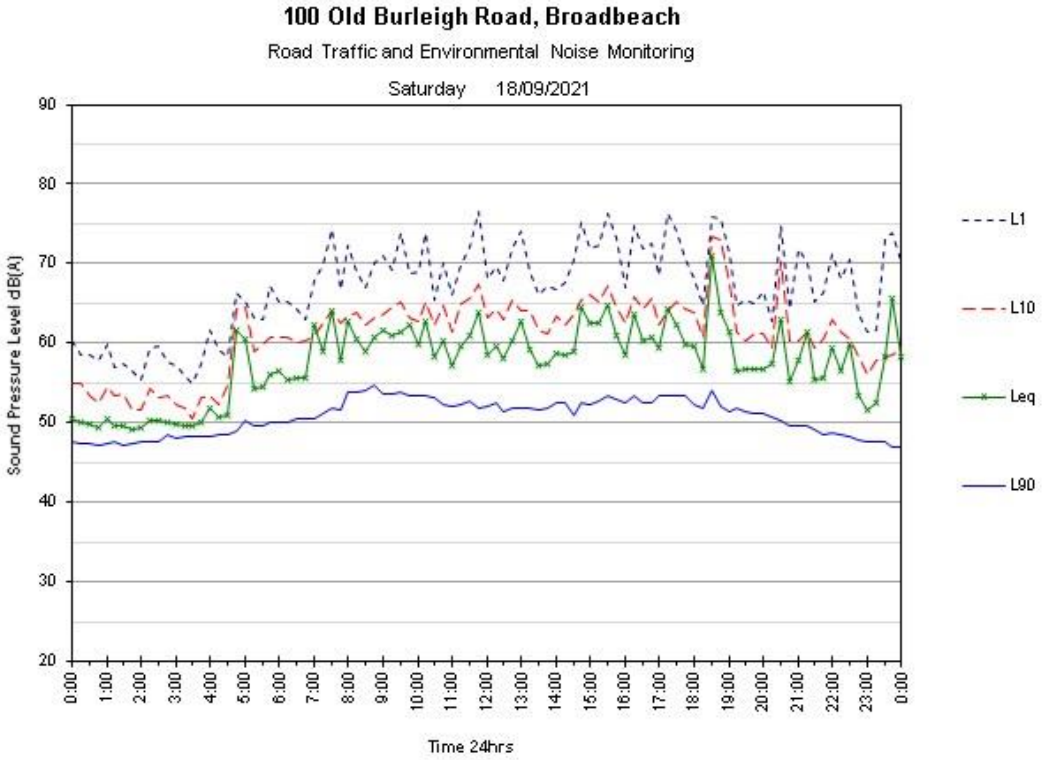
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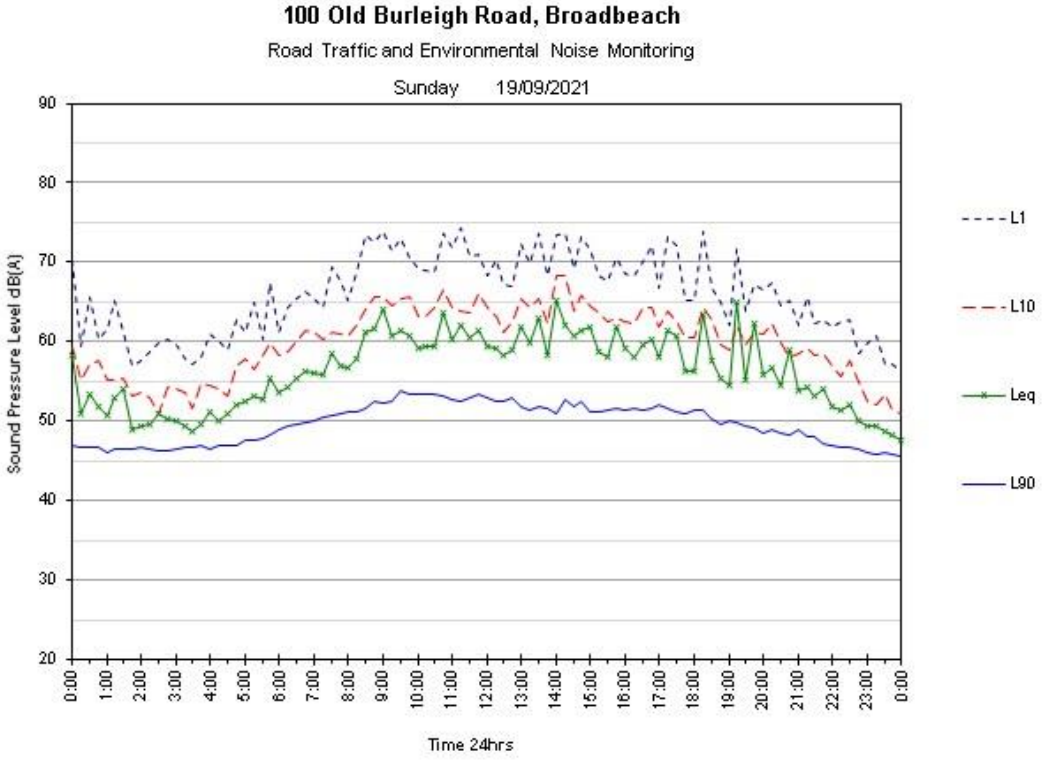
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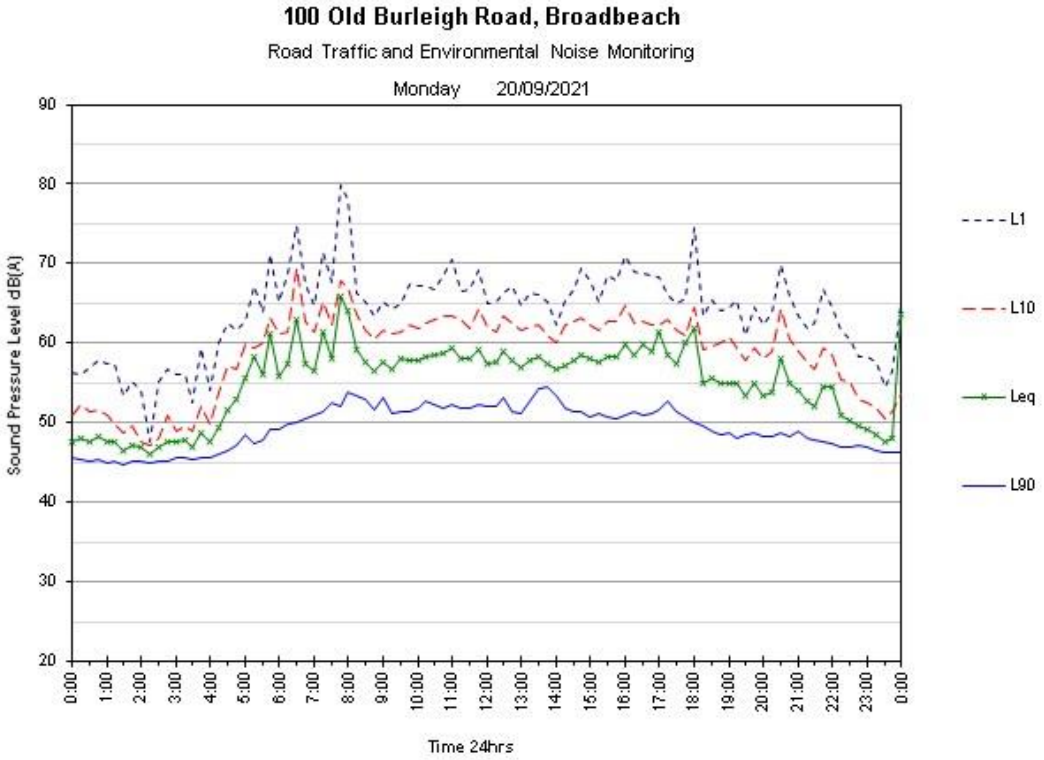


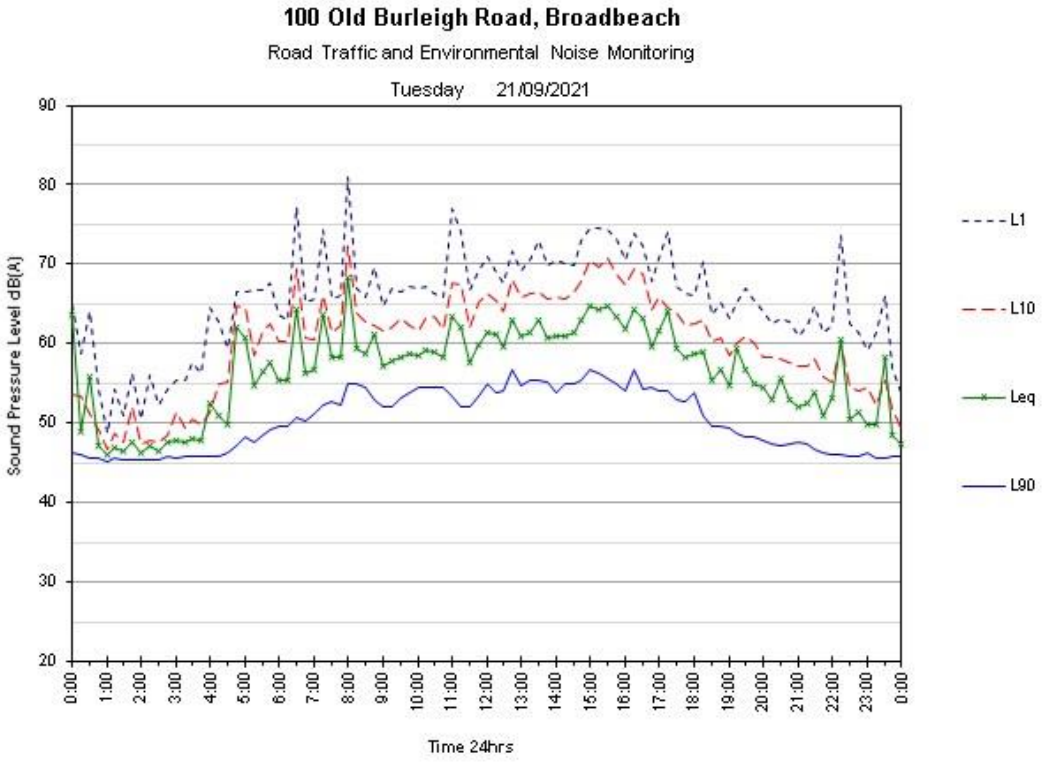


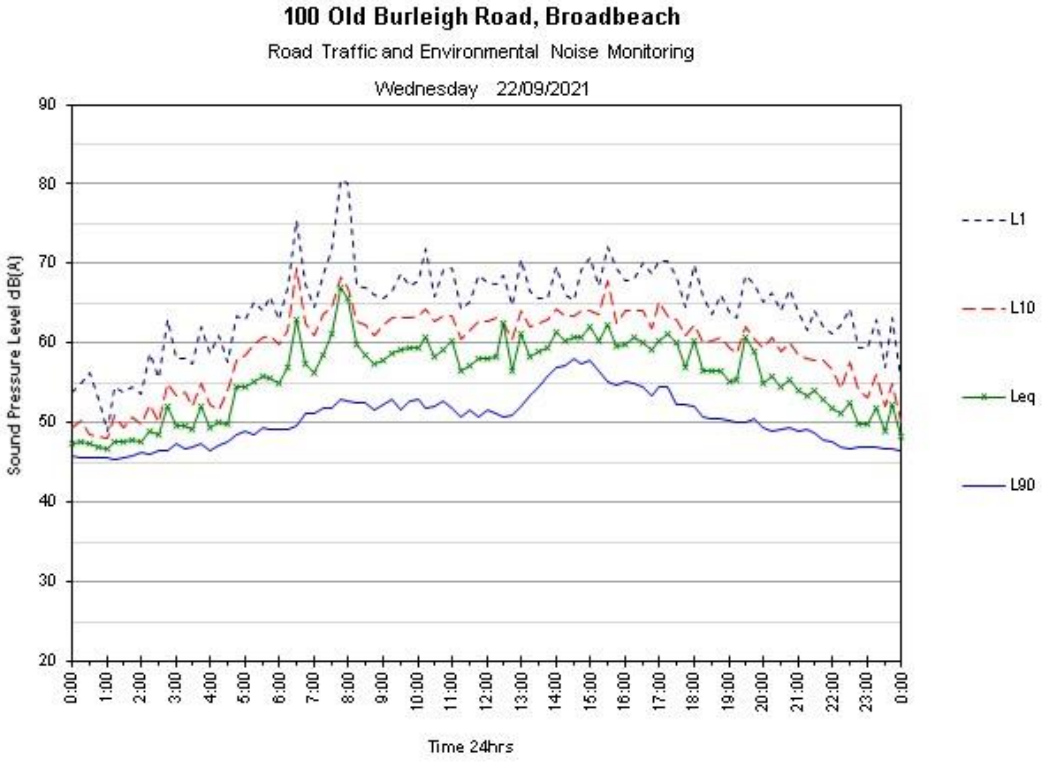

100 Old Burleigh Road, Broadbeach
Road Traffic and Environmental Noise Monitoring
Friday 17/09/2021
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90

