

DEICORP PROJECTS SHOWGROUND PTY LTD



Air Quality Management Sub-Plan

2 Mandala Parade, Castle Hill NSW

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	REDFERN NSW 2016
Original (Saved to Digital Archives)	El Australia
,	Suite 6.01, 55 Miller Street,
	PYRMONT NSW 2009

Author	Technical Reviewer



SARI ERU		MALCOLM DALE		
Senior Environmental Scientist		Senior Principal – Contaminated Land CEnvP (Ger		
		& SC Specialist) Cert No #	# 0853 & 40038	
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Table of Contents

			Page Number
1.	INTI	RODUCTION	1
	1.1	Background	1
	1.2	Proposed Development	2
	1.3	Purpose and Implementation	2
	1.4	Mission Statement	2
	1.5	Outline of AQMP	3
2.	REC	GULATORY FRAMEWORK	4
3.	SITI	E SETTING	6
	3.1	Property Identification, Location, and Physical Set	ting 6
	3.2	Meteorological Conditions	6
		3.2.1 Wind Conditions	7
		3.2.2 Atmospheric Conditions	8
	3.3	Site Receptors	8
4.	BAC	CKGROUND AIR QUALITY	9
	4.1	Previous Investigations	9
	4.2	Local Emission Sources	10
	4.3	Existing Air Quality	11
	4.4	Summary of Background Air Quality	11
5.	AIR	QUALITY IMPACTS	12
	5.1	Construction Activities	12
	5.2	Potential Impacts	12
	5.3	Contaminants Related to Air Quality	13
		5.3.1 Weather	13
		5.3.2 Mobile Plant	13
	5.4	Acceptance Limits for Air Quality	14
	5.5	Acceptance Limits of Possible Pollutants	14
6.		QUALITY & ODOUR MANAGEMENT	16
	6.1	Objective of Air Quality & Odour Management	16
	6.2	Roles and Responsibilities	17
	6.3	Ambient Air Monitoring	17
		6.3.1 Monitoring Locations	17
		6.3.2 Monitoring Frequency 6.3.3 Dust Sampling Methods	18 19
		6.3.4 Monitoring Triggers	19
	6.4	Reporting	20
	6.5	Hours of Work	20
	6.6	Induction and Training	20



	6.7	Communication and Complaints	21
	6.8	Review of AQMP	22
7.	RISK	ASSESSMENT AND MITIGATION	23
	7.1	Risk Assessment	23
	7.2	Management Measures	25
	7.3	Mitigation Measures	25
	7.4	Mitigation Measures for VOCs	27
	7.5	Suppression Improvements Plan	27
8.	STAT	TEMENT OF LIMITATIONS	29
RE	FERE	NCES	30
AB	BREV	IATIONS	31
nec	dule	e of Figures	
		9	
Figu	ure 3-1	Mean Wind Conditions for Site	7
_		•	10
Figu	ure 7-1	Risk Assessment Matrix	23
nec	dule	e of Tables	
		Consent Conditions addressed by AQMP	3
			4 6
			8
		•	9
Tab	le 5-1	Criteria for Air Quality Pollutants	15
Tab	le 6-1	Air Quality Targets	16
		·	17
			18
			18 19
		•	20
		• • • • • • • • • • • • • • • • • • • •	24
		Air Quality Management Measures	25
		Air Quality Mitigation Measures	25
Tab	le 7-4	Suppression Improvements Plan	28
	8. RE AB Tel: Figure Fi	7. RISK 7.1 7.2 7.3 7.4 7.5 8. STA REFERE ABBREV COULC Figure 3-1 Figure 4-1 Figure 7-1	7. RISK ASSESSMENT AND MITIGATION 7.1 Risk Assessment 7.2 Management Measures 7.3 Mitigation Measures 7.4 Mitigation Measures for VOCs 7.5 Suppression Improvements Plan 8. STATEMENT OF LIMITATIONS REFERENCES ABBREVIATIONS Pedule of Figures I Mean Wind Conditions for Site Emissions by Sector for Baulkham Hills (2013) Risk Assessment Matrix Pedule of Tables Table 1-1 Consent Conditions addressed by AQMP Table 3-1 Regulatory Framework Site Setting Information Table 3-2 Generalised Atmospheric Conditions Table 5-1 Criteria for Air Quality Pollutants Table 6-2 Summary of Responsibilities Table 6-2 Summary of Responsibilities Table 6-3 Ambient Air Quality Monitoring Table 6-4 Summary of Trigger Values Table 7-1 Air Quality Management Table 7-2 Air Quality Management Table 7-3 Air Quality Mitigation Measures

Appendices

APPENDIX A - FIGURES

A.1 Site Locality Plan

A.2 Monitoring Location Plan

APPENDIX B - PROPOSED DEVELOPMENT



APPENDIX C - REACTIVE MANAGEMENT PROCEDURE

- C.1 Reactive Management Procedure
- C.2 Additional Management Measures



1. Introduction

1.1 Background

Following the opening of the Sydney Metro North West (SMNW) rail project in May 2019, Landcom and Sydney Metro are working together to develop walkable, attractive mixed use places around the SMNW stations. This includes the government owned land located adjacent to the Hills Showground Station, at 2 Mandala Parade, Castle Hill NSW ('the site'). The site was bound by De Clambe Drive to the north, Doran Drive to the west, Mandala Parade to the south and Andalusian Way to the east (see **Figure 1**, **Appendix A**).

El Australia (El) was engaged by Deicorp Projects Showground Pty Ltd to prepare an Air Quality Management Sub-Plan (AQMP), outlining the mitigation measures to be implemented at the site, in response to conditions C25, C26 and C27 of development consent SSD-15882721 which states:

AIR QUALITY MANAGEMENT SUB-PLAN

- C25 Prior to the commencement of any earthwork or construction, the Applicant must submit to the satisfaction of the Certifier an Air Quality Management Sub-Plan (AQMP) for the development. The Sub-Plan must include, as a minimum, the following elements:
- (a) be prepared by a suitably qualified and experienced expert in accordance with the EPA's Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (the Approved Methods);
- (b) relevant environmental criteria to be used in the day-to-day management of dust and volatile organic compounds (VOC/odour);
- (c) mission statement;
- (d) dust and VOCs/odour management strategies consisting of:
 - (i) objectives and targets;
 - (ii) risk assessment;
 - (iii) suppression improvement plan;
 - (iv) monitoring requirements including assigning responsibility (for all employees and contractors);
 - (v) communication strategy; and
 - (vi) system and performance review for continuous improvements.
- C26. The AQMP must detail management practices to be implemented for all dust and VOC/odour sources at the site. The AQMP must also detail the dust, odour, VOC and semi-volatile organic compounds (SVOC) monitoring program (eg. frequency, duration and method of monitoring) to be undertaken for the project.
- C27. The Applicant must also develop and implement an appropriate comprehensive Reactive Air Quality and Odour Management Plan which will incorporate an Ambient Air Monitoring Program and Reactive Management Strategy to ensure that the assessment criteria are met during the works.

The likely air quality impacts resulting from construction were assessed by GHD as part of the site-specific air quality assessment, and the findings were reported as:

GHD (2019) Hills Showground Station Precinct, Concept Design Air Quality Assessment.
 Report 1258111 dated October 2019.



With regards to Condition C25(a), the Approved Methods relate specifically to the assessment and modelling of air pollutants, and does not extend to the management or mitigation of these impacts, which is the purpose of this sub-plan. No modelling or assessment of pollutants has been made by EI, and the mitigation measures described by this plan are reliant on the conclusions and recommendations made by GHD (2019). Further discussion regarding the assessment is provided in **Section 4.1.**

1.2 Proposed Development

Based on the supplied plans (**Appendix B**), the proposed development would include construction of multi-storey, mixed commercial and residential apartment buildings overlying a common (commercial) retail plaza structure with six-levels of basement car park.

1.3 Purpose and Implementation

The purpose of this AQMP was to provide a general guide for the management of emissions that may result from generic construction activities occurring during redevelopment, As indicated by development plans and air quality assessments (GHD, 2019) provided by the client. This will be achieved by:

- Identification of the likely emissions which may impact air quality during construction, and the air quality mitigation measures as determined by GHD (2019), with regards to air quality;
- Detail the site specific criteria defined by GHD (2019) for the likely emissions that may result from the construction activities, and outline the monitoring and performance measures to demonstrate compliance with the air quality requirements for the site; and
- Provide site staff with an increased level of understanding and awareness of all management issues associated with the air quality relevant for the works.

This AQMP forms part of the Construction Environmental Management Plan (CEMP) completed by Barker Ryan Steward (BRS, 2022), and should be read in conjunction with the CEMP. Further Job Safe Analysis (JSA's) and/or Safe Work Method Statements (SWMS) should be prepared for job specific situations which are not addressed by this plan.

This AQMP is to be adjusted as required by the builder/contractor prior to the commencement of works on site, particularly where the changes are made to the air quality conditions during construction. This includes any alterations made to the air quality assessment (GHD, 2019), the CEMP (BRS, 2022), or conditions of consent SSD-1588272.

Where this plan conflicts with the requirements of the CEMP or any builder/contractors Safe Work Method Statements (SWMS) or Work Health and Safety (WHS) Policy then the SWMS's and WHS and their safety and environmental obligations of the builder/contractors shall override this CEMP.

1.4 Mission Statement

The mission statement for this AQMP was to ensure that impacts associated with air quality are managed to within permitted limits as defined by the GHD (2019) criteria, as far as practicable. This includes the implementation of best practice controls and procedures during construction, to maintain an acceptable level of ambient air quality while minimising the risk of dust and odour nuisance for users surrounding the site and within the wider Hills Showground Station Precinct. This includes:

- Achieving compliance with relevant legislative requirements and conditions of approval;
- Minimising any emissions resulting from all plant, equipment and machinery used during construction; and



 Make recommendations for site-specific training and/or site inductions in line with industry best practice (where available).

1.5 Outline of AQMP

Specific sections of this AQMP have been included to address the conditions of development consent SSD-15882721 as presented in **Table 1-1** below.

Table 1-1 Consent Conditions addressed by AQMP

Condition	Requirement	Section of AQMP
C25	Prior to the commencement of any earthwork or construction, the Applicant must submit to the satisfaction of the Certifier an Air Quality Management Sub-Plan (AQMP) for the development The Sub-Plan must include, as a minimum, the following elements:	
C25 (a)	An AQMP prepared by a suitably qualified and experienced expert in accordance with the EPA's Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (the Approved Methods).	This plan was prepared by suitably trained and experienced environmental practitioners with over 10 years' experience in Contaminated Land Management, and was reviewed by a Certified Site Contamination Specialist, with the accreditation details provided in Document Control .
C25 (b)	Relevant environmental criteria to be used in the day-to-day management of dust and volatile organic compounds (VOC/odour);	Criteria defined by GHD (2019). Values derived are provided in Table 5-1 and discussed in Section 5.4
C25 (c)	Mission Statement;	Section 1.4
C25 (d)	Dust and VOCs/odour management strategies consisting of: (i) objectives and targets; (ii) risk assessment; (iii) suppression improvement plan; (iv) monitoring requirements including assigning responsibility (for all employees and contractors); (v) communication strategy; and (vi) System and performance review for continuous improvements.	Objectives and targets in Section 6.1 Risk Assessment in Section 7 Suppression Improvements in Section 7.5 Monitoring requirements in Section 6.3 Roles and Responsibilities in Section 6.2 Communication Strategy in Section 6.7 System & performance review in Section 6.8
C26	The AQMP must detail management practices to be implemented for all dust and VOC/odour sources at the site. The AQMP must also detail the dust, odour, VOC and semi-volatile organic compounds (SVOC) monitoring program (eg. frequency, duration and method of monitoring) to be undertaken for the project.	Management measures in Section 7.2 Monitoring in Section 6.3
C27	The Applicant must also develop and implement an appropriate comprehensive Reactive Air Quality and Odour Management Plan which will incorporate an Ambient Air Monitoring Program and Reactive Management Strategy to ensure that the assessment criteria are met during the works	See Section 6 Reactive Management Strategy in Appendix C



2. Regulatory Framework

Legislation, guidelines and standards relevant to air quality management for the development are presented within **Table 2-1**.

Table 2-1 Regulatory Framework

Regulatory Document	Summary of Requirements
Legislation	
Protection of the Environment Operations Act 1997 (the POEO)	The objective of the POEO Act is to achieve the protection, restoration and enhancement of the quality of the environment. The POEO Act gives rise to the POEO (Clean Air) Regulation (2010).
Environmental Planning and Assessment Act 1979 (EP&A Act)	The EP&A Act determines the category of development, and gives rise to state environmental planning policies (SEPP) developed to assist regulators with the protection of human and environmental health.
State Environmental Planning Policy (SEPP) (Major Projects) 2005.	SEPP (Major Projects) facilitates the development or redevelopment of important sites of economic, environmental or social significance to the State, to encourage works to be approved for the benefit of the State.
Local Council Plans	 The Hills Local Environmental Plan 2019; and The Hills Development Control Plan 2012.
Standards	
Standards Australia	All activities should adhere to: AS2601: 2001 The Demolition of Structures; AS2159:2009 Piling Design and Installation; AS 3580: 2007 Methods of Sampling Analysis of Ambient Air, being: Part 1.1 (2007) Guide to Siting Air Monitoring Equipment; Part 10.1 (2003): Determination of Particulate Matter - Deposited Matter (Gravimetric Method); and Part 12.1 (2001): Determination of light scattering – integrating nephelometer method.
Guidelines	
National Environment Protection Measure for Ambient Air Quality (2016), 2021 Variation (NEPM-AAQ)	National Environment Protection Standards were determined in accordance with (set) monitoring protocol, to achieve ambient air quality that allows for the adequate protection of human health and well-being.
National Environment Protection Measure (Diesel Vehicle Emissions) Measure (2001), 2009 Variation (NEPM-DVE)	National Environment Protection Standards to reduce emissions from diesel vehicles, by facilitating compliance with in-service emission standards from diesel vehicles.



Regulatory Document	Summary of Requirements
Other relevant Guidelines	 Department of Environment and Conservation NSW (DEC) Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (2007);
	 EPA (2022) Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (the Approved Methods) including earlier publications (EPA, 2016)
	 Landcom (2004) Managing Urban Stormwater: Soils and Construction (the "Blue Book"). Of particular relevance was: Volume 1 (4th Edition);
	Volume 2A Installation of Services; andVolume 2C, Unsealed Roads.



3. Site Setting

3.1 Property Identification, Location, and Physical Setting

The site is situated within an area of mixed land use, including residential, commercial and recreational activities. A summary of the site setting is presented in **Table 3-1**.

Table 3-1 Site Setting Information

Attribute	Description
Street Address	Part of the Hills Showground Station Precinct, the site was referred to as the 'Doran Drive Precinct' with the street address of 2 Mandala Parade, Castle Hill NSW.
Lot and DP	Lot 55 in Deposited Plan (DP) 1253217
Site Area	7,969 m ²
Location Description	10 km north-west of Parramatta CBD, bound by De Clambe Drive (north), Andalusian Way (east), Mandala Parade (south) and Doran Drive (west).
Topography	The site surface was moderately dipped towards the southwest, with site levels varying from 98.13m AHD in the north-east, reducing to 90.63m AHD in the south-west. The boundaries of the site were battered, with an average 1-1.5m drop observed towards the surrounding roads. Local topography gently slopes to the south-west, towards Cattai Creek.
Site Drainage	Site drainage is likely to be consistent with the general slope of the site. Any run off would be expected to flow into the new constructed stormwater pits, which discharges into the municipal stormwater system and ultimately, to the closest surface water feature, Cattai Creek (approx. 130m southwest of site).
Surrounding Use	North: Castle Hill Showground, with residential use beyond.
	 South: Hills Showground Metro Station and associated retail plaza, followed by residential properties and Carrington preschool (approx. 110m southwest)
	 East: Hills Showground Precinct East, comprising the former offices and car park of The Hills Shire Council, with residential beyond.
	 West: Hills Showground Precinct West, comprising a car park and retail plaza, with commercial use beyond.
Soil Landscapes	The site overlies an erosional Glenorie (<i>gn</i>) soil landscape, characterised by undulating to rolling low hills on Wianamatta Group shales, while the western portior of the site overlies a colluvium Hawkesbury (<i>ha</i>) soil landscape, characterised by rugged, rolling to very steep hills on Hawkesbury Sandstone.
	• (Source: Bannerman SM and Hazelton PA, 1990, Soil Landscapes of the Penrith 1:100,000 Sheet)

3.2 Meteorological Conditions

Meteorological conditions of the site are of fundamental importance to Air Quality as these conditions drive the release of emissions into the atmosphere, resulting in the occurrence of off-site impacts. In accordance with EPA (2016), the parameters of most importance are:

- Wind Direction and Speed, to determine the direction and speed at which the emissions are transported from the source(s) to the receptor; and
- Atmospheric conditions, such as rainfall, temperature and atmospheric turbulence.



