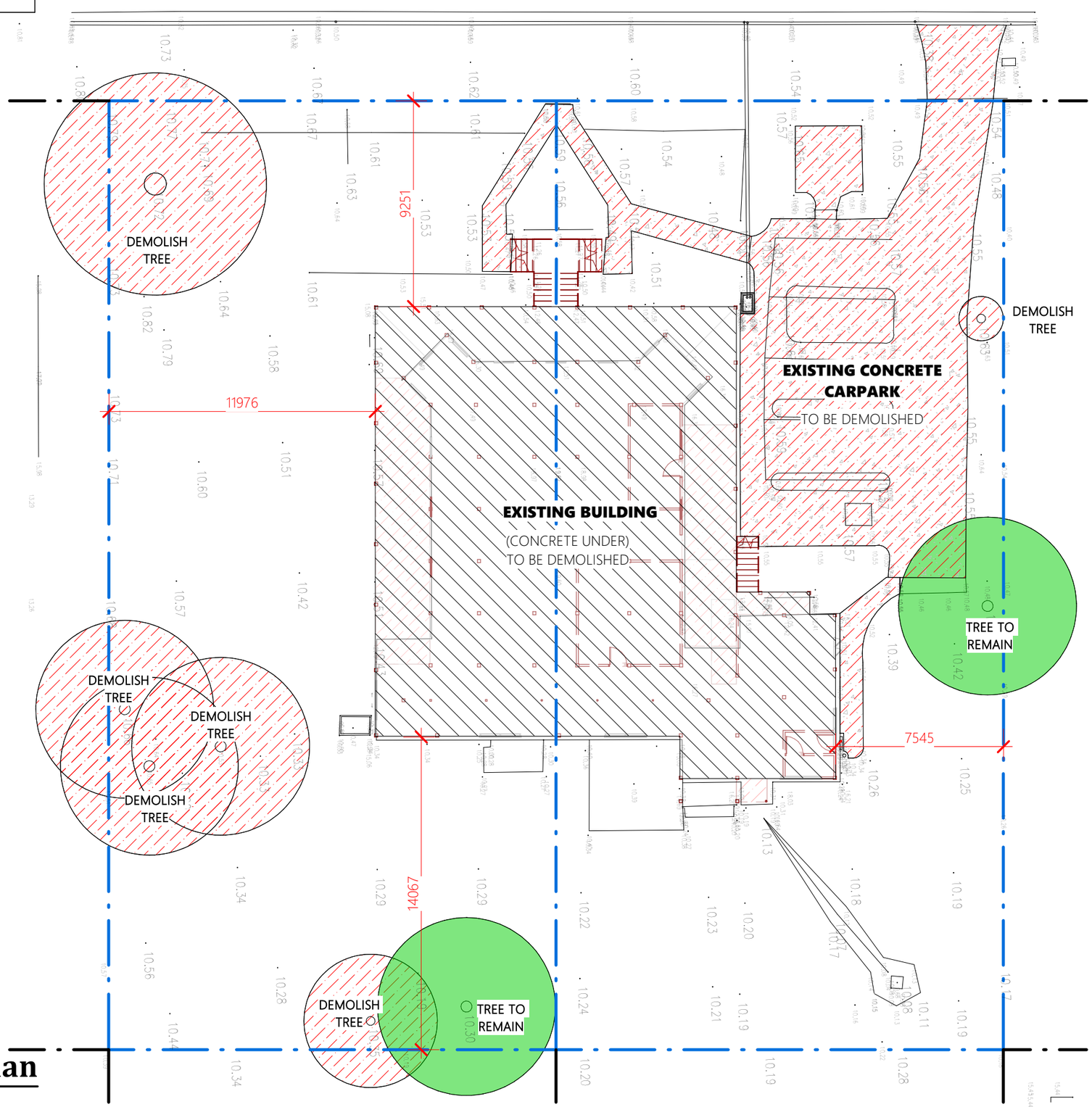
ROLL FOWARD 4.750m ↑

ROLL LEFT 6.900m ←

DENHAM STREET



Existing Site Plan

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DO NOT SCALE DRAWING

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1	DEVELOPMENT APPLICATION	19.10.2023
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APPROVED PLANS

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Dated: 3 May 2024

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PRELIMINARY

Project:

PROPOSED CHILDCARE

Address:

149 DENHAM STREET, ROCKHAMPTON

Drawing Title:

EXISTING SITE PLAN

dezignelements BUILDING DESIGNERS

0407 271 336 **M**

info@dezignelements.com.au **E**

QBCC No: 1247120 BDAQ No: 0001677

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Date:	FEB 2024	**2**
Drawn:	NJB	

Project No:	Drawing No:
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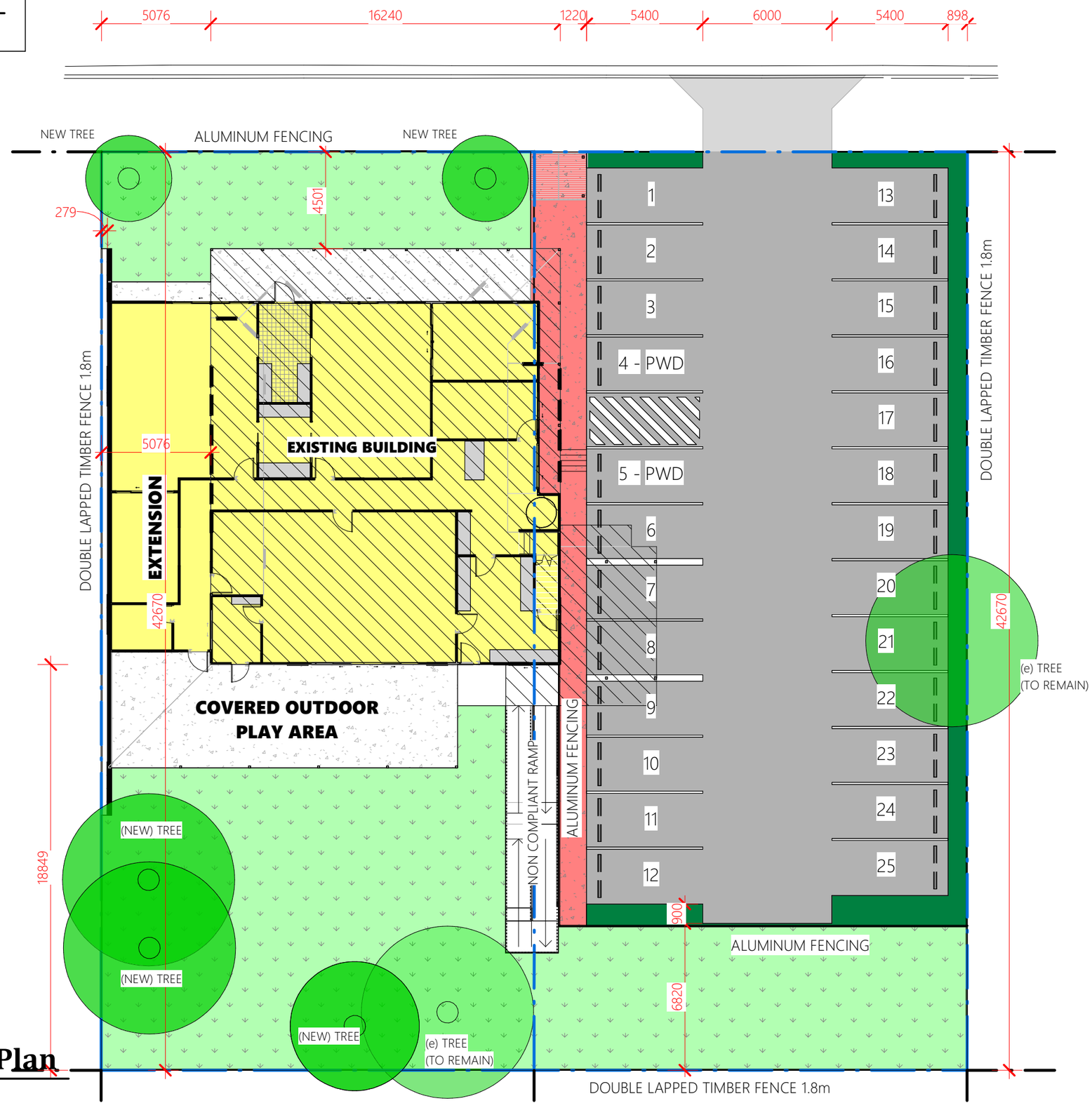
ROLL LEFT 6.900m ←

DENHAM STREET



Proposed Site Plan

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DO NOT SCALE DRAWING

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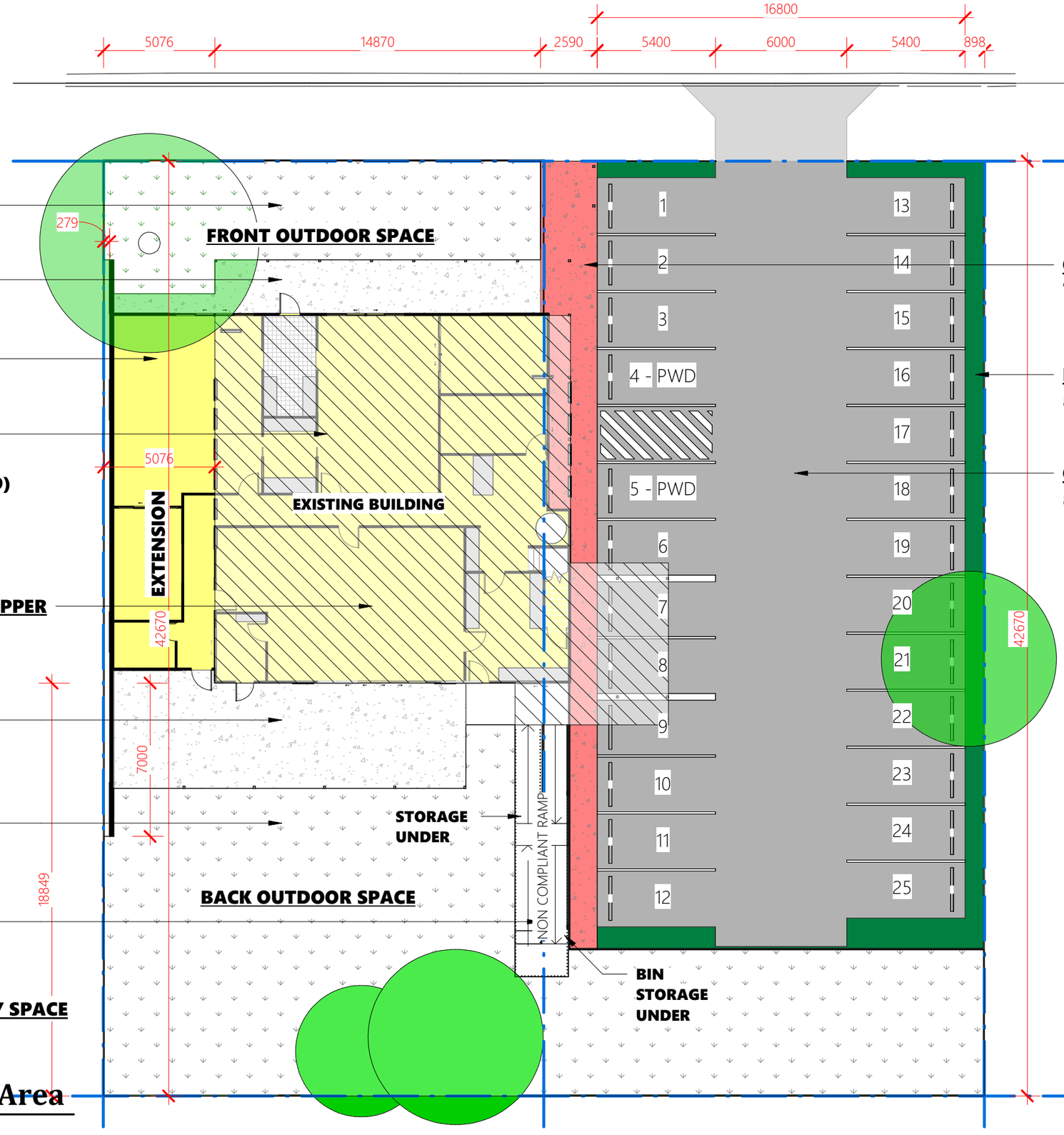

FRONT GRASS
97m²

UNDER COVER
40m²

EXTENSION
78m²

BUILDING GROUND
342m²
(EXTENSION INCLUDED)

BUILDING INTERNAL UPPER
310m²

UNDER COVER
80m²

BACK GRASS
409m²

RAMP AREA
29m²

TOTAL OUTDOOR PLAY SPACE
631m²

CONCRETE
73m²

LANDSCAPING
56m²

CAR PARKING
582m²

Proposed Site Area

1 : 200

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1	DEVELOPMENT APPLICATION	19.10.2023
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SITE AREA

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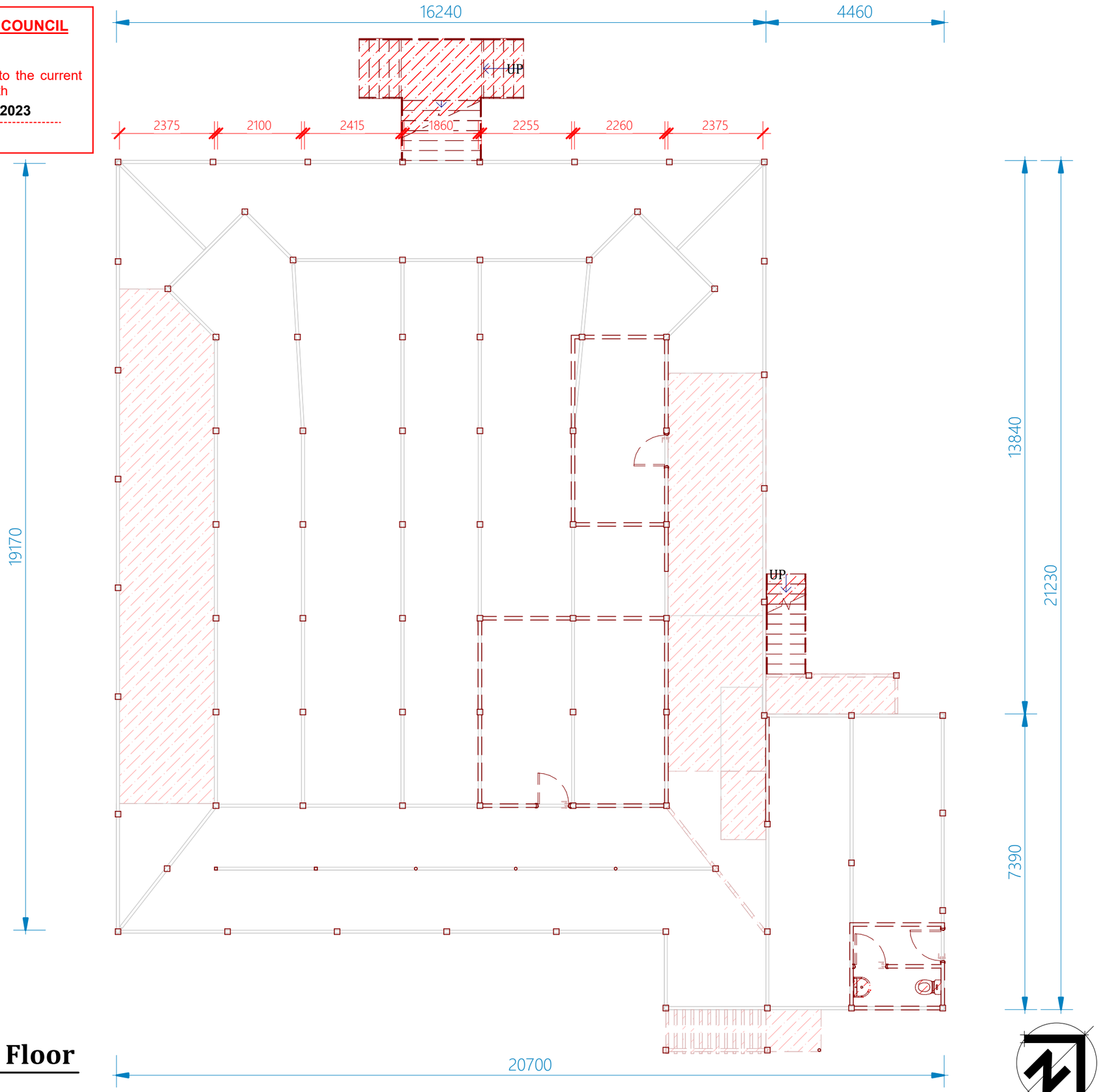

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DO NOT SCALE DRAWING

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Drawing Title:

EXISTING GROUND FLOOR

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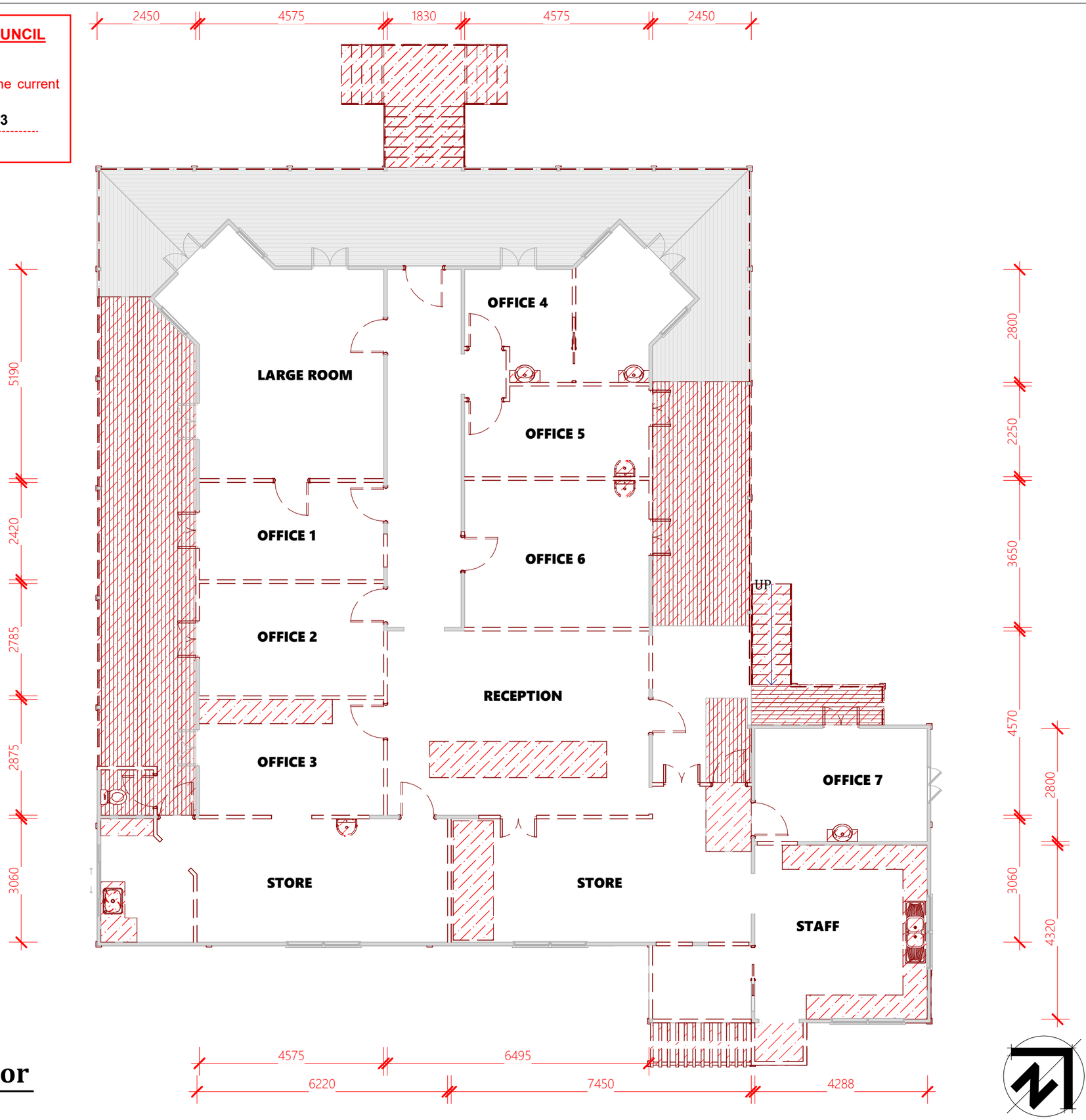

_Existing Upper Floor

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DO NOT SCALE DRAWING

ALL DIMENSION IN MILLIMETERS

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1	DEVELOPMENT APPLICATION	19.10.2023
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149 DENHAM STREET, ROCKHAMPTON

Drawing Title:

