# Appendix 7 – Overland Flow Assessment

# 263-273 & 277-281 PENNANT HILLS ROAD, CARLINGFORD Overland Flow Assessment

**13TH October 2023**

**KARIMBLA CONSTRUCTION SERVICES**

| | |
|---|---|
| **Title** | 263-281 Pennant Hills Road Carlingford Design Report |
| **File** | SY21-007-R03-01-Overland Flow Assessment |
| **Author** | Peter McCallum |
| **Review** | Frank Xie |
| **Approved** | Peter McCallum |

| Revision | Comments | Date | Author | Review | Approved |
|---|---|---|---|---|---|
| 01 | For DA Submission | 13/10/2023 | PM | FX | PM |
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# 1. INTRODUCTION

This report has been prepared to inform a Planning Proposal with Parramatta City Council for the proposed development at 263-273 & 277-281 Pennant Hills Road Carlingford.

The purpose of this report is to assess the impacts of the proposed development in the context of the civil infrastructure requirements and has been prepared in accordance with Parramatta City Council's design guidelines and relevant Australian Standards.

In assessing the civil and infrastructure requirements, the report considers, road access requirements, earthworks and stormwater management.

As part of considering the above mentioned elements at the site, this report will consider the following:

- Stormwater Management
    - On Site Detention (OSD)
    - Piped and Overland Flows
    - Water Sensitive Urban Design (WSUD)
    - Sedimentation and Erosion Control
- Overland Flows
    - External Flow and Internal Flows

## 1.1. SITE LOCATION AND DEVELOPMENT PROPOSAL

The site of the proposed development is described as Lot 1 in DP 1219291, Lot 22 in DP 21386, Lot 2-4 in DP 9614 and Lot 61 & 62 in DP 819136. This site is known as 263-273 & 277-281 Pennant Hills Road Carlingford. The location of the site is shown in Figure 1 below.


***Figure 1: Location of Site***

The existing site consists of vacant land and existing residential dwellings with a combined area of 27,982m$^2$. The site falls generally from east to west with a slope of approximately 9%.

The proposed development consists of a mix of retail space, childcare and residential apartments across 7 buildings and over 2 stages. The drainage strategy is sympathetic toward the two zonings across the site, being R4 High Density and RE1 Public Recreation.

The private access road is accessed at two points via Shirley Street.

# 2. OVERLAND FLOW AND FLOODING

## 2.1. GENERAL FLOODING

The subject site is not affected by the 1 in 100 year flood level and all water leaving the subject site is controlled by on-site detention tanks that have been designed in accordance with Council's specifications.

Using the Parramatta flood risk tool, the site is not identified as a risk for flooding.

Council has not provided flood maps for the surrounding areas; however EGIS Consulting engineers has been engaged to model the flood conditions and assess the 5%, 1% AEP and PMF. Please refer to EGIS letter within Appendix.

## 2.2. EXISTING CONDITIONS

The natural fall of the site grades from east to west from RL126.5 (AHD) to RL103.90 at approximately 8-9% across the site. The demolition of the site began as early as 2014 and completed in early 2023. However, the demolition of the existing buildings does not change the grades through the site.

The site is separated into 4 catchments as shown below in figures 2 and 3. Catchment A drains to west by a 375DN stormwater pipe into Shirley Street. Catchment B drains to Shirley Street via overland flow. Catchment C and D has since been demolished, but the previous drainage was discharged into Pennant Hills Road.

There is a portion of Pennant Hills Road which drains to a kerb inlet pit within the road reserve and discharge through Catchment A and connects to Shirley Street Kerb inlet pit.


*Figure 2: Catchment with 2014 Aerial Photo*


*Figure 3: Catchment with 2023 Aerial Photo*

## 2.3. PROPOSED CATCHMENTS AND OVERLAND FLOW

### 2.3.1. EXTERNAL CATCHMENTS

As mentioned in section 2.2, the external catchment (blue hatching from figure 3) from Pennant Hills Road drains to a kerb inlet pit, and the pipe will need to relocate the suit the proposed buildings. DRAINS modelling will be undertaken for the purpose of this realignment to ensure the 375DN pipe is designed to the 5% AEP storm event.

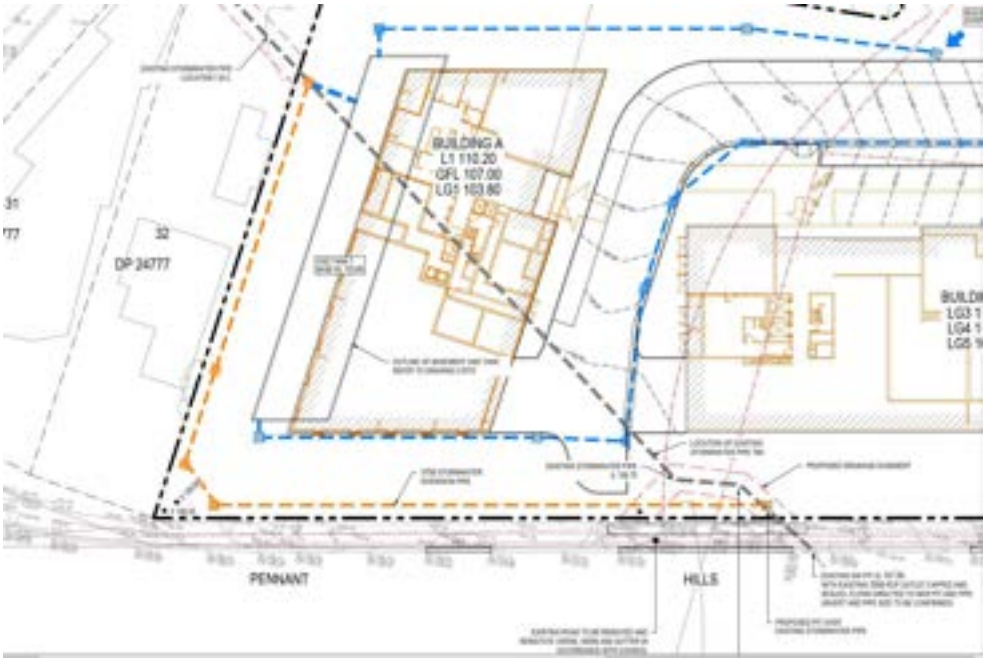



*Figure 4: Stormwater pipe diversion (shown in orange)*

### 2.3.2. INTERNAL CATCHMENTS

Catchments within the site will be separated into 3 different catchments. Catchment A – Stage 1 of the project. Catchment B – noted a future stage.