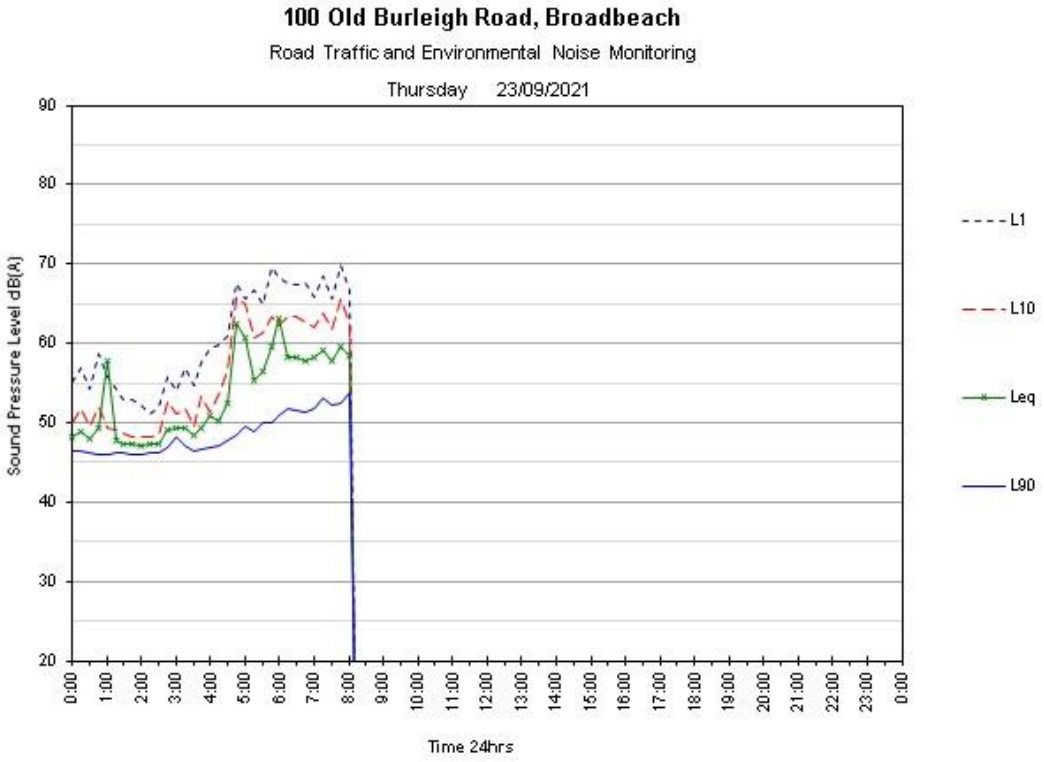

100 Old Burleigh Road, Broadbeach
Road Traffic and Environmental Noise Monitoring
Saturday 18/09/2021
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90


100 Old Burleigh Road, Broadbeach
Road Traffic and Environmental Noise Monitoring
Sunday 19/09/2021
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90


100 Old Burleigh Road, Broadbeach
Road Traffic and Environmental Noise Monitoring
Monday 20/09/2021
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
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13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90


100 Old Burleigh Road, Broadbeach
Road Traffic and Environmental Noise Monitoring
Tuesday 21/09/2021
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
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13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90


100 Old Burleigh Road, Broadbeach
Road Traffic and Environmental Noise Monitoring
Wednesday 22/09/2021
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
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11:00
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15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90


100 Old Burleigh Road, Broadbeach
Road Traffic and Environmental Noise Monitoring
Thursday 23/09/2021
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
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7:00
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12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90

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APPENDIX H WATER AND SEWER ASSESSMENT

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99 & 101 Old Burleigh Road, Broadbeach

Water and Sewer Assessment

Client: BAM Property Group
Project No: BE210274
Document No: BE210274-RP-WAS-01

November 2021

Document Control Record

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Date:	1/11/2021

Approved by:	Andrew Faulkner
Position:	WCS Engineering Pty Ltd
Date:	1/11/2021

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Appendix A – Architectural Drawings
Appendix B – Service Layout Plan
Appendix C – SEQ WS&S D&C Code Failures (Water Supply)

1. Introduction

This Detailed Water and Sewer Assessment report has been prepared for BAM Property Group, in support of a Development Application for the establishment of a Multi-Unit Residential Highrise and underground parking over 99 & 101 Old Burleigh Road properly described as Lot 0 on BUP104138 & Lot 70 on B8383 (the subject site).
The subject site is situated within the City of Gold Coast Local Government Area (LGA) and is zoned by the City of Gold Coast City Plan Version 8 as 'High Density Residential'.

1.1 Objectives

The objective of this investigation is to determine the impacts of the proposed development on the local water and wastewater network and ensure the development can be serviced while satisfying relevant design criteria. Water and wastewater infrastructure have been adopted in accordance with the City of Gold Coast's (City's) Water Supply and Sewerage Infrastructure Plan 2019 (WSSIP) master planning servicing strategies.

1.2 Scope

Specifically, this report details the following:

- Investigation of the water network capacity;
- Review of the impact of the proposed development on the existing water network;
- Review of the impact of the proposed development on the future water network at multiple planning horizons, as defined by the Local Government Infrastructure Plan;
- Investigation of the sewer network capacity;
- Review of the impact of the proposed development on the existing sewer network; and
- Review of the impact of the proposed development on the future sewer network at multiple planning horizons, as defined by the Local Government Infrastructure Plan.

This report represents an assessment of the facts and circumstances pertaining to these matters, as they are known to the writer at the time of preparation.

2. Development Summary

2.1 Location

The subject site is located over 99 & 101 Old Burleigh Road properly described as Lot 0 on BUP104138 & Lot 70 on B8383 and has a total site area of 1,283 m^2. The site is identified by the City Of Gold Coast as being located within a High Density Residential zone. Figure 2.1 below identifies the location of the subject site. The development is within the City's local government area who act as the responsible distributor-retailer water authority

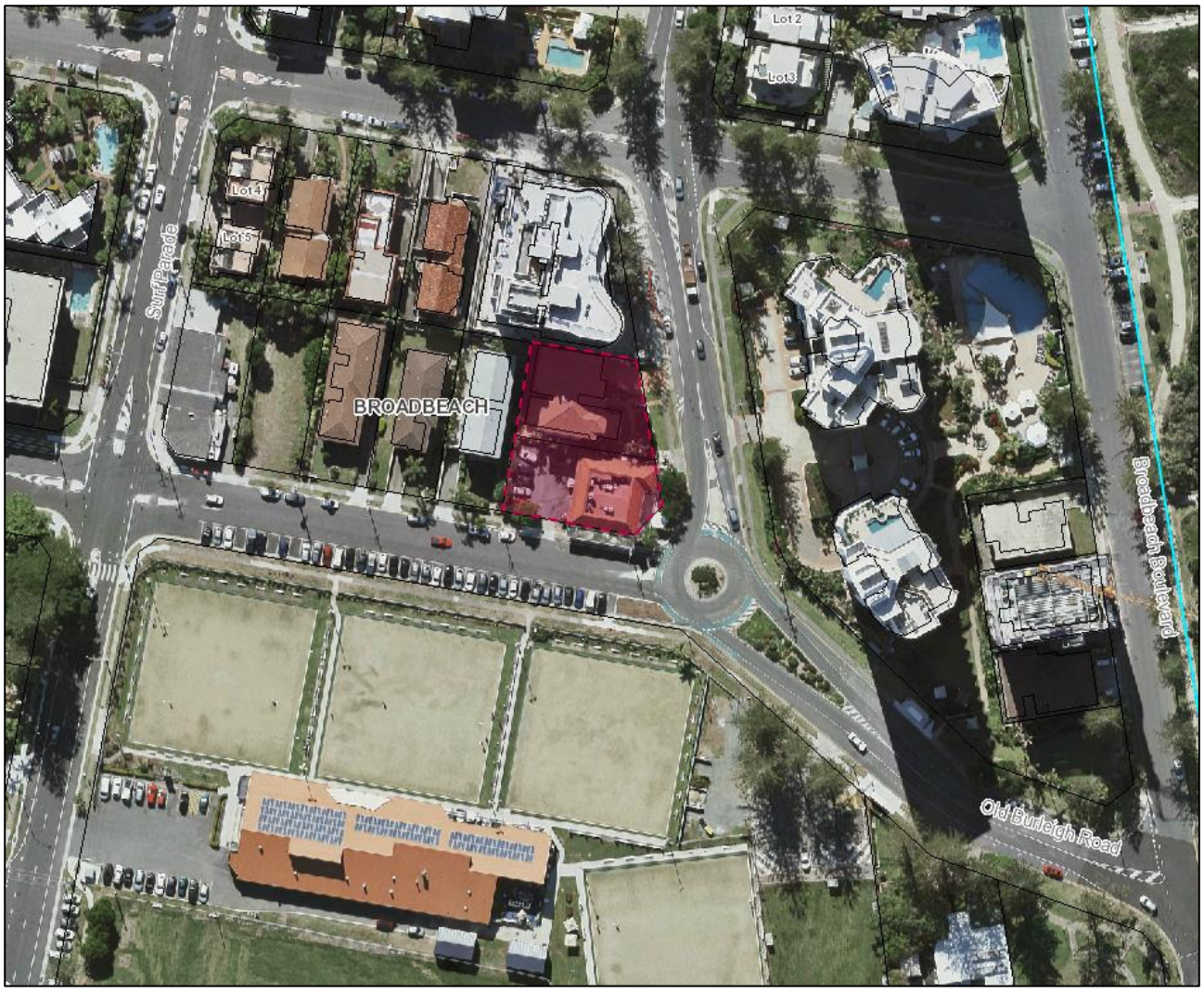


Figure 2.1 Site Locality Plan (City of Gold Coast, 2019)

2.2 Existing Land Uses

Currently located on 99 Old Burleigh road is a 3 storey apartment building which is bound to the east by Old Burleigh Road and surrounded by private property to the north south and west. Located on 101 Old Burleigh Road is a BWS Liquor store and *Lola's* which is a local café & restaurant. This site is bound by Old Burleigh Road to the east and Armrick Avenue to the south, the remaining property boundaries boarder private property.

2.3 Proposed Development

The proposal seeks to develop a forty-five (45) level residential building containing fifty-eight (58) units. The development also allows for the construction of three (3) basement carparking levels.

Figure 2,2 below shows the proposed typical floor plan for further details regarding the proposed layout, please refer to the complete site layout plan attached within Appendix A.

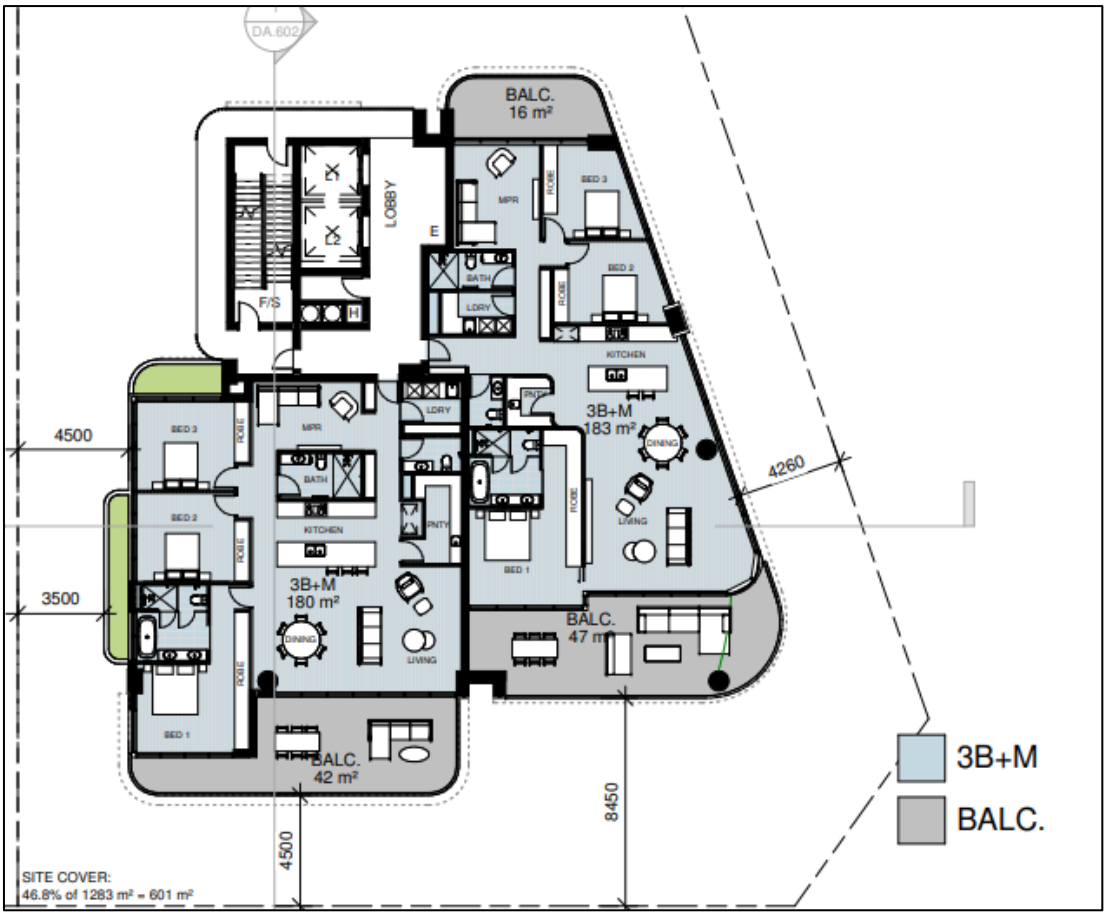


Figure 2.2 – Typical Floor Plan

2.4 Proposed Service Layout

It is proposed that the development will be serviced by a 100 mm Property Service Water Connection and an Upgraded 150 mm House Sewer Connection. A 3.05 m x 1.96 m water meter easement has been proposed along the southern boundary of the site. Please refer to the Service Layout Plan prepared by Burchills in Appendix B.

3. Assumptions

This section details key assumptions made in Old Burleigh Road proposed development water and wastewater analysis.