EXISTING UPPER FLOOR

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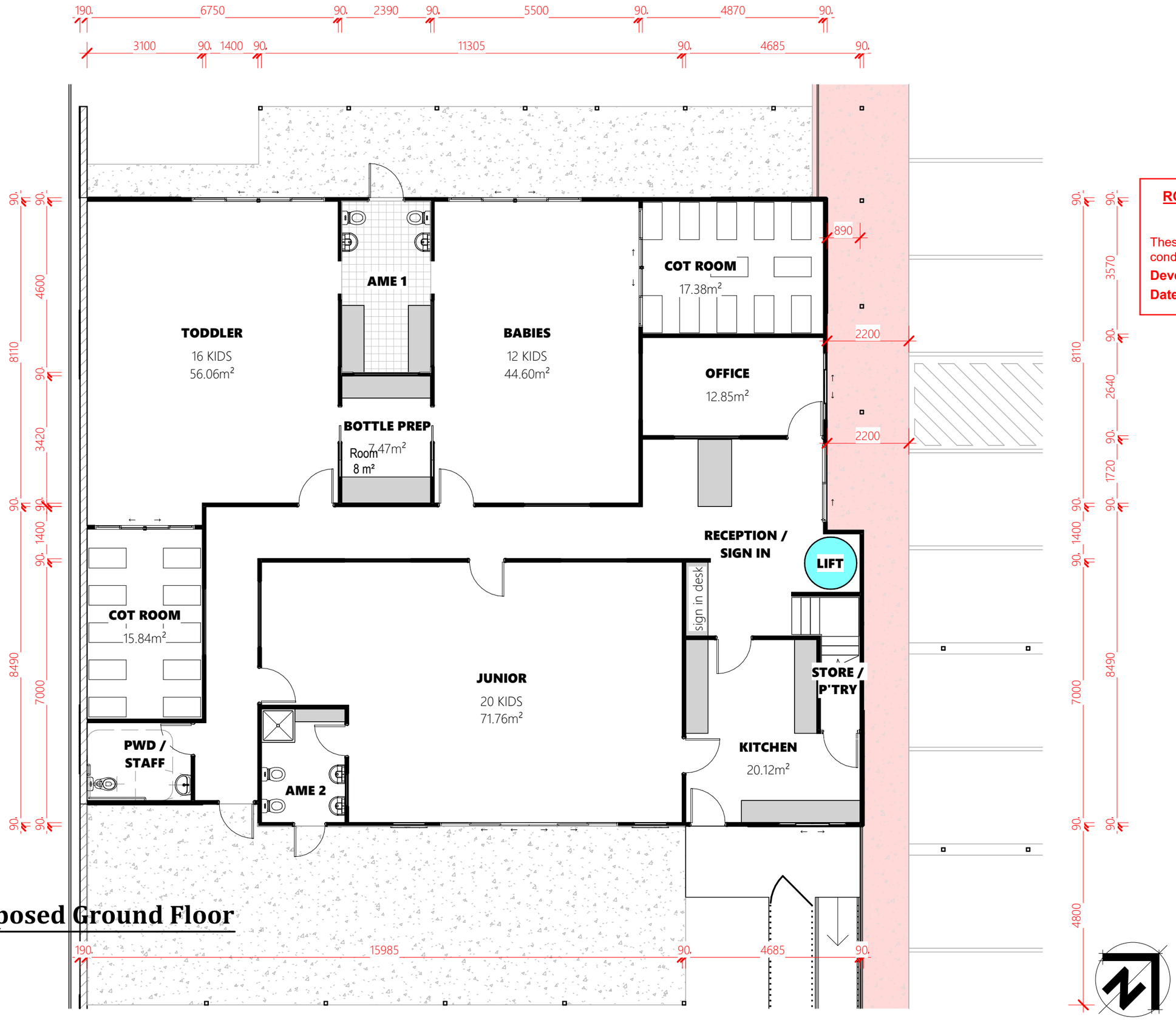

_Proposed Ground Floor

1 : 100

DO NOT SCALE DRAWING

ALL DIMENSION IN MILLIMETERS

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Drawing Title:

PROPOSED GROUND FLOOR

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Drawn:	Author		
Project No:	23_179	Drawing No:	S-11

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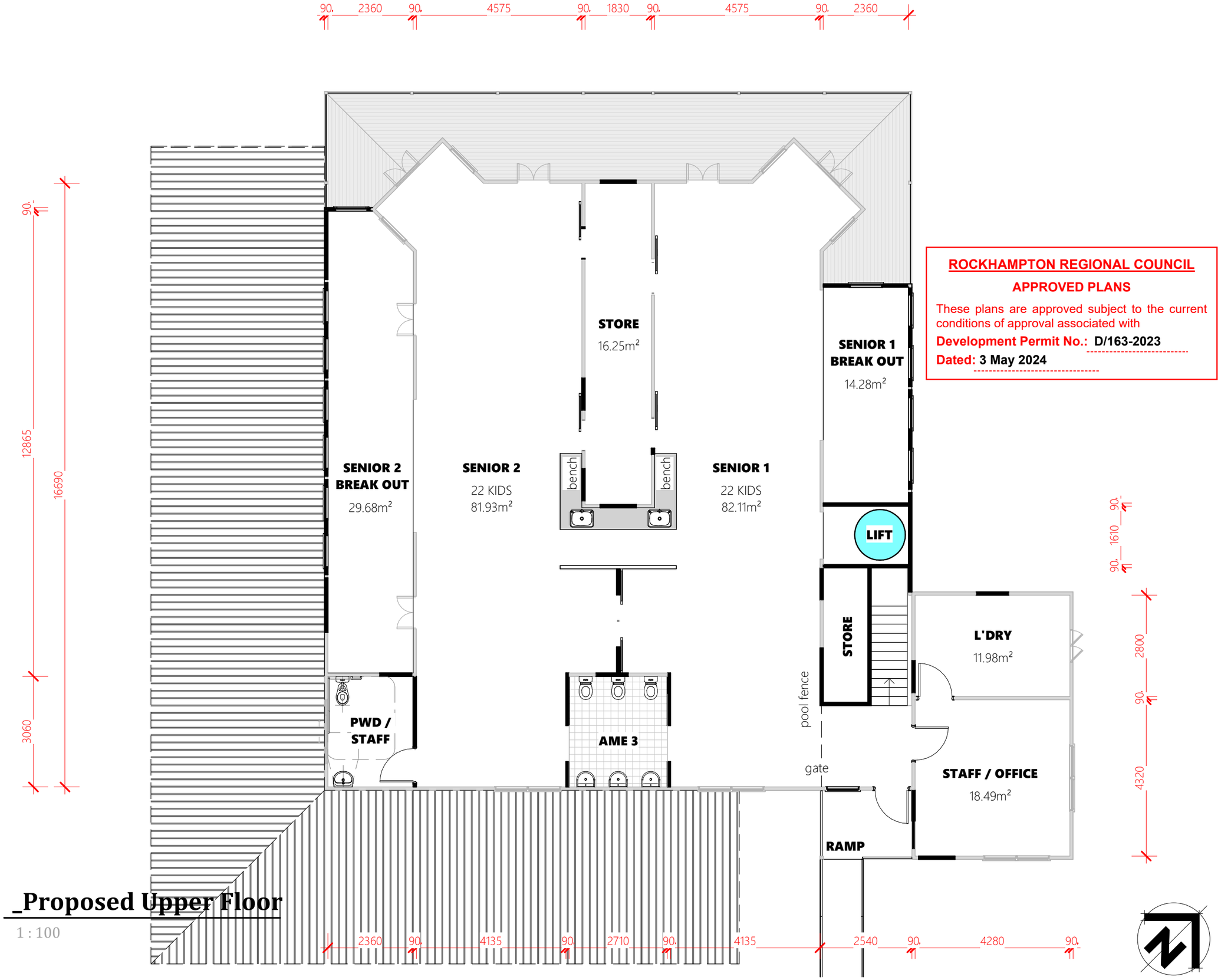

_Proposed Upper Floor

1 : 100

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Address:

149 DENHAM STREET, ROCKHAMPTON

Drawing Title:

PROPOSED UPPER FLOOR

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Project No: 23_179

Drawing No: S-12

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Existing Elevation 1

1 : 100

Proposed Elevation 1

1 : 100

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Address:

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Drawing Title:

ELEVATIONS

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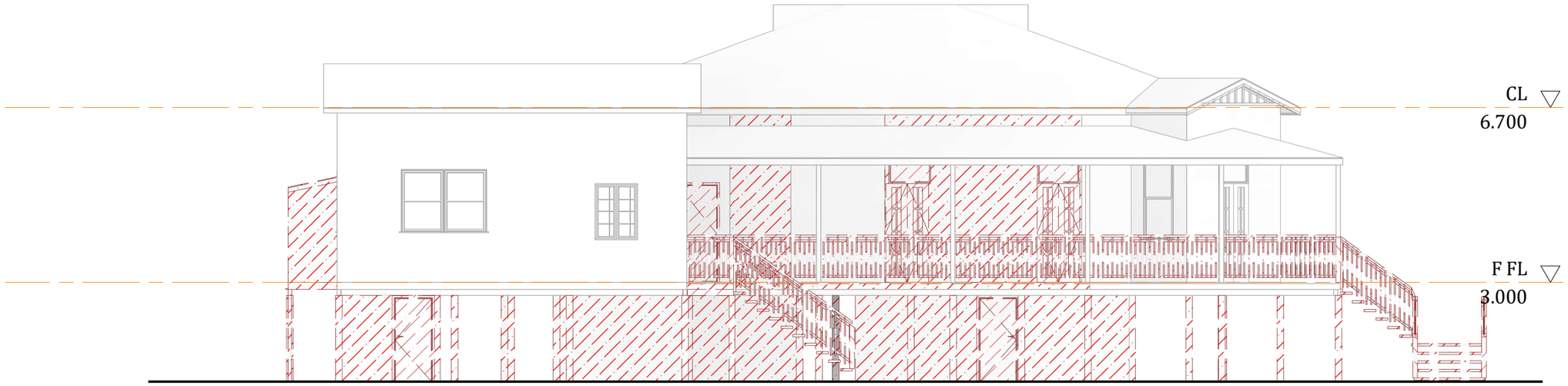

Existing Elevation 2

1 : 100

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Proposed Elevation 2

1 : 100

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Address:

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Drawing Title:

ELEVATIONS

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Existing Elevation 3

1 : 100

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Proposed Elevation 3

1 : 100

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Address:

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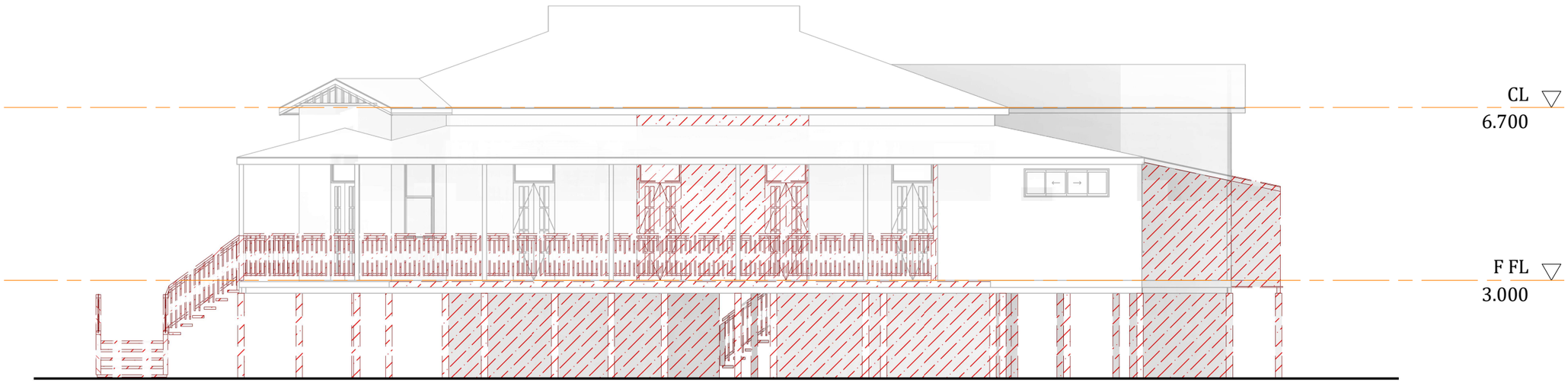
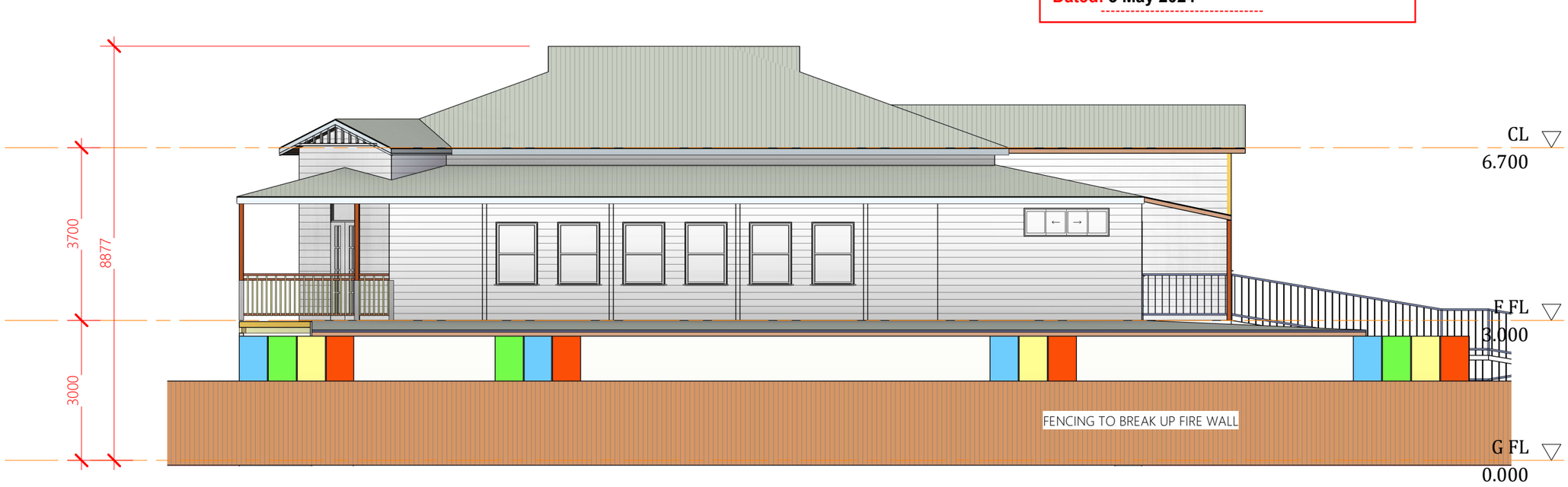


Existing Elevation 4

1 : 100



Proposed Elevation 4

1 : 100

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149 DENHAM STREET, ROCKHAMPTON

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ELEVATIONS

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Patcol Group Pty Ltd
ABN 98 620 245 598
www.patcol.com.au

149 Denham Street, Allenstown

Flood Hazard Assessment

Project Name:	149 Denham Street, Flood Hazard Assessment
Patcol Reference Number:	23-678
Project Address:	9 Hopkins Street, Park Avenue QLD (Lot 7 and 8 on RP601139/7)
Client:	Dezign Element

Issue Date	Version	Description	Approved
22.03.24	0	Original Issue	Scott Thomas

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

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Dated: **3 May 2024**

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1. INTRODUCTION

Patcol has been engaged to prepare a Flood Impact Assessment FIA) to support the Development Application (DA) of 149 Denham Street, described as Lot 7 and 8 RP601139 (the site). The site covers an area of 1717.61 m2 and is bounded by Hopkins Street to the north, the Fitzroy River to the south and existing residential lots to the east and west, as illustrated in Figure 1.

The site is not subject to flooding from the Fitzroy River, but as per the request by the council, the flood report has been prepared and hence the site DA must address the requirements of the Council's Flood Hazard Overlay Code, as detailed herein, with code responses provided in Appendix C.

Currently, the site features a single commercial building and a car park, with tree cover along the boundary of the property and grass covering the remainder. The front portion of the site, spanning approx. 40 meters, is relatively sloped towards the carpark, with elevations ranging from 8.12 to 6.8 meters Australian Height Datum (mAHD). Towards the rear, the land gradually slopes upwards, ranging from 8.32 mAHD rear side to 6.92m AHD front side, as illustrated in Figure 2.

The proposed development involves the demolition of an existing carpark, restumping and shifting of an existing house, with plans to construct a proposed cark park along with shifting of an existing building. The new building will expand the footprint northward, ensuring that the finished floor level (FFL) complies with current local catchment flood level requirements.

Figure 1 - Site Location with Flood Hazard overlay map (RRPS)

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2. FLOOD ASSESSMENT

2.1 BACKGROUND

The flood levels along the Fitzroy River, as outlined in the Council's current planning scheme, rely on the regional flood model outlined in the AECOM (2018) updated report. This model utilized TUFLOW HPC (Version 2018-03-AC) with a grid resolution of 15 meters.

Table 1 provides peak flood levels generated by the Council's Fitzroy River and Local Catchment flood models from 2023 in the vicinity of the site.

Table 1: Fitzroy River Models - Flood Levels from RRPC Flood Report

AEP (%)	RPC Council Riverine Flood Level (mAHD)	RPC Council Local Catchment Flood Level (mAHD)
0.2%	N/A	10.95
1%	N/A	10.9
2%	N/A	10.84
5%	N/A	N/A

The results in Table 1 indicate that the Council's updated Fitzroy River flood model predicts that there is riverine flooding at the site.

2.2 METHODOLOGY

The Local Catchment model has been created in HEC RAS using a Digital Elevation Model (DEM) 1 metre by the QLD government uploaded on ELVIS, the site is represented by 4 computational grid cells (shown in Figures 2 and 3) and was deemed suitable to assess the proposed site development.

The following scenarios were considered:

- Base: As per the Council's updated flood data (AECOM 2018) on DEM 1m by the QLD government; and
- Developed: Updated the model topography of the proposed development footprints ranging from 12.0 mAHD to 10.64 mAHD (represented as full blockage in all AEP flood events), as shown in Figure 2.

2.3 BACKGROUND

Flood maps for the base and developed scenarios are contained within Appendix A and B respectively. Table 2 details the peak flood levels at the Site.

Table 2: Peak Flood Levels (Water Surface Elevation-Max) at Site

AEP (%)	Base (mAHD)	Developed (mAHD)	Difference (m)
1%	10.7	10.7	0

The reporting point location is shown in Figures 2 and 3.

Appendix B and Table 2 demonstrate the proposed development results in negligible change to Local Catchment flood events.

3. CONCLUSION AND QUALIFICATIONS

This FIA has been drafted to support the proposed DA, ensuring alignment with the relevant Council development regulations and addressing the Council's Information Request (IR).

The flood data provided by the Council were obtained and utilised in conjunction with the DEM sourced from the Elvis website to perform a comprehensive assessment. The model outcomes indicate no adverse flood effects beyond the site boundaries. Moreover, the proposed building's Finished Floor Level (FFL) complies with the current flood-freeboard criteria.

This report has been prepared by Patcol, tailored to the specific project prerequisites, and should not be utilized beyond this context without further consultation and guidance from Patcol.

The assessment relies on information provided by various sources, including the Council's Fitzroy River flood data (AECOM, 2018), the Flood Report for 149 Denham Street by Rockhampton Regional Council (RRC), and the proposed building plans from Dezign Elements. The accuracy of this report hinges upon the accuracy of the furnished data. Although this report evaluates catchment hydraulic performance using industry-standard theoretical modelling techniques and engineering practices, actual observed catchment flows, levels, and inundation extents in the future may deviate from the predictions presented herein.

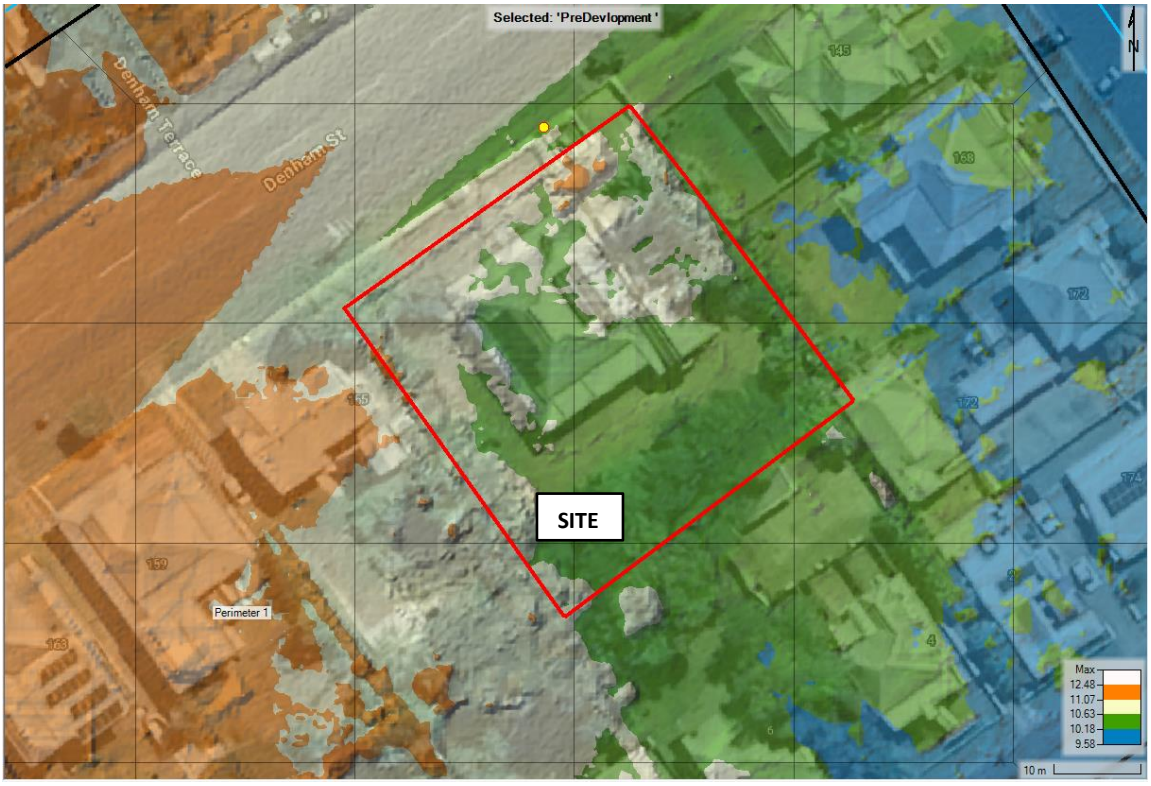

Figure 2: Base Site Hydraulic Model Topography (mAHD)

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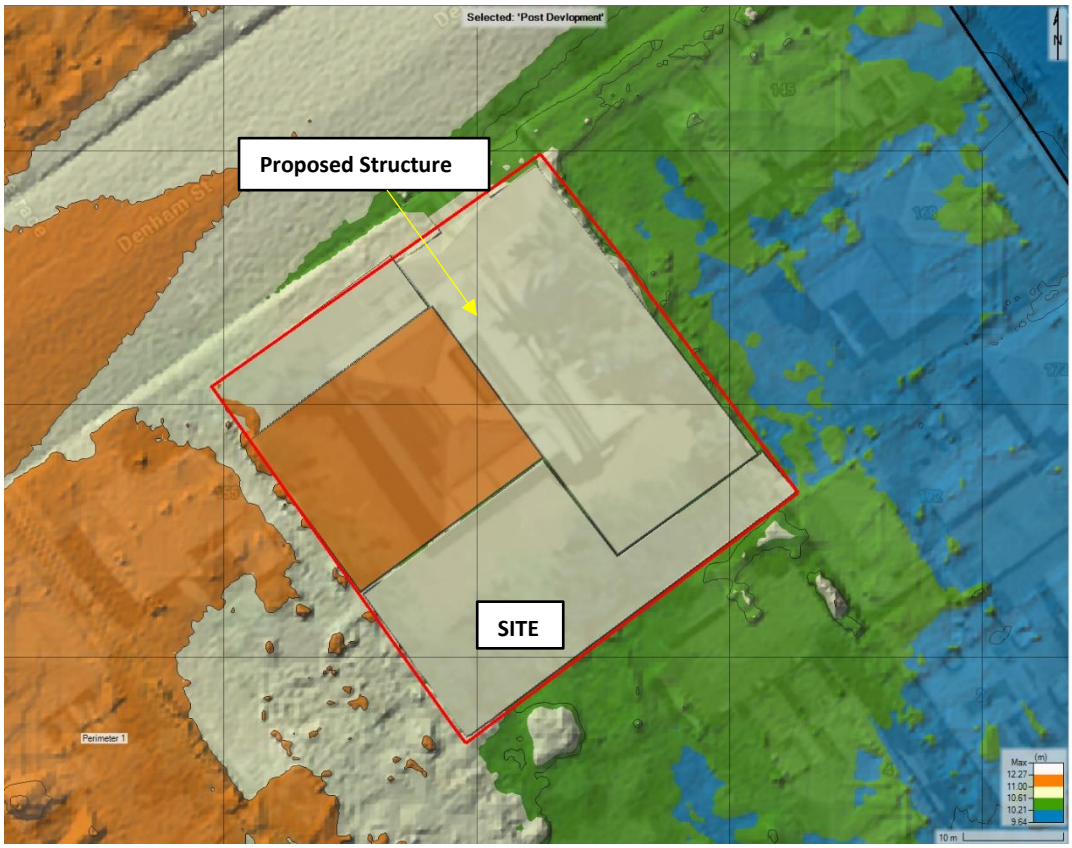

Figure 3: Developed Site Hydraulic Model Topography (mAHD)

It is observed that the proposed development plan occurring in the proximity of the site does not present significant implications for storm tide inundation flow, whether affecting the immediate property or the surrounding areas upstream and downstream.