Catchment A - Stage 1 of the project will include the access road entry/exit for the site and Buildings A, B, C, D and G. (purple hatch in figure 5)

Catchment B – Future Stage will be separated into 2 minor catchments, Catchment B1 - RE1 Zone Catchment and B2 – Building and Road Catchment. (orange hatch in figure 5)

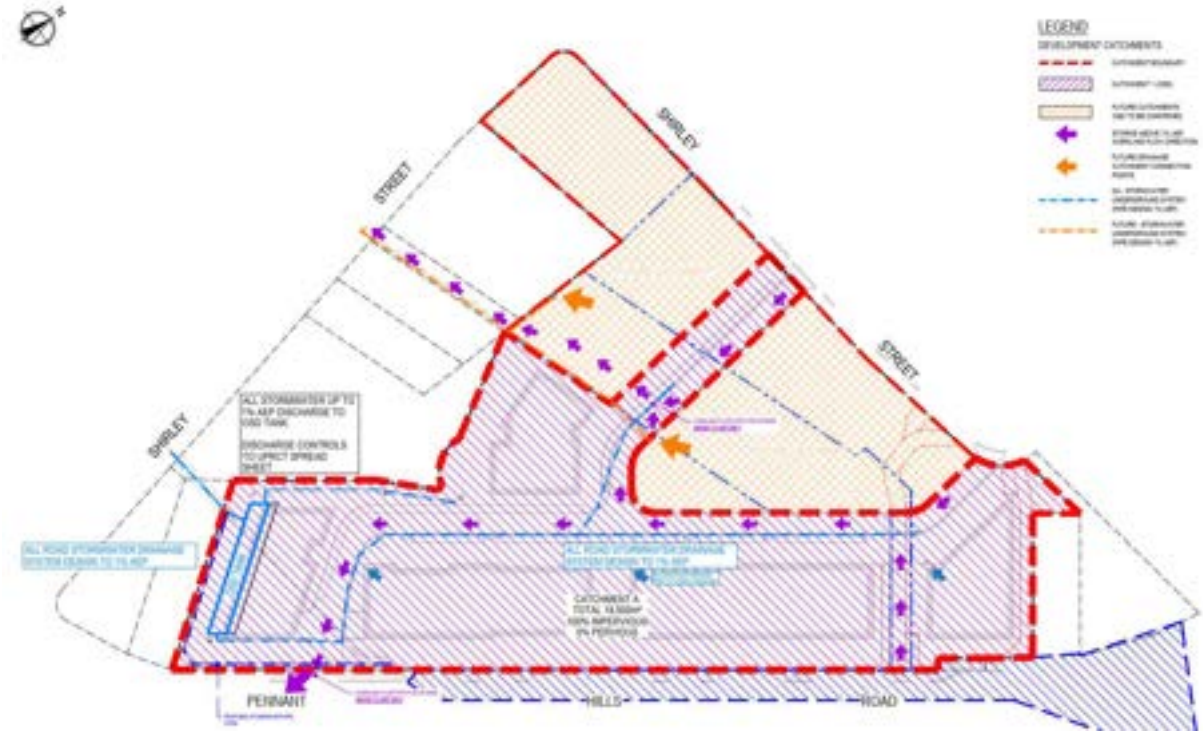



*Figure 5: Internal Catchments*

# 3. OVERALL STORMWATER MANAGEMENT

The natural fall of the site grades from east to west with a pit and pipe, by way of a drainage easement, discharging to Shirley Street drainage network. The proposed drainage design for the site collects runoff, hardstand area, landscape and flows are conveyed to water quality and detention tanks strategically located to cater for the development.

The proposed roof drainage, hardstand areas and landscaping flows are conveyed to the storm filter chamber of the detention tank(s) and roof water to rainwater tanks, for the purposes of water quality modelling. A nominal rainwater volume is proposed, subject to change as required by BASIX.

The stormwater management strategy prepared for this development considers water quality and quantity, attenuating flows and meeting the requirements of the Parramatta City Council Stormwater Disposal Policy, DCP 2011 Part 3 & Engineering Design Guidelines. The guide stipulates design in accordance with the Upper Parramatta River Catchment Trust's (UPRCT) On-site Stormwater Detention Handbook for the modelling of On-Site Detention (OSD) and Council's DCP for Water Sensitive Urban Design (WSUD) approach.

The following sections look at the design of the On-Site Detention and the Water Sensitive Urban Design to achieve Parramatta City Council's requirements and targets.

## 3.1. SITE CONTROLS

The following controls will be applied throughout the site:

- All private and public drainage infrastructures need to be design for 5% AEP with 50% blockage in sag pits and 20% blockage in on-grade pits with safe overland flow in 1% AEP with climate change.
- Using UPRCT Spreasheet V9 to control the post development peak flow up to 1% AEP.
- By using OSD tank system, no impact to neighboring properties.
- MUSIC Modelling reduction results in accordance with Parramatta City council DCP.
- Apply tailwater conditions.

## 3.2. ONSITE DETENTION

Under the requirements identified by Parramatta City Council for On-Site Detention, the OSD has been specified for the project in accordance with UPRCT On-site Stormwater Detention Handbook for the modelling of OSD. For each individual tank, the UPRCT calculation sheet has been used to design the OSD system. The calculation sheets are found in the Appendix of this report.

The OSD catchment requirements of the UPRCT handbook stipulate an OSD storage volume (Site Storage Requirement – SSR) of 455 $m^3$/Ha, for the 1% AEP event or extended detention. The total requirement for the proposed development (all catchments) is 1,274$m^3$ of SSR (1% AEP).

The OSD systems have been designed to cater for the 66% AEP and 1% AEP event with each system containing a primary and secondary control, which can be seen on the civil drawings.

To cater for the site requirements, it is necessary to provide 3 x OSD tanks for the ultimate post-development catchments. This is required to manage catchment characteristics and ensure any bypass is minimised.

The table below identifies the tanks and the buildings / roads that it caters for.

| Proposed Tank | Caters for Building / Road | Catchment ($m^2$) | Bypass ($m^2$) | Required SSR ($m^3$) |
|---|---|---|---|---|
| Tank A | Catchment A | 18,509 | 0 | 843 |
| Tank B1 | Catchment B1 | 4,065 | 0 | 185 |
| Basin/Tank B2 | Catchment B2 | 5,404 | 0 | 246 |

*Table 1: OSD Tanks*

The figure below identifies the catchments and their location on the site, corresponding to the table above.

*Figure 6: OSD Tank Catchment*

To attenuate the flows, each OSD tank is fitted with an orifice plate at each control chamber, sized to meet the Site Reference Discharge (SRD) requirement. The SRD required for the 66% AEP and 1% AEP is 40L/s/Ha and 150L/s/Ha, respectively.