3.2.1 Wind Conditions

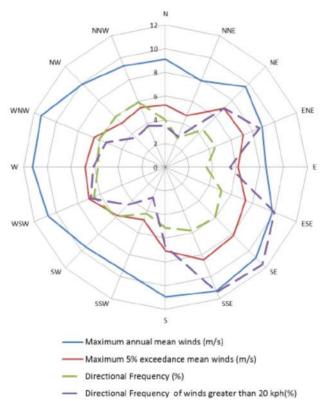
El were provided with a report on the local wind conditions for the development, prepared by Windtech Consultants Pty Ltd (Windtech), as:

 Windtech (2019) Hills Showground Station Precinct, Castle Hill Pedestrian Wind Environment Statement, prepared for Landcom, Report WF043-01F02(Rev1), dated 29 October 2019.

Findings of relevance to this AQMP were:

- The regional winds for the site are governed by three principal directions, being the north-east (NE), south and south-east (SSE), and west (W). Using data obtained from the Bankstown BOM station from 1993 to 2016, directional wind speed and frequency of occurrence was determined, and is presented in Figure 3-1 below;
- As shown in **Figure 3-1**, the annual wind pattern was dominated by SSE and W flows, with a maximum annual wind speed of 10-12metres per second (m/s);
- NE winds prevail through the summer months, with W winds prevalent in the winter and SSE winds occurring all year round;
- The site was situated at the north-eastern end of a low-rise former industrial area, with residential buildings to the south. These structures were unlikely to shield the site from prevailing winds due to their height and distance, however taller structures to the west may provide some shelter for the W prevailing winds during development; and
- The rise in site topography towards the north-east may accelerate the westerly and southerly winds, however the expected effects were considered minimal.

Figure 3-1 Mean Wind Conditions for Site





3.2.2 Atmospheric Conditions

El reviewed the statistical data obtained from the nearest meteorological monitoring station to the site, collected by the Bureau of Meteorology (BOM). The closest station to the site with useable data was Seven Hills (Colin Street) Station (Site ID 067026) situated approximately 9 km to the southwest of the site. A summary of the meteorological conditions for the site are presented in **Table 3-2**.

Table 3-2 Generalised Atmospheric Conditions

Attribute	Description
Temperature	In general, the local climate comprised warm summers and mild winters, Mean temperatures range from 4.5° C to 17.4° C in July, and 15.3° C to 28.4° C in December. Annual average temperatures ranged from 11.2° C to 23.4° C.
	(Source: http://www.bom.gov.au/climate/averages/tables/cw_067026.shtml , accessed 15 April 2021)
Rainfall	Rainfall occurred throughout the year, with wetter periods observed from January to June. The mean monthly rainfall recorded by BOM for the closest monitoring site (Seven Hills – Collin St) ranged from 43.6 mm in July to 116 mm in February, with an average annual rainfall of 913.8mm.
	(Source: http://www.bom.gov.au/climate/averages/tables/cw_067026.shtml , accessed 15 April 2021)

3.3 Site Receptors

In accordance with EPA (2016), site receptors were defined as locations where people or things are, or would likely reside (i.e. residential housing areas, schools, offices or public space). Site receptors of greatest concern include those sensitive to environmental change, such as the very young, the elderly and the infirm. The closest sensitive receptors identified for the site were:

- The residential land users located:
 - > 70m to the south;
 - 250m to the north; and
 - > 200m to the east.
- Recreational and ecological users of Cattai Creek, 200m southwest of site;
- Users of the Castle Hill Showground, the Hills Showground Metro Station, Station Plaza and commuter carpark adjacent the site to the south and west; and
- The site worker any external work areas immediately adjacent to the site boundary during the construction work.



4. Background Air Quality

4.1 Previous Investigations

Previous consultant, GHD Pty Ltd (GHD), completed an Air Quality Assessment (AQA) in support of a State Significant Development (SSD) application for the larger Hills Showground Precinct. The findings were provided to EI as:

 GHD (2019) Hills Showground Station Precinct, Concept Design Air Quality Assessment for Landcom, Report 12518111, dated October 2019.

The AQA provided pertinent information regarding background air quality for the site, with the relevant findings presented in **Table 4-1**.

Table 4-1 Summary of GHD (2019) Air Quality Assessment

Table 4-1 Su	minary of Orib (2013) Air Quanty Assessment
Attribute	Description
Objective	The objective was to assess the likely air quality impacts expected for the Hills Showground Station Precinct and provided mitigation measures to be considered for the management of air quality at the current site and surrounds. The AQA included: 1 Mandala Parade, being lots 50 and 54 in DP 1253217; 2 Mandala Parade, being Lot 55 in DP 1253217 (the current site); 3 Andalusian Way, being Lot 56 in DP 1253217; 5 De Clambe Drive, being Lot 53 in DP 1253217; and 3 De Clambe Drive, being Lot 52 in DP 1253217.
Scope of Works	The AQA assessed the air quality impacts for the development, in accordance with the following scope of works:
	 A review of all relevant Office of Environmental and Heritage (OEH) air quality monitoring data and any significant existing sources of localised emissions, road traffic emissions and any expected rail emissions;
	 The relevant criteria relating to air quality was outlined as per EPA (2016);
	 The likely air quality impacts on the proposed sensitive receivers (residential, commercial and industrial) in the precinct were assessed; and
	 High level (in-principle) recommendations were provided for building locations and design, to minimise air quality impacts.
Emission Sources	GHD completed a review of the Australian Government's, Department of the Environment and Energy (DEE) <i>National Pollution Inventory</i> (NPI) which identified two potential source of industrial emissions within a 5 km radius of the development area, being Castle Hill Sewage Treatment Plant (1.5km north) and Hytec Yarrabee Road Quarry (4.7km south). The potential risks posed by these sources were regulated by the POEO Environmental Protection Licencing (EPL) scheme, and assuming the facilities maintain compliance with their EPL, no adverse air quality impacts were expected. In addition, emission sources within the development area were identified, and the potential to impact the site receptors was assessed, as follows:
	 Rail emissions from SMNW train movements were found to be minor due to the underground nature of the operation, and no adverse air quality impacts from rail emissions were expected; and
	 Road vehicle emissions were assessed for the major arterial routes, Carrington Road and Showground Road only, being the worst case scenario anticipated for the development, based on traffic levels.
	development, based on traincrevers.



Attribute	Description
Conclusions	GHD (2019) concluded that emissions from the SMNW and local sources were minor and were unlikely to impact the site, however conservative assessments screening road traffic emissions identified that under worst-case conditions, the annual PM2.5 emissions produced by the major arterial roads may present an unacceptable level of air quality for the residential users for the end site. Recommendations were made for the building design; however these strategies were not relevant for the construction phase of works.

4.2 Local Emission Sources

El reviewed the Air Emissions Inventory for the Baulkham Hill locality using 'Air Emissions in My Community' (https://www.epa.nsw.gov.au/your-environment/air/air-emissions-inventory/air-emissions-my-community-tool). This tool provides a graphical representation of data gathered for the 2013 Air Emissions Inventory collected by the NSW EPA, with the findings presented below in **Figure 4-1**.

Human vs **Top Emission** Sector Geographic **Natural Emissions** Activities **Emission Trends** Comparison Refresh Export LGA: Baulkham Hills Region: Sydney Substance: PM2.5, NOx and VOC Substance: PM2.5, NOx and VOC Unit: tonnes per year Unit: tonnes per year Human vs. Natural Emissions (2013) Human vs. Natural Emissions (2013) Show Tables Show Tables Human Natural Human Natural PM2.5 PM2.5 NO NOx VOC 150k t/vr 150k t/vr 100k Emission by Sector (2013) Emission by Sector (2013) VOC NOx PM2.5 VOC NOx PM2.5 Commercial Commercial Businesses Businesses EPA-Licensed EPA-Licensed Industry Industry Non-Road Equipment Non-Road Equipment and Transport and Transport Natural Sources Natural Sources Road Transport Road Transport Household Activities Household Activities 60k t/yr 60k t/yr 0k 20k 40k 20k 40k

Figure 4-1 Emissions by Sector for Baulkham Hills (2013)

The sectors responsible for the majority of emissions for the locality were EPA licenced industry, road transport and the most significant contributor, household activities. As reviewed by GHD (2019), local industrial activity would be of low concern (**Table 4-1**), therefore road transport and household activities were the primary sources of emissions for the locality.



4.3 Existing Air Quality

Background air quality was determined by GHD (2019) using information obtained from the NSW Office of Environmental Heritage (OEH) ambient air quality monitoring stations. The nearest, useable dataset for the site was Macquarie Park, located at the Macquarie University Sports Fields in Culloden Road, approx. 11km southeast of the site. The 90th percentile concentrations for background air quality pollutants were reviewed for 2019 to be:

- PM10: 26.8 μg/m³ over 24 hours and 17.2 μg/m³ annual;
- PM2.5: 11 μg/m³ over 24 hours and 7 μg/m³ annual;
- CO: 0.3 mg/m³ per hour or 0.3 mg/m³ over 8 hours; and
- NO_2 : 24.4 μ g/m³ over 1 hour and 11.3 μ g/m³ annual.

Using the average annual concentrations of PM10 and PM2.5, GHD derived a conservative ration of 0.5 for particulate emissions for the AQA. The annual average background concentrations were relatively high, indicating poor air quality on a regional level.

4.4 Summary of Background Air Quality

A high background PM2.5 concentration of 7 μ g/m³ was recorded by GHD (2019) accounting for 87.5% of the allowable assessment criteria of 8 μ g/m³. Exceedances of the criteria were detected for proposed buildings along Showground Road (10 m from the roadway) however emissions from the Sydney Metro Northwest or surrounding industrial and development were not expected to impact on the air quality of the development.

Given the elevated $PM_{2.5}$ concentrations in ambient air, additional $PM_{2.5}$ concentrations emitted during construction would potentially impact air quality in the surrounding areas. $PM_{2.5}$, being the measure of depositional dust would be of primary concern for the construction phase of works.



5. Air Quality Impacts

5.1 Construction Activities

As stated in **Section 4.2**, the locality was contributing to elevated PM_{2.5} concentrations and as a result, any further increases in depositional dust has the potential to impact air quality in the vicinity of the site. With reference to **Section 1.2**, the construction phase of works will involve:

- Bulk Excavation of site soils to at least 19 mBGL of the existing site, for the construction of the basement car park;
- The installation of foundations, underground services and lift pits and/or crane pads;
- Construction of the above ground structures; and
- Landscaping.

Site preparation works, including demolition was complete, and site stripping has removed all trees and plantings across the site. Activities of greatest concern to air quality to be completed for construction were identified as:

- Soil disturbance activities, including bulk excavation, drilling and/or piling, general earthworks, the installation of services and landscaping;
- The importation and stockpiling of material (i.e. aggregate and soils) and uncovered loads;
- Cutting, grinding and sawing activities and the operation of concrete / asphalt agitators;
- Wind erosion in areas of exposed soil within an open environment; and
- The operation of mobile plant, including excavators, piling rigs and haulage trucks, including the use and idling of machinery and trucks and driving over unpaved surfaces.

5.2 Potential Impacts

A review of background air quality data (see **Section 4.4**) shows that elevated levels of background particulate matter (i.e. $PM_{2.5}$) is likely to occur at times, hence care should be taken to ensure the constructions works do not intensify air quality impacts. In addition, given the proximity to major roads, background concentrations of combustion gasses could also be be higher than those recorded by GHD (2019) and care is required to minimise gaseous emissions where possible. Sources of dust and emissions from the site during construction may result in the following impacts:

- Dust emissions resulting from demolition works or from exposed soils generating dust;
- Human Health impacts (i.e. breathing or eye irritation) resulting from the generation of particulate matter (dust) where elevated levels persist.
- Negative aesthetic impacts and reduced visibility due to increased particulate and dust.
- Poor working conditions due to health implications.
- Additional cleaning effort/costs leading to damage of personal property as a result of increased particulate in air and/or depositional dust.
- Erosion and/or loss of soils due to windborne loss
- Gaseous / exhaust emissions associated with the combustion of fuel from plant, machinery and vehicles that may generate oxides of nitrogen (NO_x), carbon monoxide (CO), sulfur dioxide (SO₂) and trace amounts of non-combustable hydrocarbons such as semi-volatile organic compounds (SVOCs).



The potential for impacts on air quality will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts attributable to construction may occur during work establishment, earthworks, spoil handling, storage and transport and due to plant and vehicle movement and emissions. These are covered in more detail in the following sections. Overall, with the implementation of the control measures identified in **Section 7**, the likely impacts for air quality are expected to be minimal.

5.3 Contaminants Related to Air Quality

Given the lack of contamination identified within the site, the primary contaminant of concern for Air Quality during construction was dust, otherwise referred to as Particulate Matter (PM). There are three size fractions for PM, being:

- PM2.5 (i.e. being less than 2.5 microns in size), associated with fuel burning, industrial combustion and vehicle emissions;
- PM10 (i.e. being less than 10 microns in size) associated with coarse grained dusts (i.e. road dust) and construction activities; and
- PM with aerodynamic diameter of 50 microns or less (Total Suspended Particulates TSP).

During mechanical motion and earth movements, the vast majority of PM generated is between 2.5 microns and 50 microns in aerodynamic diameter. PM greater than 10 microns in aerodynamic diameter cannot pass into the human respiratory system; however, PM of this size fraction can result in nuisance to surrounding receptors as a result of dust deposition. Consequently, in relation to PM, two potential impacts from dust generation are considered:

- Ambient concentration of PM10; and
- Dust deposition (as a nuisance issue).

Given the nature of the construction works required, the activities associated with earthworks and construction of the below ground structures and the installation of foundations, services and landscaping were considered to be the activities of greatest concern to the generation of PM.

5.3.1 Weather

Weather can have a large impact on Air Quality. With higher temperatures, and as wind speeds increase there will be a greater potential for dust generation to occur. Weather reporting should be provided to all site contractors on a daily basis, which would be based on Bureau of Meteorology (BoM) information for Seven Hills (Collins Street), 11km to the southwest, and was considered to be the closest station to the site, . The information would be delivered to all staff during toolbox / pre- start meetings, or where required, significant changes in conditions may be announced over the site radio. As stated in **Table 3-2**, the site was typically of a warm to moderate climate, with low levels of rainfall occurring over the summer months. During periods of dry weather and in periods of high wind the likelihood of dust to be generated from onsite activities would increase, and additional controls may be required, or works may cease altogether.

5.3.2 Mobile Plant

It was considered that any mobile plant emissions generated through the combustion of fuel will be short term and minimal, in comparison to the emissions generated by vehicles travelling along the surrounding roadways. Given the short term and low level of emissions of these pollutants from the site during the construction works, fuel combustion contaminants, such as volatile organic compounds (VOCs) or Nitrogen Oxides (NOx) were unlikely to impact air quality.