3.1 Development Demands

The ultimate Equivalent Person (EP) demand for the proposed Old Burleigh Road development has been nominated as 149 EP for both wastewater and water supply loadings. The proposed site concept produced by FerroChow Architecture was used as the basis to calculate the demand value adopted for the purposes of this assessment and is summarised in Table 2 1.

Table 2 1: Adopted development demand rates

Development Type	Demand Equivalent Conversion Rate	Quantity[1]	Demand (ET)	Demand (EP)[2]
Multi-Unit Dwelling 3 bedroom +	0.90 ET / Dwelling	59	53.1	148
Commercial	0.6 ET / 100m^2 GFA	0.75	0.5	1
		TOTAL	**53.6**	**149**

Notes: 1) yields adopted as per development summary produced by FerroChow Architecture (October 2021)
2) 2.79 ET/EP conversion rate adopted as per advice from the City and rounded to nearest whole number

The City has further requested that the impacts of additional ultimate (2066) demand from nearby approved development applications be assessed in the water and wastewater network analyses (approximately 1,239 EP & 367 EP respectively).

3.2 Desired Standard of Service

Key Design Standards of Service (DSS) adopted from the SEQ Water Supply and Sewerage Design & Construction Code (SEQ WS&S D&C Code) for water are presented in **Table 3-1**.

Table 3-1: Key DSS adopted for water supply and wastewater

Design Criteria	Summary
Water Supply (adopted in accordance with Table 4.1 of the SEQ WS&S D&C Code)	
Average Day Demand (AD)	220 L/EP/day
Estimated Non-Revenue Water (NRW)	20 L/EP/day
Maximum allowable velocity (m/s)	2.5 m/s at peak hour (PH) demand
Minimum service pressure under normal operating conditions[2]	22 m in the main adjoining the Property boundary
Emergency fire operating conditions[2]	12 m min at the main at the hydrant
Urban Fire Fighting	Residential: 15 L/s for 2 hours Commercial / Industrial: 30 L/s for 4 hours
Minimum Operating Level (MOL)	15% depth maintained in all tanks
Wastewater (adopted in accordance with Table 10 of the SEQ WS&S D&C Code)	
Average Dry Weather Flow (ADWF)	200 L/EP/d up to 2041 and 180 L/EP/d thereafter
Peak Wet Weather Flow (PWWF)	5 x ADWF
Emergency storage	4 hours at ADWF
Total pump station capacity	PWWF
Required pump station operating volume	0.9*Q/N

Design Criteria	Summary
Gravity sewer performance criteria (Existing / New)	>1 m freeboard at PWWF / PWWF within 75% d/D
Rising main recommended velocities (Max. / Min.)	3 m/s / 0.75 m/s

4. Water Supply Network Assessment

The water supply network analysis has been undertaken in accordance with the 2019 WSSIP master planning service strategies.

4.1 Extent Of Assessment

The proposed primary connection points and adjacent existing water supply network servicing the proposed development can be seen in Figure 4-1.

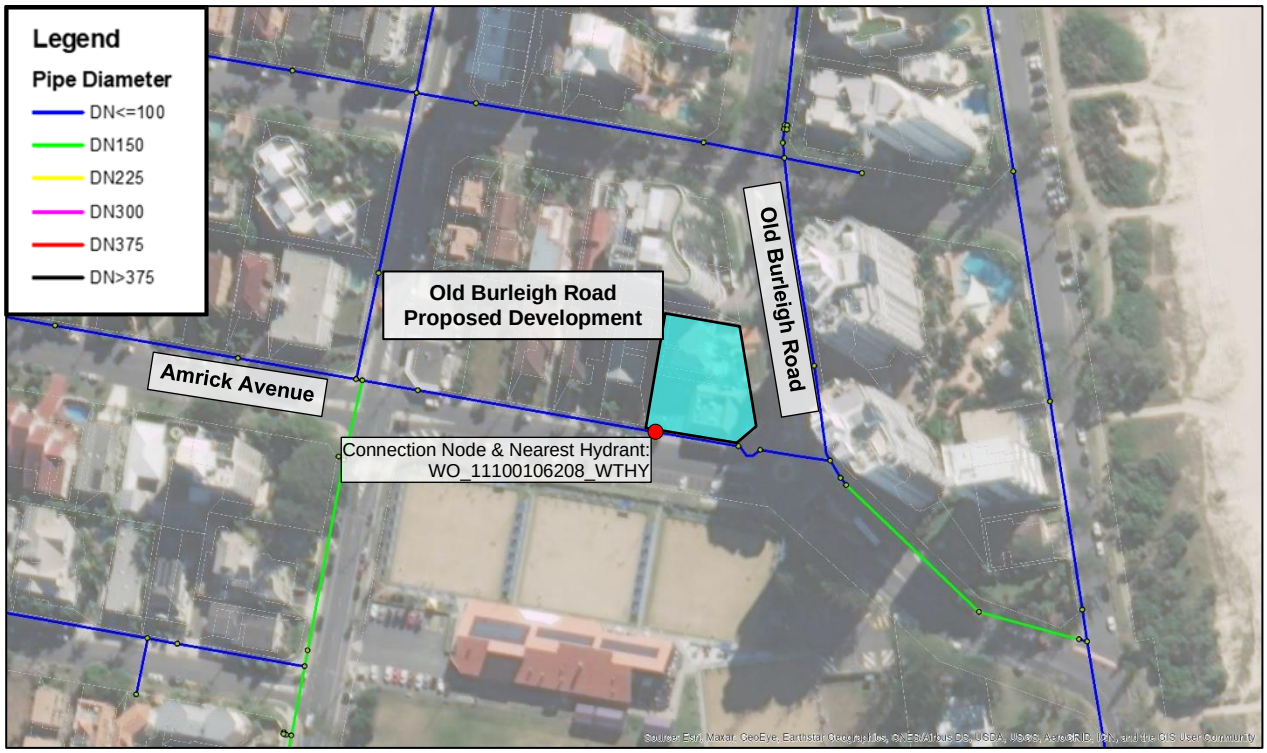


Figure 4-1: Existing external water supply infrastructure servicing the proposed development

All demands from the proposed development have been loaded to node WO_11100106208_WTHY located on the existing DN100 running along Amrick Avenue. The nearest hydrant for fire flow analysis is also WO_11100106208_WTHY.

The proposed development is gravity supplied by the Worongary Tanks (65 ML) approximately 9.2 km to the west-southwest. **Figure 4-2** illustrates the extent of the greater Worongary Low Level Zone (LLZ) assessed.

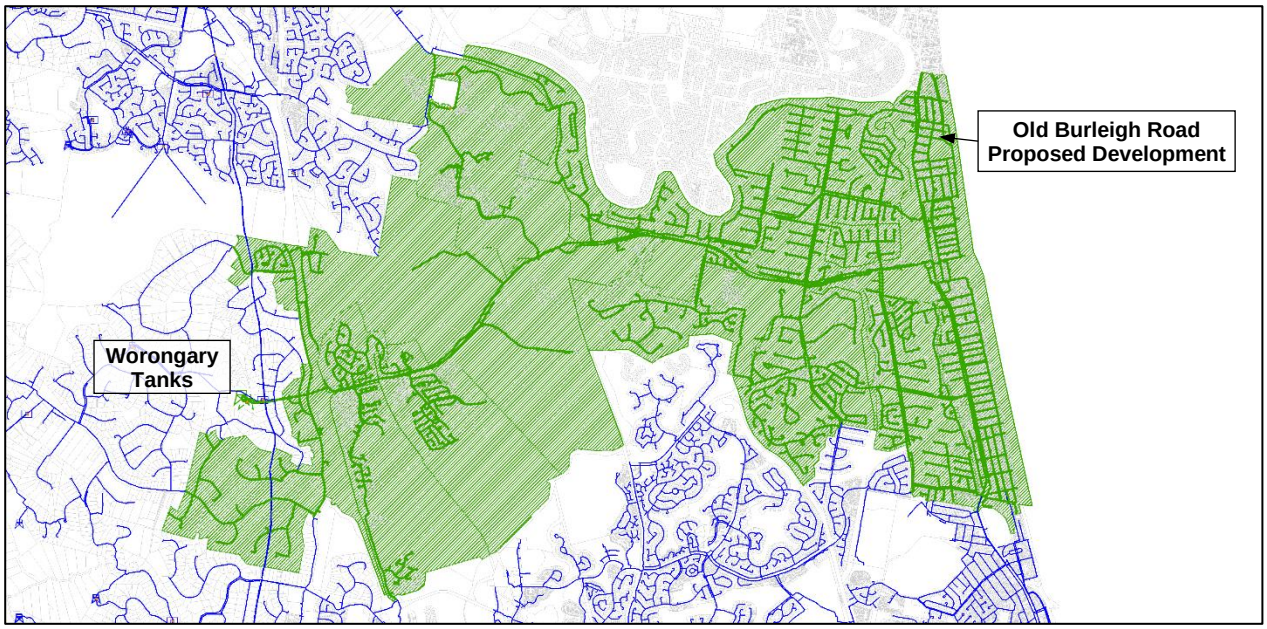


Figure 4-2: Extent of greater Worongary LLZ area assessed (highlighted in green)

4.2 Flow Projections

The following water flow projections have been estimated in accordance with the SEQ WS&S D&C Code. These projections have been compared to the City's 2019 WSSIP predicted demands and are presented in **Table 4-1.**

Table 4-1: Daily water flow projections

Site Loading	Land Use	Demand (EP)	Average Day (kL/d)	MDMM (kL/d)	Peak Day (kL/d)	Peak Hour (L/s)
Existing (2021) WSSIP Demand	Multi-Residential	8	1.9	2.4	2.7	0.1
	Commercial	10	2.5	2.6	2.7	0.1
	TOTAL	*18*	*4.4*	*5.0*	*5.4*	*0.1*
Proposed DA	Multi-Residential	148	35.6	44.4	50.2	1.2
	Commercial	1	0.3	0.3	0.3	0.0
	TOTAL	*149*	*35.9*	*44.7*	*50.6*	*1.2*
Total Increase		**131**	**31.5**	**39.7**	**45.2**	**1.0**
Ultimate (2066) Approved DAs	Multi-Residential	1,037	248.9	310.4	351.5	8.1
	Tourist	202	48.4	82.2	115.5	3.1
	TOTAL	*1,239*	*297.3*	*392.6*	*467.0*	*11.2*

The daily water flow projections indicate that the proposed development is expected to increase the existing (2021) peak hour demand by approximately 1.0 L/s. However, beyond the intermediate (2041) planning horizon, calculated flow projections decrease as the proposed development has lower demand (EP) than the 2019 WSSIP projections associated with the site.

It should also be noted that previously approved development demands within the greater Worongary LLZ area assessed are expected to increase the ultimate (2066) peak hour demand by approximately 11.2 L/s.

4.3 Network Modelling

Hydraulic modelling of the water supply network was undertaken using the InfoWater model for the City's southern potable water network (Southern v95_WSSIP_2019) provided by the City. The hydraulic modelling was completed to evaluate system performance under existing (2021) through to the intermediate (2041) planning horizon flow conditions, including additional approved DAs, both with and without the proposed development loading. The ultimate (2066) planning horizon was not considered as part of this assessment as the proposed development decreases the modelled demands compared to the 2019 WSSIP projections.

4.3.1 Reservoir Analysis

To ensure the Worongary Tanks achieve the City's DSS recommended minimum operating level of 15% depth, a 3-day extended simulation was run in accordance with SEQ WS&S D&C Code recommendations using the Maximum Day (MD) demand scenario within the network model.

Modelling results indicate that the existing (2021) through intermediate (2041) network demand depletes the Worongary Tanks marginally below the DSS of 15% when demands from the approved and proposed developments are applied. Correspondence with the City has confirmed that this is not likely to cause any significant impact on the model performance or results.

4.3.2 Peak Hour Analysis

To determine peak hour minimum pressures and maximum network velocities, a 3-day standard flow analysis was run using the MD scenario within the network model.

It should be noted that beyond the intermediate (2041) planning horizon, desktop analysis shows the proposed development demands will lead to a decrease in overall EP compared to the 2019 WSSIP projections. Therefore, no modelling was undertaken for the ultimate (2066) planning horizon.

The results from the network peak hour analysis are detailed in

Table 4-2 and **Table 4-3**

Table 4-2: Peak hour minimum pressures modelled at connection node and greater Worongary LLZ

Planning Horizon	Location	Peak Hour Minimum Pressure (m)					
		Existing	Failures	w/ Approved DAs	Failures	w/ Approved DAs & Proposed Development	Failures
2021	WO_11100106208_WTHY	63.8	-	62.8	-	62.4	-
	Worongary LLZ	24.5	-	24.5	-	24.5	-
2026	WO_11100106208_WTHY	62.1	-	61.1	-	60.7	-
	Worongary LLZ	24.5	-	24.5	-	24.5	-
2031	WO_11100106208_WTHY	57.6	-	56.5	-	56.0	-
	Worongary LLZ	24.5	-	24.5	-	24.5	-
2036	WO_11100106208_WTHY	47.3	-	46.1	-	45.5	-
	Worongary LLZ	24.5	-	24.5	-	24.5	-
2041	WO_11100106208_WTHY	57.5	-	52.7	-	52.7	-
	Worongary LLZ	24.5	-	24.5	-	24.5	-

Modelling results indicate that the existing (2021) through intermediate (2041) networks have sufficient capacity to service the proposed development under peak hour demands while satisfying the SEQ WS&S D&C Code recommended minimum pressure of 22 m.