The below tables show the attenuation for the tanks below.

| Tank | 66% AEP Discharge (L/s) | 1% AEP Discharge (L/s) |
|---|---|---|
| Tank A | 74 | 277 |
| Tank B1 | 16 | 61 |
| Basin/Tank B2 | 21 | 81 |

*Table 2: Site Attenuation Flows*

## 3.3. WATER QUALITY MODELING

Rainfall Station used PARRAMATTA NORTH MASONS DR (66124) 6 minutes data from 1988 to 1998 (10 years). It is also available in MUSIC-Link for MUSIC_X.

The water quality for the site has been designed in accordance with Council's stormwater objectives, as documented in Parramatta City Council's Part 3 of DCP 2011. The table below provides the Target Pollutant Removal Efficiencies as follows:

| Pollutant | % Post Development Reduction in Annual Pollutant Load |
|---|---|
| Gross Pollutants | 90% reduction of litter and vegetation larger than 5mm |
| Total Suspended Solids (TSS) | 85% reduction of annual pollutant load |
| Total Phosphorous (TP) | 65% reduction of annual pollutant load |
| Total Nitrogen (TN) | 45% reduction of annual pollutant load |

***Table 3: Target Pollutant Removal Efficiencies***

To determine compliance with this requirement, a full analysis of the water quality of the stormwater discharge leaving the site was undertaken using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software modelling package.

All proprietary product modelled are subject to change to equivalent.

The analysis considered the use of the following devices to provide a treatment train to improve the quality of stormwater discharge leaving the developed site:

Catchment A - Tank A

- 20 x OceanGuard pit inserts collecting road flow.
- OceanProect StormFilter chamber with 8 x Psorb StormFilter in Tank A.

Catchment B1 – Tank B1

- 5 x OceanGuard pit inserts collecting road flow.
- OceanProect StormFilter chamber with 2 x Psorb StormFilter in Tank B1.

Catchment B2 – Basin/Tank B2

- 5 x OceanGuard pit inserts collecting park flow.


*Figure 7: WSUD Catchment*

Piped and surface runoff will be directed through this treatment train prior to discharging into the council drainage system excluding bypass areas, as identified in the civil drawing catchment plan.

- **MUSIC Input Parameters**

Input parameters representing urban catchment areas with varying fractions of effective impervious areas have been adopted in accordance with Parramatta City Council's requirements. Rainfall runoff parameters were based on a predominantly clay soil type consistent with the area.

The post development catchments use 3 sub-catchments, which are represented in MUSIC by source nodes with varying pollutant generation properties. The three types of source node sub-catchments modelled are:

- Roof Area - Roof area draining rainwater tank and the Stormfilter chamber.
- Landscape – Area drains to Stormfilter chamber.
- Driveway & Road – Areas drain to the OceanProtect Psorb and Stormfilter chamber.

Table 4 below shows the input values used for the source nodes in the MUSIC model. It is noted that MUSIC-link is utilised for all source nodes in accordance with Council's requirements.

| Data Type | Source Nodes | | |
|---|---|---|---|
| | Roof | Mixed | Road / Driveway |
| **Area Parameters** | | | |
| Impervious Area (%) | 100% | various | 100% |
| **Rainfall Runoff Parameters** | | | |
| Rainfall Threshold (mm/day) | 1.0 | 1.4 | 1.4 |
| Soil Storage Capacity (mm) | 120 | 120 | 120 |
| Initial Storage (%) | 30 | 30 | 30 |
| Field Capacity (mm) | 80 | 80 | 80 |
| Infiltration Capacity Coefficient - a | 200 | 200 | 200 |
| Infiltration Capacity Exponent - b | 1 | 1 | 1 |
| **Groundwater Properties** | | | |
| Initial Depth (mm) | 10 | 10 | 10 |
| Daily Recharge Rate (%) | 25 | 25 | 25 |
| Daily Baseflow Rate (%) | 5 | 5 | 5 |
| Daily Deep Seepage Rate (%) | 0.0 | 0.0 | 0.0 |

*Table 4: MUSIC Input Parameters*

- **MUSIC Results**

The site has been divided into catchments as shown in the figure below. The engineering drawings prepared by SKY Engineering and Project Management show the water quality measures for the proposed development as well as the catchment plan, consistent with the figure below.

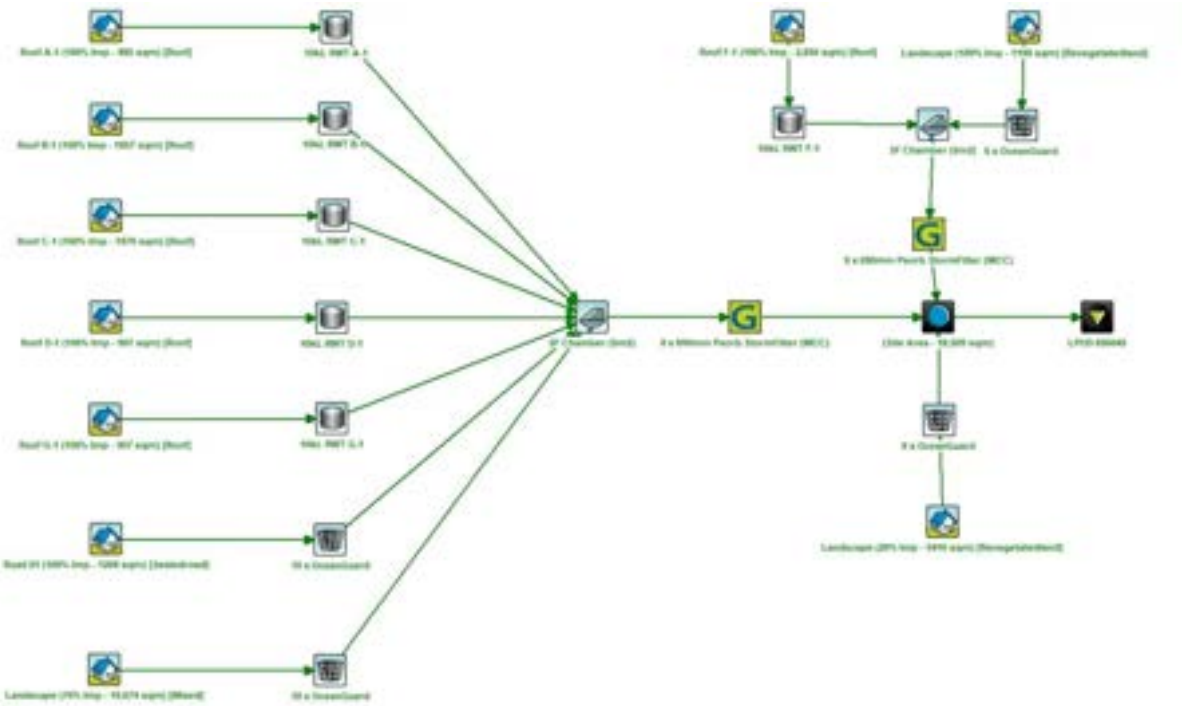


*Figure 8: MUSIC Model Layout*

The below figure is generated from MUSIC and demonstrates compliance with Council's targets.