Pre-start inspections should be completed on all mobile plant to ensure the equipment is well maintained and serviced so that vehicular emissions remain within relevant air quality guidelines and standards. Any equipment or vehicles seen to create excessive emissions should be either replaced or serviced. Given these conditions are met, the most significant issue related to mobile plant at the site would be the generation of dust resulting from driving along unpaved surfaces, and the haulage of soils (including loading and unloading). Currently, it was anticipated that all traffic will gain access to the site from De Clambe Drive in the north. Consideration of the sites proximity to site receptors site is required (Section 3.3) for the selection of internal haulage routes at the site.

5.4 Acceptance Limits for Air Quality

As stated in **Section 5.3.2**, the emissions of greatest concern for the site were related to the generation of dust from the construction activities occurring onsite and individual VOC contaminants were not likely to be generated. An acceptable level of air quality will be achieved when:

- No complaints are received from nearby residents or local road users in relation to dust and sediment beyond the site boundary;
- No visible dust is identified at, or beyond the site boundary which has migrated from the site:
- No dust generated within the site has the potential to affect the site workers;
- Site workers and visitors during construction are made aware of the air quality requirements of the site and the existence of this AQMP;
- Relevant measures and procedures are implemented throughout the construction phase of works; and
- Air quality meets the air quality goals and DEC's guidelines for dust as listed in Table 5-1;
- Effective communication is maintained with Council, the NSW EPA and key stakeholders of the development.

A secondary effect resulting from the construction works may include the emissions of pollutants and/or odour levels generated from mobile plant. The levels of odour within the site shall be monitored using olfactory methods (i.e. through smell) as determined by the Project Manager, Site Supervisor and/or Environmental Consultant. The odour would be described as non-detectable, low, moderate or strong and an acceptable limit for the site will be achieved when:

- No detectable odour is identified at the site boundary; and/or
- No odours greater than moderate or strong are present onsite, or that have the potential to affect workers.

5.5 Acceptance Limits of Possible Pollutants

GHD (2019) found that dust deposition would be the primary concern for air quality with regards to construction; however the GHD (2019) AQA identified a number of toxic and carcinogenic air pollutants (including VOC and SVOCs) which may be generated as a result of the proposed activities.

In particular, the generation of volatile organic compounds (VOCs) from mobile plant, machinery or vehicles may react under the influence of sunlight, to generate nitrous oxide (NO₂) and/or photochemical smog. Impacts related to the generation of VOCs would therefore be assessed where secondary effects are identified as a concern. This would be achieved through the monitoring of NO₂ and should meet the criteria presented in **Table 5-1**.



The assessment criteria for pollutants as derived by GHD (2019) to be met by the site are presented in **Table 5-1** below.

Table 5-1 Criteria for Air Quality Pollutants

Pollutant and Averaging Period	Criteria (GHD, 2019)
Annual maximum increase dust ^a concentration	2 g/m ² /month ^b
Annual maximum total dust ^a concentrations	4 g/m ² /month ^c
Maximum 1 hour average carbon monoxide (CO) concentrations	30 mg/m ³
Maximum 8 hour average CO concentrations	10 mg/m ³
Maximum 1 hour average nitrous dioxide (NO ₂) concentrations	246 μg/m ³
Annual average NO ₂ concentrations	62 μg/m³
Maximum 1 hour average SO ₂	570 μg/m³
Maximum 24 hour average SO ₂ concentrations	228 μg/m ³
Annual average SO ₂ concentrations	60 μg/m³
Maximum 24 hour average PM ₁₀ concentrations	50 μg/m³
Annual average PM ₁₀ concentrations	25 μg/m³
Maximum 24 hour average PM _{2.5} concentrations	25 μg/m³
Annual average PM _{2.5} concentrations	8 μg/m³
Total Suspended Particulates (Annual)	90 μg/m³

Notes:

- a) dust is assessed as insoluble solids as defined by AS 358.10.1-1991 (AM-19)
- b) maximum increase in deposited dust level
- c) maximum total deposited dust level



6. Air Quality & Odour Management

6.1 Objective of Air Quality & Odour Management

Day to day management of air quality impacts resulting from construction activities will require management of dust, odour and VOC emissions generated onsite. This will occur through the implementation of mitigation measures at the site, and the performance will be determined by visual monitoring of boundary emissions. Continuous control of emissions at the source will assist with the sites compliance with the limits applicable to the site(Section 5.4 and 6.3). Conformance with these limits shall ensure, as far as possible, that construction activities may continue unimpeded, without impacting the surrounding air quality.

Specific air quality targets and performance criteria were established for the management of air quality during construction which was based on recommendations made by GHD (2019). Note, given the ambient concentrations of $PM_{2.5}$, air quality monitoring using PM_{10} concentrations was recommended to assess impacts resulting from the construction activities. These are summarised in Table 6-1 below.

Table 6-1 Air Quality Targets

Impact requiring mitigation	Target	Monitoring and/or mitigation required
Dust	No visible dust leaving the site boundary	- Daily visual inspections at:
Odour	No odours detected at the site boundary	 Boundary locations M1 to M4;
VOCs	No clearly visible exhaust emissions resulting from any machinery or mobile plant to be observed at or beyond the site boundary	In proximity to site works. See Section 6.3 .
Particulate emissions (PM ₁₀)	Average daily PM ₁₀ emissions should not exceed 50 μg/m ³ over a 24 hr period	Passive dust deposition monitoring of PM ₁₀ to be completed monthly. See Section 6.3
Complaints	No complaints related to air quality or dust to be received.	Additional monitoring of the emissions impacting the receiver at offsite locations. See Section 6.3

The performance of air quality for the construction works is ultimately the responsibility of all site workers, their visitors and subcontractors carrying out works at the site. The Project Manager holds overall responsibility for the sites conformance with the targets specified in Table 6-1.

Where triggers are, or could exceed the air quality criteria, site management must be informed, and contingency measures implemented. Should repetitive complaints or non-conformances are identified, additional monitoring may be required (i.e. boundary PM₁₀ monitoring) and should this situation arise, advice from the Environmental Consultant shall be sought.

A Reactive Air Quality Management Procedure is provided in Appendix C.



6.2 Roles and Responsibilities

The roles and responsibilities associated with the works are outlined in **Table 6-2**. The Project Manager will have the main responsibility for maintaining and implementing this AQMP. Responsibility for implementing certain components of the AQMP may be delegated to particular project staff and/or contractor(s) nominated to undertake those works.

Table 6-2 Summary of Responsibilities

Role	Brief Description of Responsibilities
Project Manager	 Ensure effective overall management of environmental performance during the site development.
	 Review this AQMP to ensure compliance with requirements.
	Ensure the AQMP is implemented.
	 Undertake environmental reviews required by consent conditions and regulatory policie and legislation.
	 Undertake all community consultation and notifications associated with the works.
Site Supervisor	 Supervise the work activities and ensure all environmental controls are in place.
	 Monitor daily work routines so that environmental controls are established and maintained as per the AQMP and detailed mitigation measures.
	 Monitor daily work routines so that environmental protection requirements are communicated to all personnel and contractors under his/her control.
	 Where necessary stop work activities until adequate environmental safeguards have been implemented.
	Identify areas of improvement and notify the head contractor.
	 Ensure environmental issues are communicated to all site staff.
Environmental	Provide advice regarding the requirements of Air Quality for construction at the site;
Consultant	 Outline the monitoring requirements for Air Quality as and when required;
	 Assist with the investigation and resolution of any complaints received with regards to Air Quality; and
	 Assist with communicating the performance of Air Quality at the site to key stakeholder and regulators as required.
All site staff and contractors	All contractors must employ best practices in managing any air quality related impacts during site redevelopment. All contractors must also:
	 Ensure work instructions reflect the requirements of this AQMP and all requirements ar implemented.
	 Ensure all required records/documentation are maintained and submitted to the head contractor.
	 Ensure training/induction of personnel is carried out and that staff operate in an environmentally responsible manner.
	 Undertake and report on all monitoring and inspections completed.
	 Report all environmental incidents and near misses.

6.3 Ambient Air Monitoring

6.3.1 Monitoring Locations

Routine visual monitoring of emissions will be required to mitigate any impacts that may result from the proposed activities. Monitoring will occur in locations both on and off site, depending on the target to be achieved, and includes:

Visual inspections in close proximity to site works;



- At selected boundary locations (M1, M2, M3 and M4) (see Table 6-3 and as presented in Figure 2); and
- Where a complaint has been received by the client, off-site locations may be selected to provide an indication of exposure or to identify background levels of influence.

The on-site boundary monitoring locations are summarised below in Table 6-2.

Table 6-3 Summary of Ambient Air Monitoring Locations

Location ID	Approx. coordinates #	Frequency and Type of Monitoring	Nearby Receptors
M1 De Clambe Drive	E:313489.679, N:6266308.077	Visual inspections (Daily) PM10 monitoring (monthly)	Users of the Castle Hill Showground (20m)
M2	E:313555.751, N:6266298.724		Users of the carpark and the former The Hills Shire Council administration building (<20m)
M3	E:313518.547, N:6266243.057		Users of the Hills Showground Metro Station and commuter carpark (<5m) Residence (70m)
M4	E:313451.179, N:6266255.106		Users of the Station Plaza and commuter carpark (<5m)
Background	E:313305.733 N:6266165.647		Cattai Creek (200m)

Notes: # - Coordinates referenced from (GDA2020-MGA56)

6.3.2 Monitoring Frequency

The following monitoring is proposed during the construction activities. Other monitoring may be carried out on an as needs basis (e.g. a specific complaint). The type and frequency of monitoring is presented in **Table 6-4**.

Table 6-4 Ambient Air Quality Monitoring

Monitoring	Performance Indicator	Frequency
Weather – Meteorological Data Including daily rainfall, temperature and wind (direction and speed) from Seven Hills (Collins St) Station, obtained by BOM	Delivery to site staff during toolbox meetings, announced over site radio where required. Parameters of interest are: Wind Speed and Direction to determine the site receptors up and down-wind of the site, and the likely risk; and Temperature as well as rainfall to inform the extent of natural dust attenuation through watering, and if additional watering is necessary.	Daily
Visual surveillance for dust emission and site inspection for visible dust deposits on surface / mud tracking off site	No dust emissions or sediment tracking beyond the site boundary and no incidents or complaints reported. Procedure for completing visual surveillance at the site is presented below.	Daily



Monitoring	Performance Indicator	Frequency
	 A designated person on site will undertake the following visual checks near the site boundary at least once on each working day until the project works are completed. 	
	 If dust migration beyond the site boundary is observed, identify the source of the dust being generated at the source (e.g. wheel generated dust, excavators, stockpiles, wind erosion). 	
	• Inspect and report on watering of site surfaces (i.e. water cart activity and daily water usage rate), and/or where dust and sediment are seen beyond the site boundary. The weather conditions (Section 3.2) will also be recorded when a non-conformance is reported during a visual surveillance check.	
	 Prepare a summary of the findings as part of an environmental inspection report. Non- conformance (e.g. excessive dust generation, dust/earth/ other materials leaving the site) will be reported immediately to the Project Manager or management. 	
Inspections to verify unusual odours	No unusual odour detected at boundary and no complaints received.	Daily
Plant/equipment inspections including daily pre-start inspections	Inspections undertaken in line with operational requirements and regularly serviced, with inspection sheets maintained.	Daily / as required.
Dust monitoring	No exceedance of monitoring trigger values listed in Table 6-5 .	Monthly

6.3.3 Dust Sampling Methods

Dust methods are currently using dust fallout method suitable for construction site based on the Australian Standard AS3580.

The various sampling methods and method references are summarised in Table 6-4.

Table 6-5 Summary of methods and sources

Target analyte	Media	Method reference
Particulate matter	Dust fallout filter (passive)	AS 3580

Notes: * up to 75 compounds, ** 42 compounds

6.3.4 Monitoring Triggers

Trigger values are to protect both worker health and the surrounding sensitive receptors including local residents, commuter carpark and metro station users, and the more distant Carrington Childcare.



The trigger values for occupational and non-occupational exposure for the primary on-site chemicals and other VOCs detected were outlined in **Table 6-5**.

Table 6-6 Summary of Trigger Values

Compound	Occupational (TWA) (μg/m³) ¹	Non-occupational (μg/m³)²	HSL Res A/B (μg/m³)³	Monitoring Investigation Levels (µg/m³)⁴
Dust	-	4g/m ² /month ⁵	-	-

- 1 Safework 2013
- 2 US EPA Region 9 Regional Screening Levels (May 2016) Lifetime Carcinogenic Risk 1x10⁻⁶ Residential Ambient Air
- 3 NEMP (2013) HSL uses sand at 0 <1 m
- 4 NEPM (2004) Air Toxics 1 year average
- 5 DEC (2005) Air Quality Monitoring Criteria for Deposited Dust
- # Yearly monitoring level requiring 6 measurements per year for human health (NEPM, 2010)

Any exceedances of the above levels, El would undertake a preliminary risk screening to assess the potential risk to the surrounding receptors.

6.4 Reporting

Record keeping and reporting requirements may be undertaken by the site project manager and include relevant project team members and stakeholders. The record keeping will include:

- A copy of the complaints register for the month and details of how complaints were addressed and resolved;
- Identification of non-compliance with the conditions of the development consent that includes dust and odour, including a record of visual surveillance undertaken at the site;
- Details of additional measures to be implemented to address any noncompliance;
- Details relating to excavated volumes and types of soil disturbed within the site, including dates of excavation; and
- Details of any fill material imported into site.

6.5 Hours of Work

Construction activities were identified as the primary source of dust generated at the site, therefore the period of time when these activities are occurring would be of greatest risk to the sites receptors. For the site, the working hours typically approved by the Hills Shire Council will be specified by consent, to ensure that construction is carried out in a safe and environmentally friendly manner. Any works occurring outside of these hours must be approved by council, and will be subject to conditions. The hours consented for the works were not known, however generalised working hours were expected to be:

- Monday to Friday, 7:00am to 6:00pm;
- Saturday, 8:00am to 1:00pm; and
- Sunday / Public Holidays, no work.

6.6 Induction and Training

All employees and contractors work on site will undergo an induction training relating to air quality management issues, prior to being authorised to work within the site. Specific information related to air quality to be included during induction/training will include:



- Information regarding the existence of this AQMP, and the requirements of consent, including the identification of site boundaries (Figure 2) and the site specific environmental measures required;
- Details of the potential sources and emissions of concern (Sections 5.2) and Information regarding typical activities that may impact air quality;
- Details of the mitigation measures for the typical site activities; and
- Incident response procedures, including details of the complaints handling process for the site.

Records of all training activities, including inductions, will be maintained by the Project Manager. These records shall include (but not be limited to):

- Details of the person being inducted, including their employer, the role and activities to be completed within the site and the time period of the works;
- Details of the person responsible for providing the training; and
- Where applicable, reference to the material presented, and a copy of the information provided.

6.7 Communication and Complaints

Effective communication between the Project Manager, Site Supervisor, sub-contractors, other members of the project team and external stakeholders is important to ensure effective implementation of the AQMP. Project communication can be categorised into internal and external communications.

6.7.1 Internal Communications

Communication on air quality issues within the project team will be maintained through the following channels:

- Site inductions to be provided by the Project Manager or delegate.
- Daily work briefings briefings by the Site Supervisor prior to work commencement each morning should highlight air quality issues and mitigation measures relevant to the day's works.
- Weekly toolbox talks ongoing training is to be provided by Site Supervisor, nominated delegate or specialist, including issues such as potential sources and emissions of concern, incident response, and other matters as identified from time to time, in accordance with Section 6.4.
- Emergency contact sheets to be located at the site compound, site entrance and other
 appropriate locations. The sheets will contain emergency contact numbers and other
 information such as evacuation maps.