Table 4-3: Maximum velocities modelled within Worongary LLZ

Planning Horizon	Location	Peak Hour Maximum Velocity (m/s)					
		Existing	Failures	w/ Approved DAs	Failures	w/ Approved DAs & Proposed Development	Failures
2021	Worongary LLZ	2.4	-	2.4	-	2.4	-
2026		2.4	-	2.5	-	2.5	-
2031		**2.7**	**2**	**2.8**	**2**	**2.8**	**2**
2036		**3.6**	**2**	**3.7**	**2**	**3.7**	**2**
2041		**2.7**	**4**	**2.8**	**4**	**2.8**	**4**

Note: No water mains under 10 m in length were considered as part of this assessment

Modelling results indicate that the existing (2021) through intermediate (2026) networks satisfy the SEQ WS&S D&C Code recommended peak hour maximum velocity of 2.5 m/s. Beyond the intermediate (2026) planning horizon, demands from the existing 2019 WSSIP lead to several maximum velocity breaches (See **Appendix C** for details).

4.3.3 Fire Flow Analysis

Fire flow simulations were completed using the InfoWater Fireflow simulator and the 2/3 PH time noted in the model. Minimum fire flow residual pressures modelled at the nearest hydrant to the proposed development and greater Worongary LLZ are summarised in **Table 4-4**.

Table 4-4: Fire flow minimum residual pressures modelled at nearest hydrant and greater Worongary LLZ

Planning Horizon	Location	Fire Flow Minimum Residual Pressure (m)					
		Existing	Failures	w/ Approved DAs	Failures	w/ Approved DAs & Proposed Development	Failures
2021	WO_11100106208_WTHY	68.7	-	68.2	-	67.9	-
	Worongary LLZ	**-26.8**	**12**	**-26.8**	**12**	**-26.8**	**12**
2026	WO_11100106208_WTHY	67.6	-	67.2	-	66.8	-
	Worongary LLZ	**-31.5**	**12**	**-31.5**	**12**	**-31.5**	**12**
2031	WO_11100106208_WTHY	64.9	-	64.4	-	64.0	-
	Worongary LLZ	**0.8**	**12**	**-33.0**	**12**	**-33.0**	**12**
2036	WO_11100106208_WTHY	58.8	-	58.3	-	58.0	-
	Worongary LLZ	**-35.0**	**12**	**-35.0**	**12**	**-35.0**	**12**
2041	WO_11100106208_WTHY	46.7	-	45.9	-	65.0	-
	Worongary LLZ	**-36.3**	**12**	**-36.3**	**12**	**-36.3**	**12**

Note: 1) Fire flow pressure calculated in accordance with SEQ WS&S D&C Code recommendations at 2/3 PH demand (11:00) with 15 L/s adopted at the proposed development hydrant

The fire flow analysis indicates that the existing (2021) through intermediate (2041) networks have sufficient capacity to service the proposed development for fire flow demands with the nearest hydrant (WO_11100106208_WTHY) having adequate capacity to satisfy SEQ WS&S D&C Code recommended 12 m minimum residual pressure.

However, there are a significant number of failures withing the greater Worongary LLZ under all planning horizons assessed (see **Appendix C**). These failures occur both with and without demands from the proposed development and are not significantly worsened by the proposed development demands, thereby considered existing failures.

4.4 Conclusion and Recommendations

Analysis of the water supply network has concluded that there is sufficient capacity in the existing (2021) through intermediate (2041) network to service the proposed development during peak hour and fire flow demand while satisfying SEQ WS&S D&C Code recommendations. The ultimate (2066) planning horizon has been assumed to be able to service the proposed development as the demands will decrease from the 2019 WSSIP projections.

Within the greater Worongary LLZ, there are several locations where modelled water infrastructure supply does not meet the SEQ WS&S D&C Code fire flow recommendations under the planning horizons assessed. These are all considered existing failures which are not significantly impacted by the additional demands from the proposed development.

It is suggested that the proposed development of approximately 149 EP be approved with respect to adequate water supply network capacity.

5. Wastewater Network Assessment

The wastewater network analysis has been undertaken in accordance with the City's 2019 WSSIP master planning service strategies.

5.1 Extent Of Assessment

The sewerage impact assessment included the gravity main from the proposed development loading node to the downstream sewage pumping station (SPS) A025 as seen in **Figure 5-1**.



Figure 5-1: Existing wastewater infrastructure from the proposed development through to SPS A026 (shown in red)

All demands from the proposed development have been loaded to node SEMH_A026_9000153480 on an existing DN150 main to the southwest of the site which gravity feeds approximately 660 m to SPS A026.

5.2 Flow And Emergency Storage Projections

The wastewater flow and emergency storage (ES) projections for the Old Burleigh Road development have been estimated in accordance with the SEQ WS&S D&C Code and are presented in **Table 5-1**.

Table 5-1: Wastewater flow and emergency storage projections

Site Loading	Demand (EP)	ADWF (L/s)	PWWF (L/s)	Additional ES Required (kL)
Existing (2021) WSSIP Demand	17	0.0	0.2	0.5
Proposed DA	149	0.3	1.7	5.0
2021-2041 Total Increase	**132**	**0.3**	**1.6**	**4.5**
Intermediate (2041) Approved DAs	908	2.1	10.5	30.3

Note: Proposed wastewater flow projections calculated in accordance with existing Conventional Sewer design criteria

The analysis indicates that the proposed development is expected to increase the existing (2021) PWWF demands of the SPS A026 catchment by approximately 1.6 L/s. However, beyond the intermediate (2041) planning horizon, calculated PWWF projections decrease as the proposed development has lower demand than the 2019 WSSIP projections associated with the site.

It should be noted that there is also an additional intermediate (2041) demand of approximately 10.5 L/s PWWF from approved DAs in the SPS A026 catchment.

5.3 Network Modelling

Hydraulic modelling of the wastewater network was undertaken using the InfoSWMM model for Coombabah (CO_WSSIP_2019) provided by the City. The hydraulic modelling was completed to evaluate system performance under existing (2021) through to the intermediate (2041) planning horizon flow conditions, including additional approved DAs, both with and without the proposed development loading.

It should be noted that beyond the intermediate (2041) planning horizon, desktop analysis shows the proposed development demands will lead to a decrease in overall EP compared to the existing 2019 WSSIP projections. Therefore, no modelling was undertaken for the ultimate (2066) planning horizon.

5.4 Impact Assessment

5.4.1 Gravity mains

Key profiles of the gravity network immediately downstream of the proposed development to SPS A026 can be seen in **Figure 5-2** and **Figure 5-3**.

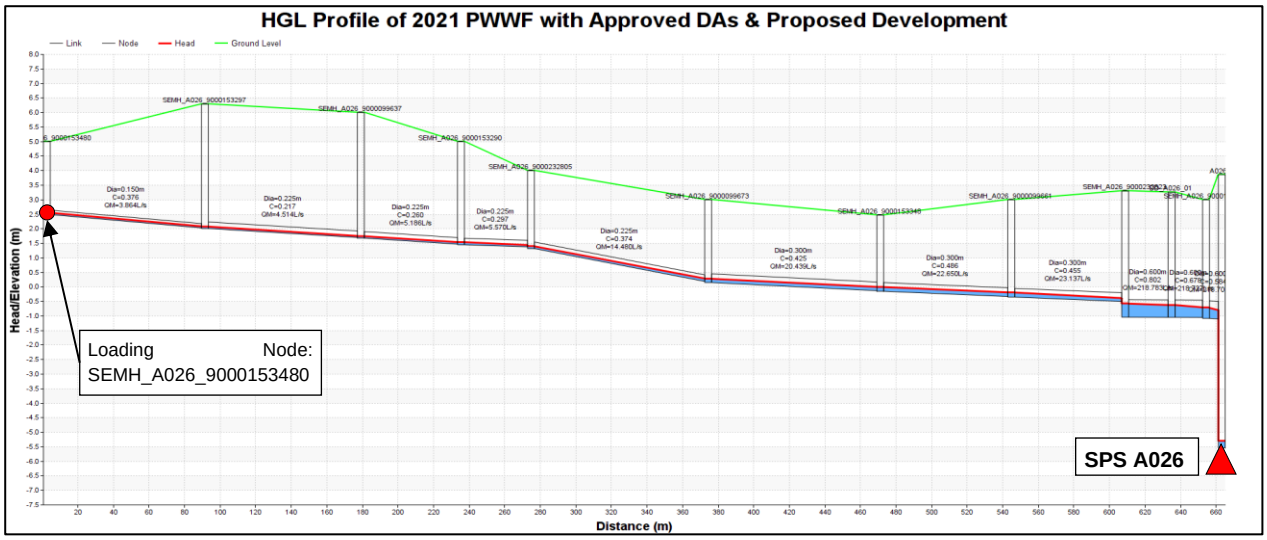


Figure 5-2: Downstream trunk main under existing (2021) PWWF including demands from approved DAs and proposed development.

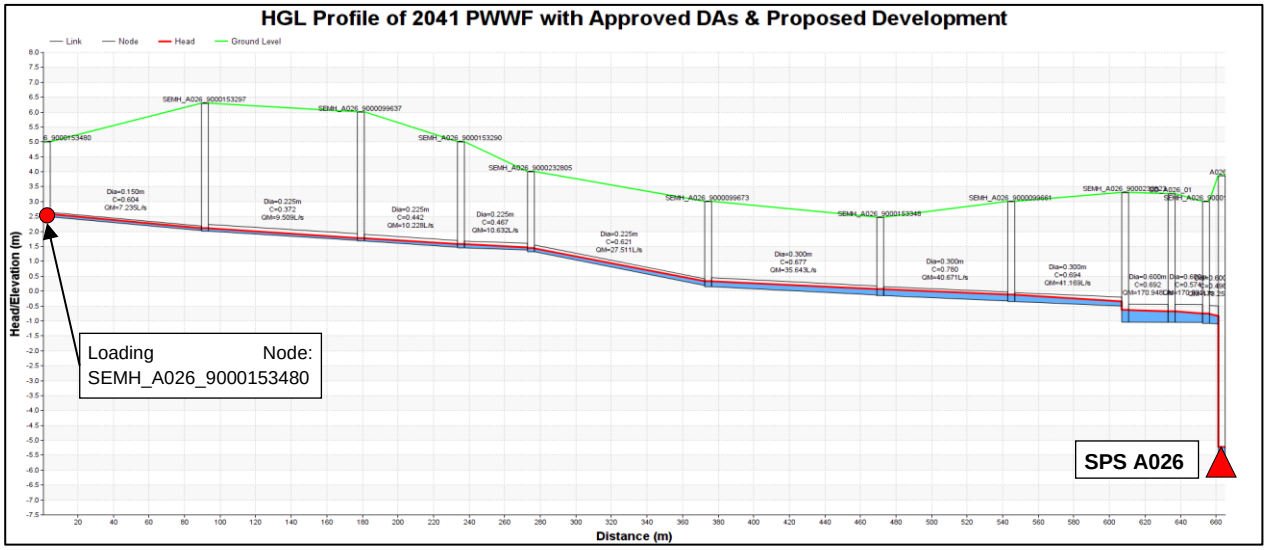


Figure 5-3: Downstream trunk main under intermediate (2041) PWWF including demands from approved DAs and proposed development.

As illustrated in the gravity main profiles, the downstream sewer network adequately satisfies the 1 m freeboard criteria adopted by the City and has sufficient capacity to service the proposed Old Burleigh Road development from existing (2021) demands through to the intermediate (2041) planning scenario.

5.4.2 SPS A026 sewage pumping station

A desktop assessment was completed using the demands nominated in the Coombabah wastewater network model, CO_WSSIP_2019, to ensure that the proposed development could be adequately serviced by the existing pump station (SPS A026) and is summarised in the following sections:

Pump Capacity

Table 5-2: Flow requirements versus existing capacity

Planning Horizon	Maximum Capacity[1] (L/s)	PWWF (L/s)		
		Existing 2019 WSSIP[2]	With Approved DAs	With Approved DAs & Proposed Development
Existing (2021)	**244.3**	168.0	185.5	187.1
2026		196.0	213.0	214.6
2031		237.2	**249.7**	**251.3**
2036	**826.7**	283.5	295.2	296.8
2041		363.5	374.1	375.6

Note: 1) SPS A026 existing dual pumps capacity obtained from email received from the City of Gold Coast
2) Demands for PWWF calculations obtained from the *CO_WSSIP_2019* network models.

Operating Volume

Table 5-3: Operating volume requirements versus existing capacity

Planning Horizon	Existing Capacity1 (L/s)	Operating Volume Required (m3)		
		Existing 2019 WSSIP[2]	With Approved DAs	With Approved DAs & Proposed Development
Existing (2021)	**39.8**	13.2	14.6	14.7
2026		15.4	16.8	16.9
2031		18.7	19.7	19.8
2036		22.3	23.2	23.4
2041		28.6	29.5	29.6

Note: 1) SPS A026 existing operating storage volume obtained from email received from the City of Gold Coast
2) Demands for PWWF calculations obtained from the *CO_WSSIP_2019* network models.

Rising Main

Table 5-4: Rising main velocities

Planning Horizon	Rising Main Internal Diameter[1] (mm)	Velocity @ Ultimate (2066) PWWF (m/s)		
		Existing 2019 WSSIP	With Approved DAs	With Approved DAs & Proposed Development
Existing (2021)	**294.6**	2.5	2.7	2.7
2026		2.9	**3.1**	**3.1**
2031		**3.5**	**3.7**	**3.7**
2036	**894.6**	0.5	0.5	0.5
2041		0.6	0.6	0.6

Note: 1) Diameters obtained from the *CO_WSSIP_2019* network model

Emergency Storage

Table 5-5: Emergency storage requirements versus existing capacity

Planning Horizon	Available Emergency Storage[1] (kL)	Emergency Storage Required for 4hrs @ADWF (kL)		
		Existing 2019 WSSIP[2]	With Approved DAs	With Approved DAs & Proposed Development
Existing (2021)	**449.1**	145.9	196.3	200.8
2026	**439.4**	151.3	200.2	204.6
2031	**636.1**	186.6	222.6	227.1
2036	**628.1**	239.8	273.5	277.9
2041	**615.8**	380.5	410.8	415.3

Note: 1) SPS A026 existing available emergency storage volume obtained from email received from the City of Gold Coast
2) Demands for PWWF calculations obtained from the *CO_WSSIP_2019* network models.