Yours sincerely,

Scott Thomas

Manager – B. Eng (Civil/Structural) RPEQ 16203

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Appendix A: Architectural Reference Drawings

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PROPOSED CHILDCARE

149 DENHAM STREET, ROCKHAMPTON

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Dated: 3 May 2024

REAL PROPERTY DESCRIPTION

Lot Number:	7 & 8
Reg/Survery Plan Number:	RP 601 139

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OVERALL LOCATION

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Project:

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149 DENHAM STREET, ROCKHAMPTON

Drawing Title:

3D VIEW

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149 DENHAM STREET, ROCKHAMPTON

Drawing Title:

3D VIEW

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3D VIEW

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ALL DIMENSION IN MILLIMETERS

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Project:

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Drawing Title:

3D VIEW

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QBCC No: 1247120 BDAQ No: 0001677

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Date:	AUG 2023	-
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Project No:	Drawing No:
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Drawing Title:

3D VIEW

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Project No:	Drawing No:
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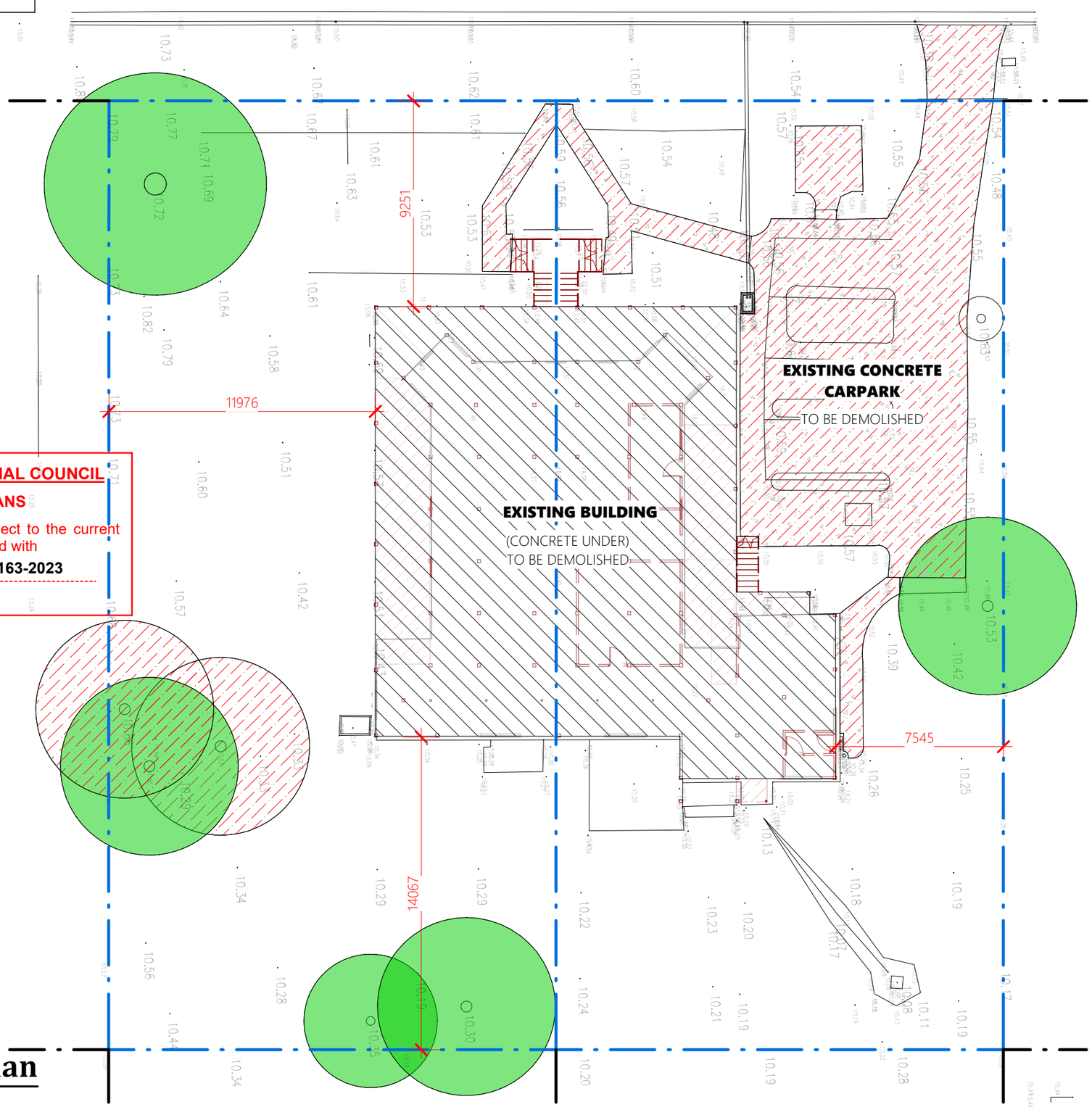
ROLL FOWARD 4.750m ↑

ROLL LEFT 6.900m ←

DENHAM STREET



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Existing Site Plan

1 : 200

DO NOT SCALE DRAWING

ALL DIMENSION IN MILLIMETERS

REVISIONS

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Address:

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Drawing Title:

EXISTING SITE PLAN

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Scale:	1 : 200	Rev:	-
Date:	AUG 2023		
Drawn:	NJB		
Project No:	Drawing No:		
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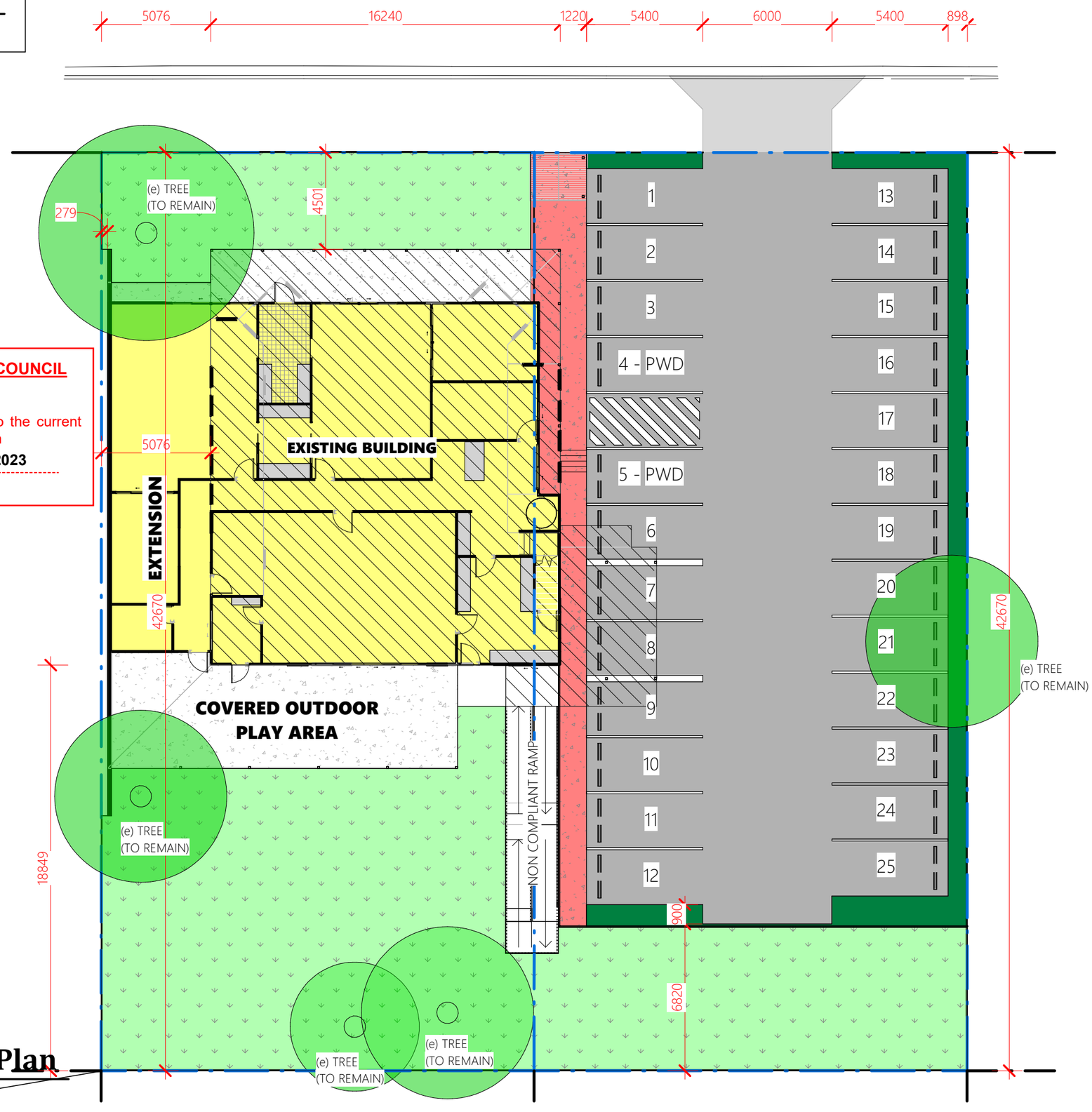
ROLL LEFT 6.900m ←

DENHAM STREET



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Dated: 3 May 2024

Proposed Site Plan

1 : 200

DO NOT SCALE DRAWING

ALL DIMENSION IN MILLIMETERS

No:	Description:	Date:
-	-	-

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Drawing Title:

PROPOSED SITE PLAN

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Date:	AUG 2023		
Drawn:	NJB		

Project No: **23_179**

Drawing No: **S-07**

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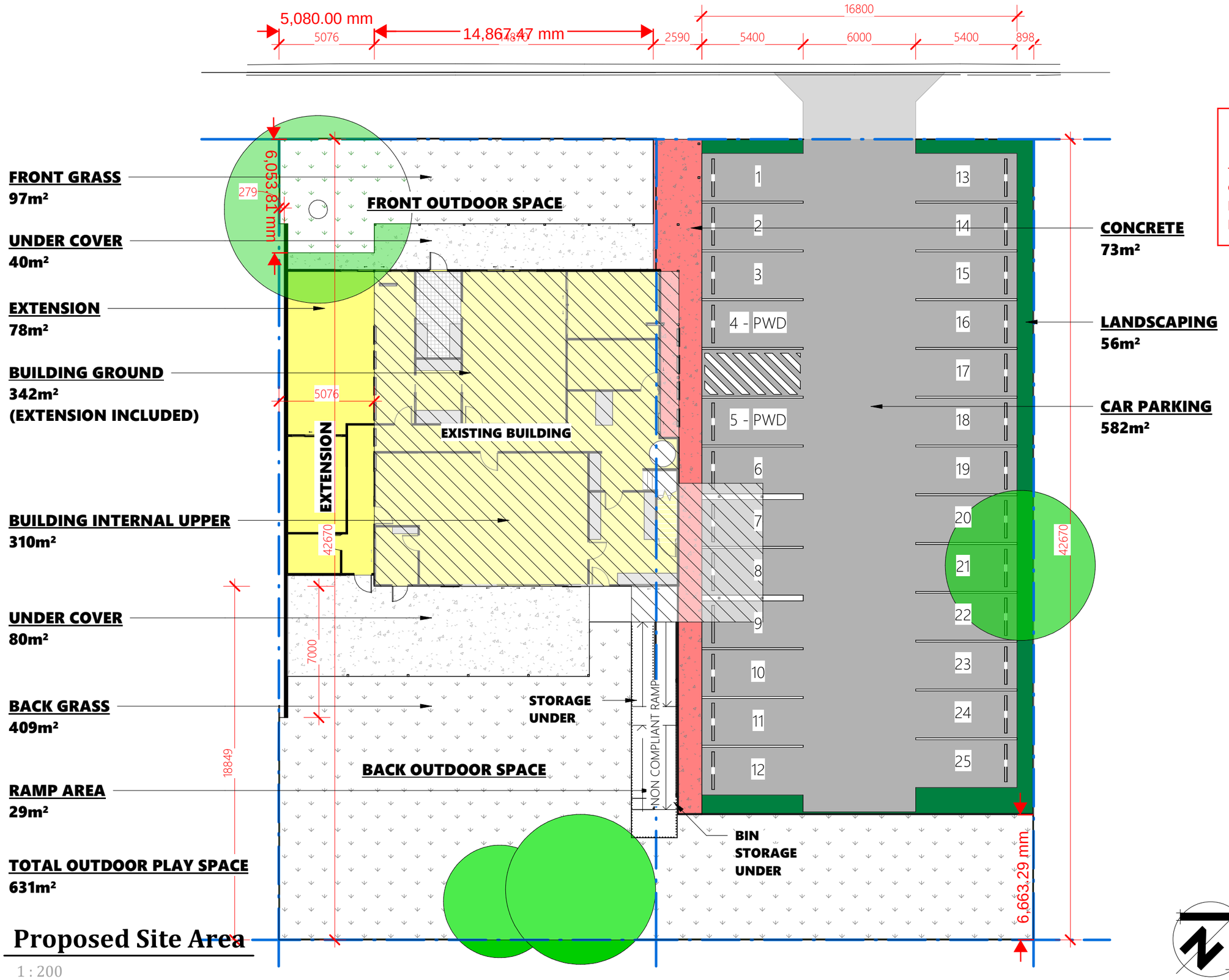

FRONT GRASS
97m²

UNDER COVER
40m²

EXTENSION
78m²

BUILDING GROUND
342m²
(EXTENSION INCLUDED)

BUILDING INTERNAL UPPER
310m²

UNDER COVER
80m²

BACK GRASS
409m²

RAMP AREA
29m²

TOTAL OUTDOOR PLAY SPACE
631m²

CONCRETE
73m²

LANDSCAPING
56m²

CAR PARKING
582m²

Proposed Site Area

1 : 200

DO NOT SCALE DRAWING
ALL DIMENSION IN MILLIMETERS

No:	Description:	Date:
-	-	-

REVISIONS

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Drawing Title:
SITE AREA

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Drawn:	NJB		
Project No:	23_179	Drawing No:	S-08

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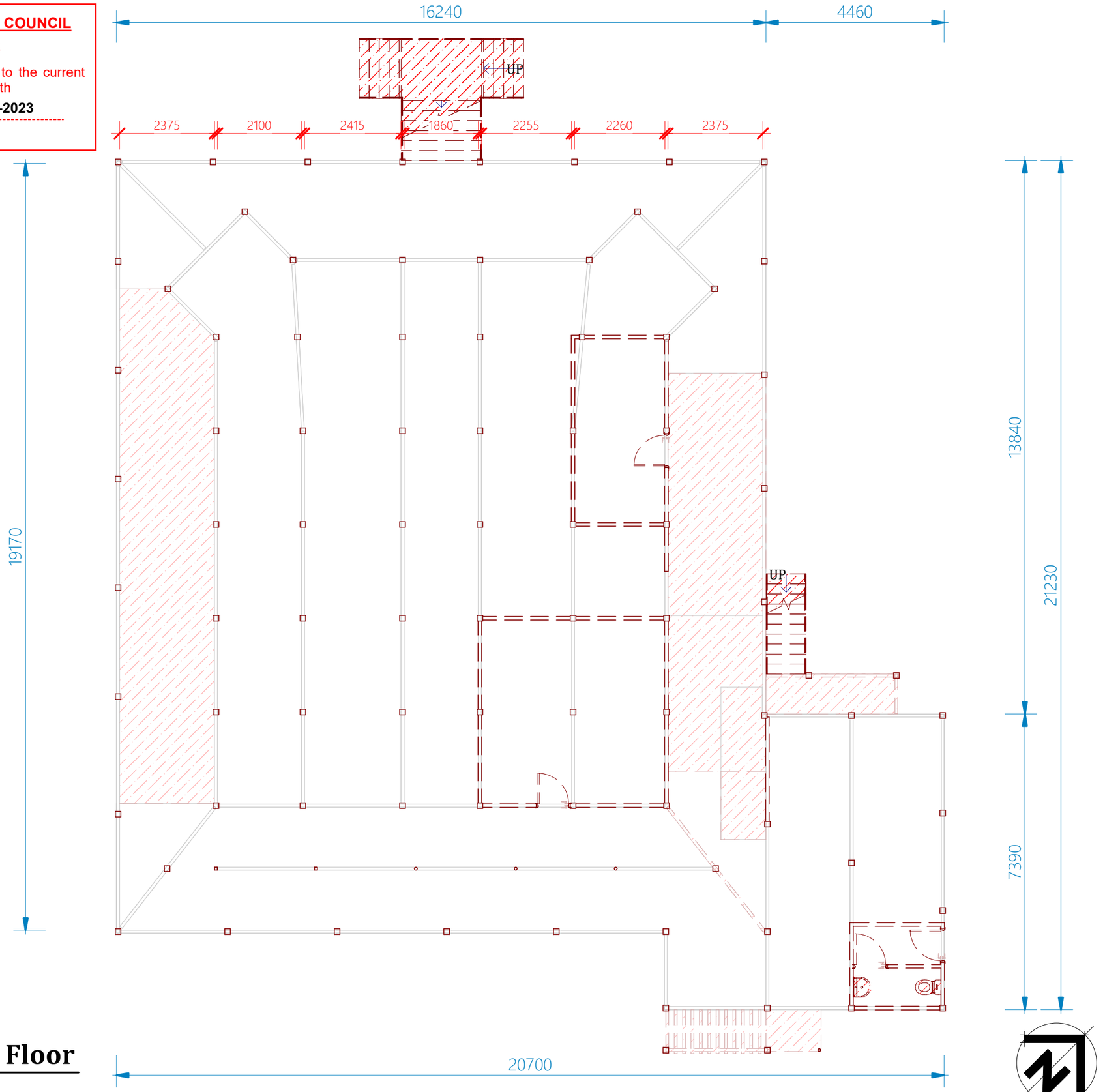

_Existing Ground Floor

1 : 100

DO NOT SCALE DRAWING

ALL DIMENSION IN MILLIMETERS

No:	Description:	Date:
-	-	-

REVISIONS

ISSUED FOR

PRELIMINARY

Project:

PROPOSED CHILDCARE

Address:

149 DENHAM STREET, ROCKHAMPTON

Drawing Title:

EXISTING GROUND FLOOR

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Scale:	1 : 100	Rev:
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Drawn:	NJB	

Project No: **23_179**

Drawing No: **S-09**

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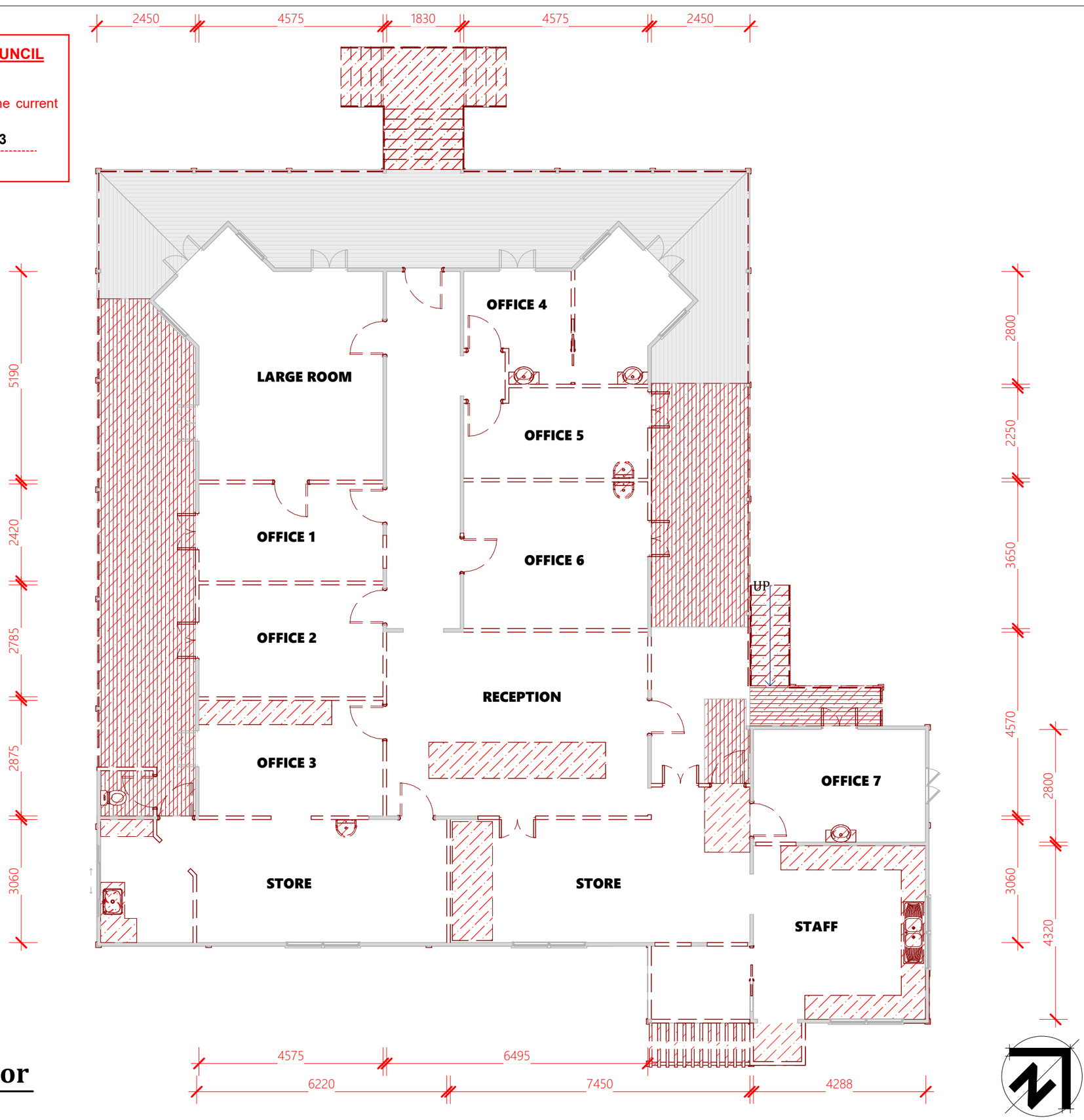