6.7.2 External Communications

General

All consultation is to be managed by the Project Manager prior to and throughout the project. The consultation program will follow a project-specific procedure. The site contractor's responsibilities in regards to external communications will include:



- Ensure that appropriate signage is displayed in accordance with the Project Manager's directions and consent conditions.
- Answer initial enquiries and direct further communications to the Project Manager.
- Provide information to the Project Manager for communication to external bodies, include emergency notifications, records, details of complaints or enquiries, and advance notification of work activities of which the community should be advised.
- Undertake incident reporting in accordance with legal and contractual requirements.

6.7.3 Consultation with Community and Regulatory Authority

All community and stakeholder consultation are to be undertaken by the Project Manager in accordance with the consent conditions prior to and throughout the project. The Project Manager's consultation program will be managed through a project-specific procedure.

6.7.4 Complaints Handling

Community and stakeholder consultation are to be undertaken by the Project Manager prior to and throughout the project. This includes the handling of complaints.

The Project Manager will respond to complaints in accordance with a project-specific procedure. Should a complaint or enquiry be directed to the head contractor or other site personnel, these should be recorded and directed to the appropriate contact person at the Project Manager's office.

6.7.5 Incident Reporting

Immediately notify the Project Manager of any unexpected find, pollution incident or situation that may or has the potential to cause material harm to the environment. Evidence will be required that notification was made, in accordance with the POEO Act 1997. When requested by the Project Manager, the Site Supervisor is to provide an incident investigation report, including identification of the cause of the incident and corrective actions taken, in the form directed. The Project Manager will act as a contact in the event of complaints of dust emissions, and is responsible for informing all necessary stakeholders of information pertaining to Air Quality compliance for the site.

6.8 Review of AQMP

This AQMP may be reviewed at any stage during the development to ensure that it addresses ongoing environmental issues and any changes in legislation, policies or guidelines. In particular, environmental incidents, non-conformance or environmental audit outcomes should be considered when undertaking a review, and may trigger a review of amendment. Updating the AQMP is the responsibility of the Site Supervisor. Approval of the updated AQMP is the responsibility of the Project Manager.



7. Risk Assessment and Mitigation

This section identifies the risks and evaluates potential environmental impacts, which form the basis for mitigation measures and safeguards to be applied for the project. Where an environmental impact is identified, the most appropriate mitigation measure may depend on factors yet to be determined, such as scheduling, equipment and materials selection, and the construction procedures to be employed.

7.1 Risk Assessment

The assessment approach presented in **Figure 7-1** will be used to determine the level of risk for identified potential impacts from the proposed works.

Figure 7-1 Risk Assessment Matrix

₹	How severe a	re potential adverse imp	What is this leve		lihood (ri /erity?	sk) of	
Severity	Human-health	Environment	Construction Schedule and/or Project Costs	Very Likely	Likely	Un- Likely	Very Unlikely
Catastrophic	Death, life- threatening injuries, permanent disability/ill health	Catastrophic environmental incident, serious risk and/or damage to onsite or offsite receptors, regulatory involvement, significant onsite and offsite remediation, financial penalties enforced, legal action	Severe delays, significant cost increases, possible project termination	16	15	13	10
Major	Major illness or injury requiring surgery / hospitalisation	Major environmental incident, onsite and offsite contaminant migration, regulatory notification and remediation needed	Lengthy project delays / major cost increases	14	12	9	6
Moderate	Injury or illness requiring treatment and resulting in lost time	Moderate environmental incident, contained onsite, requires some remedial action	Moderate project delays and cost increases	11	8	5	3
Minor	Minor injury or exposure not requiring medical attention	Minor environmental incident, localised	Minor project delays / some additional costs	7	4	2	1

Following this risk assessment system, mitigation measures must be selected as required, with responsibility allocated and the details documented in the relevant table, as part of the ongoing review of the AQMP.



Table 7-1 Air Quality Management

Aspect	Impact	Risk of Impact	Mitigation Criteria or Management Measure	Risk After Mitigation / Management	Responsibility
Pre-construction					
Vehicle movement, earthworks, stockpile management and materials handling	Generation of dust and air pollution from activities and /or wind erosion.	4	Ensure all control equipment required is made available. Assess potential for activities to generate dust, in particular filling operations and vehicle movements, and determine appropriate dust suppression measures.	1	Project Manager
Construction					
All works	Release of dust.	7	Implement dust suppression measures appropriate to ensure no dust will migrate from the working area and/or site boundary. These may include use of water carts or dust suppression sprays and work restrictions during windy periods.	1	Project Manager
Operation of plant and equipment	Air pollution from emissions.	2	Ensure equipment and machinery is maintained and switched off when not in use.	1	Site Supervisor
Vehicle movement, handling and transport of soil	Dust generated from earthworks, including materials handling and wheel dust.	4	Cover all loads of excavated material and other erodible materials that are transported to or from the work site. Avoid or restrict dust generating activities during windy periods.	1	Site Supervisor to advise all during induction
Management of stockpiles, exposed areas and general site	Wind erosion of exposed surfaces and stockpiles.	4	Monitor all work areas, stockpiles and skip bins for dust and either wet or cover any affected areas. Minimise soil and vegetation disturbance, in order to minimise dust generation.	1	Site Supervisor
Works being performed	Public complaints regarding dust.	3	Signboard at entry will include contact for site management to be available for members of public after hours, 24 hrs a day, 7 days a week, for any comments and/or complaints, including emergencies.	1	Site Supervisor
Post-construction					
Site rehabilitation of exposed surfaces	Wind erosion of exposed surfaces and stockpiles.	2	Rehabilitate exposed surfaces as soon as feasible, either by revegetation, paving, or providing other covering, in accordance with the approved landscape plan.	1	Project Manager / Architect



7.2 Management Measures

Detailed measures to be implemented at the site with respect to air quality are summarised in **Table 7-2** below.

Table 7-2 Air Quality Management Measures

Action	Responsibility	Timing
For the general public, display the name and contact details of personnel responsible for air quality / environmental management of the site.	Project Manager	Duration of Works
Record all air quality complaints or incidents that generate dust, either on or off-site. Identify the cause(s) and take appropriate measures to reduce emissions in a timely manner. Detail the measures taken, and make the complaints log available to the regulatory authorities when requested.	Site Supervisor / Project Manager	Duration of Works
Perform visual surveillance daily where receptors (Section 3.3) are in close proximity. Take action to resolve any non-conformances and detail within the incidents log.	Site Supervisor	Duration of Works
Increase the frequency of visual surveillance in dry or windy conditions, or while activities with a high potential to generate dust occur.	Project Manager	Duration of Works
If dusty conditions are observed (i.e. 10 m/s average over a 10-minute period (35-40 km/h), stop or relocate activities until conditions improve	Project Manager / Site Supervisor	Duration of Works
Locate stockpile areas and haulage routes in areas to reduce the surface area exposed to prevailing winds where practical. In addition, existing or constructed wind breaks shall be used where practical.	Site Supervisor / Project Manager	Duration of Works
Inform site contractors of daily meteorological conditions as reported, as well as any significant changes that may occur throughout the day.	Site Supervisor	Duration of Works
Prepare and ensure all staff undergo site induction prior to commencing work onsite, and ensure all staff are suitably qualified and experienced for the works to be completed.	Project Manager	Duration of Works

7.3 Mitigation Measures

Mitigation measures to be implemented at the site with respect to air quality are provided in **Table 7-4** below.

Table 7-3 Air Quality Mitigation Measures

Mitigation Criteria or Management Measure	Responsibility
Site Preparation and Bulk Excavation	
Erect solid screens or barriers along the site boundary fencing to screen works on site and limit dust migration.	
Use covered skip bins for all waste, and no burning of wastes is permitted.	- C:+-
Entry and exit points to the site will be fitted with hardstand material and wheel wash facilities (where required) to limit the amount of material tracked offsite.	Site Management
Positioning of Stockpile areas shall be as far as reasonably practicable away from residential areas, places of public access and site boundaries.	_



Mitigation Criteria or Management Measure	Responsibility
Paved roads will be regularly swept and watered when necessary. Use water assisted road sweepers within the site access and roads surrounding the site to remove any material tracked from the site, as necessary.	
Operation of a water cart on exposed soil areas, unsealed roads and excavation / worked areas during bulk excavation. The water rate will be adjusted accordingly to minimise generation of visible dust and the number and size of the water carts shall be regularly reviewed by the Project Manager to ensure that adequate watering is taking place and dust is kept to a minimum. Care is to be exercised to limit the amount of water used to ensure run-off does not occur and leave the site.	Site Supervisor
Ensure effective water suppression is used during earthworks and soil disturbance activities. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	All Staff
Limit the extent of clearing of vegetation and topsoil to the designated footprint required for construction and appropriate staging of any clearing.	
Minimise the exposure of fill and excavated material to active work fronts.	
Ensure sediment and erosion mitigation measures are in place and effective to avoid sediment and stormwater runoff leaving the site.	
Minimise drop heights for material transport to prevent dust dispersal.	
Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable, and all vehicles switch off engines when stationary and safe to do so (no idling vehicles).	
Keep site fencing, barriers and scaffolding clean through rinsing with water.	
Cover, or fence stockpiles to prevent wind erosion where they are inactive for extended periods (i.e. for two weeks or more).	
Haulage and Mobile Plant Operations	
Watering of all unsealed internal roadways and haulage routes, as well as fill and bulk excavation areas. The water rate will be adjusted accordingly to minimise generation of visible dust.	Site Management
Modify work activities during periods of high winds and/or dry conditions by limiting soil disturbance activity.	
All vehicles on-site will be confined to a designated route with a speed limit of 20 km/hr enforced.	
Dirt, sand and other materials that have been tracked onto public roads beyond the site boundary will be cleaned using a road sweeper as soon as practicable, but at a frequency of no less than weekly during construction.	
Internal sealed roads that are part of the final design will be constructed first and used, as far as practicable, for construction-related traffic.	All Staff
Trips and trip distances will be controlled and reduced, for example by coordinating delivery and removal of materials to avoid unnecessary trips.	
Dirt tracked from the site from construction traffic will be managed using shaker grids and/ or wheel cleaning. If thorough washing can be achieved, wheel washing may be carried out without a specific device, e.g. washing using a tide/ hose.	
All trucks delivering fill or leaving the site with spoil material will have their load covered.	



Mitigation Criteria or Management Measure	Responsibility
Construction Works	
Rehabilitate exposed surfaces as soon as feasible, either by revegetation, paving, or providing other covering. Rehabilitation is to be consistent with approved landscape plan.	Site Management
Construction activities shall be re-programmed so that work which could cause a nuisance or danger to people or property is carried out during periods of little wind.	All Staff
Ensure effective water suppression is used during earthworks and soil disturbance activities. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	
Only use cutting, grinding or sawing equipment that is fitted with, or in conjunction with suitable dust suppression techniques such as water sprays, exhaust ventilation etc. and avoid or restrict dust generating activities during windy periods.	
Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period of time, or during dry windy weather conditions.	

7.4 Mitigation Measures for VOCs

Should the investigation trigger level for volatile gases be detected at the site boundaries or in the surrounding area during the project, an investigation will be conducted to determine the source of the emissions, and to evaluate the appropriate measures to be implemented. These measures may include the following actions:

- Alteration in the works program to minimise the extent of disturbed open areas;
- Prompt removal and treatment of contaminated materials that have been exposed and are the source of the emissions;
- Use of fine mist sprays around the excavation area;
- Conducting the work in more favourable weather conditions;
- Use of alternate work practices to minimise the period of impact of the emissions;
- Use of additional features to control emissions from plant and equipment;
- Use of alternate work practices such as using modified equipment;
- Relocation of offending plant and equipment to less sensitive on-site areas;
- Reducing the number of plant and equipment items on-site;
- Covering the exposed areas or stockpiles; and
- Use of deodorants or masking agents.

7.5 Suppression Improvements Plan

Dust and emissions will be suppressed to the practical extent, and in addition to the mitigation and management measures detailed above, improvement measures are provided in **Table 7-4** below, for the mitigation of expected non-conformances



Table 7-4 Suppression Improvements Plan

Trigger Action Contingency Measure Visible dust leaving the · Apply dust suppression techniques (i.e. water; use of covers; stabilisation of boundaries or where stockpiles); visual surveillance Assess wind conditions and stop work if strong; identifies a potential Use of windbreaks, netting screens or semi-permeable fences; issue (Section 6.6) • enclosing shielding or providing filters on plant likely to generate excessive quantities of dust (e.g. dust extractors, filters and collectors on drilling rigs); stopping or relocating construction activities during periods of consistently high wind, i.e. 10 m/s average over a 10-minute period (35-40 km/h) until the wind velocity stops; Water spraying will be undertaken; Speed limits on unsealed access tracks will be reduced to 10 km/h (or lower if required) to further limit dust travelling to the nearest site receptor. Once Complaint is received, conduct an investigation to verify the complaint, which Air Quality complaints received for the project includes: Review most recent dust monitoring results for locality and advise Environmental Consultant for further direction. Additional monitoring may be required, and should consider positioning of monitors at each of the site boundary's, for the collection of TSP and PM10 (at least); Assess results against air quality goals and determine the need for corrective action; Discuss results with affected residents, and discuss an approach for corrective action. Action may include: Replanting or sealing completed works as soon as possible; If the project continues to receive complaints or non-conformances, further dust control measures are to be implemented such as wind fencing, matting or mulching. Nuisance odour Assess wind conditions and stop work if strong; detected at or beyond Remove odour-generating material from site; the site boundary. • Enclosing shielding or providing filters on plant likely to generate excessive Complaint received quantities of dust (e.g. dust extractors, filters and collectors on drilling rigs); Stopping or relocating construction activities during periods of consistently high wind, i.e. 10 m/s average over a 10-minute period (35-40 km/h) until the wind velocity stops. Excessive smoke / Cease use of Mobile Plant; and vehicle emissions Consult mechanic, and remove from site until resolved. Complaint received Asbestos or other air • Stop work, and isolate the area from all foot and road traffic. Inform Site quality contaminants Supervisor and/or Project Manager and contact Environmental Consultant; identified Follow the Unexpected Finds Protocol developed for the site; and Do not proceed with works until advised by Environmental Consultant.



8. Statement of Limitations

This AQMP is based on published guidelines and regulations, as referenced throughout the document.

As a sub-plan, this AQMP has been prepared to describe practical measures to be implemented primarily in order to minimise any detrimental impact on the surrounding environment resulting from the site establishment, demolition, earthworks, construction and post-construction phases of the project.

While this AQMP provides overall guidance and direction for dust and odour management, a number of Work Method Statements will need to be prepared for use in site-specific situations.

This report was prepared for Deicorp Projects Showground Pty Ltd and no responsibility is accepted for use of any part of this report in any other context or for any other purpose or by other third parties. This report does not purport to provide legal advice.

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Abbreviations

ACM Asbestos-Containing Materials
AHD Australian Height Datum
AQMP Air Quality Management Plan

AS Australian Standard
ASS Acid Sulfate Soils

CEMP Construction Environmental Management Plan

DEC Department of Environment

DP Deposited Plan El El Australia

EPA Environment Protection Authority (of New South Wales)

km Kilometres

LGA Local Government Area

m Metres

NOx Nitrous Oxide NO₂ Nitrous Dioxide

OEH Office of Environment and Heritage, NSW (formerly DEC, DECC, DECCW)

POEO Protection of the Environment Operations

PM_{2.5} Particulate matter (<2.5 microns) being a measure of dust. PM₁₀ Particulate matter (<10 microns) being a measure of dust.