| | Sources | Residual Load | % Reduction |
|---|---|---|---|
| Flow (ML/yr) | 16.3 | 14.8 | 9.4 |
| Total Suspended Solids (kg/yr) | 1970 | 223 | 88.7 |
| Total Phosphorus (kg/yr) | 4.65 | 1.62 | 65 |
| Total Nitrogen (kg/yr) | 39.7 | 20.6 | 48.1 |
| Gross Pollutants (kg/yr) | 443 | 0 | 100 |

*Figure 9: MUSIC Model Results*

The results show that the proposed storm water treatment train for the development is highly effective, reducing all pollutant loadings by more than 51%. The proposed treatment train meets the water quality objectives for the removal of Gross Pollutants, Total Nitrogen, Total Phosphorous and Total Suspended Solids.

### 3.4. RAINWATER TANKS

Rainwater tanks will be sized in accordance with BASIX requirements, rainwater tanks are not shown in the MUSIC modelling as it is the "worst case scenario". Once rainwater volumes and roof catchments are confirmed, MUSIC model will be updated in detailed design stage.

## 3.5. SEDIMENTATION AND EROSION CONTROL

A Soil and Water Management Plan (SWMP) has been prepared in accordance with the NSW Department of Housing Publication titled: Managing Urban Stormwater – Soils and Construction (2004) for the whole site.

The key objective of the SWMP is:

1. Acknowledging the activities on a construction site which may contribute to erosion, sedimentation and water quality impacts.
2. The implementation of industry best management practices to minimise adverse water quality and sedimentation impacts brought about through construction activities on waterbodies surrounding the work; and
3. Establishment of processes that effectively manage erosion, sedimentation and water quality practices during the life of the project.

The measures shown on the civil drawings will be utilised during construction to cater for sediment runoff in combination with industry best practise sediment controls and as specified on the design plans.

## 3.6. WATER QUALITY MAINTENANCE MANAGEMENT

To ensure the system functions efficiently over the long term, it will be necessary to carry out regular maintenance on the stormwater system and the water quality devices.

The maintenance of the on-site detention system will be undertaken during regular inspections. It will be necessary to prepare a maintenance schedule. This schedule sets out the frequency of maintenance inspections and who should undertake them.

In addition, during construction, erosion and sediment control devices will need to be put in place prior to works commencing.

## 4. CONCLUSION

This report specifies and reviews the proposed road upgrades and stormwater management configuration for the proposed development at 263-273 & 277-281 Pennant Hills Road Carlingford.

The specific findings of the stormwater management plan are:

- The total developable catchment area of 27,982m$^2$, will generate a site discharge of 1,273 litres per second (excluding bypass) in the 1% AEP event, attenuating flows.
- By the use of OSD system, limiting the post development flows; the flows from the site will not exceed pre-development conditions.
- Discharge from the site will be conveyed to the storm filter chamber/ onsite detention tank (including other measures) before discharging into Council stormwater kerb inlet pit infrastructure.
- Water quality target objectives will be achieved through the provision of OceanProtect stormsacks, rainwater tanks and an OceanProtect Filter chamber system.

It is expected that if the stormwater management measures discussed in this report are appropriately implemented, they will provide an effective means of controlling the management of stormwater on the site.

| | |
|---|---|
| Project: | **Carlingford Apartments - TANK 1** |
| Site Address | **263-281 Pennant Hill Road, Carlingford** |
| Job No: | **SY21-007** |
| Designer: | **FX** |
| Telephone: | **0435 144 005** |

## Site Data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OSD Area: | **Upper Parramatta River Catchment** | | | | | | |
| L.G.A | **Baulkham Hills Shire Council** | | | | | | |
| Site Area | **1.8509** | ha | **18,509** | $m^2$ | | | |
| Total Roof Area | **0.8** | ha | **8,000** | $m^2$ | | | |
| Area of Site draining to OSD Storage | **1.6** | ha | **16,000** | $m^2$ | **Satisfactory** | | |
| Residual Site Area (Lot Area - Roof Area) | **1.051** | ha | | | | | |
| Area Bypassing Storage | **0.2509** | ha | | | | | |
| Area Bypassing / Residual Site Area | **23.9%** | | | | **Satisfactory** | | **30% Max** |
| No. of Dwellings on Site | **1** | | | | **Satisfactory** | | |
| Site Area per Dwelling | **1.851** | ha | | | | | |
| Roof Area per Dwelling | **0.800** | ha | | | | | |

## Basic OSD Parameters

| | | Extended Detention | | | Detention | |
|---|---|---|---|---|---|---|
| Basic SSR Vols | Ext Detention Storage | **300** | $m^3$/ha | Total Storage | **455** | $m^3$/ha |
| Basic SRDs | Primary Outlet | **40** | L/s/ha | Secondary Outlet | **150** | L/s/ha |

## OSD Tank Bypass

| | | | | | | |
|---|---|---|---|---|---|---|
| Residual Lot Capture in OSD Tank | **76%** | | | | | |
| Adjusted SRDs | **33** | L/s/ha | | | **102** | L/s/ha |

## OSD Calculations

| | | Extended Detention | | | | Detention | |
|---|---|---|---|---|---|---|---|
| Basic SSR Volume | Ext Detention Storage | **555.27** | $m^3$ | Total Storage | | **842.16** | $m^3$ |
| Total Rainwater Tank Credits | | **0.01** | $m^3$ | | | **0.01** | $m^3$ |
| Storage Volume | | | | Total | | **842.15** | $m^3$ |
| Storage Volume | Ext Detention Storage | **555.26** | $m^3$ | Flood Detention Storage | | **286.89** | $m^3$ |
| OSD Discharges | Primary Outlet | **60.78** | L/s | Secondary Outlet | | **189.26** | L/s |
| RL of Top Water Level of Storage | | **105.500** | m | | | **105.500** | m |
| RL of Orifice Centre-line | | **103.100** | m | | | **103.100** | m |
| Number of Orifices | | 1 | | | | 1 | |
| Estimated Downstream Flood Level | | **100.00** | 1.5 yr ARI | | | **100.00** | 100 yr ARI |
| Downstream FL - RL of Orifice Cente-line | | **-3.10** | **Satisfactory** | **Satisfactory** | | **-3.10** | m |
| Design Head to Orifice Centre | | **2.400** | m | TWL Ext Detn Storage - RL Orifice | | **2.400** | m |
| Calculated Orifice Diameter | | **137** | mm | **Satisfactory** | **Satisfactory** | **242** | mm |