_Existing Upper Floor

1 : 100

DO NOT SCALE DRAWING

ALL DIMENSION IN MILLIMETERS

No:	Description:	Date:
-	-	-

REVISIONS

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PRELIMINARY

Project:

PROPOSED CHILDCARE

Address:

149 DENHAM STREET, ROCKHAMPTON

Drawing Title:

EXISTING UPPER FLOOR

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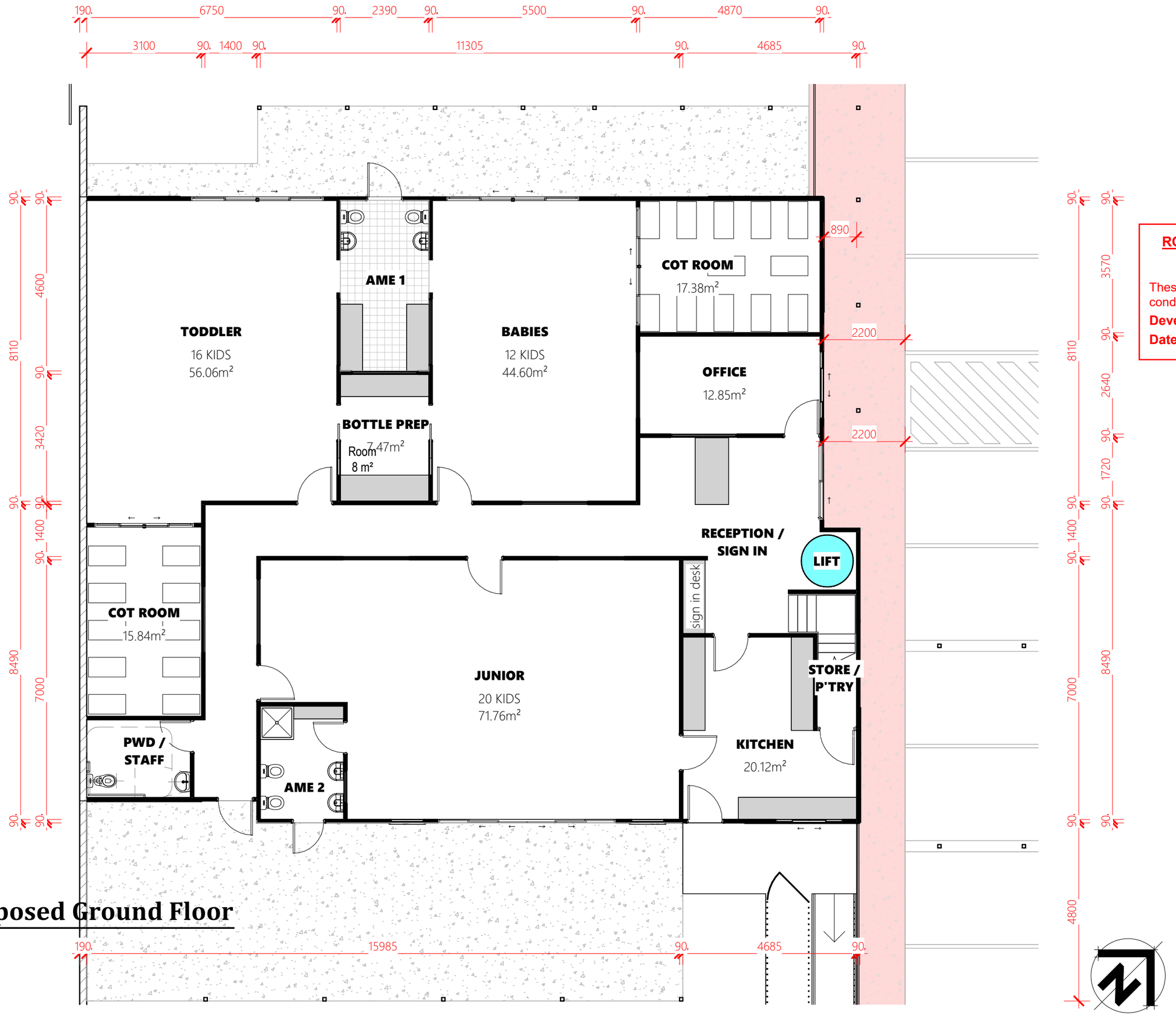

_Proposed Ground Floor

1 : 100

DO NOT SCALE DRAWING

ALL DIMENSION IN MILLIMETERS

REVISIONS

No:	Description:	Date:
-	-	-

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PROPOSED CHILDCARE

Address:

149 DENHAM STREET, ROCKHAMPTON

Drawing Title:

PROPOSED GROUND FLOOR

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Scale:	1 : 100	Rev:	-
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Drawn:	Author		
Project No:	Drawing No:		
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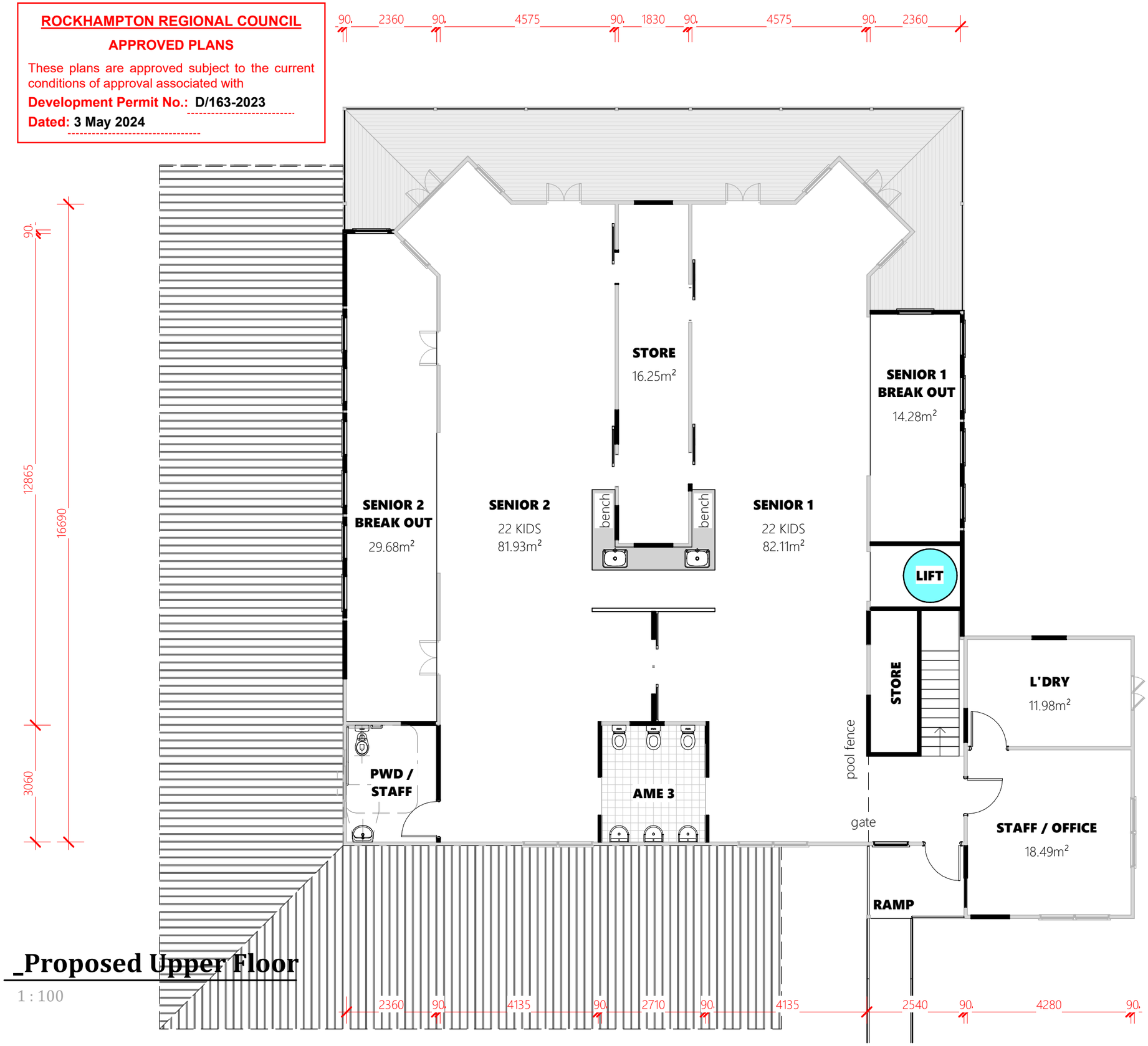

_Proposed Upper Floor

1 : 100

DO NOT SCALE DRAWING

ALL DIMENSION IN MILLIMETERS

No:	Description:	Date:
-	-	-

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Drawing Title:

PROPOSED UPPER FLOOR

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Date:	AUG 2023		
Drawn:	Author		
Project No:	Drawing No:		
23_179	**S-12**		

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Existing Elevation 1

1 : 100

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Proposed Elevation 1

1 : 100

DO NOT SCALE DRAWING

ALL DIMENSION IN MILLIMETERS

REVISIONS

No:	Description:	Date:
-	-	-

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Drawing Title:

ELEVATIONS

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Project No: **23_179**

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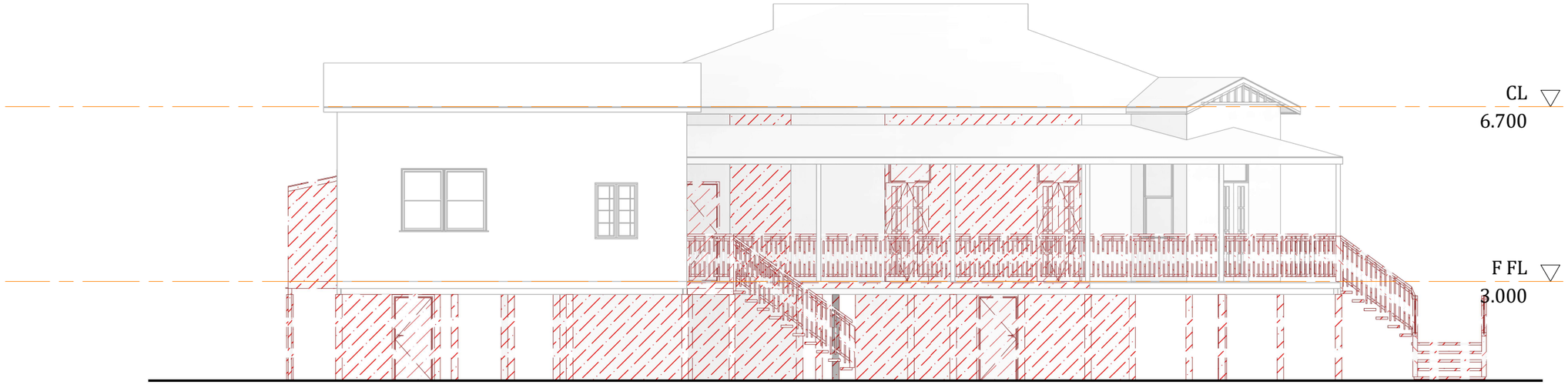

Existing Elevation 2

1 : 100

Proposed Elevation 2

1 : 100

ROCKHAMPTON REGIONAL COUNCIL

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DO NOT SCALE DRAWING

ALL DIMENSION IN MILLIMETERS

REVISIONS

No:	Description:	Date:
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Project No: **23_179**

Drawing No: **S-14**

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Existing Elevation 3

1 : 100

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Proposed Elevation 3

1 : 100

DO NOT SCALE DRAWING

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Drawing Title:

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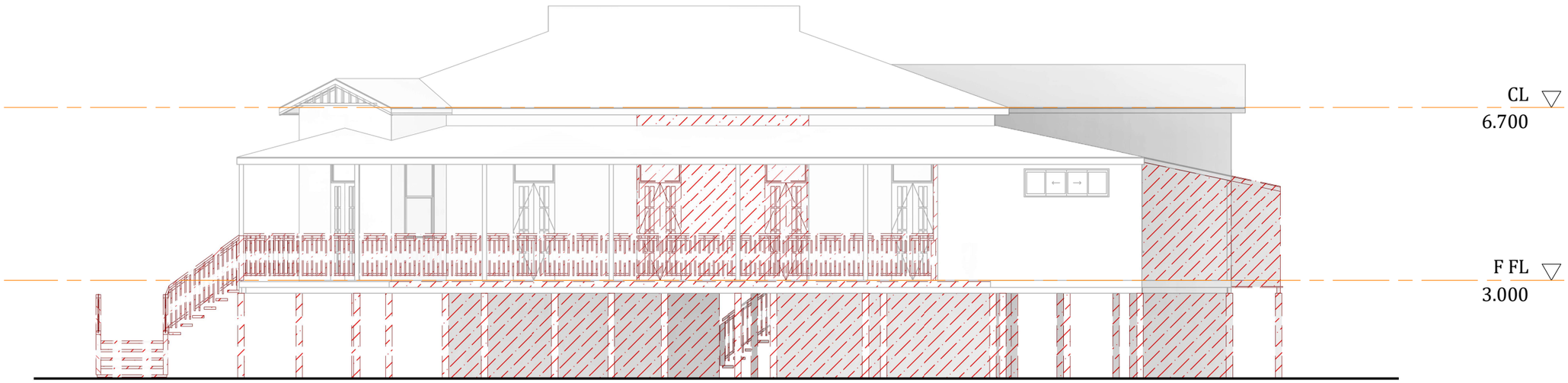
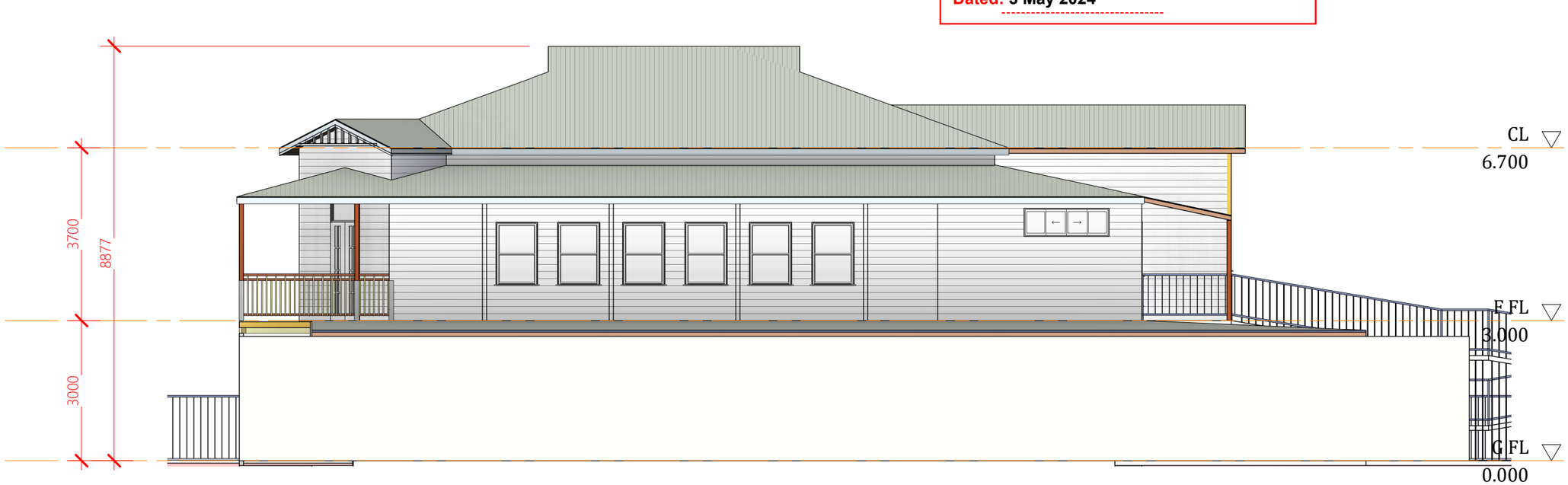


Existing Elevation 4

1 : 100



Proposed Elevation 4

1 : 100

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ABN 98 620 245 598
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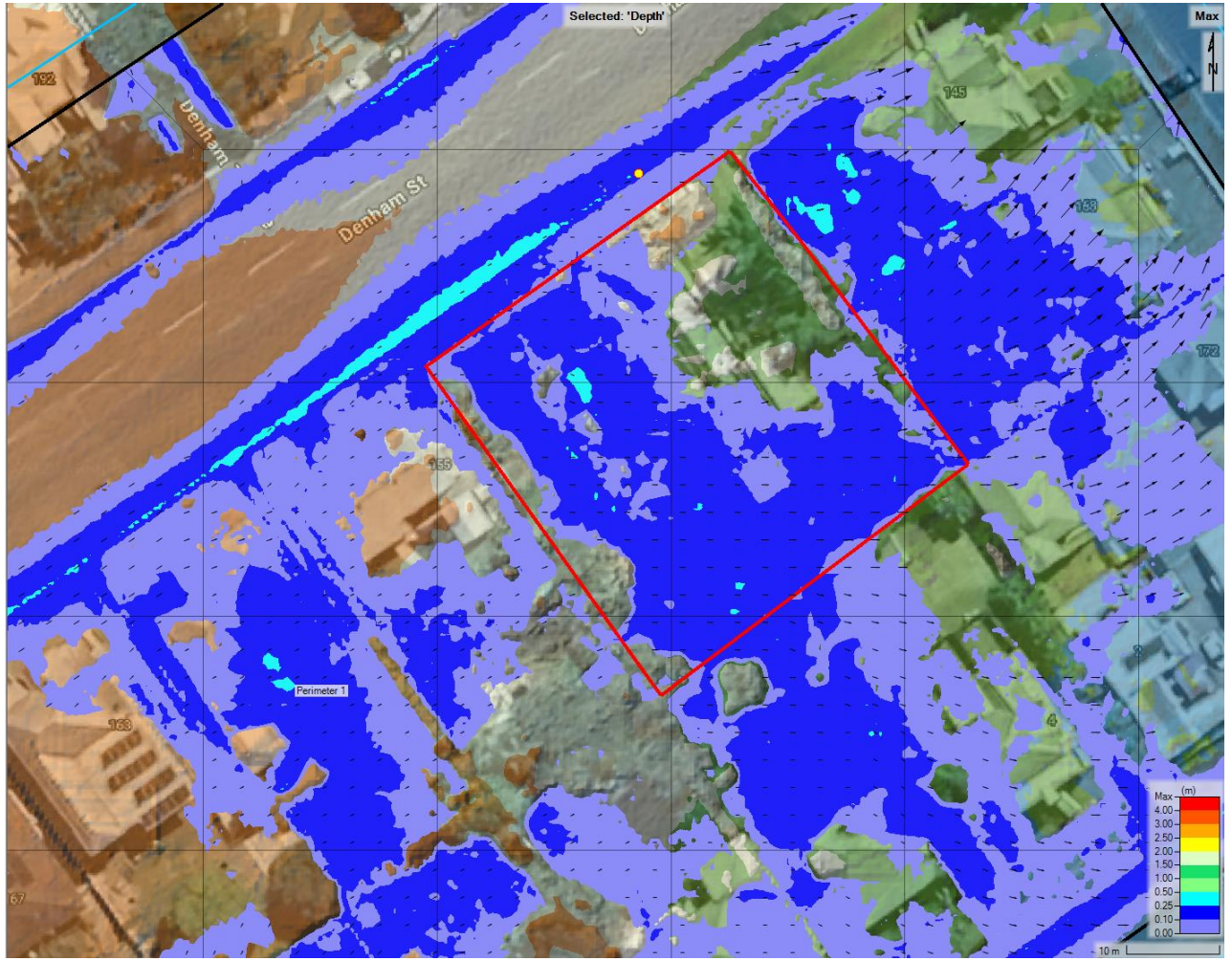