SO₂ Sulfur Dioxide

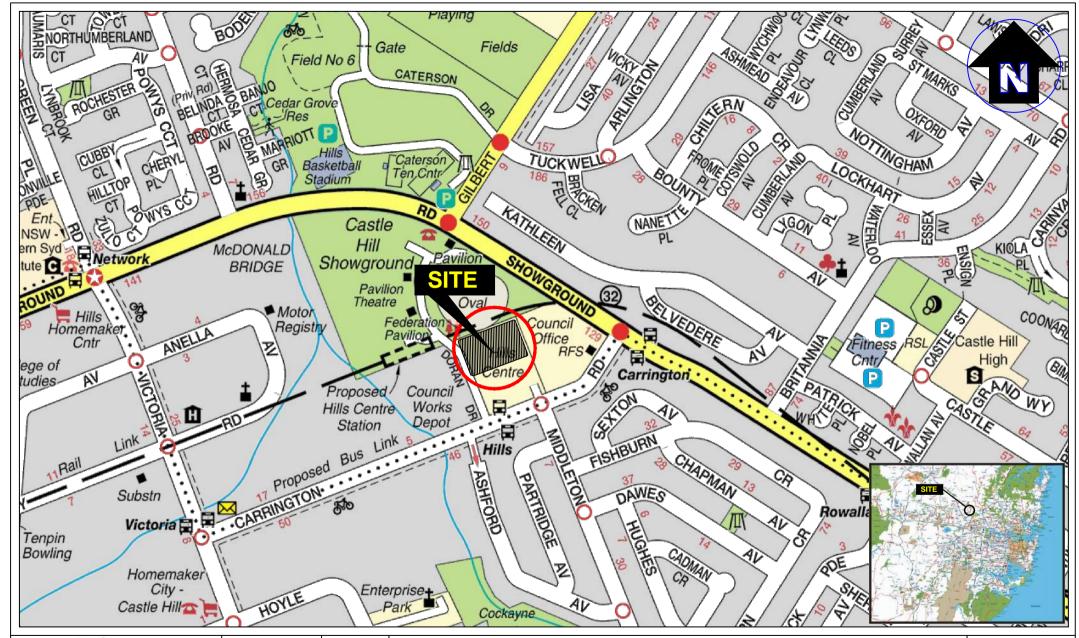
TSP Total Suspended Particulate

UPSS Underground Petroleum Storage System

UST Underground Storage Tank
VOC Volatile Organic Compounds



Appendix A - Figures





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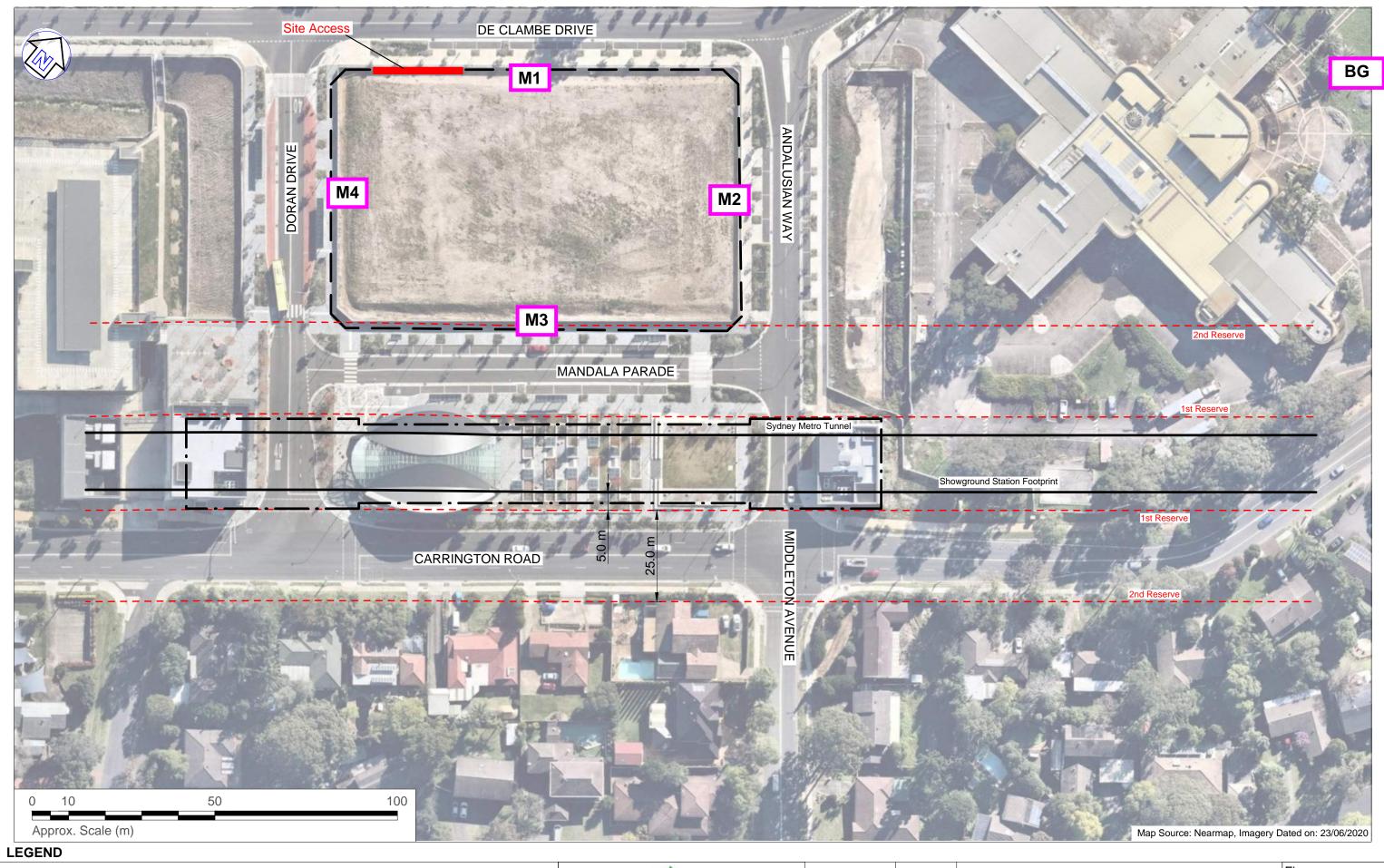
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Air Quality Management Plan 2 Mandala Parade, Castle Hill NSW Site Locality Plan

Figure:

Project: E24724.E21



--- Approximate Site Boundary

------ Approximate Sydney Metro Tunnel

Approximate Showground Station Footprint

- Approximate 1st & 2nd tunnel reserve extents 5m & 25m away from the tunnel boundaries

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Proposed Monitoring Locations



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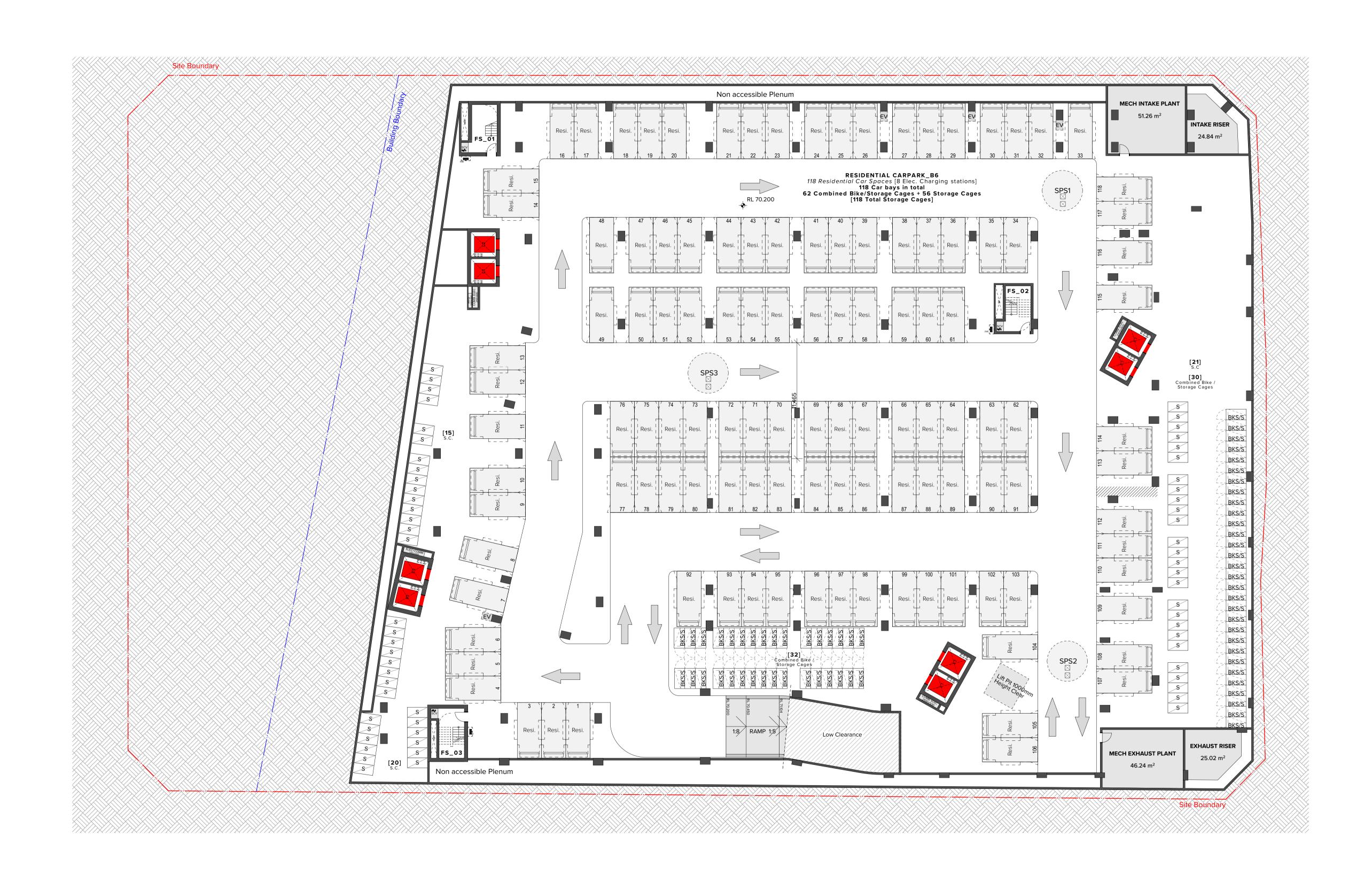
Air Quality Management Plan
2 Mandala Parade, Castle Hill NSW
Site Layout Plan

Figure:

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Project: E24724.E21

Appendix B – Proposed Development



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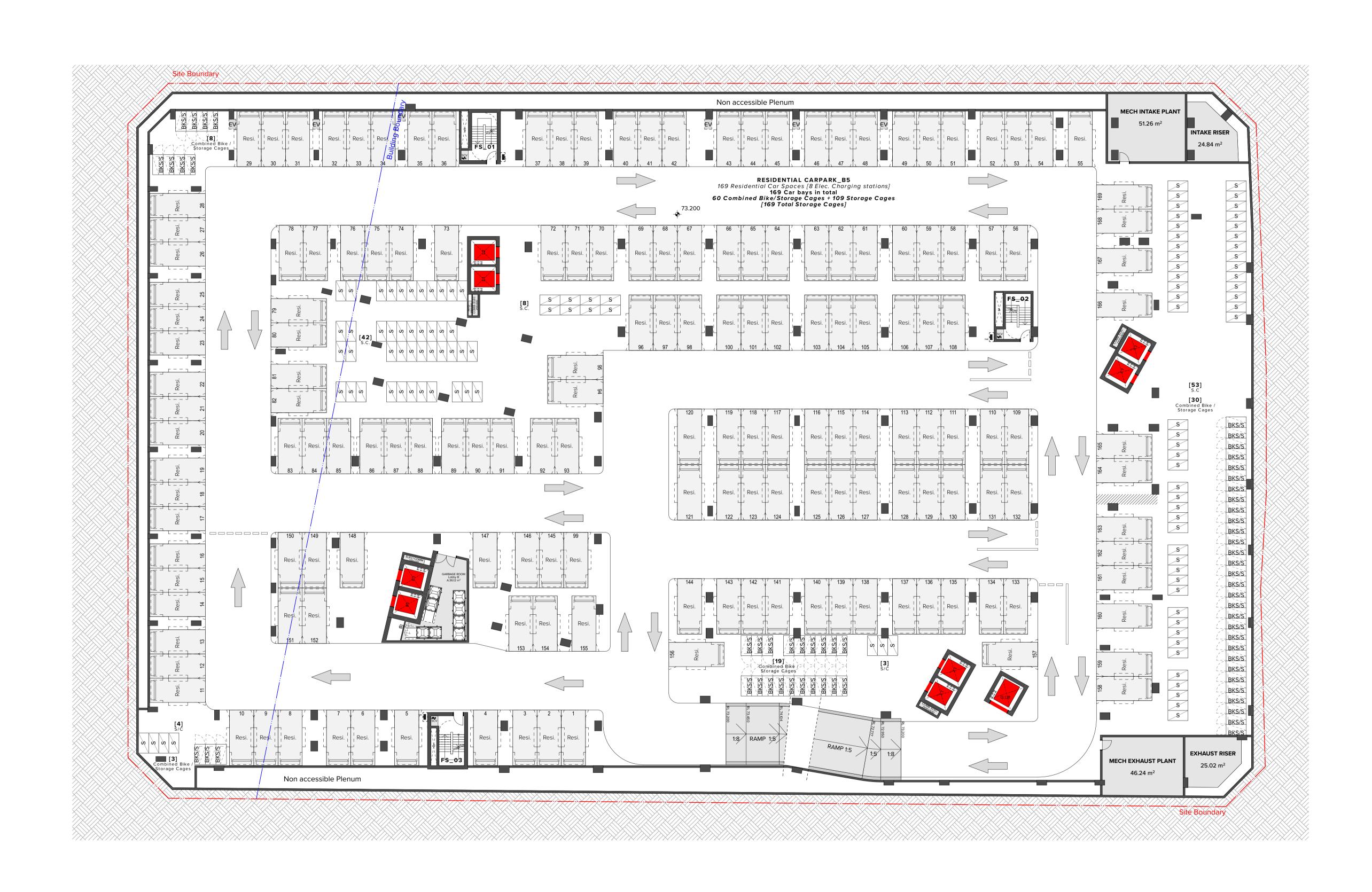
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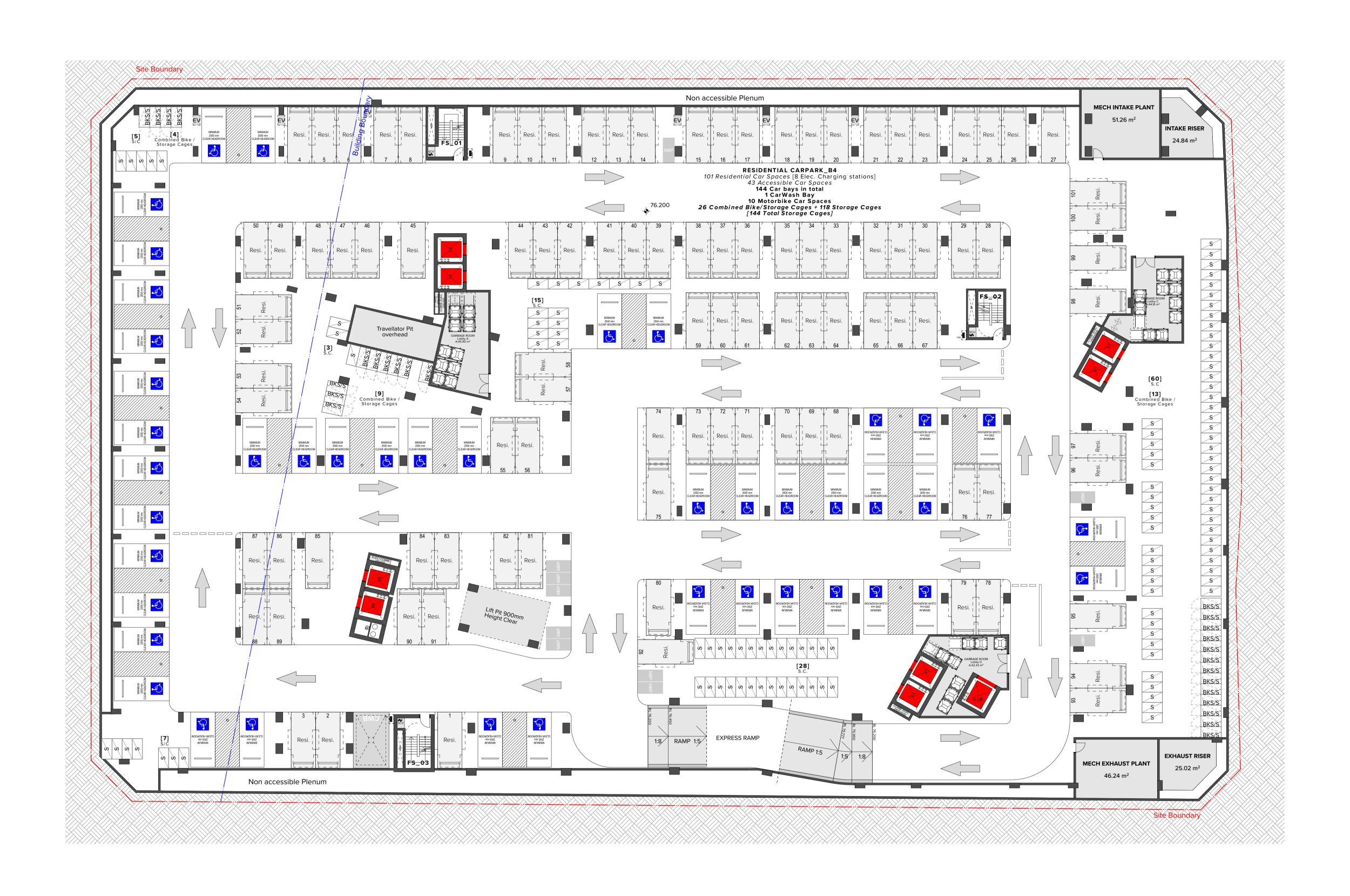
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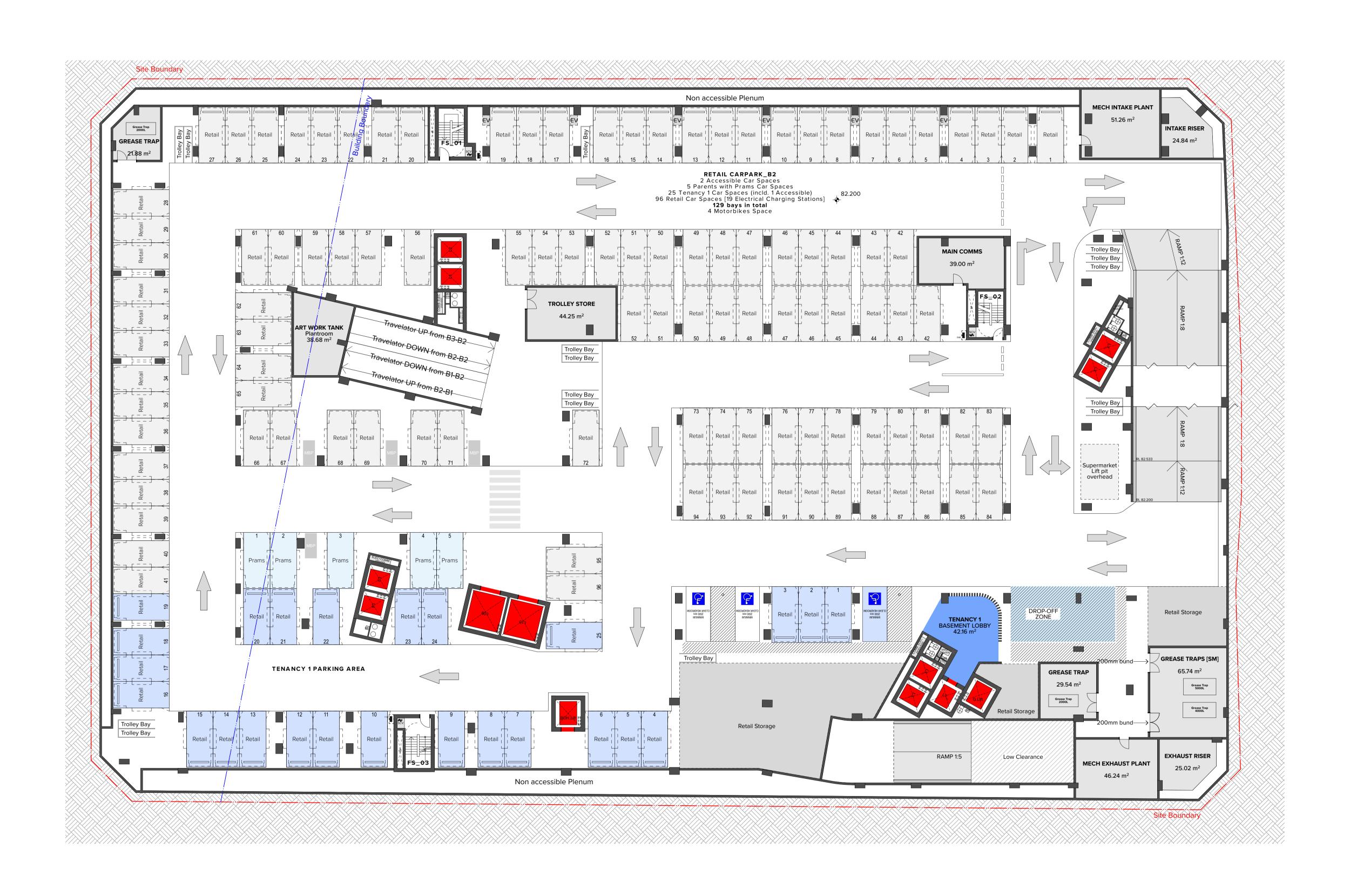
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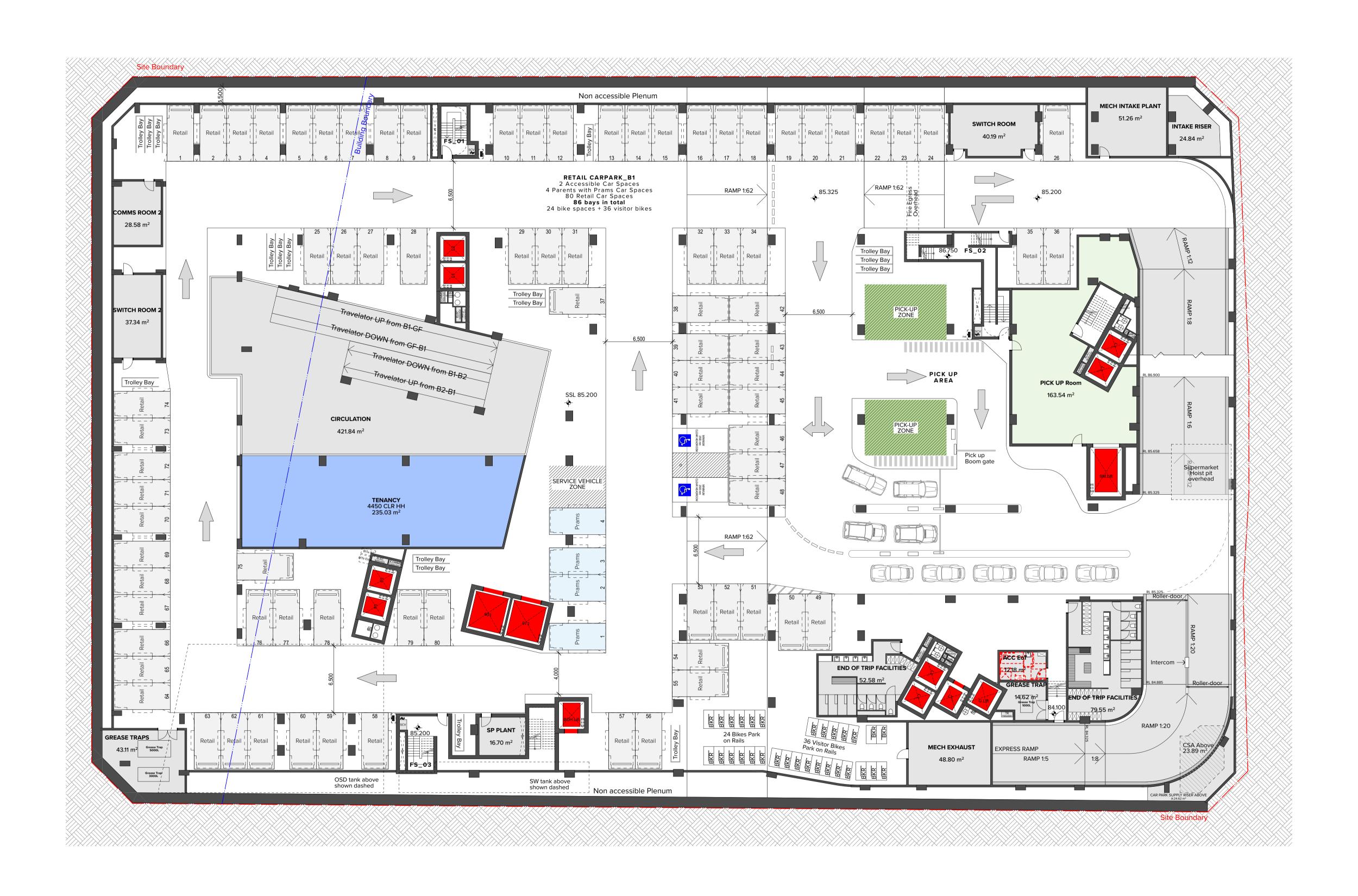
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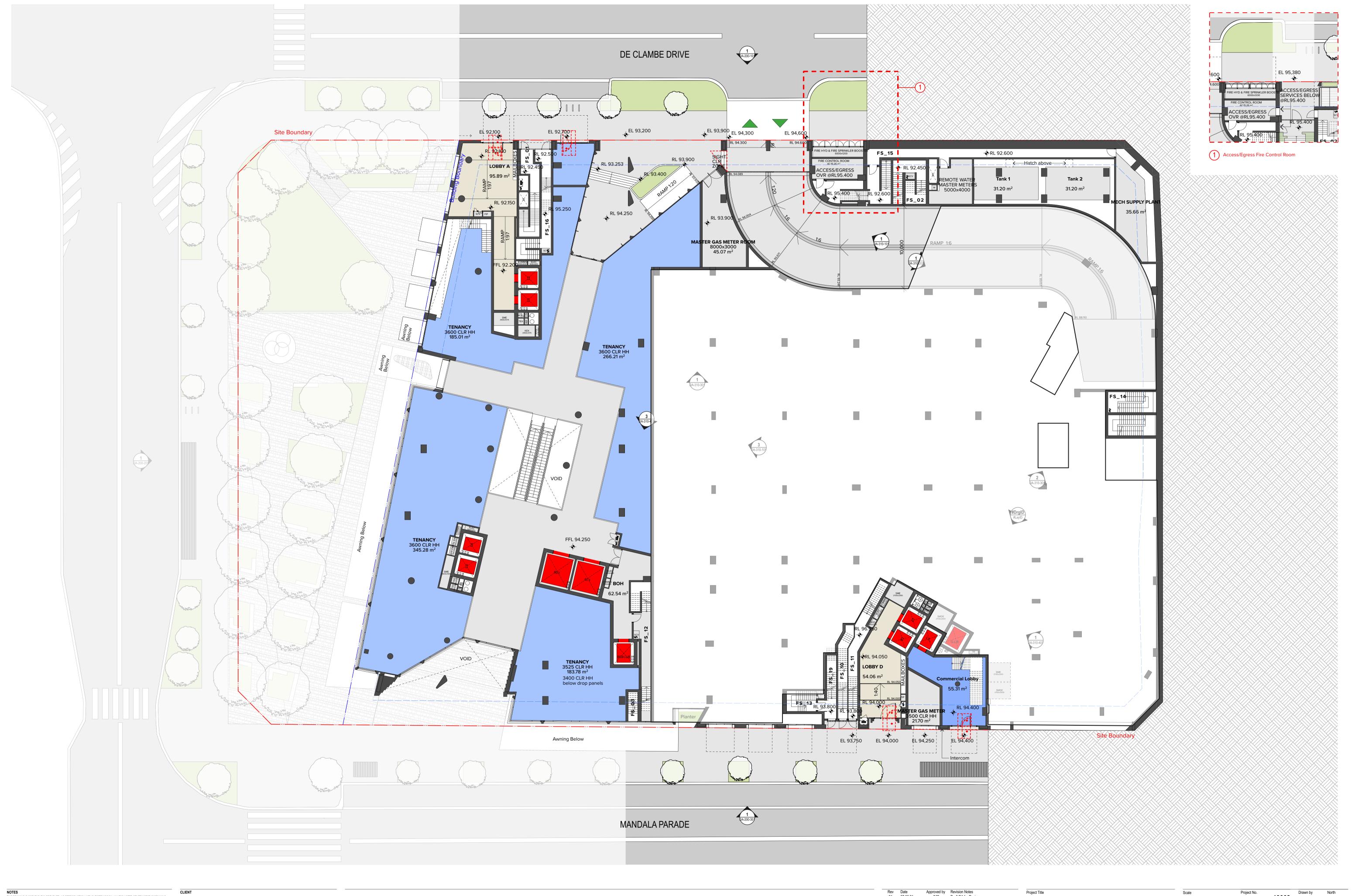
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Ground Level