The desktop assessment of SPS A026 has concluded that the pump station has sufficient capacity to service the proposed development under existing (2021) through intermediate (2026) planning horizons. However, in the intermediate (2031) planning horizon, demands from approved developments in the SPS A026 catchment exceed the nominated maximum pump capacity. It is therefore recommended that the 2036 pump upgrade nominated by the City be brought up to 2031 to adequately service the approved developments and proposed development. Similarly, the 2019 WSSIP rising main upgrade proposed for 2036 will need to be brought forward to 2026 to adequately service the demands associated with approved developments in the SPS A026 catchment.

It should be noted that this pump capacity failure is significantly impacted by already approved developments within the SPS A026 catchment and requires an upgrade prior to the previously nominated 2036 planning horizon regardless of the demands from the proposed development. Demands from the proposed development account for less than 1% of the existing (2021) catchment demand.

Emergency storage within the SPS A026 catchment was found to have adequate capacity to satisfy SEQ WS&S D&C Code recommendations for all planning horizons assessed.

Hydraulic analysis was undertaken using full network model runs for all scenarios to substantiate the desktop assessment findings and capacities noted within. Network modelling results of SPS A026 dual pump capacities confirm the capacities advised by the City of Gold Coast which are insufficient to service the approved developments and proposed development within the catchment under the existing (2021) through intermediate (2026) planning horizons.

5.5 Conclusion and Recommendations

Analysis of the wastewater network has concluded that there is currently sufficient capacity in the existing (2021) through intermediate (2041) gravity networks to service the proposed development while satisfying SEQ WS&S D&C Code recommendations.

However, the SPS A026 pump and rising main does not have sufficient capacity to service the approved developments and proposed development beyond the intermediate (2026) planning horizon. It is therefore recommended that the City bring forward the 2036 nominated pump upgrade to 2031 and the 2036 nominated rising main upgrade to 2026 to account for the approved developments within the catchment and the additional 1.6 L/s PWWF from the proposed development. Demands from the proposed development account for less than 1% of the total existing (2021) catchment demand.

The ultimate (2066) planning horizon has been assumed to be able to service the proposed development as the demands are less than the 2019 WSSIP projections.

It is therefore suggested that the proposed development of approximately 149 EP be approved with respect to adequate wastewater network capacity, with the following recommendations:

- The developer liaises with the City to ensure that the nominated 2036 pump capacity and rising main upgrades at SPS A026 account for all demands associated with the approved and proposed developments and be moved forward as necessary.

6. References

1. City of Gold Coast (COGC), 2011. “Gold Coast Planning Scheme Policy 11 – Land Development Guidelines”
2. South East Queensland Water (SEQ), 2013. “SEQ Water Supply and Sewerage Design & Construction Code (SEQ WS&S D&C Code)”
3. Water Services Association of Australia (WSAA), 2014. “Sewerage Code of Australia (WSA 02-2014)”
4. Water Services Association of Australia (WSAA), 2011. “Water Supply Code of Australia (WSA 03-2011)”

Appendix A – Architectural Drawings

DEVELOPMENT SUMMARY

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

32 STOREYS

MIXED-USE DEVELOPMENT

RPD		LOT 70 on B8383 & CP on BUP104138
SITE AREA		1283 m^2

SITE COVER

SITE COVER	L4	46.53% (597 m2)	
DENSITY		1 per 6.38 m^2 (201 Beds)	
GBA (UNDER ROOF)		28769	m^2
NSA		15948	m^2

TOTAL UNITS

NUMBER OF UNITS	
3 Beds, 2.5 Baths + MPR	36
4 Beds, 3 Baths + MPR	22
5 Beds	1
Total Units	**58**

PARKING

REQUIRED	
3 Beds (1 per 1 unit)	36
4 Beds (1 per 1 unit)	22
5 Beds	1
Visitors (1 per 10 units)	5.8
Food and Beverage (1 per 75m^2)	1
Total Required	**65.8**
PROVIDED	
Residential Parking	**118**
Visitor Parking	**6**
Retail Parking	**1**
SRV	**1**
Total Provided	**126**
Bicycles (1 per Unit)	58
Visitors	6
Retail	1
Total	**65**

COMMUNAL SPACE

PROVIDED	523.85 m^2

DRAWINGS LIST

SHEET NUMBER	NAME	REVISION
DA.001	DEVELOPMENT SUMMARY	B
DA.002	LOCATION PLAN	A
DA.097	BASEMENT 3	A
DA.098	BASEMENT 2	B
DA.099	BASEMENT 1	B
DA.100	GROUND LEVEL	B
DA.101	LEVEL 1	B
DA.102	LEVEL 2	B
DA.103	LEVEL 3	B
DA.104	LEVELS 4 - 21	B
DA.122	LEVEL 22	A
DA.123	LEVEL 23 - 43	A
DA.144	LEVEL 44	
DA.145	LEVEL 45	
DA.146	LEVEL 46	
DA.401	BUILDING FORM	A
DA.402	BUILDING FORM	A
DA.403	BUILDING FORM	A
DA.411	MATERIALITY	A
DA.412	MATERIALITY	A
DA.413	MATERIALITY	A
DA.421	PERSPECTIVES	A
DA.422	PERSPECTIVES	A
DA.423	PERSPECTIVES	
DA.424	PERSPECTIVES	
DA.431	PERSPECTIVES	A
DA.432	PERSPECTIVES	
DA.433	PERSPECTIVES	
DA.434	PERSPECTIVES	
DA.451	SHADOW ANALYSIS	
DA.452	SHADOW ANALYSIS	
DA.453	SHADOW ANALYSIS	
DA.501	EAST ELEVATION	A
DA.502	NORTH ELEVATION	A
DA.503	SOUTH ELEVATION	A
DA.504	WEST ELEVATION	A
DA.601	SECTION A	B
DA.602	SECTION B	A

PRELIMINARY

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MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	17.09.2021	PRELIMINARY ISSUE
B	15.10.2021	PRELIMINARY ISSUE

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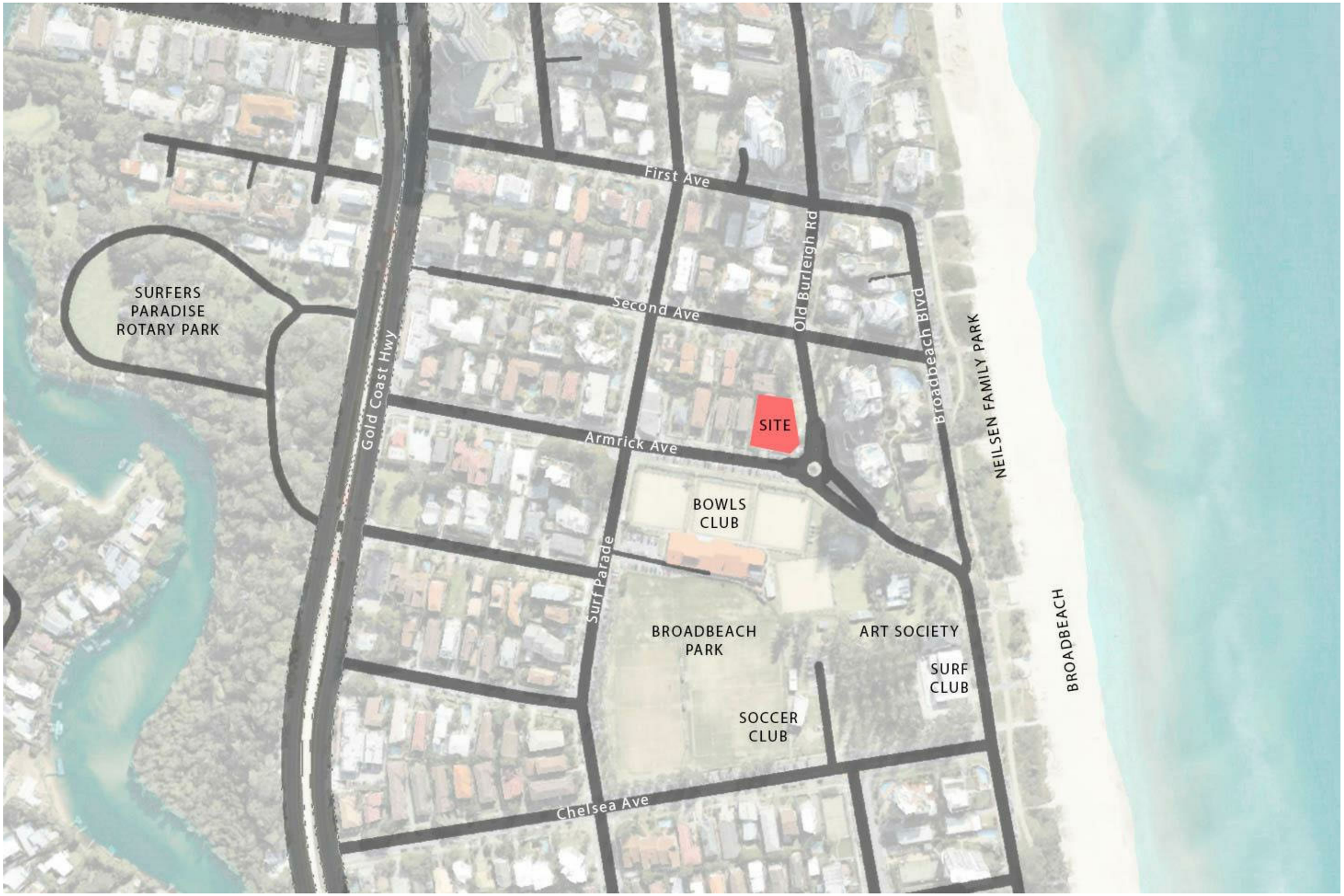
DEVELOPMENT SUMMARY

DRAWING NUMBER

DA.001

SCALE(A1)

REVISION B



PRELIMINARY

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MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
A	17.09.2021	PRELIMINARY ISSUE

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LOCATION PLAN

DRAWING NUMBER

DA.002

SCALE(A1)

REVISION A

PEDESTRIAN SIGHT TRIANGLE TO BE KEPT CLEAR OF OBSTRUCTION TO VISIBILITY. LOW LEVEL LANDSCAPING PERMITTED TO A MAXIMUM MATURE HEIGHT OF 500mm ABOVE DRIVEWAY LEVEL

CONCRETE TRIANGLE TO BE DEMOLISHED

STORMWATER TANK

BUILDING OVER

1418

LANDSCAPING

1:20

6300

1:10

1:8

1

DA.602

2500

Type A Crossover

6100

RL 5.30

LANDSCAPING

Water Meter

Sewer M/H
SL 5.114

FH

OLD BURLEIGH ROAD

LOBBY
80 m²
RL 5.600

M1

M2

H

2121

300

5500

300 F/S

1:4

1:8

M

RL 5.500

REFUSE

MSB/
NBN

FIRE
CONTROL
ROOM

MAIL

BUILDING OVER

HB

M

PWD

Telstra Pit

PP

PROPOSED DEVELOPMENT

1

DA.601

7 VIS.
BIKES

Sewer M/H
SL 5.463

TURN AROUND

6 VISITOR CARS
1 RETAIL CARS
1 SRV

RL 5.5

RETAIL
75 m²

RL 5.600

DEEP
PLANTING
ZONE

RL 5.500

BUILDING OVER

RL 5.283

BIN SERVICING

PMT

Sewer M/H
SL 5.196

SRV

3050

AWNING OVER

1960

WATER METER

6200

Type A Crossover

Water Meter

Telstra Pit

PP

Gully Pit
SL4.980

Sewer M/H
SL 4.910

ARMRICK AVENUE

Sewer M/H
By Records

Sewer M/H
SL 5.276

Stormwater M/H
By Records

Stormwater M/H
SL 5.330

TREE
Ht = 5
Spread = 2.0
Trunk = 0.10
Type = PALM

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MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION
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GROUND LEVEL