Figure 4: Catchment Flood Depth 1% AEP Flood Depth – Base

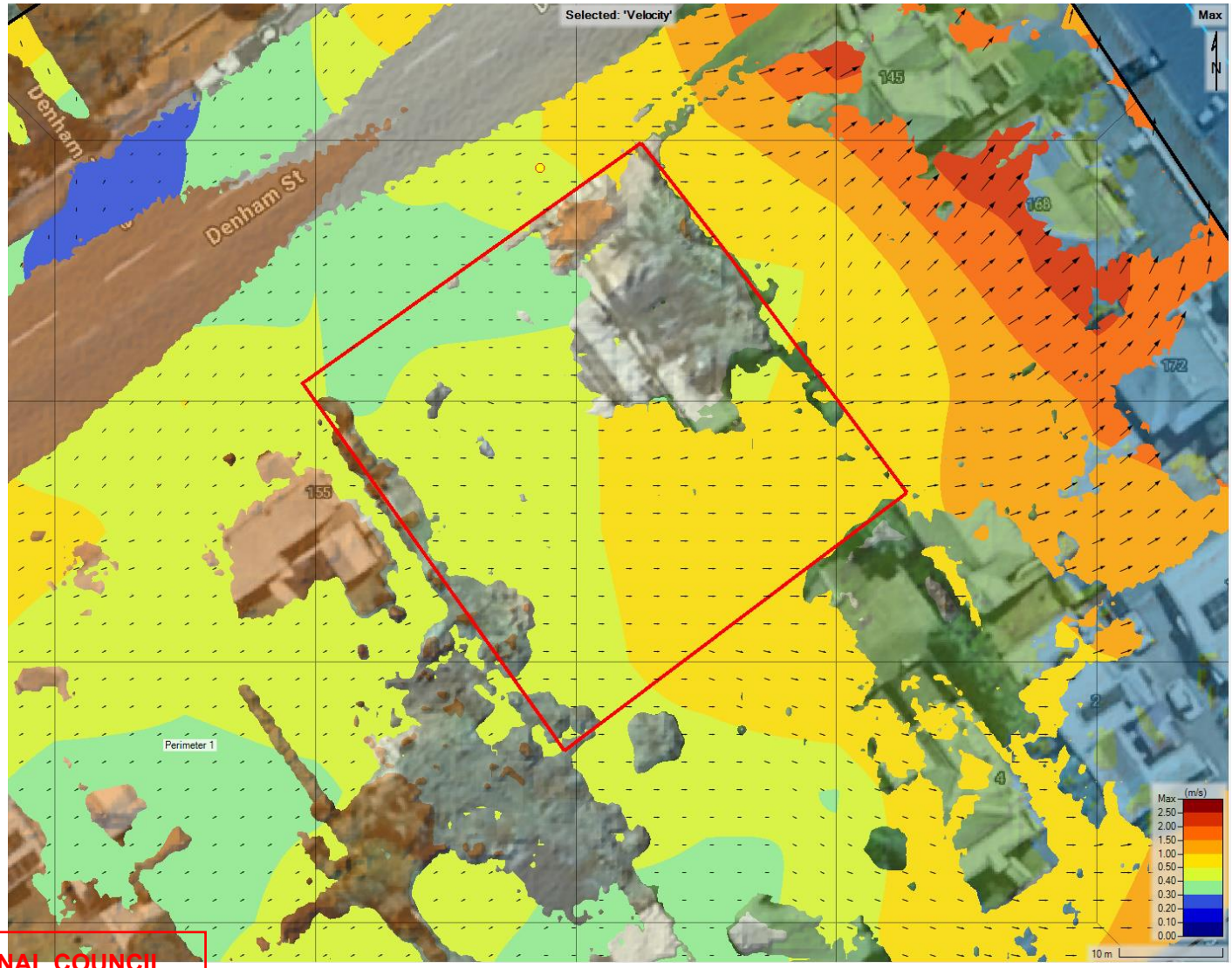

Figure 5: Catchment Flood Velocity 1% AEP Flood Velocity – Base

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Appendix C: Floods Maps-Developed

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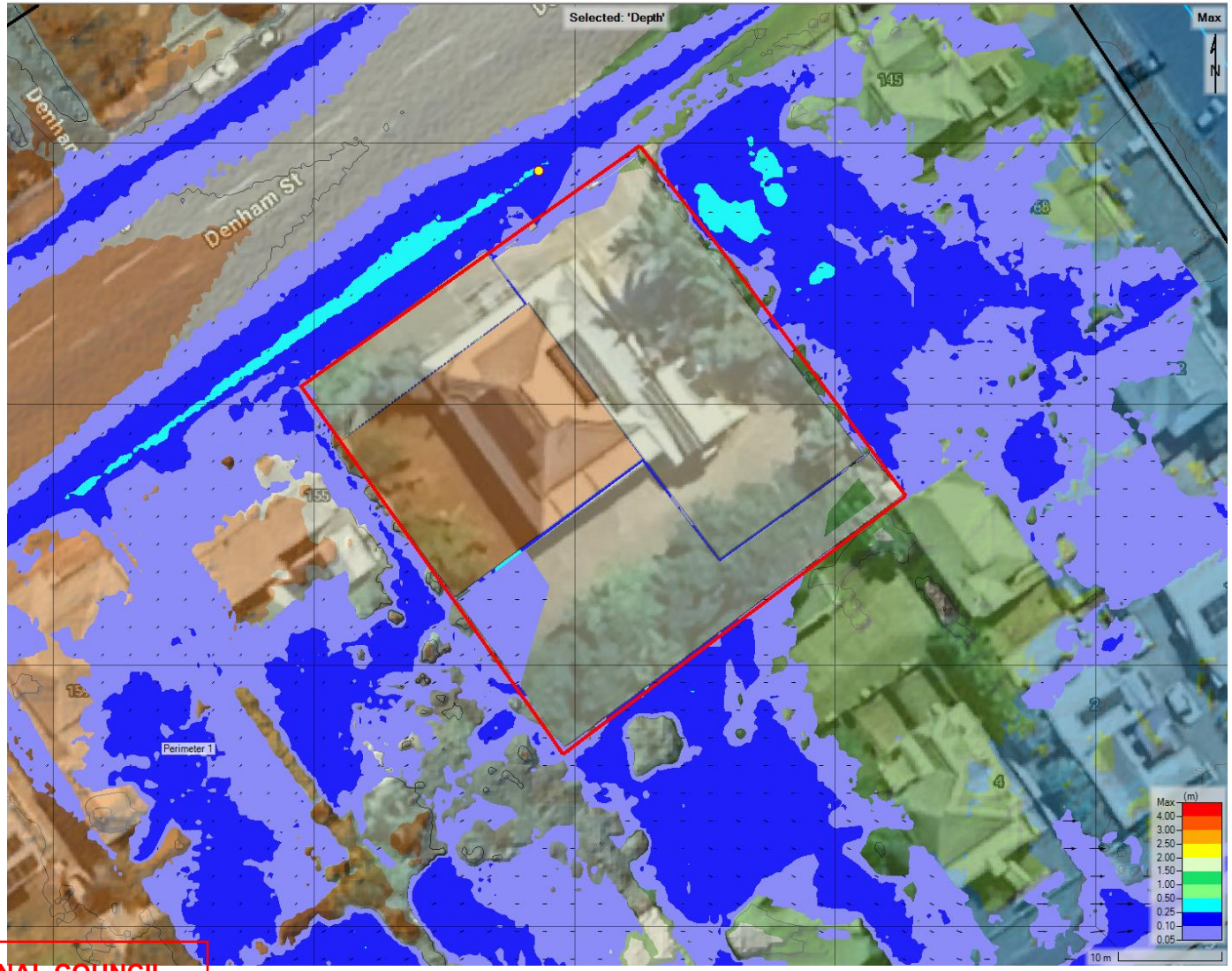

Figure 6: Fitzroy River 0.2% AEP Flood Depth – Developed

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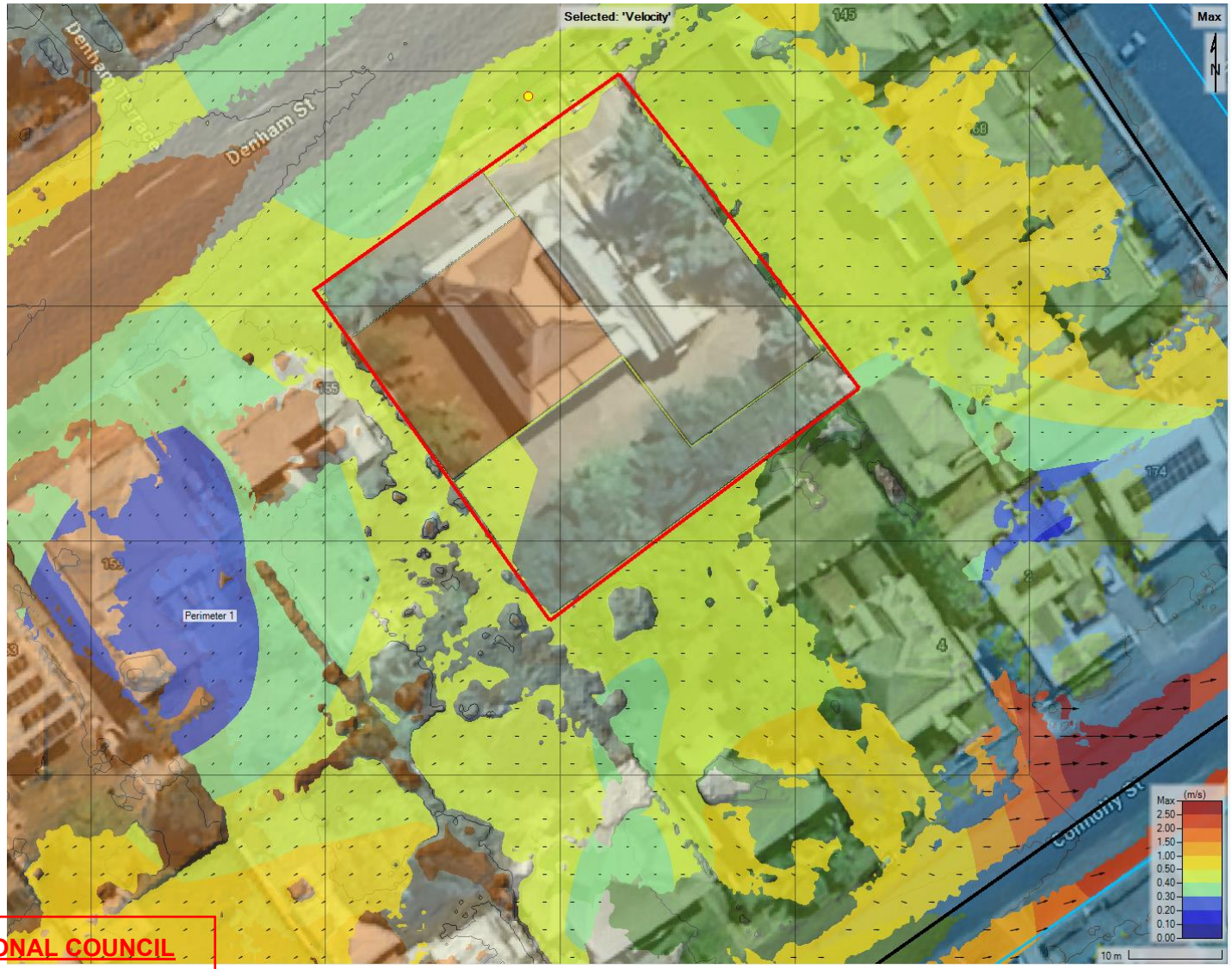

Figure 7: Fitzroy River 1% AEP Flood Depth – Developed

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Appendix D: Flood Hazard Area Overlay Code

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Dated: **3 May 2024**

FITZROY RIVER – ALL HAZARD AREAS, NORTH ROCKHAMPTON FLOOD MANAGEMENT AREA OR CREEK CATCHMENT – ALL PLANNING AREAS

TABLE 8.2.8.3.2 DEVELOPMENT OUTCOMES FOR ASSESSABLE DEVELOPMENT

Performance outcomes	Acceptable outcomes
Reconfiguring a lot **Development in Fitzroy River flood area – all hazard areas, North Rockhampton flood management area or Creek catchment flood - all planning areas**	
PO14 **Development does not result in the creation of additional lots.**	**AO14** **Reconfiguring a lot does not result in new lots.** Not applicable

FLOODPLAIN INVESTIGATION AREA

TABLE 8.2.8.3.2 DEVELOPMENT OUTCOMES FOR ASSESSABLE DEVELOPMENT

Performance outcomes	Acceptable outcomes
Development in floodplain investigation area	
PO15 **Development provides vehicle access to a road network that is sufficient to enable safe access.**	No acceptable outcome is nominated. Not applicable, the development is not within the floodplain investigation area.
Onsite access is provided to a building envelope or fill area in which a building is to be constructed. The access is located on land classified as a low flood hazard in the defined flood event.	**AO16** **Onsite access to a building envelope or fill area is provided over land that is designated as a low flood hazard.** Not applicable, the development is not within the floodplain investigation area.

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Dated: 3 May 2024

Operational work

Table 8.2.8.3.2 Development outcomes for assessable development (part)

Performance outcomes	Acceptable outcomes
Operational work	
PO17 Development does not materially impede the flow of floodwaters through the site or worsen flood flows external to the site.	**AO17.1** Development does not involve: a) filling with a height greater than 100 millimetres; or b) block or solid walls or fences; or c) garden beds or other structures with a height more than 100 millimetres; or d) the planting of dense shrub hedges. The development does not materially impede the flow of floodwaters through the site or worsen flood flows external to the site.

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Appendix E: Flood Report from Rockhampton Regional Council

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Flood Report for 149 Denham Street Allenstown QLD 4700

Printed from GeoCortex on 28/03/2024

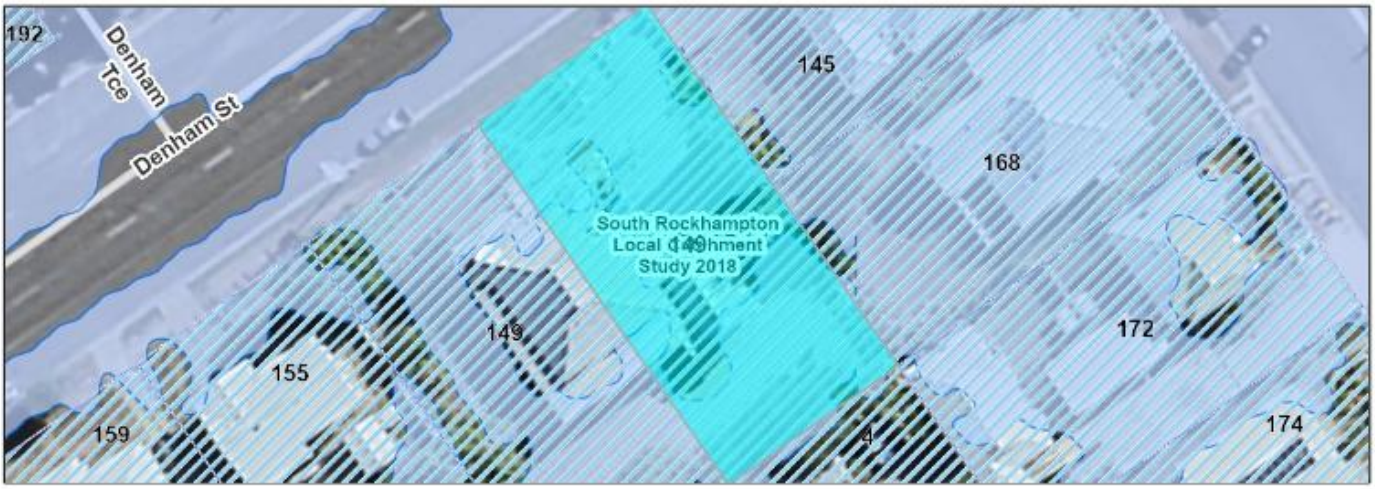
Rockhampton Regional Council

Owners: Perina Daycare Pty Ltd Tte

Ratepayer Address: Perina Daycare Trust 1277 Nungil Rd JONDARYAN QLD 4403

Parcel ID: RP601139/8

Land use: Offices



Riverine Catchment: Fitzroy River Flood Study

Creek Catchment: South Rockhampton Local Catchment Study 2018

Mitigation Area: N/A

Horizontal Datum: MGA 56, GDA 2020 Elevation / WSL: mAHD Velocity: m/sec

Comments

N/A

Riverine

PMF WSL Min:	11.89	AEP 2% WSL Min:	N/A
PMF WSL Max:	11.90	AEP 2% WSL Max:	N/A
PMF Velocity Min:	0.09	AEP 2% Velocity Min:	N/A
PMF Velocity Max:	0.11	AEP 2% Velocity Max:	N/A
AEP 0.05% WSL Min:	N/A	AEP 5% WSL Min:	N/A
AEP 0.05% WSL Max:	N/A	AEP 5% WSL Max:	N/A
AEP 0.05% Velocity Min:	N/A	AEP 5% Velocity Min:	N/A
AEP 0.05% Velocity Max:	N/A	AEP 5% Velocity Max:	N/A
AEP 0.2% WSL Min:	N/A	AEP 10% WSL Min:	*N/A*
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AEP 1% Velocity Min:	N/A	AEP 39% Velocity Min:	*N/A*
AEP 1% Velocity Max:	N/A	AEP 39% Velocity Max:	*N/A*

Creek \ Local Catchment

PMF WSL Min:	*10.74*	AEP 5% WSL Min:	*N/A*
PMF WSL Max:	*11.18*	AEP 5% WSL Max:	*N/A*
PMF Velocity Min:	*0.21*	AEP 5% Velocity Min:	*0.07*
PMF Velocity Max:	*1.20*	AEP 5% Velocity Max:	*0.68*
AEP 0.05% WSL Min:	*10.58*	AEP 10% WSL Min:	*N/A*
AEP 0.05% WSL Max:	*11.00*	AEP 10% WSL Max:	*N/A*
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AEP 0.2% Velocity Max:	*1.26*	AEP 18% Velocity Max:	*0.26*
AEP 0.5% WSL Min:	*10.43*	AEP 39% WSL Min:	*N/A*
AEP 0.5% WSL Max:	*10.89*	AEP 39% WSL Max:	*N/A*
AEP 0.5% Velocity Min:	*0.05*	AEP 39% Velocity Min:	*N/A*
AEP 0.5% Velocity Max:	*0.80*	AEP 39% Velocity Max:	*N/A*
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AEP 1% WSL Max:	*10.90*	AEP 63% WSL Max:	*N/A*
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AEP 1% Velocity Max:	*0.94*	AEP 63% Velocity Max:	*N/A*
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AEP 2% WSL Max:	*10.84*		
AEP 2% Velocity Min:	*0.05*		
AEP 2% Velocity Max:	*0.72*		

Property Elevation

Ground Elevation (Min):	
Ground Elevation (Max):	No data found

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/163-2023

Dated: 3 May 2024

PATCOL GROUP

Patcol Group Pty Ltd
ABN 98 620 245 598
www.patcol.com.au

Flood Report for 149 Denham Street Allenstown QLD 4700

Printed from GeoCortex on 28/03/2024

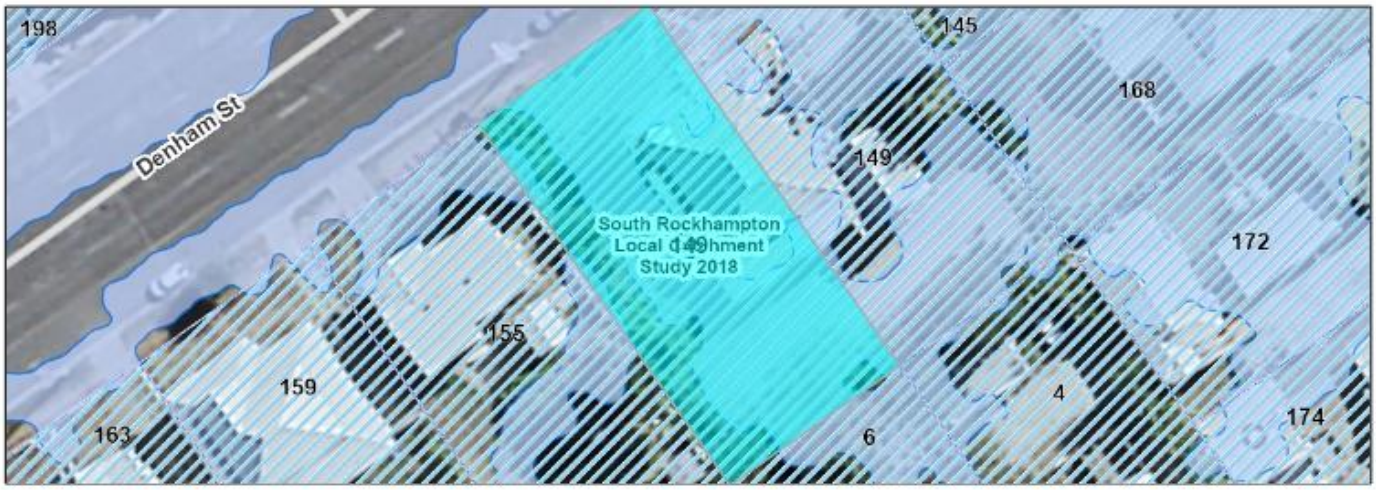
Rockhampton Regional Council

Owners: Perina Daycare Pty Ltd Tte

Ratepayer Address: Perina Daycare Trust 1277 Nungil Rd JONDARYAN QLD 4403

Parcel ID: RP601139/7

Land use: Offices



Riverine Catchment: Fitzroy River Flood Study

Creek Catchment: South Rockhampton Local Catchment Study 2018

Mitigation Area: N/A

Horizontal Datum: MGA 56, GDA 2020 Elevation / WSL: mAHD Velocity: m/sec

Comments

N/A

Riverine

PMF WSL Min:	11.89	AEP 2% WSL Min:	N/A
PMF WSL Max:	11.90	AEP 2% WSL Max:	N/A
PMF Velocity Min:	0.09	AEP 2% Velocity Min:	N/A
PMF Velocity Max:	0.10	AEP 2% Velocity Max:	N/A
AEP 0.05% WSL Min:	N/A	AEP 5% WSL Min:	N/A
AEP 0.05% WSL Max:	N/A	AEP 5% WSL Max:	N/A
AEP 0.05% Velocity Min:	N/A	AEP 5% Velocity Min:	N/A
AEP 0.05% Velocity Max:	N/A	AEP 5% Velocity Max:	N/A
AEP 0.2% WSL Min:	N/A	AEP 10% WSL Min:	*N/A*
AEP 0.2% WSL Max:	N/A	AEP 10% WSL Max:	*N/A*
AEP 0.2% Velocity Min:	N/A	AEP 10% Velocity Min:	*N/A*
AEP 0.2% Velocity Max:	N/A	AEP 10% Velocity Max:	*N/A*
AEP 0.5% WSL Min:	N/A	AEP 18% WSL Min:	*N/A*
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AEP 0.5% Velocity Min:	N/A	AEP 18% Velocity Max:	*N/A*
AEP 0.5% Velocity Max:	N/A	AEP 18% Velocity Max:	*N/A*
AEP 1% WSL Min:	N/A	AEP 39% WSL Min:	*N/A*
AEP 1% WSL Max:	N/A	AEP 39% WSL Max:	*N/A*
AEP 1% Velocity Min:	N/A	AEP 39% Velocity Min:	*N/A*
AEP 1% Velocity Max:	N/A	AEP 39% Velocity Max:	*N/A*

Creek \ Local Catchment

PMF WSL Min:	*10.77*	AEP 5% WSL Min:	*N/A*
PMF WSL Max:	*11.20*	AEP 5% WSL Max:	*N/A*
PMF Velocity Min:	*0.24*	AEP 5% Velocity Min:	*0.04*
PMF Velocity Max:	*1.18*	AEP 5% Velocity Max:	*0.25*
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AEP 0.05% Velocity Min:	*0.24*	AEP 10% Velocity Min:	*0.03*
AEP 0.05% Velocity Max:	*1.05*	AEP 10% Velocity Max:	*0.22*
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AEP 0.2% WSL Max:	*11.03*	AEP 18% WSL Max:	*N/A*
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AEP 0.2% Velocity Max:	*1.10*	AEP 18% Velocity Max:	*N/A*
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AEP 0.5% WSL Max:	*10.95*	AEP 39% WSL Max:	*N/A*
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AEP 1% WSL Max:	*11.00*	AEP 63% WSL Max:	*N/A*
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AEP 2% WSL Max:	*10.86*		
AEP 2% Velocity Min:	*0.03*		
AEP 2% Velocity Max:	*0.57*		

Property Elevation

Ground Elevation (Min):	
Ground Elevation (Max):	No data found

Project No. 23-678

Date: 27/11/23

To:

Gideon Genade
Principal Town Planner
Gideon Town Planning
gg@gideontownplanning.com.au

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/163-2023

Dated: 3 May 2024

From:

Scott Thomas
Director
Patcol Group Pty Ltd.
scott@patcol.com.au

Re: 149 Denham Street, Allenstown – Proposed Site Development Stormwater Management Plan

Introduction

Patcol Group Pty Ltd. has been commissioned by Mr. Anthony Ramsey to conduct a site-specific Stormwater Management Plan (SMP) for the proposed development of a Child Day Care Unit situated at 149 Denham St. Allenstown, encompassing Lot 7 and Lot 8 on RP601139.