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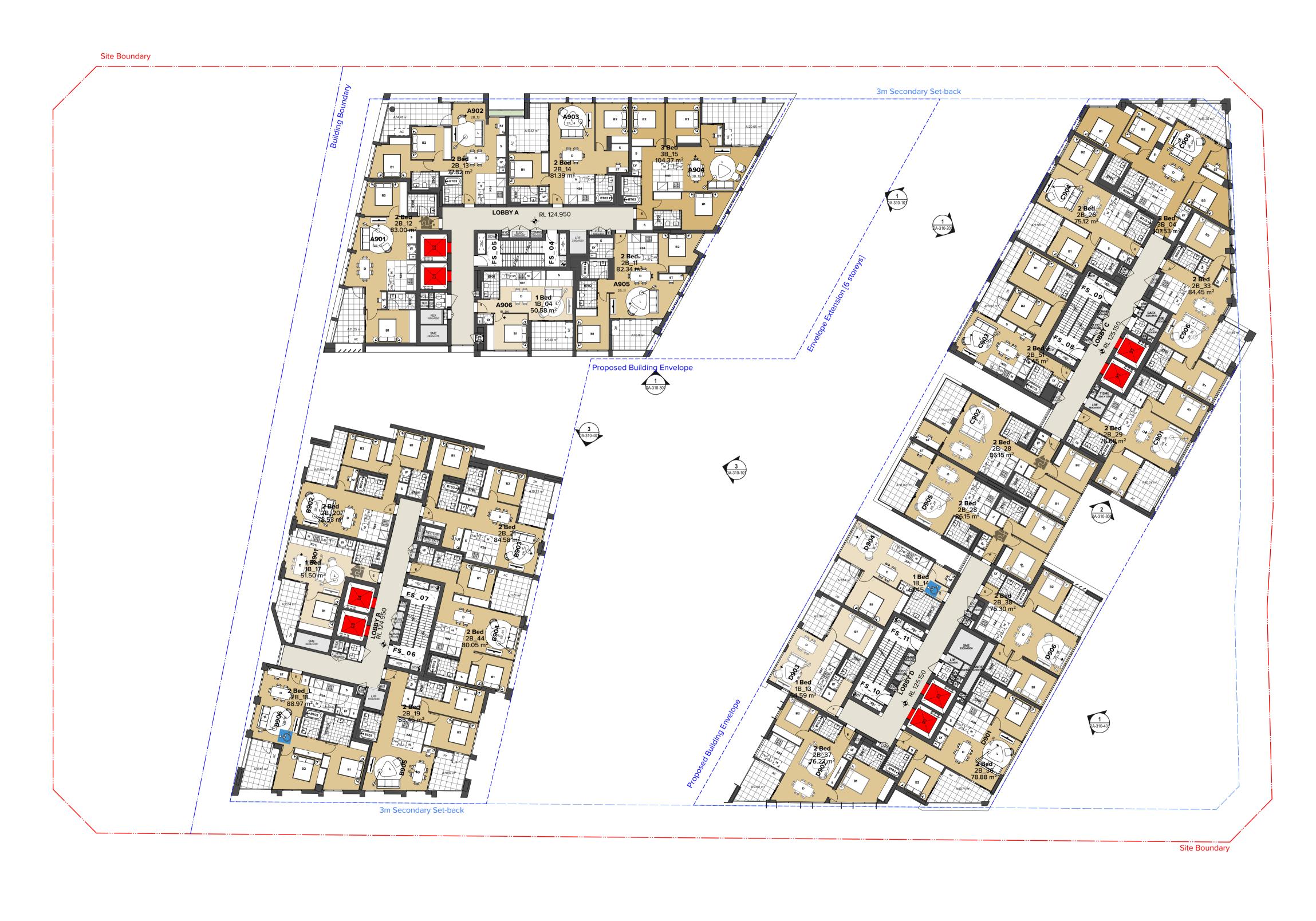
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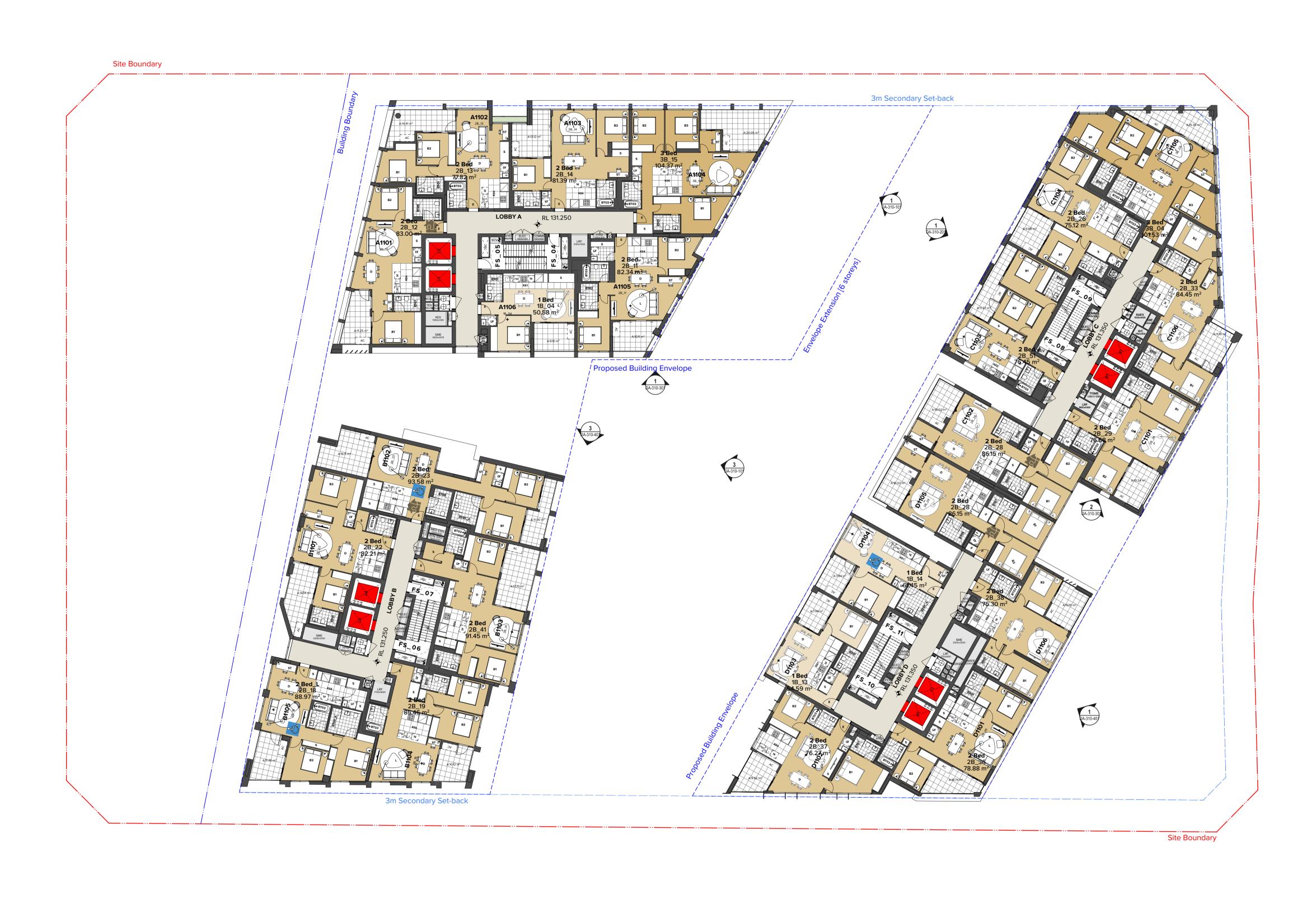
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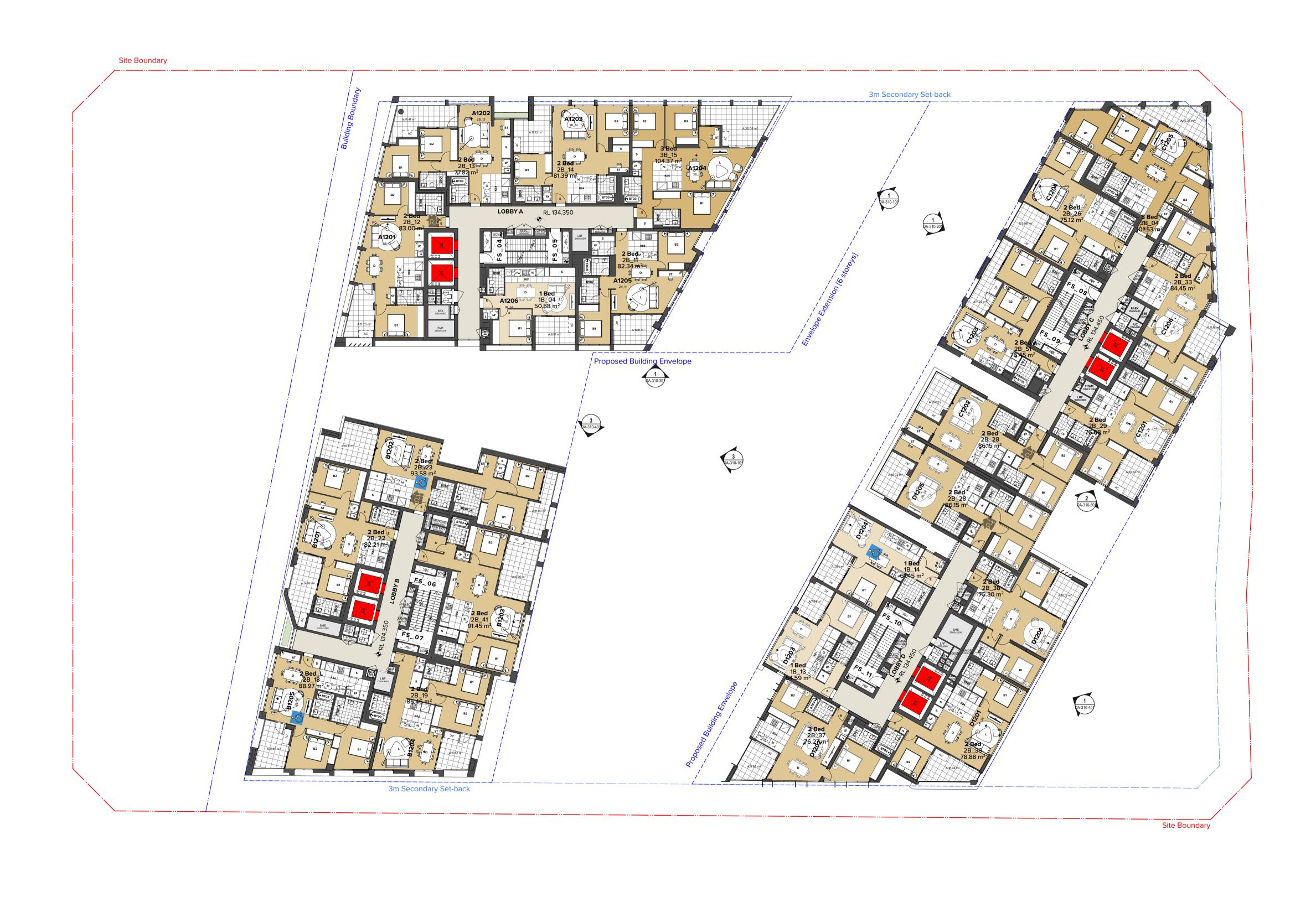
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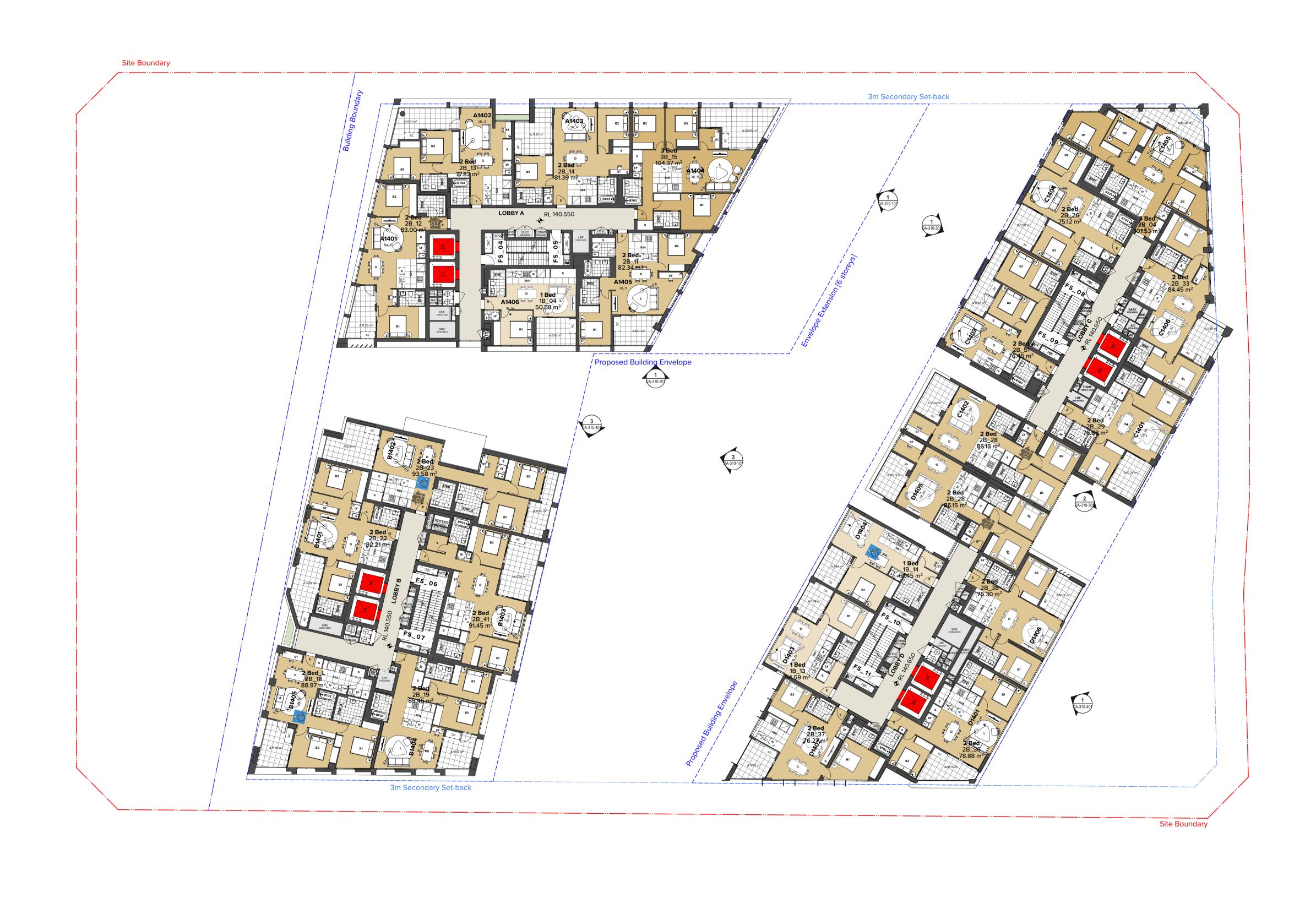