DRAWING NUMBER

DA.100

SCALE (A1) 1 : 200

REVISION B

DA.602

1668

6300

1:4

1:8

7 BIKES

4000

3000

2121

M1

M2

H

H/S

WAITING ZONE

1:4

1:8

300

5500

300

PROPOSED DEVELOPMENT

SCREENING

16

17

18

2400

2400

2400

SMALL

4

5

6

2400

600

2400

2400

1

DA.601

16 CARS
7 BIKES
RL 9.700

1504

6611

OLD BURLEIGH ROAD

2932400 600 2400 2400 600 2400 2400 2400 600 2400 2400

16 15 14 13 12 11 10 9 8

2400

L

5340

RL 9.700

LANDSCAPING

2427

4500

2467

ARMRICK AVENUE

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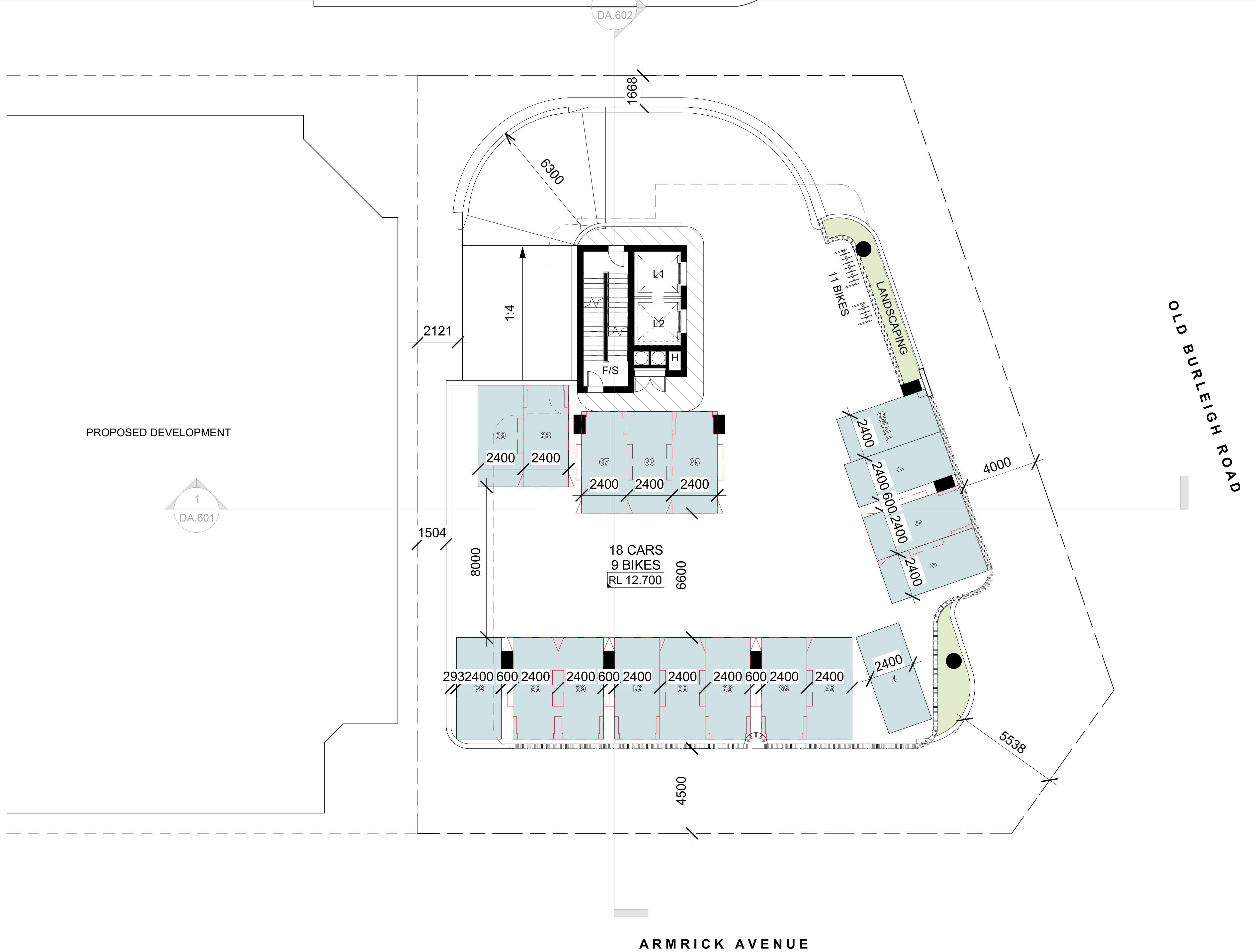
LEVEL 1

DRAWING NUMBER

DA.101

SCALE (A3) 1 : 200

REVISION B



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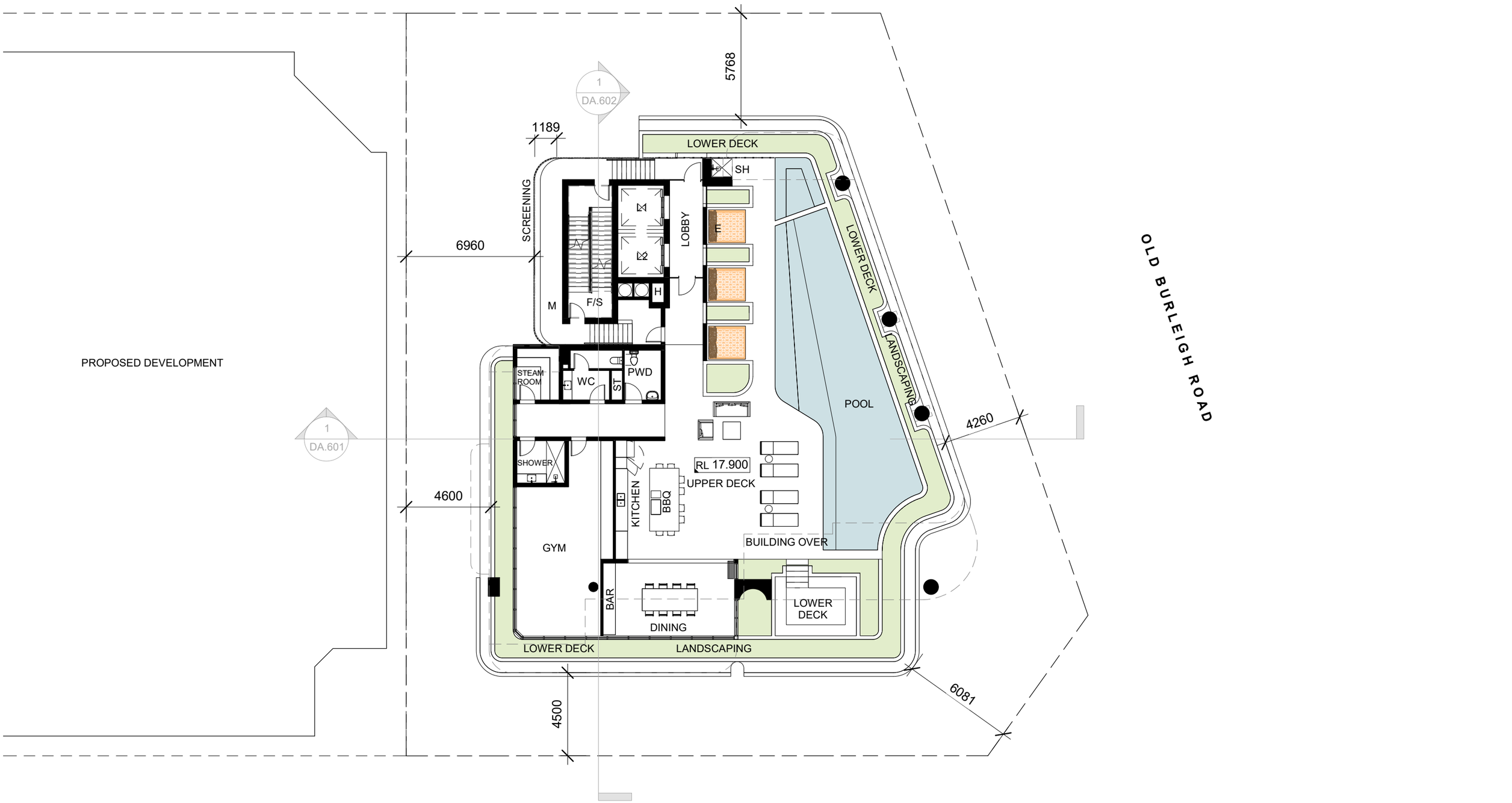
LEVEL 2

DRAWING NUMBER

DA.102

SCALE (A3) 1 : 200

REVISION **B**



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LEVEL 3

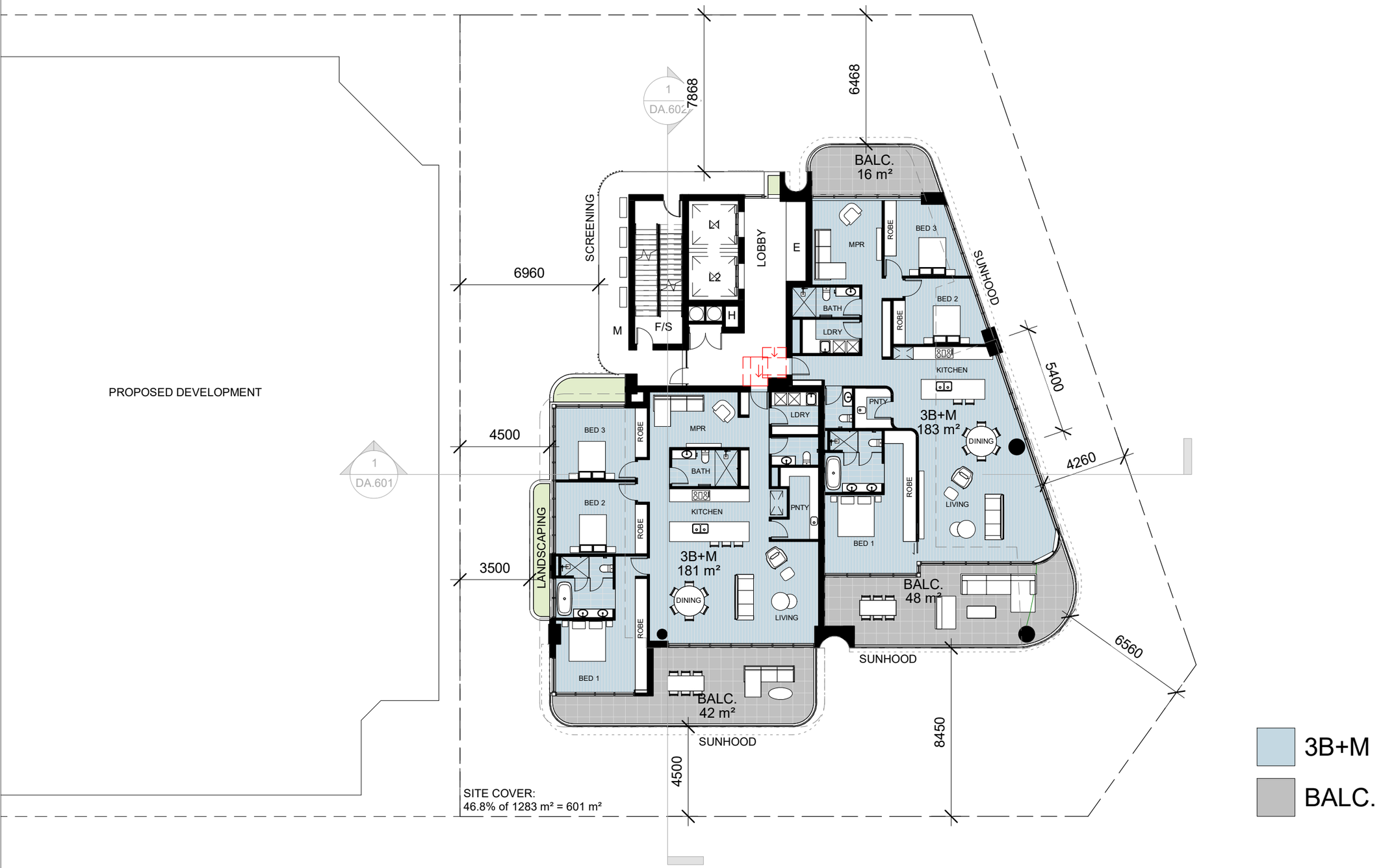
DRAWING NUMBER

DA.103

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SCALE (A1) 1 : 200

REVISION B



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LEVELS 4 - 21

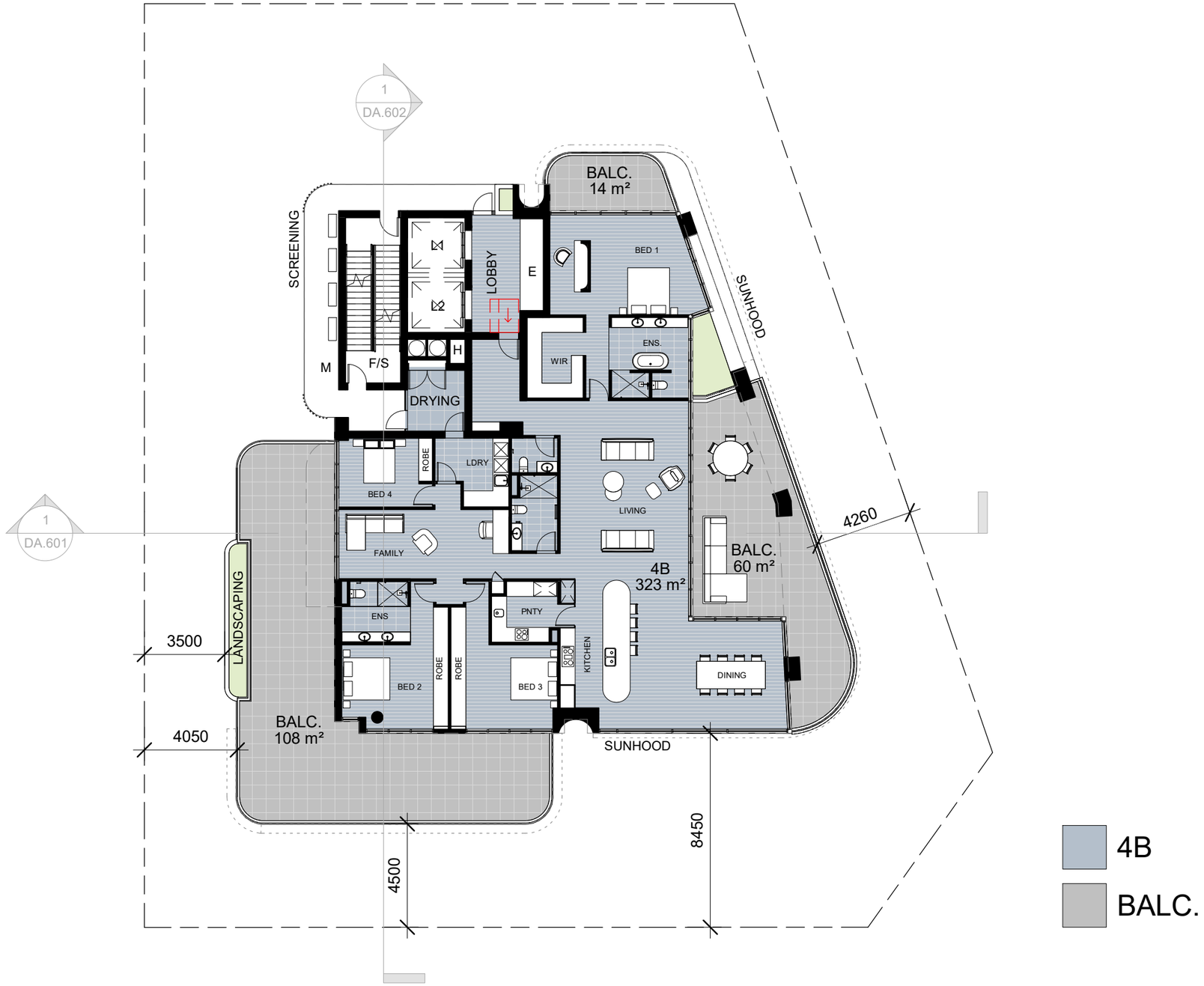
DRAWING NUMBER

DA.104

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SCALE(A3) 1 : 200

REVISION B



4B

BALC.