The primary objective of this SMP is to ensure that the planned development aligns with the stipulations outlined in the Capricorn Municipal Development Guidelines (CMDG), Queensland Urban Drainage Manual (QUDM 2016), Australian Rainfall and Runoff 2016 (ARR'16), and State Planning Policy (SPP 2017).

The proposed site layout, detailed in Figure 3 (Rev No. A), entails an open car park situated at the northeast boundary. An extension to the existing building's roof surface has been incorporated, along with the addition of a concrete pathway between the proposed car park and the existing building. Furthermore, undercover areas are proposed for both the front and rear portions of the building. These modifications result in an increase in impervious areas post-development. The overall impact on peak discharge and stormwater quality directed towards the existing road kerb has been similar results in both minor (10%AEP) and major (1%AEP) storm event. Consequently, this development is not anticipated to cause any significant nuisance to the adjacent properties, hence meeting the requirements of the Rockhampton Council Stormwater Management Planning Scheme Policy

Figure 1: Location of the Study Area at 149 Denham Street, Allenstown, Coordinates: 2446938.29 m E, 7411596.89 m S, Zone- 56K

STORMWATER REPORT – Proposed Site Development Stormwater Management Report

Project Number:	23-678
Client:	Anthony Ramsey
Site:	149, Denham Street, Allenstown
Scope:	Stormwater Management Plan

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/163-2023

Dated: 3 May 2024

Rev No.	Revision	Author	RPEQ	Issue Date
A	Original Issue	Utkarsh Singh	Scott Thomas	27.11.2023
A1	Revision Issue	Utkarsh Singh	Scott Thomas	19.01.2024
A2	Revision Issue	Utkarsh Singh	Scott Thomas	04.04.2024

Figure 1:Location of the Study Area at 149, Denham Street, Allenstown

Coordinates: 2446938.29 m E, 7411596.89 m S, Zone- 56K.

CONTENTS

1 INTRODUCTION

1.1 PROJECT OVERVIEW

Patcol Group Pty Ltd. has been engaged by Mr. Anthony Ramsey to undertake a site- based Stormwater Management Plan (SMP) for a proposed carpark at Child Day Care Unit. The site is located at 149 Denham St. Allenstown on Lot 7 and Lot 8 on RP601139.

The aim of this SMP is to demonstrate that the proposed development will comply with Capricorn Municipal Development Guidelines (CMDG), Queensland Urban Drainage Manual (QUDM 2016), Australian Rainfall and Runoff 2016 (ARR'16) and State Planning Policy (SPP 2017).

1.2 METHODOLOGY

The assessment methodology adopted for this SMP is summarised below.

– Identify Lawful Point of Discharge (LPOD) for the site stormwater runoff.

– Identify the critical storm events and duration for this project.

– Estimate peak discharge runoff for pre-development and post-development scenarios.

– Identify potential mitigation and management strategies to ensure no worsening to downstream catchments and infrastructure.

1.3 DATA SOURCES

The background data used to undertake this assessment were collected from the following sources:

- ARR'16 data hub
  - Rainfall data
  - Design storm ensemble temporal patterns
- Livingstone Shire Council GIS data
  - 2016 LiDAR
  - Infrastructure GIS mapping
- Preliminary overall layout plan (completed by Desizn Elements)

2 SITE CHARACTERISTICS

2.1 PRE-DEVELOPMENT CONDITION

The proposed site is fronted by Denham Street to the north, with residential units surrounding it to the east, west, and south.

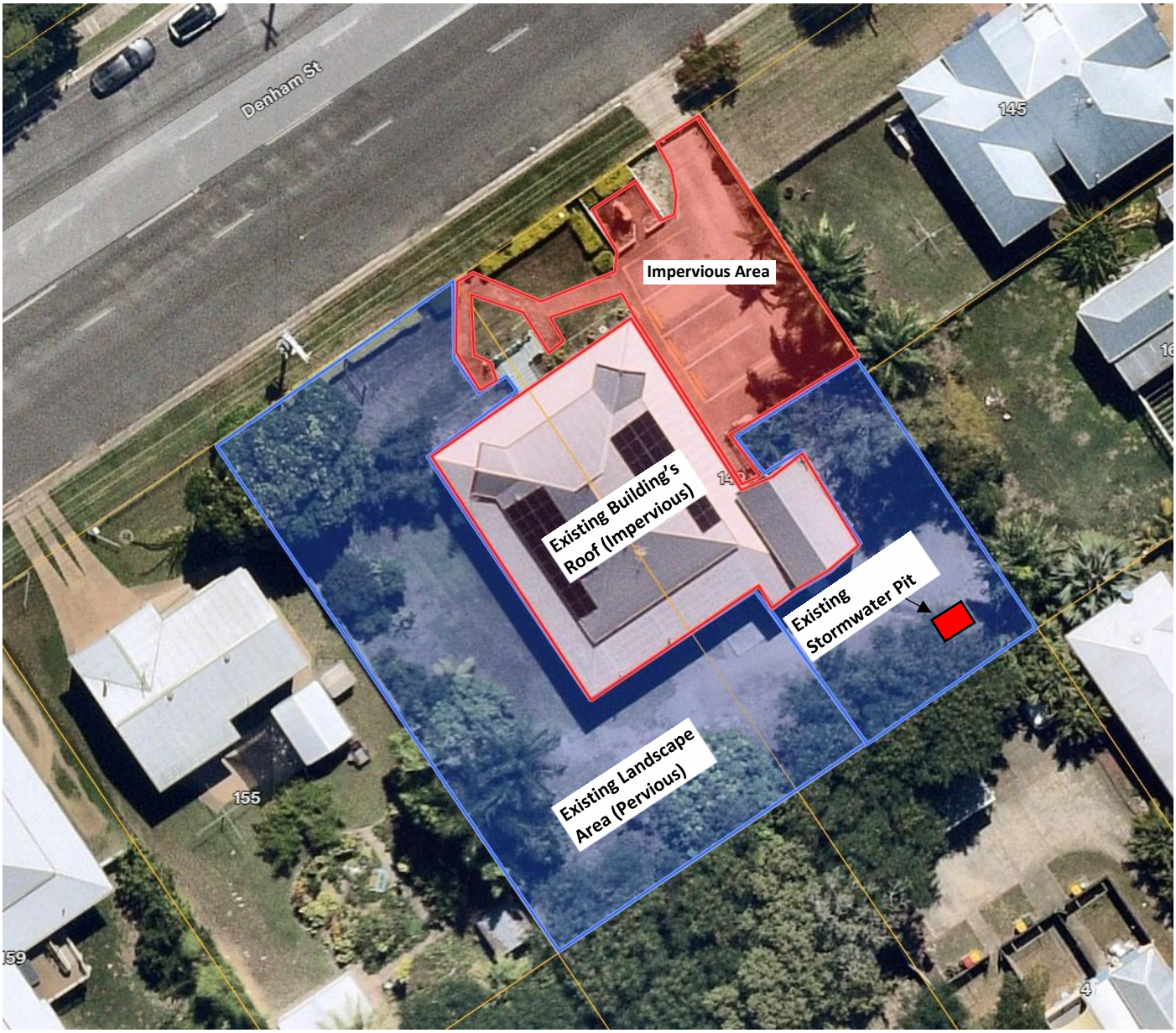

Figure 2: Site plan showing existing site conditions

Figure 2 shows the existing carpark is generally having a concrete finish top surface, existing building's roof, encompassing the roof of the existing building and the landscape area. Within the landscape area, a stormwater pit is situated, designed to gather water and subsequently convey it through a pumping system to the curb along Denham Street. The carpark site generally falls towards Denham Street at approximately 0.28% fall, and approximate levels ranging from RL10.62m to RL10.38m. The landscape site generally falls towards the South-East at approximately 1.43% fall. Existing infrastructure is shown in Appendix A.

2.2 Post Development Condition

The proposed use of the site entails a commercial use for a child day care as shown to Figure 3. It is proposed that demolition of an existing carpark with bulk earthworks are carried out, such as to maximise the existing fall approx. 0.8% grade.

Figure 3: Proposed Development Plan

It is expected that the development of the site will result in a net change to the hydraulic properties of the site and will therefore revise the pre-development condition from a stormwater management perspective. The management strategy for the layout shown in Figure 7 is to provide a 2x Rectangular Hollow Section (RHS) pipe in between the proposed car park and the pre-existing curb infrastructure.

2.3 Lawful Point of Discharge

The proposed lawful point of discharge for the lot will remain unchanged, with all discharge to the front of the lot into Denham St. Road reserve, which is under the lawful control of the local government and satisfies the requirements for Lawful Points of Discharge (LPOD) in accordance with QUDM.

2.4 External Catchment

An upslope catchment analysis has been conducted to confirm the presence of any catchments external to the site which may contribute to the net flow through the proposed stormwater management strategy. Refer to Figure 4 External catchments plan.

Figure 4: External Catchment Plan

The planned elevation variance of 300mm between the proposed carpark (RL10.95m) and the landscaped area (RL10.65m) is designed to effectively channel water away from the neighbouring lot and the designated landscape area. This strategy is aligned with the anticipated flow patterns on the site. Consequently, there's no necessity to account for external catchments when calculating the maximum water discharge at the existing road kerb.

3 HYDROLOGY

3.1 HYDROLOGIC MODELLING APPROACH

Hydrologic calculations have been undertaken using EPASWMM 5.2 for pre and post development scenarios. The modelling within the EPASWMM environment has been undertaken to estimate the peak discharge for storms up to 1% AEP and 1% AEP With Climate Change. Hydrologic modelling has been undertaken using the Laurenson Runoff Routing Method. Laurenson's Method is an industry leading hydrologic routing method that can be used for catchments ranging between 10m2 up to 20,000km2. The information required to apply Laurenson's Method include:

- Rainfall Intensity Data (obtained from the Bureau of Meteorology 2016 IFD utility)
- Rainfall Temporal Patterns (obtained from the ARR'16 Data Hub)
- Catchment Area (ha)
- Catchment Slope
- Initial and Continuing Infiltration Data
- Catchment Roughness (Manning's 'n')

Given the relatively limited scope of this hydraulic impact assessment, a lumped catchment approach as defined by ARR'16 and shown in Figure 5 below, was applied to the hydrologic review of the site. The lumped approach is suitable for this site given the relative consistency in land use and the ultimate purpose of the model.

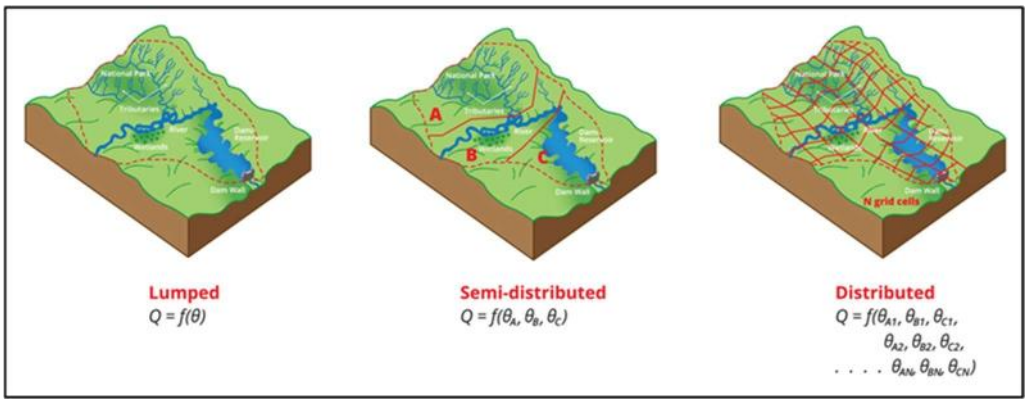

Figure 5: Lumped vs distributed catchment analysis options

3.2 HYDROLOGIC MODELLING APPROACH

Table 1 and Table 2 present the input data for the development site in pre-development and post-development conditions.

Table 1: Pre-development model parameters (EPA SWMM)

Pre-development sub-catchment parameters			
		Pervious	Impervious
Area (ha)		0.098	0.061
Percentage Impervious (%)		0	100
Manning's 'n'		0.025	0.015
Storm Losses	Initial Losses (mm/hr)	15	0
	Continuing Losses (mm/hr)	1.5	0

Table 2: Post-development model parameters (EPA SWMM)

Post-development sub-catchment parameters			
		Pervious	Impervious
Area (ha)		0.056	0.080
Percentage Impervious (%)		0	100
Manning's 'n'		0.025	0.015
Storm Losses	Initial Losses (mm/hr)	15	0
	Continuing Losses (mm/hr)	1.5	0

3.3 HYDROLOGY RESULTS

Table 3 summarises the maximum mean storm events for the site, where the post-development events were taken as all storm events that exceed the pre-development case.

Table 3: Pre and Post development Max Mean Flow (m3/s) of Impervious Area using EPA_SWMM

Comparison in between Pre-development and Post-development peak discharges in Impervious Area				
	Pre- Development Max Flow (m3/s)	Post- Development Max Flow (m3/s)	Change (m3/s)	Change (%)
10% AEP (m3/s)	0.030	0.042	+0.012	+40%
1% AEP (m3/s)	0.050	0.065	+0.015	+30%

Table 4: Pre and Post development Max Mean Flow (m3/s) of Pervious Area using EPA_SWMM

Comparison in between Pre-development and Post-development peak discharges in Pervious Area				
	Pre- Development Max Flow (m3/s)	Post- Development Max Flow (m3/s)	Change (m3/s)	Change (%)
10% AEP (m3/s)	0.030	0.023	-0.007	-23.3%
1% AEP (m3/s)	0.067	0.045	-0.022	-32.8%

Table 5: Critical storm events for Pervious and Impervious Area

Annual Exceedance Probability (AEP %)	Maximum Mean Storm Event	
	Pervious Area	Impervious Area
10% AEP	ECN_10%_15MIN	ECN_10%_5MIN
1% AEP	ECN_1%_15MIN	ECN_1%_5MIN

Table 6: Pre and Post development Max Mean Flow (m3/s) of Impervious Area using Rational Method

Comparison in between Pre-development and Post-development peak discharges in Impervious Area				
	Pre- Development Max Flow (m3/s)	Post- Development Max Flow (m3/s)	Change (m3/s)	Change (%)
10% AEP (m3/s)	0.030	0.040	+0.01	+33.3%
1% AEP (m3/s)	0.046	0.060	+0.014	+30.4%

Table 7: Pre and Post development Max Mean Flow (m3/s) of Pervious Area using Rational Method

Comparison in between Pre-development and Post-development peak discharges in Pervious Area				
	Pre- Development Max Flow (m3/s)	Post- Development Max Flow (m3/s)	Change (m3/s)	Change (%)
10% AEP (m3/s)	0.027	0.015	-0.012	-44.44%
1% AEP (m3/s)	0.049	0.028	+0.021	-42.85%

Table 8: Comparison of Max Mean Flow (m3/s) of Pervious Area using Rational Method and SWMM_EPA

Comparison in between Post-development peak discharges in Pervious Area				
	Post- Development Max Flow (m3/s) SWMM_EPA	Post- Development Max Flow (m3/s) Rational Method	Change (m3/s)	Change (%)
10% AEP (m3/s)	0.023	0.015	-0.008	-34.78%
1% AEP (m3/s)	0.045	0.028	-0.017	-37.7%

Table 9: Comparison of Max Mean Flow (m3/s) of Impervious Area using Rational Method and EPA_SWMM

Comparison in between Post-development peak discharges in Impervious Area				
	Post- Development Max Flow (m3/s) SWMM_EPA	Post- Development Max Flow (m3/s) Rational Method	Change (m3/s)	Change (%)
10% AEP (m3/s)	0.042	0.040	-0.002	-4%
1% AEP (m3/s)	0.065	0.060	-0.005	-7%

Table 10: Net Change in Pre and Post Development in SWMM_EPA and Rational Method

Comparison in between Post-development peak discharges in Impervious Area				
	Pre- Development Total Flow (m3/s) SWMM_EPA	Post- Development Total Flow (m3/s) Rational Method	Change (m3/s)	Change (%)
EPA_SWMM	0.177	0.175	-0.002	-1%
Rational Method	0.152	0.143	-0.009	-5%

Note: Total Flow- Sum of maximum discharge of all events in pervious and impervious areas.

4 HYDRAULICS

4.1 HYDRAULIC MODELLING APPROACH

The hydraulic assessment for the site has been carried out using EPASWMM 5.2. The aim of the hydraulic modelling is to demonstrate that the post-development minor and major storm peak discharge at the Lowest point of Discharge (LPOD) is equal or more than the peak pre-development discharge.

The suggested stormwater management approach involves the implementation of a RHS (150mm x 100mm) stormwater pipe connected to a kerb adapter at the parking's lowest elevation. The objective is to facilitate the version of water from the carpark as runoff towards the pre-existing kerb infrastructure. The absence of a stormwater pipe network near the lot renders below ground tanks unfeasible, making this the sole available choice.

Refer to Appendix A for the site general arrangement, which displays the planned strategy for stormwater management on the site.

The primary exit of the carpark was designed as 3x RHS (150mm x 100mm) stormwater pipe at the lowest position, to provide a 1% downward slope towards the kerb invert. A kerb weir with a width of 200mm was simulated to facilitate the maximum discharge of 0.42 cubic meter per second (CMS) at average velocity of 0.85m/s.

The remaining backyard grassed areas will drain directly to the kerb invert with a pressurised pipe from an existing sump of size 300m x 300m x 300m which has been represented in the model as 'PVC_PIPE'.

Due to the long, slope nature of the kerb, the overflow will effectively become sheet flow draining to the Denham St. Road reserve.

Figure 6: Stormwater management strategy layout plan of Proposed Site Plan

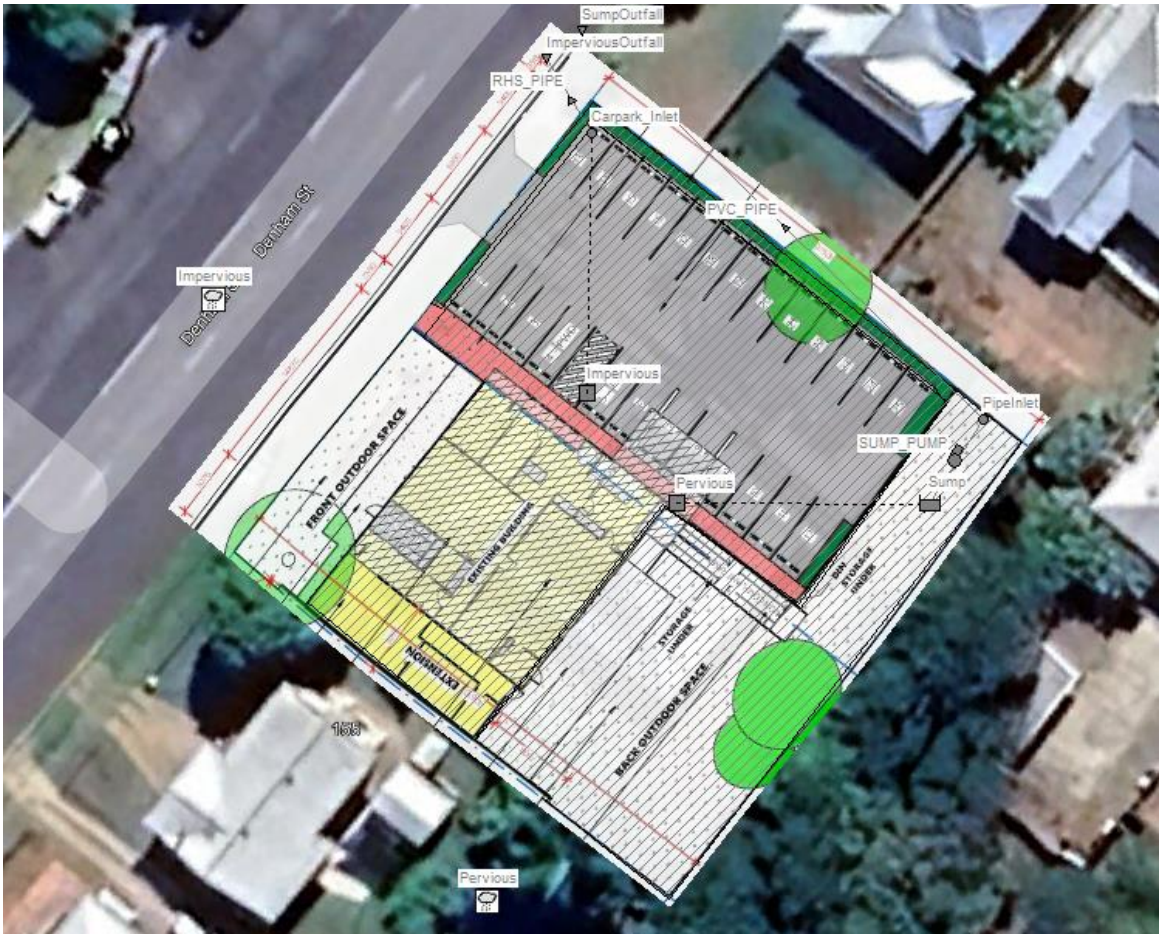

Figure 7: Stormwater management plan layout in EPA_SWMM_5.2

The 2x RHS (150mm x 100mm) outlet has been checked for self-cleansing performance for events including and exceeding the 10% AEP event and has been found to provide sufficient ~0.89m/s velocity performance across all events.