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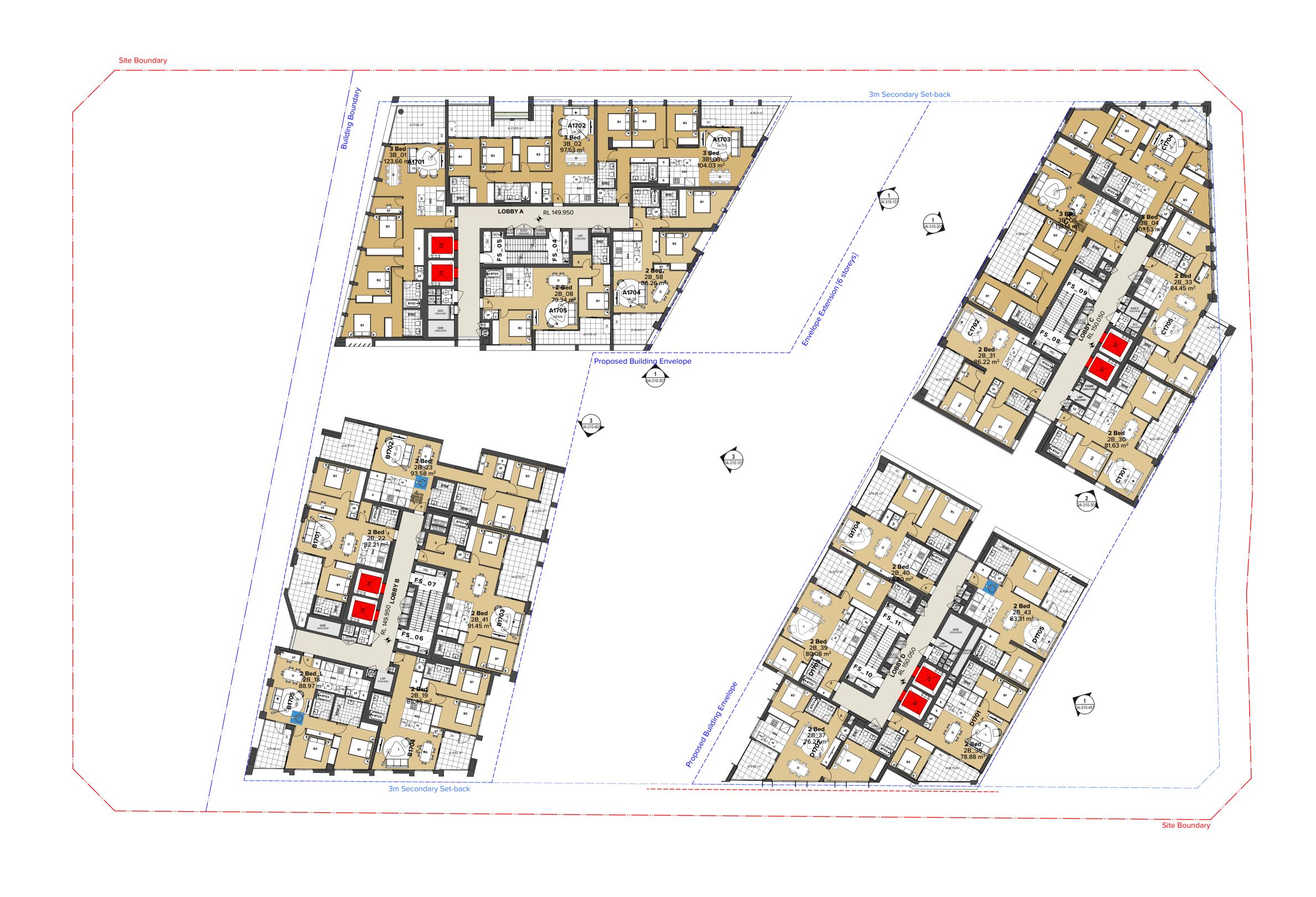
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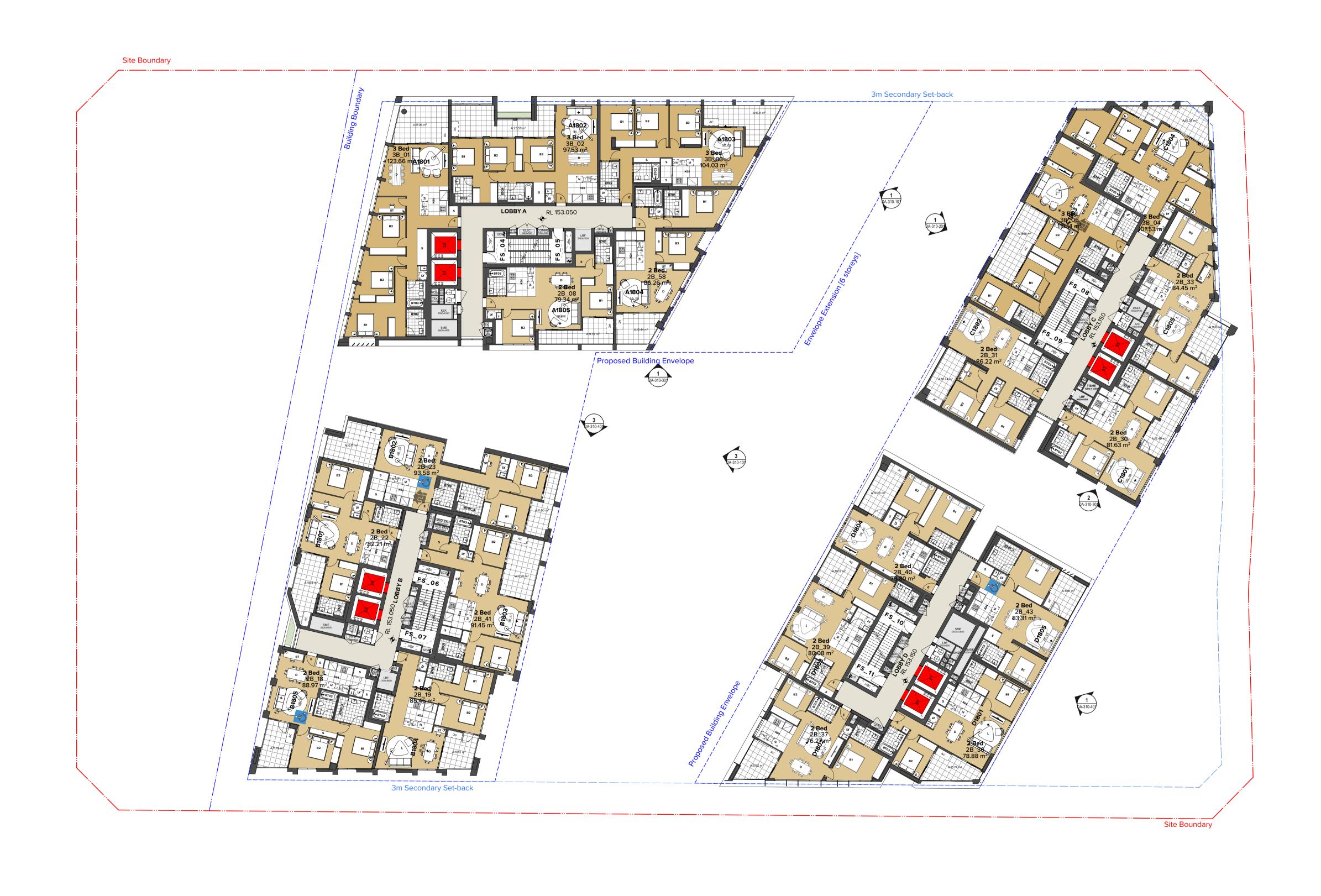


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 Retail Update

 04
 06.07.21
 JMC
 DA Submission

Project Title

Doran Drive
Doran Drive, Castle Hill Castle Hill NSW 2154 Australia

Drawing Title

GA PLANS
Level 19

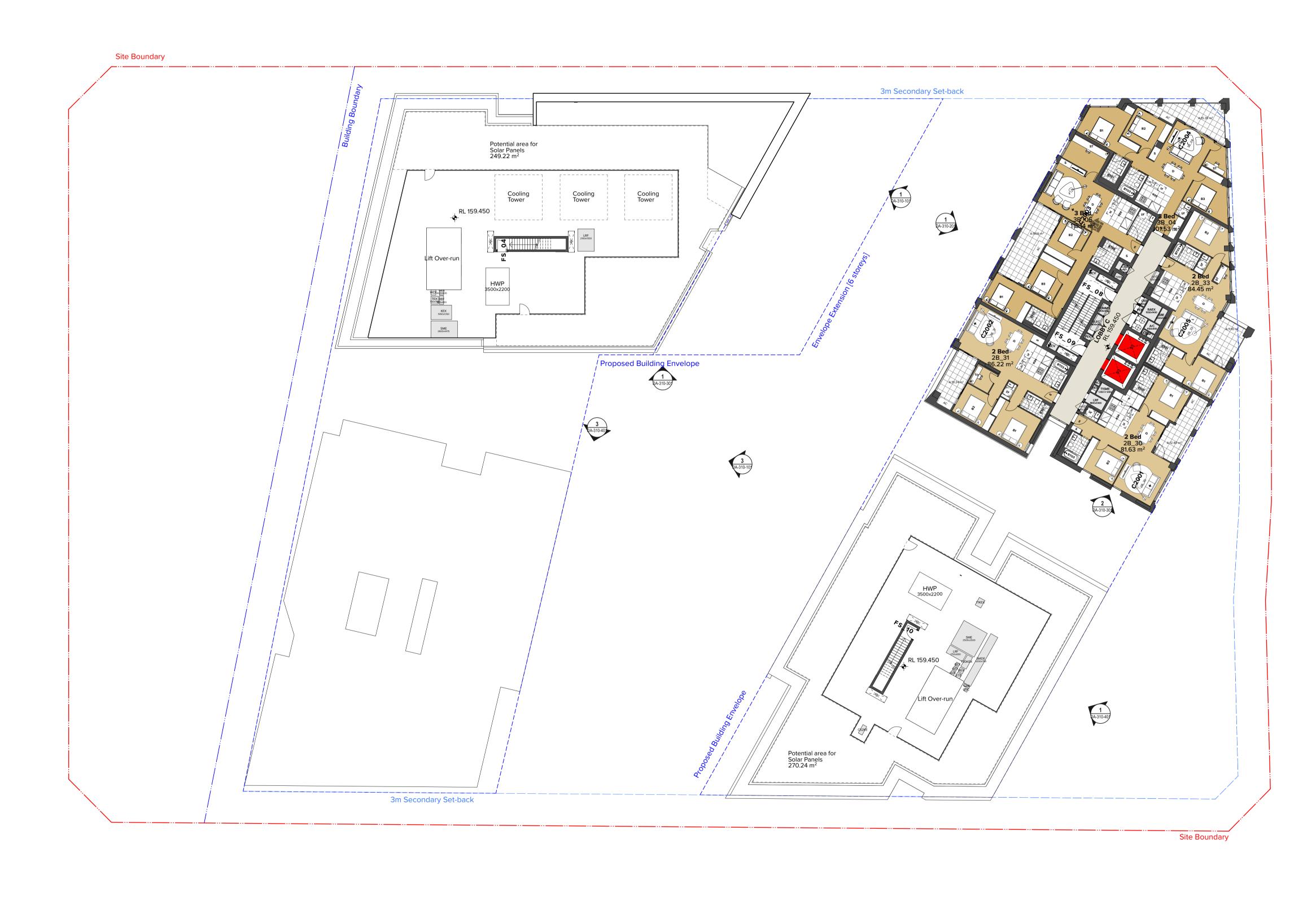
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 North

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 19068
 AM, VT, JL, JE
 Rev

 DA Submission
 DA-110-190
 04

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Project Title

Doran Drive

Doran Drive, Castle Hill Castle Hill NSW 2154 Australia

Drawing Title

GA PLANS

Level 20

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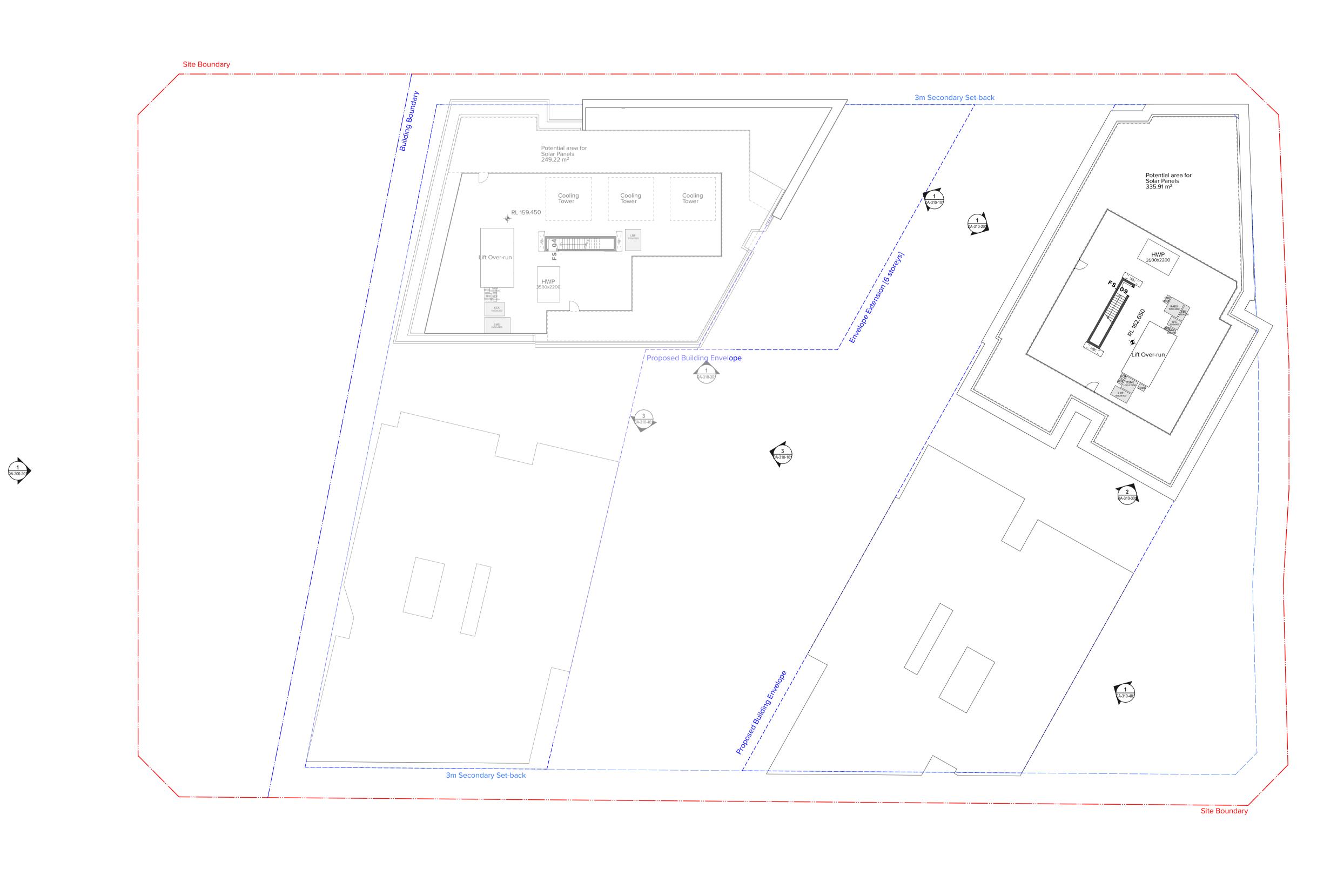
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DLCS Quality Endorsed Company ISO 9001:2015, Registration Number 20476 Nominated Architect: Nicholas Turner 6695, ABN 86 064 084 911

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Project Title

Doran Drive
Doran Drive, Castle Hill Castle Hill NSW 2154 Australia

Drawing Title

GA PLANS
Level 21

 Scale
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 19068
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 04

Appendix C – Reactive Management Procedure

C.1 Reactive Management Procedure

The Air Quality Assessment (GHD, 2019) identified potential dust (as PM10) emissions to be of primary concern for construction and the Sections 6 and 7 of this AQMP detailed a range of measures to minimise these impacts. However, due to the elevated background concentrations identified, exceedances of the limits for PM10 are possible, and a reactive management procedure was developed using a three-stage approach as follows:

- INVESTIGATE: Site staff to identify the likely reasons for the elevated pollutant concentration and to formulate a contingency response should ACTION (Step 2) be reached. Action should be undertaken at this stage if deemed necessary;
- ACTION: Implement the measures formulated in Section 7 and review their effectiveness; and
- STOP WORK: Where there is a high probability that an exceedance will occur, and the works will continue to generate excessive dust then all works should stop at this stage until the measured pollutant levels are below the action level.

Pollutant	Trigger Stage	Avg Period	Trigger Value	Responsibility	Action Required
	1 Investigate	1 hr	Visible dust / odour extending beyond boundary	Project Manager	Project Manager to contact Environmental Consultant and undertake review of possible dust sources operating during the average period.
		3 hr			Identify possible control measures for these activities, action taken if deemed necessary.
					Complete Environmental Incident / response Form.
	2 Action	1 hr	Visible dust / _ odour	Environmental Consultant	Environment Consultant to attend site and ensure implementation of the control actions identified in stage 1.
PM10		3 hr	extending beyond boundary		
					Effectiveness of control actions to be reviewed and escalate where appropriate. Identify long- term solutions to dust issues. Monitor as per Section 6.3
					Complete Environmental Response Form.
	3 Stop Work	1 hr	85 (μg/m³)	Project Manager / Site	Targeted shut down of site activities until the measured
		3 hr	80 (µg/m³)	Supervisor & Environmental Consultant	pollutant levels are below the stated Action period trigger value.
					Complete Environmental Response Form.



C.2 Additional Management Measures

Should the trigger level of PM10 or any other pollutants be reached, then an investigation to determine the source/s of dust and/or emissions would be necessary to determine the appropriate mitigation measures to be implemented. Measures specified by GHD (2019) and within the Air Quality Management Sub- may include the following:

- Increased use of a water cart and/or water sprays to suppress dust in open areas or roadways;
- Installation of temporary sheeting to cover localised exposed areas or stockpiles;
- Ensuring excavated material is moist at the time of exposure and handling;
- Keep stockpiles damp where soil stockpiles are being stored up to 2 weeks;
- Covering soil stockpiles that will remain on the site for more than 2 weeks (where practicable);
- Consolidation of material stockpiles;
- Conducting the work in more favourable weather conditions;
- Use of chemical dust-suppressants provided the chemicals do not pose a contamination or occupational health and safety hazard;
- Use of alternative coverings such as hydromulch to stabilise the surface of open disturbed areas;
- Use of additional dust suppression features on items of dust generating plant and equipment;
- Securing work approval hours that permit emergency dust suppression on non-work days, if the need arises; and
- Ceasing works when works are generating unacceptable dust levels.