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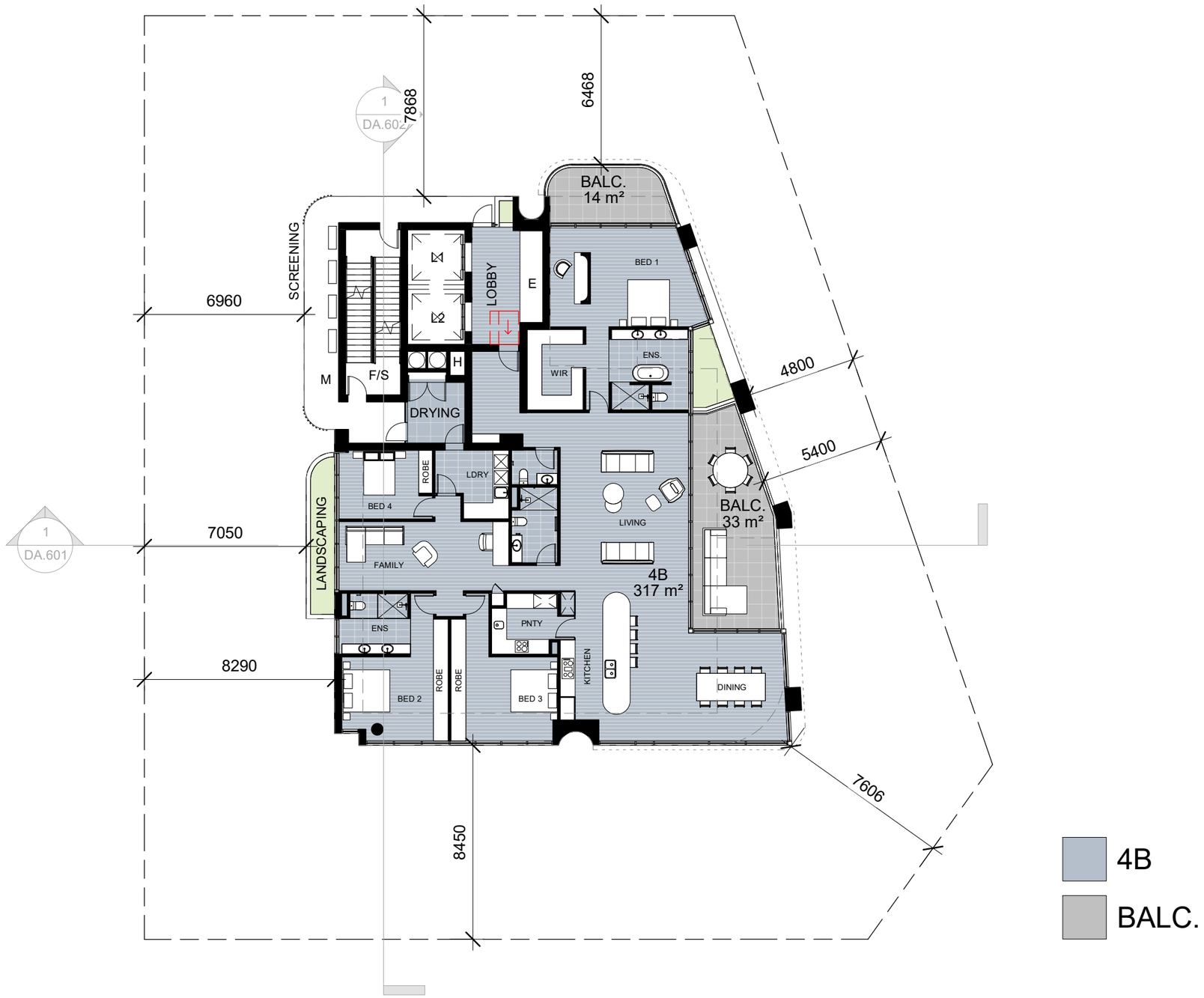
LEVEL 22

DRAWING NUMBER

DA.122

SCALE (A1) 1 : 200

REVISION A



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LEVEL 23 - 43

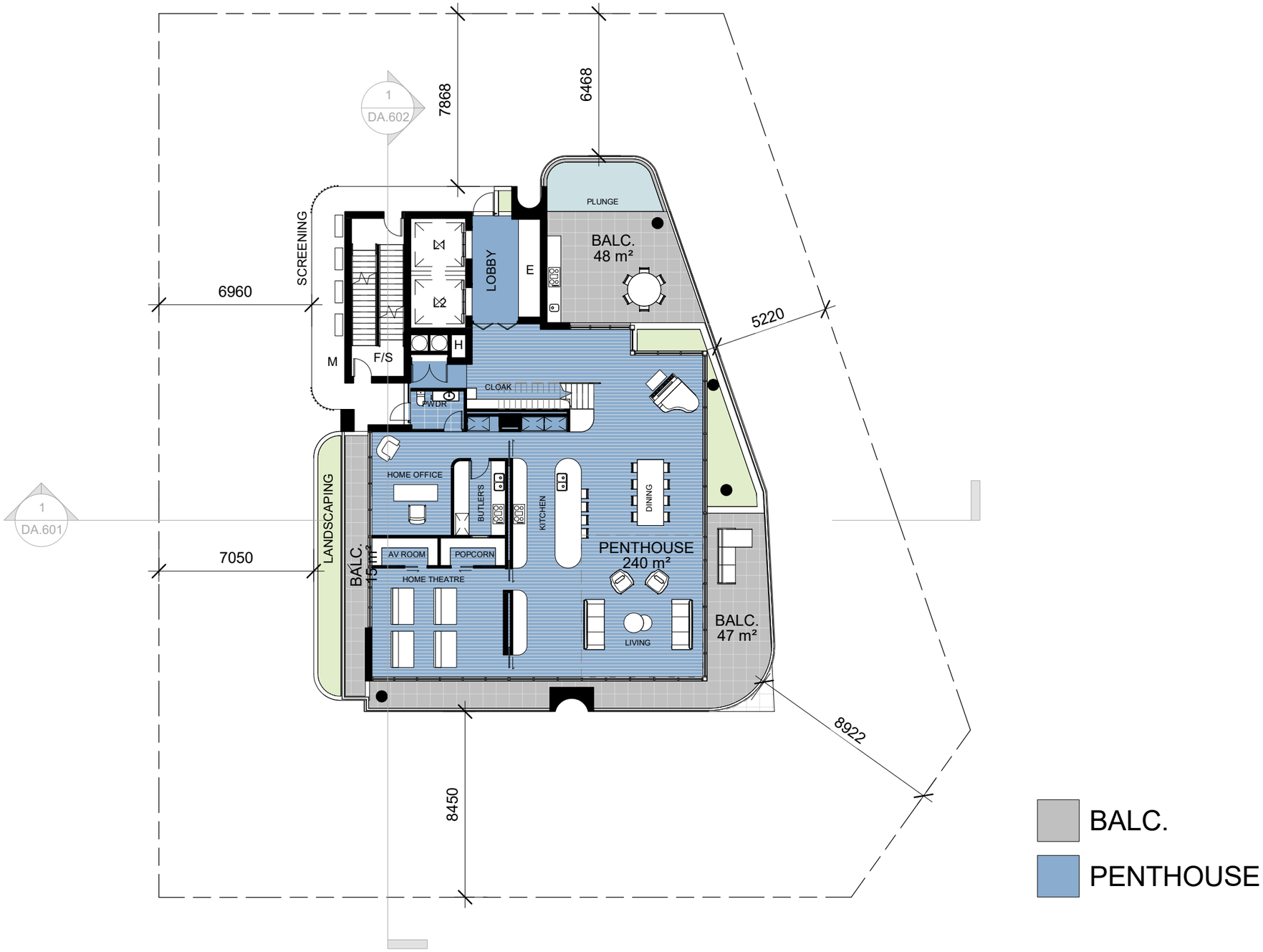
DRAWING NUMBER

DA.123

PRELIMINARY

SCALE (A1) 1 : 200

REVISION A



BALC.

PENTHOUSE

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MIXED-USE DEVELOPMENT

99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION

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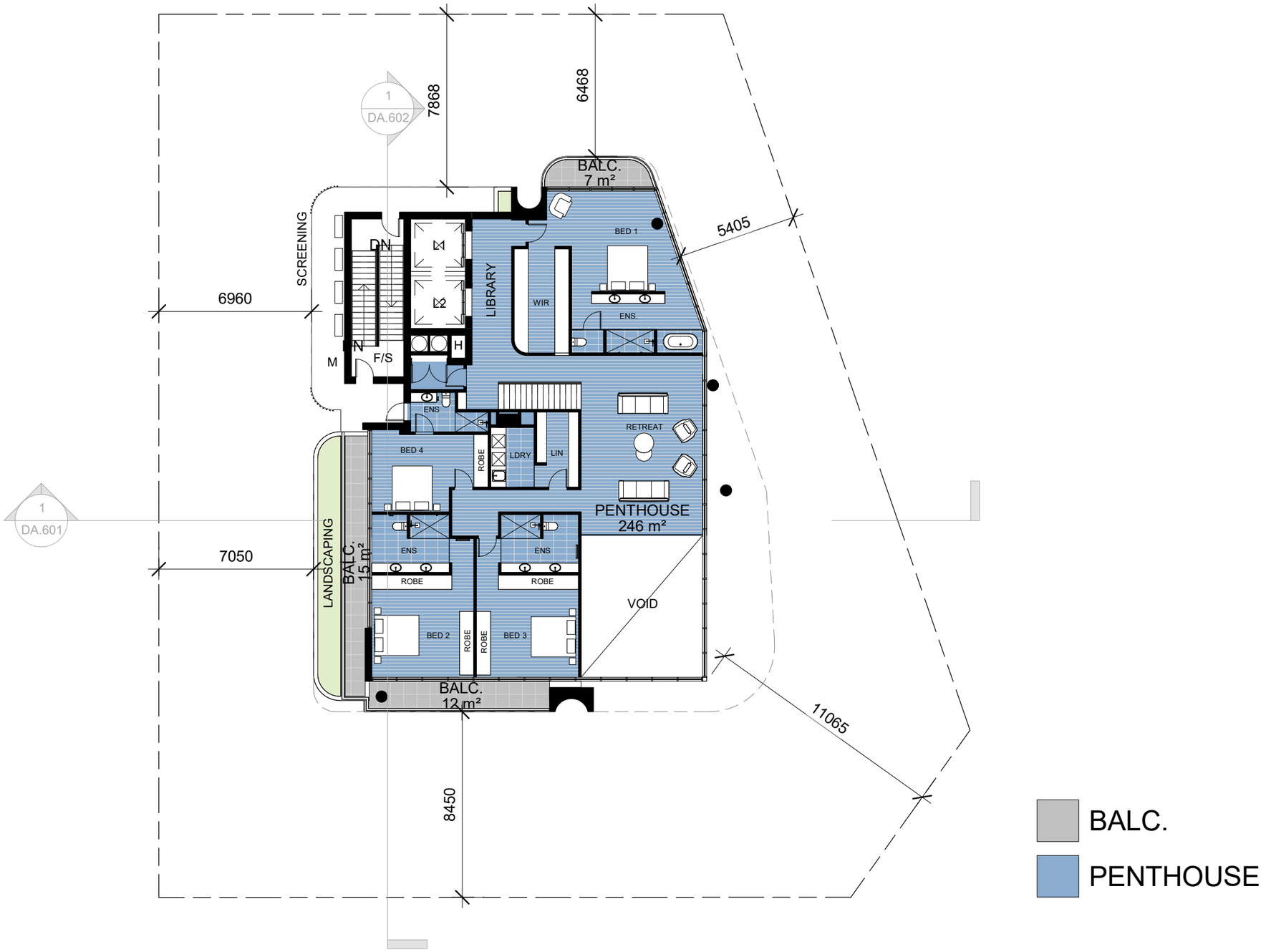
LEVEL 45

DRAWING NUMBER

DA.145

SCALE (A3) 1 : 200

REVISION



BALC.