The following Table 4 summarises the performance of the proposed stormwater management strategy relative to the pre- development and post-development cases.

Table 11: Site Discharge rates (Sum of impervious and pervious area discharge using EPA_SWMM)

	Pre- Development Max Flow (m3/s)	Mitigated Max Flow (m3/s)	Mitigated Development Max Discharge (m^3/s)	
			2x RHS pipes to Kerb	Sump to Kerb
10% AEP (m3/s)	0.060	0.065	0.042	0.0184
1% AEP (m3/s)	0.117	0.110	0.065	0.040

The properties of the detention system and outlet structures are provided in the below Table 12.

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

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Dated: 3 May 2024

Table 12: RHS Pipe Properties

Basin Properties	
Outlet Properties	2 x RHS pipe 150mm x 100mm on 1% grade to existing kerb in north-eastern corner of lot.
RHS PIPE Inlet Invert at Carpark	RL-10.65m
RHS PIPE Invert at Kerb	RL-10.45m

The proposed system results in a net increase of minor and major flows of 0.0L/s, effectively of stormwater quantity discharge from the site.

Furthermore, the proposed discharge from the kerb weir does not present any actionable nuisance with regards to velocity criteria, due to being discharge over the weir with approximately 0.89m/s velocity in the major event, which is the equivalent depth/velocity product rating of H1 per the Australian Emergency Management Institute guidelines.

5 STORMWATER QUALITY

5.1 SCOPE

The development being smaller than 2500m2 does not trigger the need to address the stormwater quality provisions of the State Planning Policy 2017 (SPP 2017). This section aims to provide a high-level guide on measures to address the potential for an increase in pollutant loads during operational works.

5.2 DURING OPERATIONAL WORKS

The main risk of increased pollutant loads during construction is likely to be from erosion and sediment loss from disturbing the site. The following are the key pollutants that must be addressed during construction.

Table 13: Key Pollutants During Construction

Pollutant	Sources
Litter	Paper, construction packaging, food packaging, cement bags, material offcuts etc.
Sediment	Exposed soil and stockpiled soil/gravel.
Hydrocarbons	Fuel and oils.
Toxic Materials	Cement, asphaltic materials, solvents, cleaning agents etc.
Acids or Alkaline Materials	Acid sulphate soils, cement.

Erosion and sediment control devices will be the main hard control to lower pollutant loads during construction. At operational works design stage an Erosion & Sediment Control Plan (ESCP) will be provided detailing the controls required, however the below provides high-level measures that will be implemented.

Pre-Construction:

- Site personnel are to be informed and made aware of the ESCP and its implementation, maintenance, and decommissioning requirements.

- Sediment fences to all areas requiring bulk earthworks will be installed.
- Major flow paths (kerb and channel, formalised drains etc.) will have erosion & sediment control devices installed upstream.
- The site access/s will have rumble pads installed to limit soil material tracked off-site by vehicles.
- Topsoil (if any) will be stripped and stockpiled to be reinstated after construction. Stockpiled topsoil will be bunded off.

During Construction:

- All bulk earthworks to be kept tidy with batters and stockpiles ironed to minimise erosion by wind and rain.
- Areas of bulk filling to be bunded off during construction.
- Erosion and sediment control devices are to be monitored and maintained for the duration of construction.
- Appropriate waste disposal facilities are to be provided onsite – e.g., skip bins.

Post-Construction:

- Areas to be revegetated to have topsoil reinstated prior to placement of turf or hydro mulching.
- Sediment fencing to remain in place until revegetation has occurred.

6 RATIONAL METHOD

The peak flow (design flow) was determined using the Rational Method based on the IFD Design Rainfall Data (2016) per AR&R recommendations. The Rational Method formula estimates the peak rate of runoff at any location in a catchment as a function of the drainage area, a runoff coefficient (related to the catchment land-use), and the mean rainfall intensity for a duration equal to the time of concentration (i.e. the time required for water to flow from the furthest point of the catchment to the location being analysed).

The formula used is expressed as below:

$$Q = \frac{1}{360} CIA$$

Where,

Q = discharge (m3/s), C = runoff coefficient,

I = mean rainfall intensity over a duration

equal to the time of concentration (mm/hr),

A = catchment area (Ha)

IFD DATA

The intensity data used for the purposes of design and calculation is presented in Table 1. The data has been obtained using the BoM IFD database (2016 Design Rainfall Data System).

Table 14: BoM IFD Design Rainfall Intensity Data (mm/h)

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	158	176	234	274	315	371	415
2 min	132	147	195	229	262	306	341
3 min	125	139	185	217	248	290	323
4 min	120	133	177	208	238	279	311
5 min	115	128	170	200	229	268	300
10 min	96.0	107	142	166	191	225	252
15 min	82.1	91.3	121	142	163	193	216

A. Pre-Development Case

Area of Pervious = 980 sqm = 0.098 Ha, Area of Impervious = 614.22 sqm = 0.0614 Ha, t_c pervious = 15min (Table 4.6.2_QUDM), t_c impervious = 5min (Table 4.6.3_QUDM),

For pervious case,

1% AEP $C_y = F_y \cdot C_{10} = 1.2 \times 0.7 = 0.84$ and 10% AEP Cy = Fy . C10 = 1 x 0.7 = 0.7

For impervious case,

1% AEP Cy = Fy . C10 = 1.2 x 0.76 = 0.912 and 10% AEP Cy = Fy . C10 = 1 x 0.7 = 0.7

Q for Pervious Case

For 1% AEP,

Q = 1/360 x (0.84 x 216 x 0.098) = 0.049 CMS (m3/s)

For 10% AEP,

Q = 1/360 x (0.7 x 142 x 0.098) = 0.027 CMS (m3/s)

Q for Impervious Case

For 1% AEP,

Q = 1/360 x (0.912 x 300 x 0.061) = 0.046 CMS (m3/s)

For 10% AEP,

Q = 1/360 x (0.9 x 200 x 0.061 = 0.030 CMS (m3/s)

B. Post-Development Case

Area of Pervious = 562 sqm = 0.056 Ha, Area of Impervious = 804 sqm = 0.0804 Ha, t_c pervious = 15min,

t_c impervious = 5min,

For pervious case,

1% AEP $C_y = F_y \cdot C_{10} = 1.2 \times 0.7 = 0.84$ and 10% AEP Cy = Fy . C10 = 1 x 0.7 = 0.7

For impervious case,

1% AEP Cy = Fy . C10 = 1.2 x 0.76 = 0.912 and 10% AEP Cy = Fy . C10 = 1 x 0.7 = 0.7

Q for Pervious Case

For 1% AEP,

Q = 1/360 x (0.84 x 216 x 0.056) = 0.028 CMS (m3/s)

For 10% AEP,

Q = 1/360 x (0.7 x 142 x 0.056) = 0.015 CMS (m3/s)

Q for Impervious Case

For 1% AEP,

Q = 1/360 x (0.912 x 300 x 0.080) = 0.060 CMS (m3/s)

For 10% AEP,

Q = 1/360 x (0.9 x 200 x 0.080) = 0.04 CMS (m3/s)

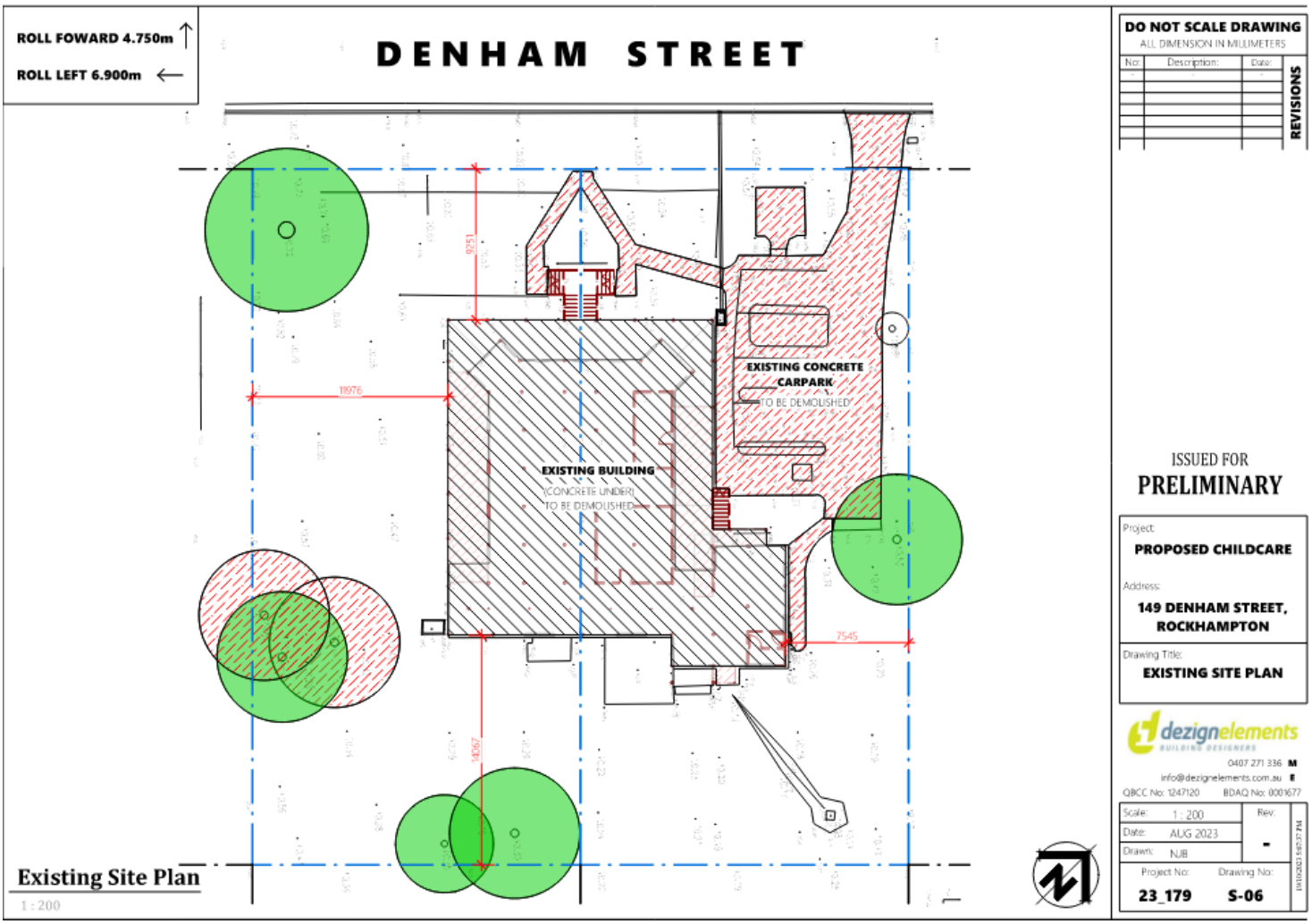
7 CONCLUSION

The aim of this report was to identify a suitable strategy to facilitate the development of 149, Denham Street, Allenstown from an existing residential unit to proposed child day care commercial unit, with regards to providing acceptable stormwater management post-development outcomes.

The development plan includes the proposed car park area, and the impact of development on stormwater runoff was modelled for a range of events. It was found that the post-development discharge is similar to the existing stormwater discharge meeting the requirements of the Rockhampton Council Stormwater Management Planning Scheme Policy.

APPENDIX A – EXISTING INFRASTRUCTURE

Figure 8: Existing Site Plan



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APPENDIX B – PRE-DEVELOPMENT BOX AND WHISKER PLOTS

Figure 9: Pre-development Impervious Area 10% AEP box and whisker plot

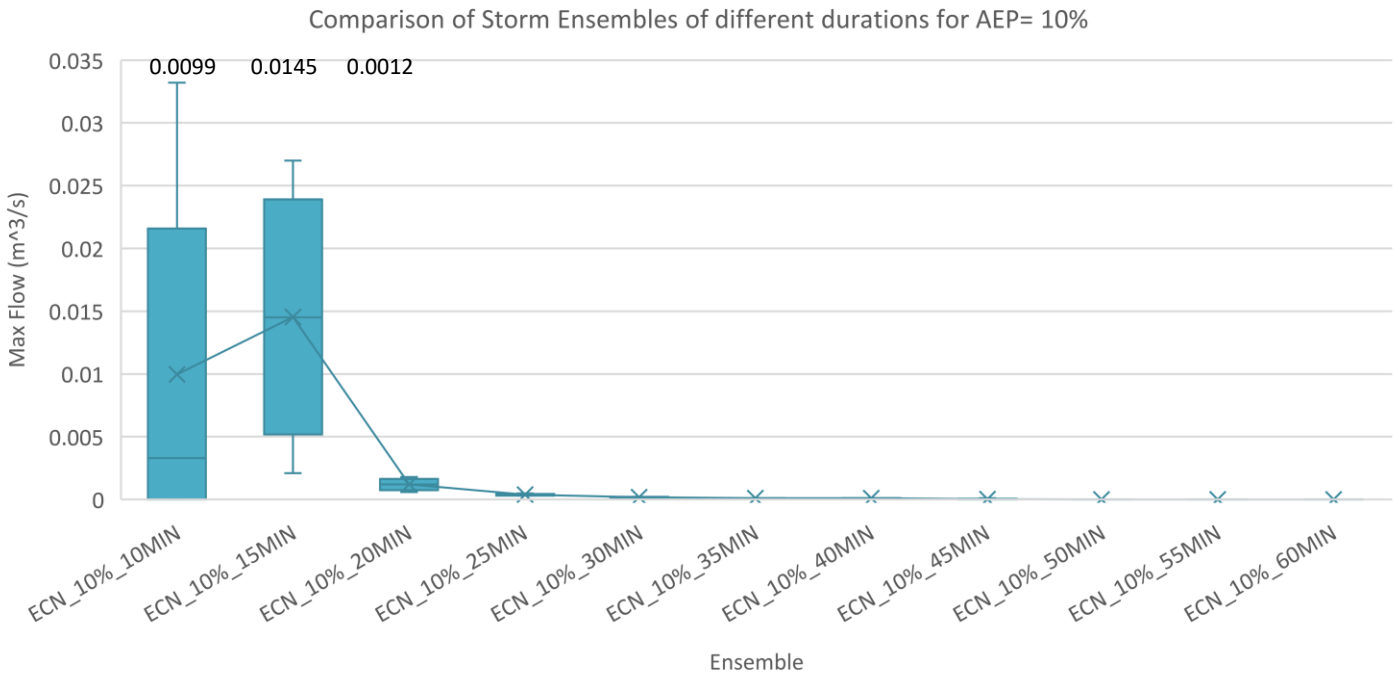


Figure 10: Pre-development Impervious Area 1% AEP box and whisker plot

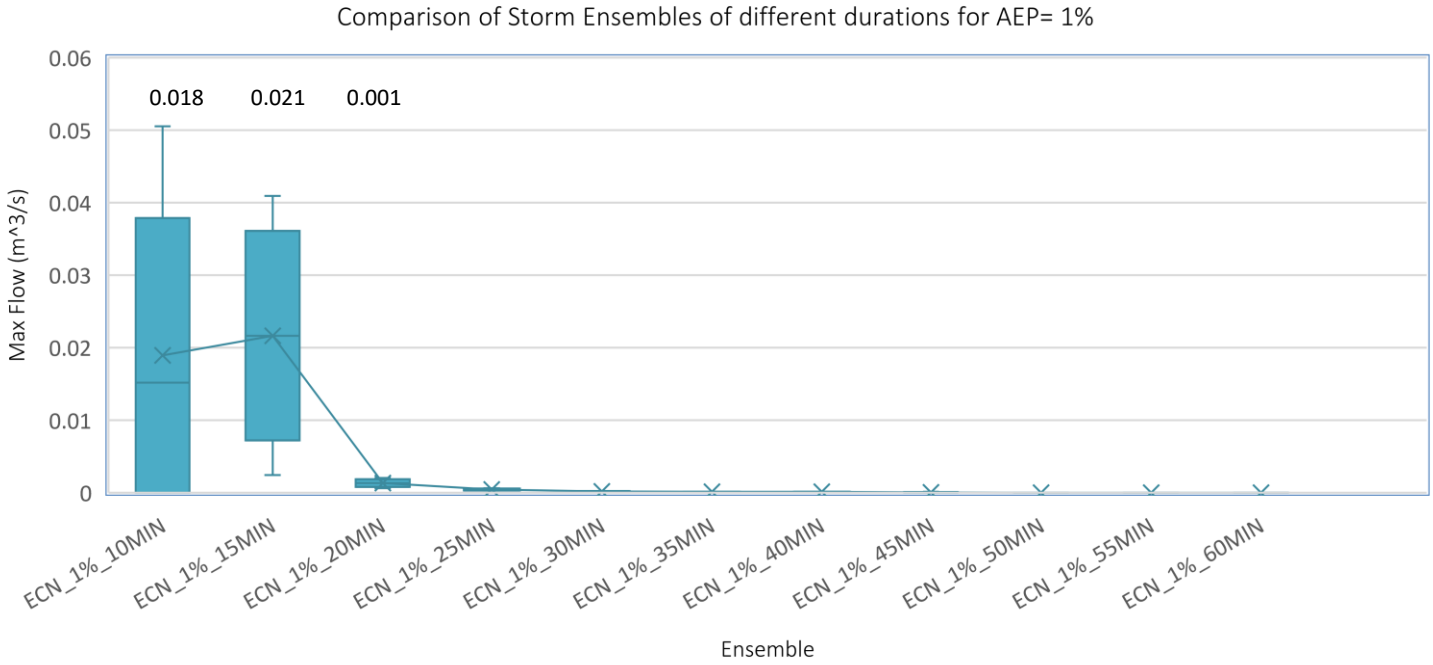


Figure 11: Pre-development Pervious Area 10% AEP box and whisker plot

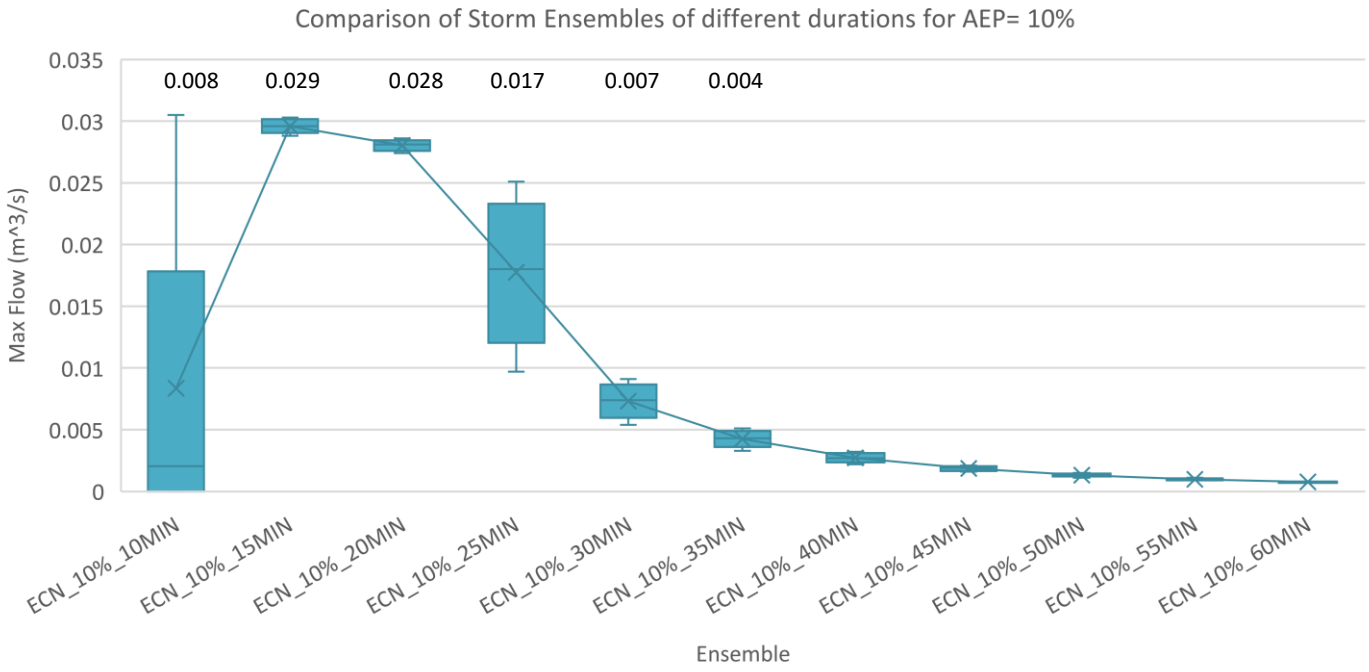
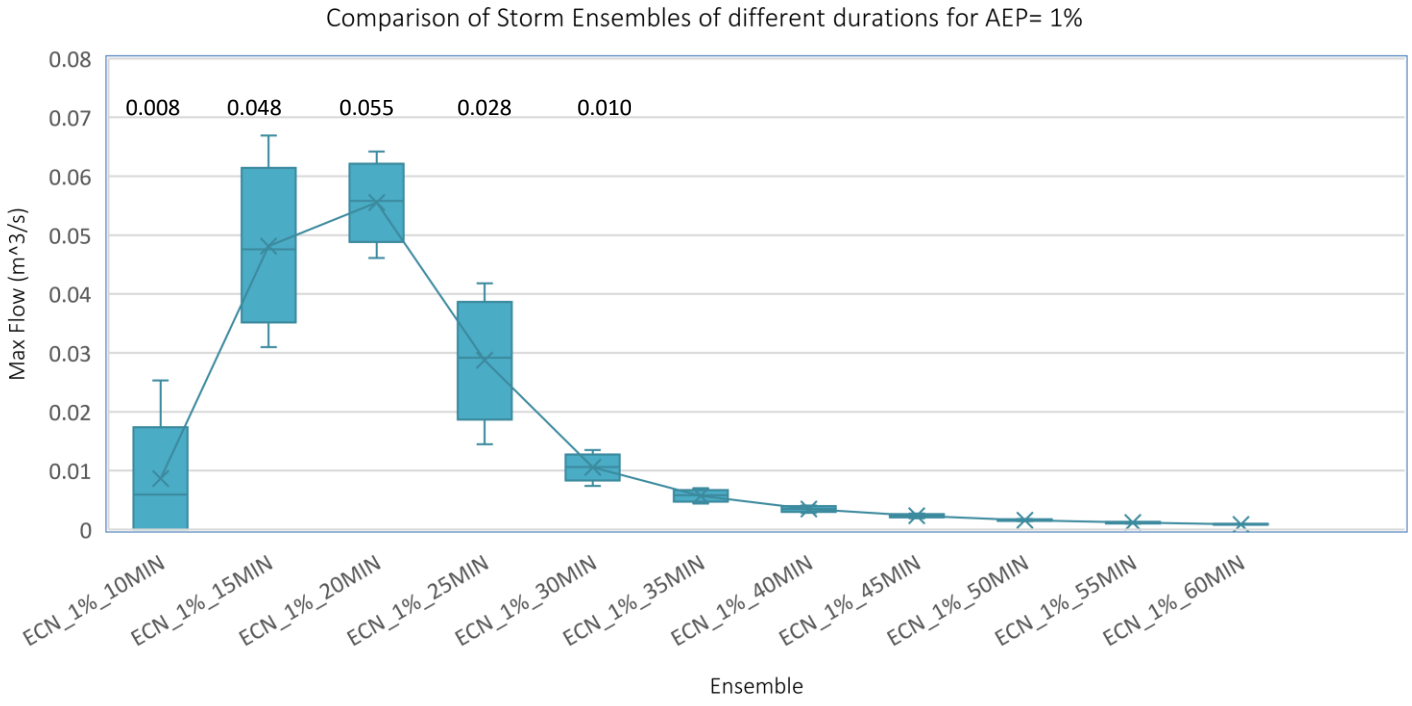