## Overflow Weir & Freeboard Calculation

| | | | | |
|---|---|---|---|---|
| RL of Minimum Habitable Floor Level | | | **106.000** | m |
| RL of Minimum Garage Floor Level | | | **107.950** | m |
| Length of Overflow Weir | | | **2.00** | m |
| Site Runoff Coefficient | **Baulkham Hills Shire Council** | | **0.75** | |
| Storm Intensity (5 min 100 yr ARI) | | | **239** | mm/h |
| Peak Flow over Weir | | | **796.7** | L/s |
| Depth of Flow over Weir | | | **392** | mm |
| Freeboard to Habitable Floor | | **Unacceptable - Min Freeboard = 200 mm** | **108** | mm |
| Freeboard to Garage Floor | | **Satisfactory** | **2058** | mm |

| | |
|---|---|
| Project: | **Carlingford Apartments - TANK B1** |
| Site Address | **263-281 Pennant Hill Road, Carlingford** |
| Job No: | **SY21-007** |
| Designer: | **FX** |
| Telephone: | **0435 144 005** |

## Site Data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OSD Area: | **Upper Parramatta River Catchment** | | | | | | |
| L.G.A | **Baulkham Hills Shire Council** | | | | | | |
| Site Area | **0.4065** | ha | **4,065** | $m^2$ | | | |
| Total Roof Area | **0.2757** | ha | **2,757** | $m^2$ | | | |
| Area of Site draining to OSD Storage | **0.4065** | ha | **4,065** | $m^2$ | **Satisfactory** | | |
| Residual Site Area (Lot Area - Roof Area) | **0.131** | ha | | | | | |
| Area Bypassing Storage | **0** | ha | | | | | |
| Area Bypassing / Residual Site Area | **0.0%** | | | | **Satisfactory** | | **30% Max** |
| No. of Dwellings on Site | **1** | | | | **Satisfactory** | | |
| Site Area per Dwelling | **0.407** | ha | | | | | |
| Roof Area per Dwelling | **0.276** | ha | | | | | |

## Basic OSD Parameters

| | | Extended Detention | | | Detention | |
|---|---|---|---|---|---|---|
| Basic SSR Vols | Ext Detention Storage | **300** | $m^3$/ha | Total Storage | **455** | $m^3$/ha |
| Basic SRDs | Primary Outlet | **40** | L/s/ha | Secondary Outlet | **150** | L/s/ha |

## OSD Tank Bypass

| | | | | | | |
|---|---|---|---|---|---|---|
| Residual Lot Capture in OSD Tank | **100%** | | | | | |
| Adjusted SRDs | **40** | L/s/ha | | | **150** | L/s/ha |

## OSD Calculations

| | | Extended Detention | | | | Detention | |
|---|---|---|---|---|---|---|---|
| Basic SSR Volume | Ext Detention Storage | **121.95** | $m^3$ | | Total Storage | **184.96** | $m^3$ |
| Total Rainwater Tank Credits | | **0.03** | $m^3$ | | | **0.02** | $m^3$ |
| Storage Volume | | | | | Total | **184.93** | $m^3$ |
| Storage Volume | Ext Detention Storage | **121.92** | $m^3$ | | Flood Detention Storage | **63.01** | $m^3$ |
| OSD Discharges | Primary Outlet | **16.26** | L/s | | Secondary Outlet | **60.98** | L/s |
| RL of Top Water Level of Storage | | **108.200** | m | | | **108.200** | m |
| RL of Orifice Centre-line | | **106.950** | m | | | **106.950** | m |
| Number of Orifices | | 1 | | | | 1 | |
| Estimated Downstream Flood Level | | **100.00** | 1.5 yr ARI | | | **100.00** | 100 yr ARI |
| Downstream FL - RL of Orifice Cente-line | | **-6.95** | **Satisfactory** | | **Satisfactory** | **-6.95** | m |
| Design Head to Orifice Centre | | **1.250** | m | TWL Ext Detn Storage - RL Orifice | | **1.250** | m |
| Calculated Orifice Diameter | | **83** | mm | **Satisfactory** | **Satisfactory** | **162** | mm |

## Overflow Weir & Freeboard Calculation

| | | | | |
|---|---|---|---|---|
| RL of Minimum Habitable Floor Level | | | **110.050** | m |
| RL of Minimum Garage Floor Level | | | **110.050** | m |
| Length of Overflow Weir | | | **2.00** | m |
| Site Runoff Coefficient | **Baulkham Hills Shire Council** | | **0.75** | |
| Storm Intensity (5 min 100 yr ARI) | | | **239** | mm/h |
| Peak Flow over Weir | | | **202.4** | L/s |
| Depth of Flow over Weir | | | **156** | mm |
| Freeboard to Habitable Floor | | **Satisfactory** | **1694** | mm |
| Freeboard to Garage Floor | | **Satisfactory** | **1694** | mm |

| | |
|---|---|
| Project: | **Carlingford Apartments - TANK B2** |
| Site Address | **263-281 Pennant Hill Road, Carlingford** |
| Job No: | **SY21-007** |
| Designer: | **FX** |
| Telephone: | **0435 144 005** |

## Site Data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OSD Area: | **Upper Parramatta River Catchment** | | | | | | |
| L.G.A | **Baulkham Hills Shire Council** | | | | | | |
| Site Area | **0.5404** | ha | **5,404** | $m^2$ | | | |
| Total Roof Area | **0.2926** | ha | **2,926** | $m^2$ | | | |
| Area of Site draining to OSD Storage | **0.5404** | ha | **5,404** | $m^2$ | **Satisfactory** | | |
| Residual Site Area (Lot Area - Roof Area) | **0.248** | ha | | | | | |
| Area Bypassing Storage | **0** | ha | | | | | |
| Area Bypassing / Residual Site Area | **0.0%** | | | | **Satisfactory** | **30% Max** | |
| No. of Dwellings on Site | **1** | | | | **Satisfactory** | | |
| Site Area per Dwelling | **0.540** | ha | | | | | |
| Roof Area per Dwelling | **0.293** | ha | | | | | |

## Basic OSD Parameters

| | | Extended Detention | | | Detention | |
|---|---|---|---|---|---|---|
| Basic SSR Vols | Ext Detention Storage | **300** | $m^3$/ha | Total Storage | **455** | $m^3$/ha |
| Basic SRDs | Primary Outlet | **40** | L/s/ha | Secondary Outlet | **150** | L/s/ha |