PENTHOUSE

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99 & 101 OLD BURLEIGH ROAD, BROADBEACH

REVISION	DATE	DESCRIPTION

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LEVEL 46

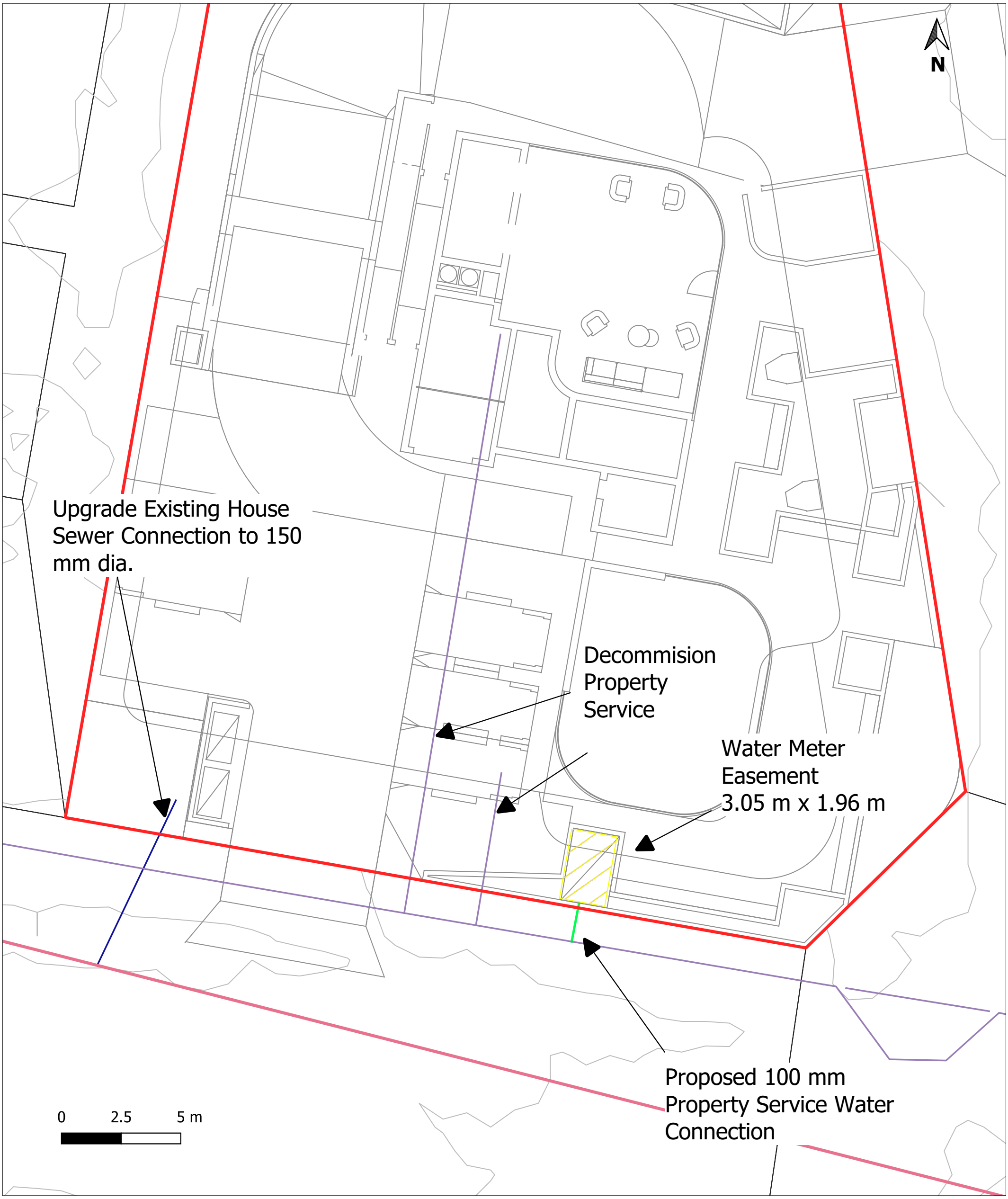
DRAWING NUMBER

DA.146

SCALE (A1) 1 : 200

REVISION

Appendix B – Service Layout Plan



99 & 101 Old Burliegh Road, Broadbeach

Service Layout Plan

Project: BE210274	Date:1/11/2021
Scale: 1:150 at A3	Projection:
Data Sources:	

Legend

- Site Boundary
- Existing Sewer
- Existing Sewer Connection
- Existing Water
- Proposed Water Connection

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Appendix C – SEQ WS&S D&C Code Failures (Water Supply)

Fire Flow Residual Pressure

2021 Existing WSSIP	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-26.78
WO_11100107622_WTHY	-19.05
WO_11100419228_WTHY	-18.06
WO_11100323428_WTHY	-4.02
WO_11100126745_WTHY	0.77
WO_11100323414_WTHY	0.96
WO_11100324075_WTHY	5.48
WO_11100324166_WTHY	7.77
WO_11100110909_WTHY	7.87
WO_11100323554_WTHY	11.22
WO_11100300179_WTHY	11.55
WO_11100324023_WTHY	11.74

2026 w/ Additional DAs	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-31.53
WO_11100419228_WTHY	-22.81
WO_11100107622_WTHY	-19.02
WO_11100323428_WTHY	-7.66
WO_11100323414_WTHY	-2.29
WO_11100126745_WTHY	0.81
WO_11100324075_WTHY	5.32
WO_11100110909_WTHY	7.05
WO_11100324166_WTHY	7.91
WO_11100300179_WTHY	11.24
WO_11100323554_WTHY	11.29
WO_11100324023_WTHY	11.51

2021 w/ Additional DAs	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-26.78
WO_11100107622_WTHY	-19.05
WO_11100419228_WTHY	-18.06
WO_11100323428_WTHY	-4.02
WO_11100126745_WTHY	0.77
WO_11100323414_WTHY	0.96
WO_11100324075_WTHY	5.48
WO_11100324166_WTHY	7.77
WO_11100110909_WTHY	7.87
WO_11100323554_WTHY	11.22
WO_11100300179_WTHY	11.55
WO_11100324023_WTHY	11.74

2026 w/ Additional DAs & Proposed Development	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-31.53
WO_11100419228_WTHY	-22.81
WO_11100107622_WTHY	-19.02
WO_11100323428_WTHY	-7.66
WO_11100323414_WTHY	-2.29
WO_11100126745_WTHY	0.81
WO_11100324075_WTHY	5.32
WO_11100110909_WTHY	7.05
WO_11100324166_WTHY	7.91
WO_11100300179_WTHY	11.24
WO_11100323554_WTHY	11.29
WO_11100324023_WTHY	11.51

2021 w/ Additional DAs & Proposed Development	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-26.78
WO_11100107622_WTHY	-19.05
WO_11100419228_WTHY	-18.06
WO_11100323428_WTHY	-4.02
WO_11100126745_WTHY	0.77
WO_11100323414_WTHY	0.96
WO_11100324075_WTHY	5.48
WO_11100324166_WTHY	7.77
WO_11100110909_WTHY	7.87
WO_11100323554_WTHY	11.22
WO_11100300179_WTHY	11.55
WO_11100324023_WTHY	11.74

2031 Existing WSSIP	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-33.03
WO_11100419228_WTHY	-24.32
WO_11100107622_WTHY	-19.11
WO_11100323428_WTHY	-8.83
WO_11100323414_WTHY	-3.30
WO_11100126745_WTHY	0.84
WO_11100324075_WTHY	5.25
WO_11100110909_WTHY	6.87
WO_11100324166_WTHY	8.07
WO_11100300179_WTHY	11.17
WO_11100323554_WTHY	11.32
WO_11100324023_WTHY	11.43

2026 Existing WSSIP	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-31.53
WO_11100419228_WTHY	-22.81
WO_11100107622_WTHY	-19.02
WO_11100323428_WTHY	-7.66
WO_11100323414_WTHY	-2.29
WO_11100126745_WTHY	0.81
WO_11100324075_WTHY	5.32
WO_11100110909_WTHY	7.05
WO_11100324166_WTHY	7.91
WO_11100300179_WTHY	11.24
WO_11100323554_WTHY	11.29
WO_11100324023_WTHY	11.51

2031 w/ Additional DAs	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-33.03
WO_11100419228_WTHY	-24.32
WO_11100107622_WTHY	-19.11
WO_11100323428_WTHY	-8.83
WO_11100323414_WTHY	-3.30
WO_11100126745_WTHY	0.84
WO_11100324075_WTHY	5.25
WO_11100110909_WTHY	6.87
WO_11100324166_WTHY	8.07
WO_11100300179_WTHY	11.17
WO_11100323554_WTHY	11.32
WO_11100324023_WTHY	11.43

2031 w/ Additional DAs & Proposed Development	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-33.03
WO_11100419228_WTHY	-24.32
WO_11100107622_WTHY	-19.11
WO_11100323428_WTHY	-8.83
WO_11100323414_WTHY	-3.30
WO_11100126745_WTHY	0.84
WO_11100324075_WTHY	5.25
WO_11100110909_WTHY	6.87
WO_11100324166_WTHY	8.07
WO_11100300179_WTHY	11.17
WO_11100323554_WTHY	11.32
WO_11100324023_WTHY	11.43

2036 Existing WSSIP	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-34.99
WO_11100419228_WTHY	-26.28
WO_11100107622_WTHY	-19.10
WO_11100323428_WTHY	-10.39
WO_11100323414_WTHY	-4.73
WO_11100126745_WTHY	0.85
WO_11100324075_WTHY	5.13
WO_11100110909_WTHY	6.37
WO_11100324166_WTHY	8.31
WO_11100300179_WTHY	10.79
WO_11100324023_WTHY	11.27
WO_11100323554_WTHY	11.37

2036 w/ Additional DAs	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-34.99
WO_11100419228_WTHY	-26.28
WO_11100107622_WTHY	-19.10
WO_11100323428_WTHY	-10.39
WO_11100323414_WTHY	-4.73
WO_11100126745_WTHY	0.85
WO_11100324075_WTHY	5.13
WO_11100110909_WTHY	6.37
WO_11100324166_WTHY	8.31
WO_11100300179_WTHY	10.79
WO_11100324023_WTHY	11.27
WO_11100323554_WTHY	11.37

2036 w/ Additional DAs & Proposed Development	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-34.99
WO_11100419228_WTHY	-26.28
WO_11100107622_WTHY	-19.10
WO_11100323428_WTHY	-10.39
WO_11100323414_WTHY	-4.73
WO_11100126745_WTHY	0.86
WO_11100324075_WTHY	5.13
WO_11100110909_WTHY	6.37
WO_11100324166_WTHY	8.31
WO_11100300179_WTHY	10.79
WO_11100324023_WTHY	11.27
WO_11100323554_WTHY	11.37

2041 Existing WSSIP	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-36.26
WO_11100419228_WTHY	-27.55
WO_11100107622_WTHY	-19.10
WO_11100323428_WTHY	-11.32
WO_11100323414_WTHY	-5.55
WO_11100126745_WTHY	0.89
WO_11100324075_WTHY	4.79
WO_11100110909_WTHY	6.24
WO_11100324166_WTHY	8.38
WO_11100300179_WTHY	10.73

2041 Existing WSSIP	
ID	Residual Pressure (m)
WO_11100324023_WTHY	11.08
WO_11100323554_WTHY	11.38

2041 w/ Additional DAs	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-36.26
WO_11100419228_WTHY	-27.55
WO_11100107622_WTHY	-19.10
WO_11100323428_WTHY	-11.32
WO_11100323414_WTHY	-5.55
WO_11100126745_WTHY	0.89
WO_11100324075_WTHY	4.79
WO_11100110909_WTHY	6.24
WO_11100324166_WTHY	8.38
WO_11100300179_WTHY	10.73
WO_11100324023_WTHY	11.08
WO_11100323554_WTHY	11.38

2041 w/ Additional DAs & Proposed Development	
ID	Residual Pressure (m)
WO_11100188024_WTHY	-36.26
WO_11100419228_WTHY	-27.55
WO_11100107622_WTHY	-19.10
WO_11100323428_WTHY	-11.32
WO_11100323414_WTHY	-5.55
WO_11100126745_WTHY	0.89
WO_11100324075_WTHY	4.79
WO_11100110909_WTHY	6.24
WO_11100324166_WTHY	8.38
WO_11100300179_WTHY	10.73
WO_11100324023_WTHY	11.08
WO_11100323554_WTHY	11.38

Maximum Velocity Failures

2031 Existing WSSIP	
ID	Max.Value (m/s)
WO_54287PIPE_11100432645	2.74
WO_54168PIPE_11100469394	2.66

2031 w/ Additional DAs	
ID	Max.Value (m/s)
WO_54287PIPE_11100432645	2.76
WO_54168PIPE_11100469394	2.68

2031 w/ Additional DAs & Proposed Development	
ID	Max.Value (m/s)
WO_54287PIPE_11100432645	2.76
WO_54168PIPE_11100469394	2.69

2036 Existing WSSIP	
ID	Max.Value (m/s)
WO_54287PIPE_11100432645	3.65
WO_54168PIPE_11100469394	3.57

2036 w/ Additional DAs	
ID	Max.Value (m/s)
WO_54287PIPE_11100432645	3.67
WO_54168PIPE_11100469394	3.59

2036 w/ Additional DAs & Proposed Development	
ID	Max.Value (m/s)
WO_54287PIPE_11100432645	3.67
WO_54168PIPE_11100469394	3.60

2041 Existing WSSIP	
ID	Max.Value (m/s)
WO_54257PIPE_11100466738	2.73

2041 Existing WSSIP	
ID	Max.Value (m/s)
WO_54182PIPE_11100271248	2.73
WO_53138PIPE_11100300006	2.73
WO_54183PIPE_11100271248	2.73

2041 w/ Additional DAs	
ID	Max.Value (m/s)
WO_54183PIPE_11100271248	2.73
WO_54257PIPE_11100466738	2.73
WO_54182PIPE_11100271248	2.73
WO_53138PIPE_11100300006	2.73

2041 w/ Additional DAs & Proposed Development	
ID	Max.Value (m/s)
WO_54257PIPE_11100466738	2.73
WO_54183PIPE_11100271248	2.73
WO_54182PIPE_11100271248	2.73
WO_53138PIPE_11100300006	2.73