Figure 12: Pre-development Pervious Area 1% AEP box and whisker plot



APPENDIX C – POST-DEVELOPMENT BOX AND WHISKER PLOTS

Figure 13: Post development Impervious Area 10% AEP box and whisker plot

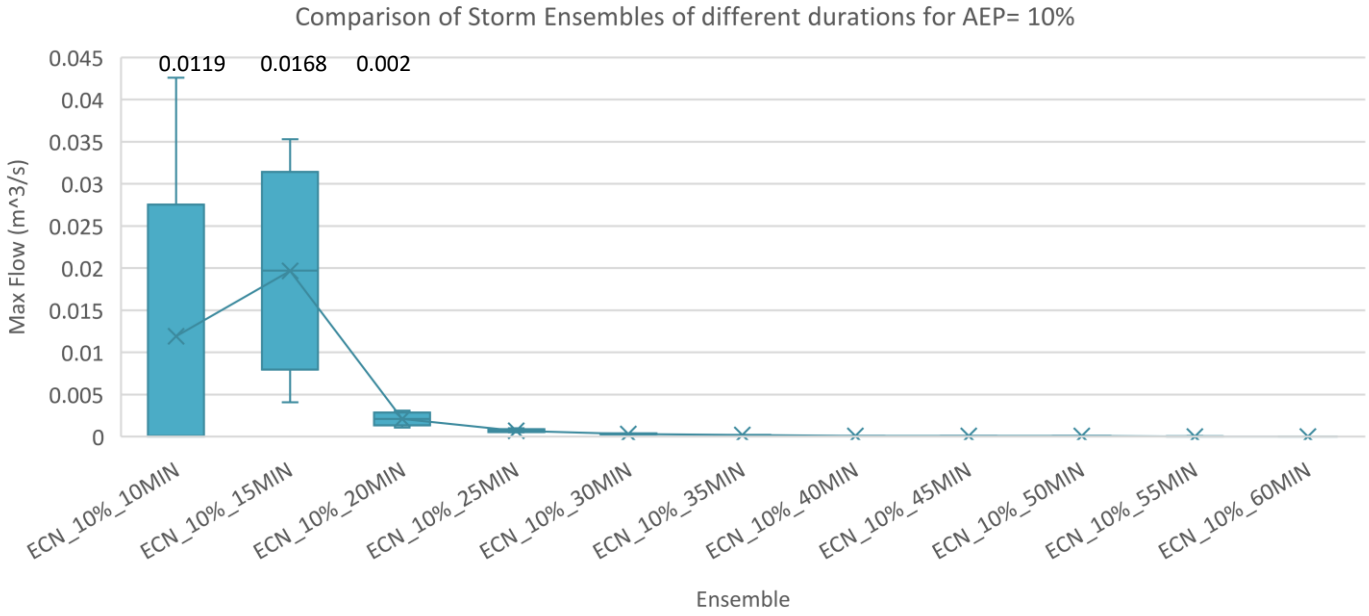


Figure 14:Post development Impervious Area 1% AEP box and whisker plot

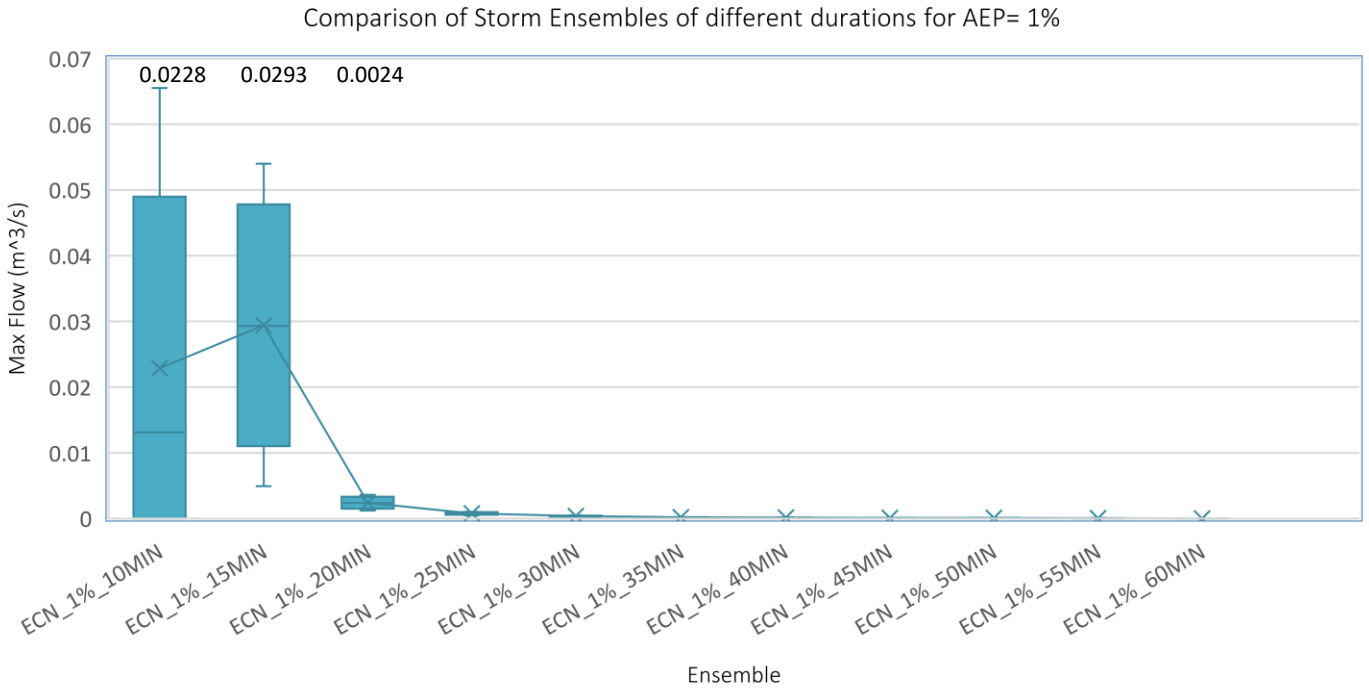


Figure 15: Post development Pervious Area 10% AEP box and whisker plot

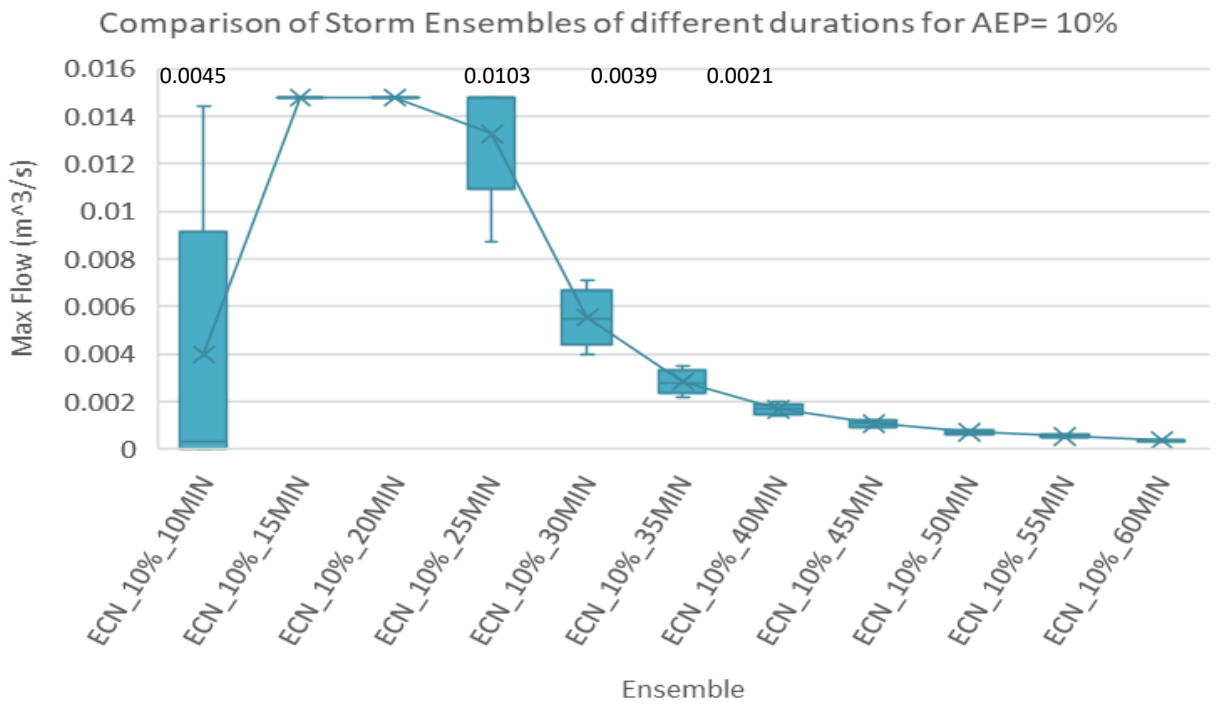
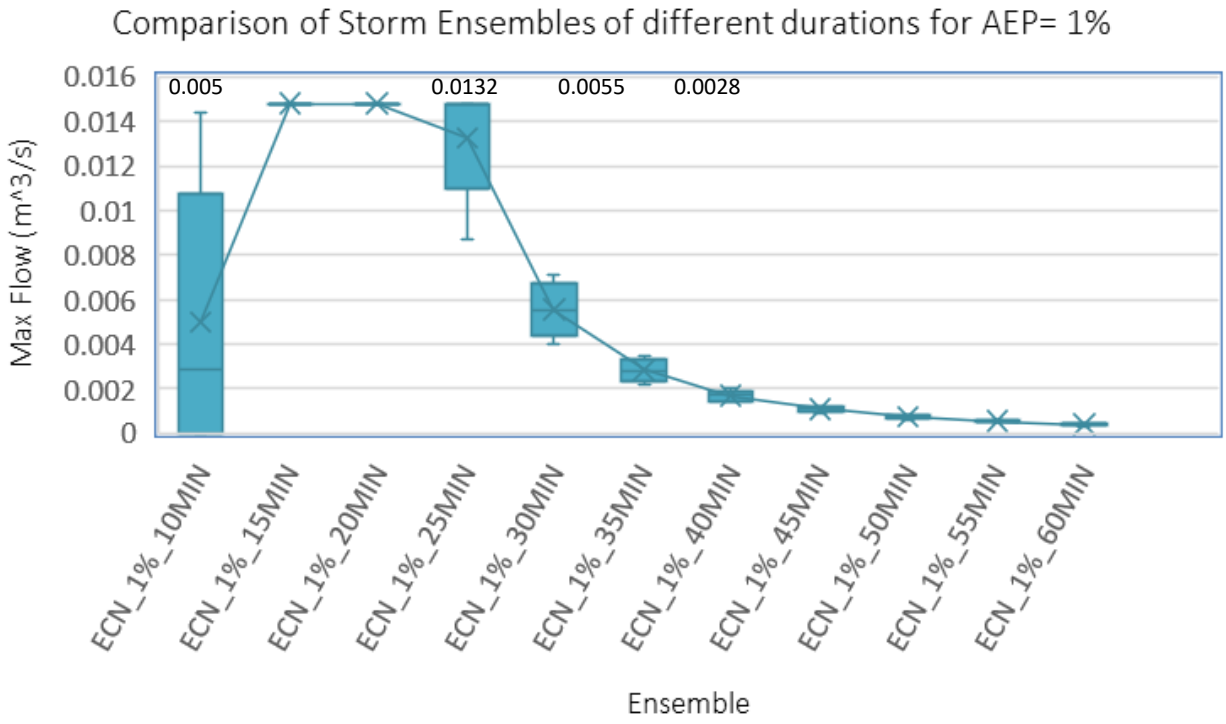


Figure 16: Post development Pervious Area 1% AEP box and whisker plot



APPENDIX D – MITIGATED CASE GRAPHS (EPA_SWMM)

Figure 17:Hydrograph of existing and proposed carpark and building's roof

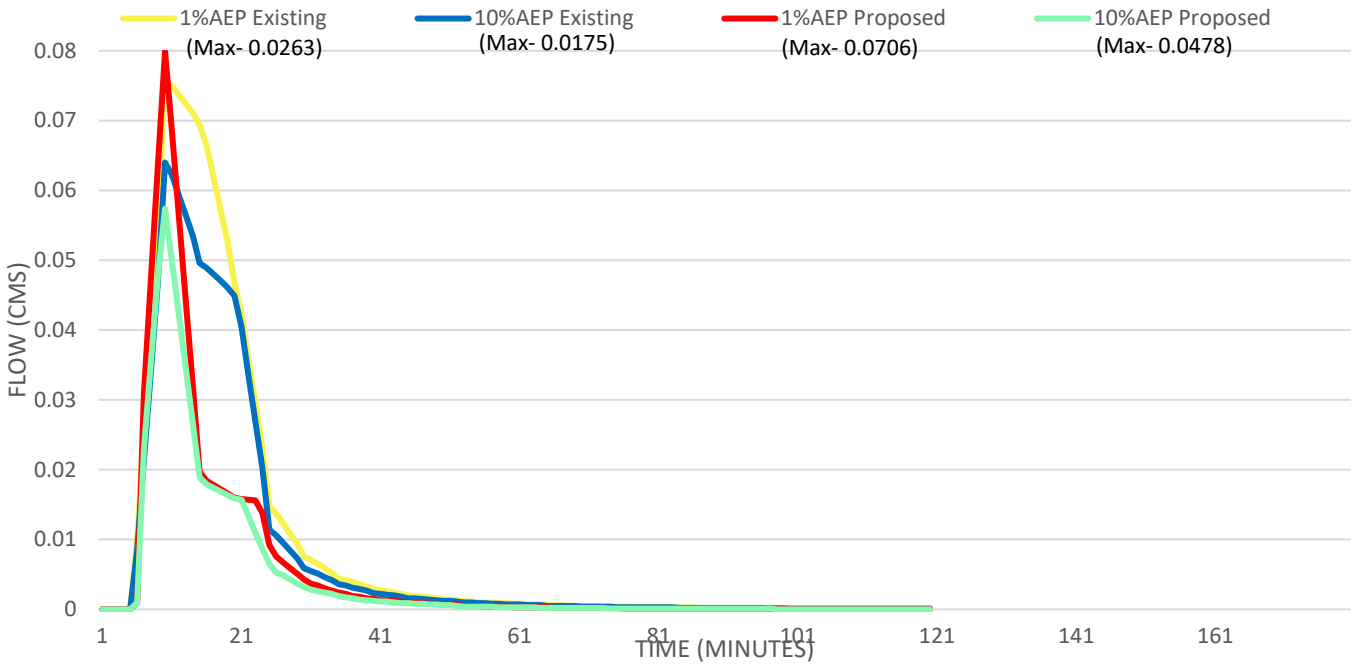


Figure 18: Hydrograph of conduit (RHS Pipe) from carpark to outlet (Kerb)

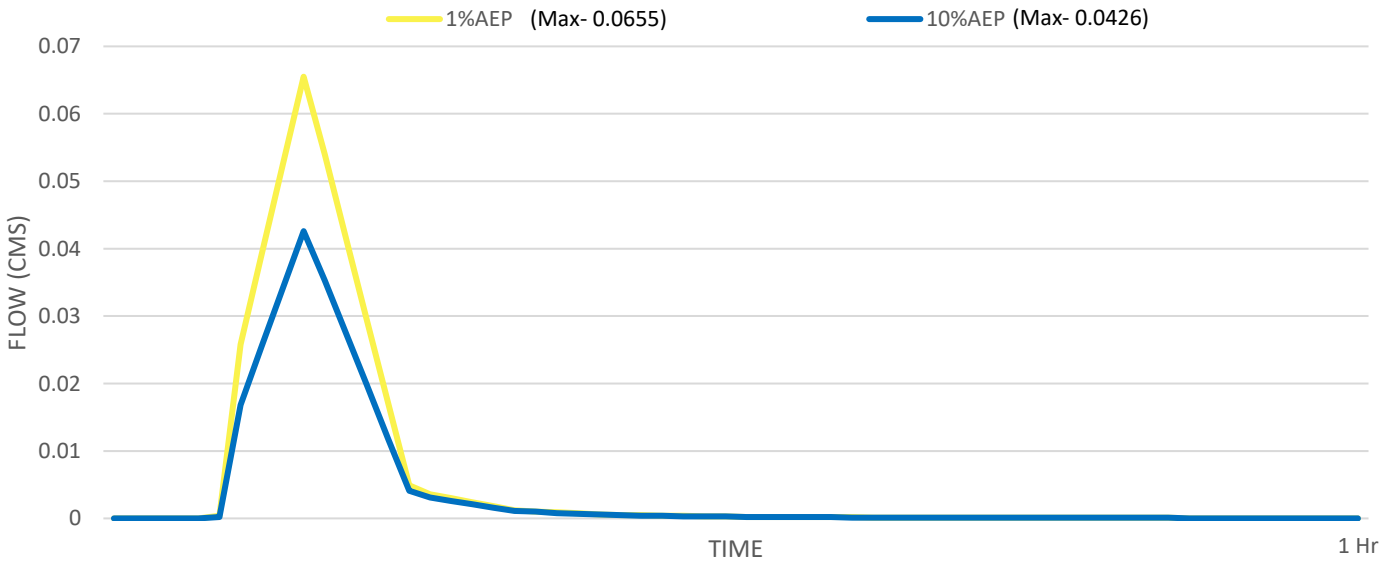
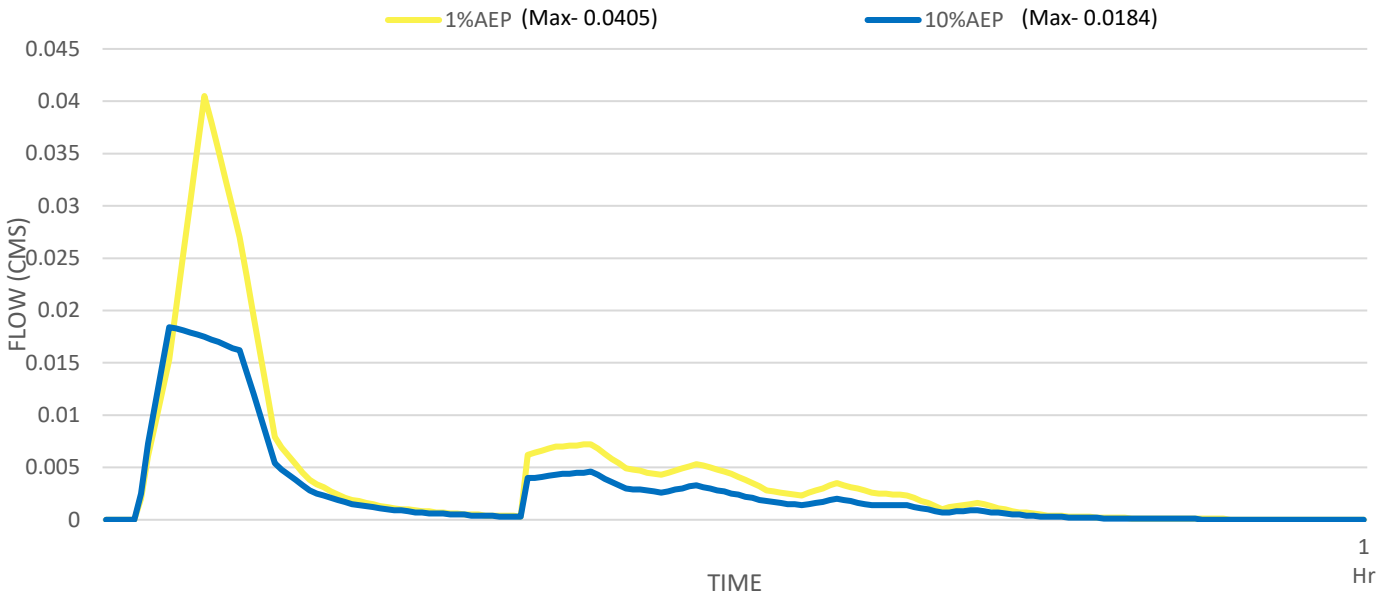


Figure 19: Hydrograph of flow from sump to outlet (Kerb)



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APPENDIX E – EARTHWORKS PLAN

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EARTHWORKS LEGEND

	−0.70m TO −0.30 (CUT)
	−0.30m TO 0.00m (CUT)
	0.00m TO +0.30m (FILL)
	+0.30m TO +0.70m (FILL)

EARTHWORK VOLUMES		
CUT	m^3	32.00
GENERAL FILL	m^3	340.00

EARTHWORKS PLAN

SCALE 1:100

REF. DRG. No.	REFERENCE DRAWING TITLE	REV		DRWN	DSN'D	APP'D	DATE
		A	ISSUED FOR APPROVAL	S.S.J.	S.S.J.	S.M.T.	05.04.24

REGISTERED PROFESSIONAL ENGINEER QUEENSLAND

RPEQ NO: 16203
SCOTT MATTHEW THOMAS

SIGNATURE: ..... DATE: 05.04.2024

SCALE (A1)

IF IN DOUBT ASK

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ANTHONY RAMSEY

149 DENHAM STREET, ALLENSTOWN - OPW APPLICATION

EARTHWORKS PLAN

DRAWING No.		REV.
23-678/EW001	ISSUED FOR APPROVAL	A