## OSD Tank Bypass

| | | | | | | |
|---|---|---|---|---|---|---|
| Residual Lot Capture in OSD Tank | **100%** | | | | | |
| Adjusted SRDs | **40** | L/s/ha | | | **150** | L/s/ha |

## OSD Calculations

| | | Extended Detention | | | | Detention | |
|---|---|---|---|---|---|---|---|
| Basic SSR Volume | Ext Detention Storage | **162.12** | $m^3$ | | Total Storage | **245.88** | $m^3$ |
| Total Rainwater Tank Credits | | **0.01** | $m^3$ | | | **0.01** | $m^3$ |
| Storage Volume | | | | | Total | **245.88** | $m^3$ |
| Storage Volume | Ext Detention Storage | **162.11** | $m^3$ | | Flood Detention Storage | **83.76** | $m^3$ |
| OSD Discharges | Primary Outlet | **21.62** | L/s | | Secondary Outlet | **81.06** | L/s |
| RL of Top Water Level of Storage | | **114.700** | m | | | **114.700** | m |
| RL of Orifice Centre-line | | **113.100** | m | | | **113.100** | m |
| Number of Orifices | | 1 | | | | 1 | |
| Estimated Downstream Flood Level | | **102.00** | 1.5 yr ARI | | | **102.00** | 100 yr ARI |
| Downstream FL - RL of Orifice Cente-line | | **-11.10** | **Satisfactory** | | **Satisfactory** | **-11.10** | m |
| Design Head to Orifice Centre | | **1.600** | m | | TWL Ext Detn Storage - RL Orifice | **1.600** | m |
| Calculated Orifice Diameter | | **90** | mm | **Satisfactory** | **Satisfactory** | **175** | mm |

## Overflow Weir & Freeboard Calculation

| | | | | |
|---|---|---|---|---|
| RL of Minimum Habitable Floor Level | | | **119.300** | m |
| RL of Minimum Garage Floor Level | | | **119.300** | m |
| Length of Overflow Weir | | | **2.00** | m |
| Site Runoff Coefficient | **Baulkham Hills Shire Council** | | **0.75** | |
| Storm Intensity (5 min 100 yr ARI) | | | **239** | mm/h |
| Peak Flow over Weir | | | **269.1** | L/s |
| Depth of Flow over Weir | | | **189** | mm |
| Freeboard to Habitable Floor | | **Satisfactory** | **4411** | mm |
| Freeboard to Garage Floor | | **Satisfactory** | **4411** | mm |

# APPENDIX A
# Flood Modelling - Response to RFI

Our Ref: 23-000195

12 October 2023

Ashna Aggarwal
Meriton
Level 11, Meriton Tower
528 Kent Street
Sydney 2000

**Response to RFI – Flood Modelling 263-273 & 227-281 Pennant Hill Road, Carlingford**

Dear Ashna,

This letter is in response to the flooding items within City of Parramatta Council's request for additional information that you have sent us on 9 October 2023. Items relevant to the flood modelling are reiterated below:

- Demonstrate that there is no impact to the neighbouring properties. Storm events to be considered are 5% AEP, 1% AEP, and PMF. Flood impact maps (post-development minus pre-development) should be included.
- Include a map showing existing overland flow paths and proposed flow paths for overland flooding.
- An electronic copy of 2D modelling preferrably TUFLOW needs to be provided to Council with a brief report for review including interaction between Pennant Hills Road and downstream/slope of the site via Shirley Street for :
  - 1% AEP storms including 20% increase in rainfall for climate change.
  - PMF
  - Pre-development (as now)
  - Post-development
  - Post-development with 100% pipe blockage (all overland flow)

Our review of publicly available information in Council and SES websites has identified that previous flood studies have been undertaken that include the subject site:

- Upper Parramatta River Catchment Floodplain Risk Management Study and Plan (Bewsher, 2003)
- Floodplain Risk Management Study for the Carlingford Precinct

It has been noted from Council flood maps that the site is not impacted by existing regional flooding. As part of the development proposal, on-site detention is provided to ensure that the existing peak flows are not aggravated as part of the development to not cause adverse impacts to existing private properties. Pit and pipe network will convey the overland flow though the development. Egis is undertaking the TUFLOW modelling and preparing the flood mapping as required by Council.

Egis will provide a flood impact assessment report which will include GIS flood maps of the study area:

- Pre-development and post-development peak flood depth, level, and hazard for the 5% AEP, 1% AEP, and PMF events
- Post-development peak flood depth, level, and hazard for the 1% AEP climate change scenario

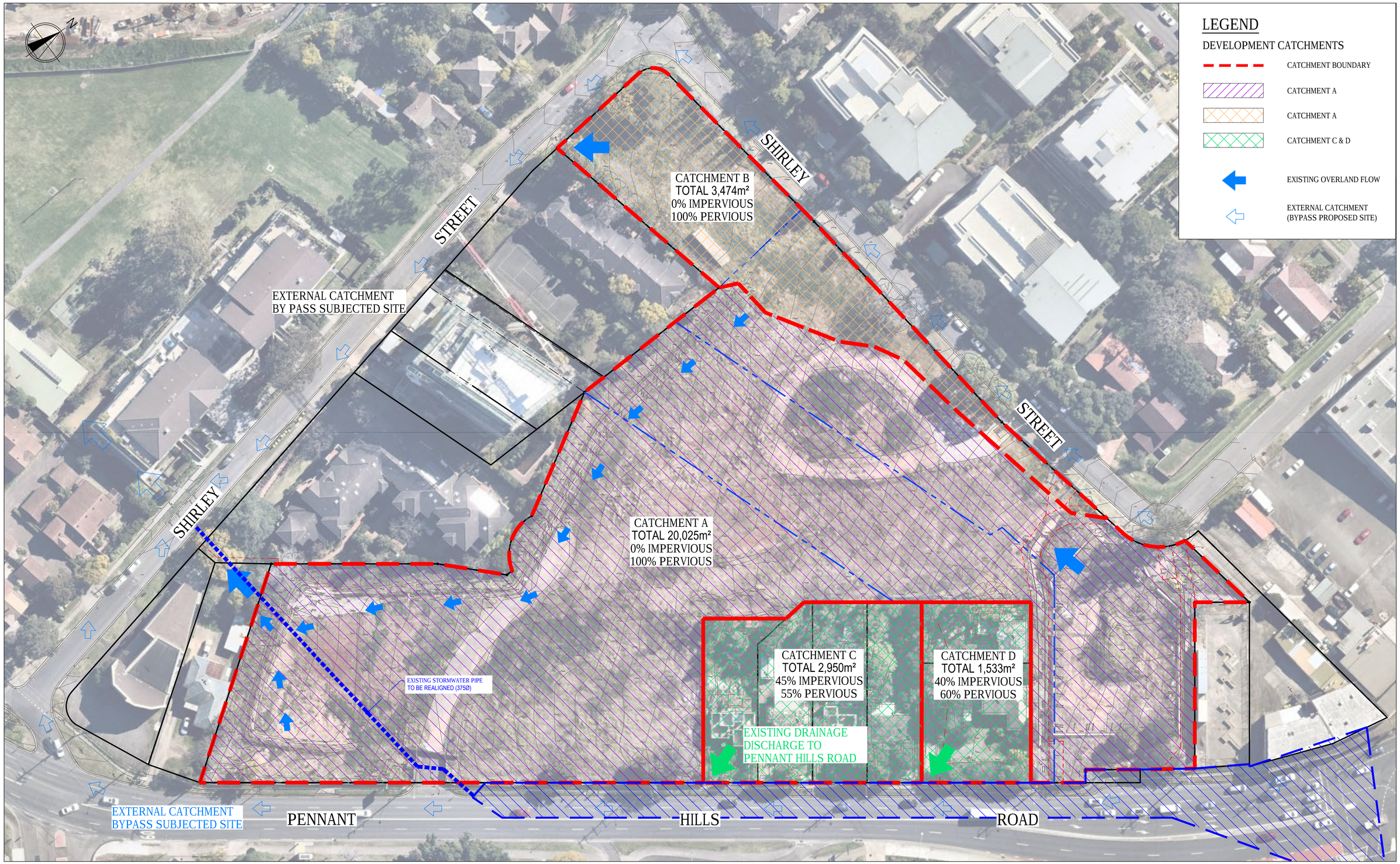
- Post-development peak flood depth, level, and hazard for the 1% AEP with 100% drainage network blockage
- Impact mapping showing change in peak flood levels and flood hazard for the 5% AEP, 1% AEP, and PMF events.

Yours sincerely,

Water Resources Team Lead

**Egis Consulting Pty Ltd**

# APPENDIX B
# Catchment plans




PRE-DEVELOPMENT CATCHMENT

SCALE 1 : 1000

| REV | DESCRIPTION | BY | APRVD | DATE |
|---|---|---|---|---|
| P2 | PRELIMINARY ISSUE | FX | PM | 10/10/2023 |
| P1 | ISSUED FOR APPROVAL | FX | PM | 04/10/2023 |

REVISIONS

BAR SCALES

0 5 10 15 20 25 30m

SCALE 1:500 AT A1 SIZE

CLIENT

KARIMBLA
CONSTRUCTION SERVICES (NSW)
PTY LIMITED

Level 11, 528 Kent Street, Sydney NSW 2000
Tel: (02) 9287 2888 Fax: (02) 9287 2777
Email: info@design.meriton.com.au
Internet: http://www.meriton.com.au

PROJECT

CARLINGFORD
APARTMENTS
263-281 PENNANT HILLS RD
CARLINGFORD

TITLE

PRE-DEVELOPMENT
CATCHMENT PLAN

STATUS

ISSUED FOR INFORMATION

| Drawn | Designed | Checked | Approved |
|---|---|---|---|
| FX | FX | PM | PM |

| Height Datum | Grid | SCALE |
|---|---|---|
| AHD | MGA | AS SHOWN AT A1 SIZE |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| Project No. | Drawing No. | Issue |
|---|---|---|
| SY21-007 | -C-3 300 | P2 |

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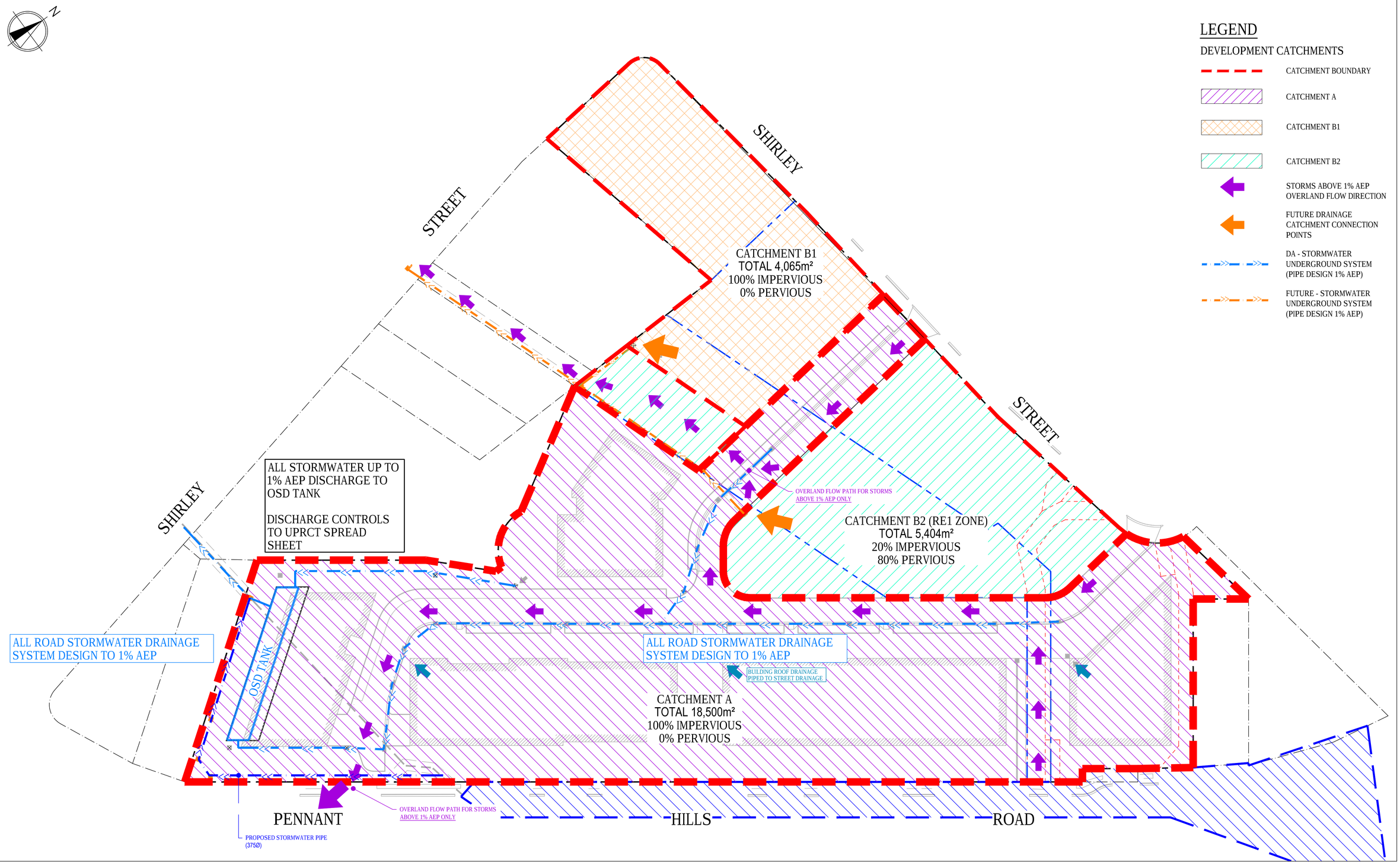


POST-DEVELOPMENT (ULTIMATE) CATCHMENT

SCALE 1 : 500

| REV | DESCRIPTION | BY | APRVD | DATE |
|---|---|---|---|---|
| P1 | PRELIMINARY ISSUE | FX | PM | 10/10/2023 |

REVISIONS

BAR SCALES

0 5 10 15 20 25 30m

SCALE 1:500 AT A1 SIZE

CLIENT

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PROJECT

CARLINGFORD APARTMENTS
263-281 PENNANT HILLS RD
CARLINGFORD

TITLE

POST-DEVELOPMENT (ULTIMATE) CATCHMENT

STATUS

ISSUED FOR INFORMATION

| Drawn | Designed | Checked | Approved |
|---|---|---|---|
| FX | FX | PM | PM |

| Height Datum | Grid | SCALE | |
|---|---|---|---|
| AHD | MGA | AS SHOWN | AT A1 SIZE |


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| Project No. | Drawing No. | Issue |
|---|---|---|
| SY21-007 | -C-3 301 | P1 |

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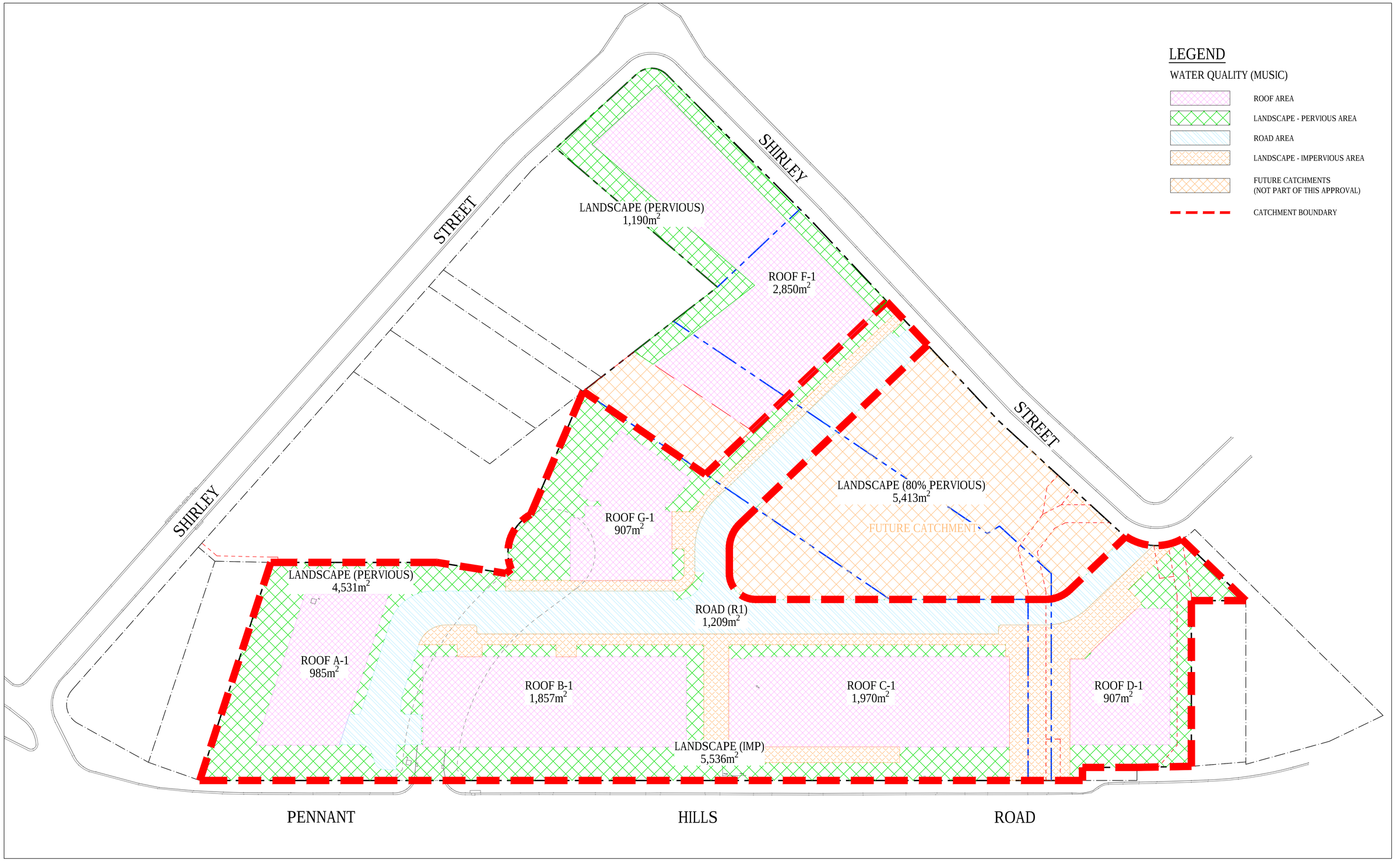


POST-DEVELOPMENT
WATER QUALITY CATCHMENTS

SCALE 1 : 500

| REV | DESCRIPTION | BY | APRVD | DATE |
|---|---|---|---|---|
| P1 | PRELIMINARY ISSUE | FX | PM | 10/10/2023 |

REVISIONS

BAR SCALES

0 5 10 15 20 25 30m
SCALE 1:500 AT A1 SIZE

CLIENT

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PROJECT

CARLINGFORD APARTMENTS
263-281 PENNANT HILLS RD
CARLINGFORD

TITLE

POST-DEVELOPMENT WATER QUALITY CATCHMENT

STATUS

ISSUED FOR INFORMATION

| Drawn | Designed | Checked | Approved |
|---|---|---|---|
| FX | FX | PM | PM |

| Height Datum | Grid | SCALE |
|---|---|---|
| AHD | MGA | AS SHOWN AT A1 SIZE |

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| Project No. | Drawing No. | Issue |
|---|---|---|
| SY21-007 | -C-3302 | P1 |

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