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Y2 Architecture

Stormwater Management Strategy

Our Lady Help of Christians – 28 Selby Rd, Warrnambool VIC 3280

June 2024



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RMG Job Number: 230388

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		Name	Signature	Name	Signature	Date
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1. INTRODUCTION

1.1 SCOPE

RMG has been engaged by Y2 Architecture Pty Ltd to prepare a Stormwater Management Strategy to support the planning application for the development of Our Lady Help of Christians Primary School in Warrnambool. The strategy will demonstrate that the appropriate drainage requirements are met for the proposed development, which includes:

- Conveyance of minor (piped) and major (overland) flows through the site,
- Flood Analysis
- Stormwater Treatment

This drainage strategy has been prepared in consideration of planning scheme clauses 53.18 Stormwater Management in Urban Development, 14.02-1S Catchment Planning and Management, and 19.03-3S Integrated Water Management.

1.2 LOCATION

The site is approximately 3.2 hectares in size and is located at 28 Selby Rd, Traralgon VIC 3844. The proposed developments are shown outlined in yellow and red below and are approximately 0.017 and 0.24 hectares respectively (Figure 1).



Figure 1 – Site Location

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1.3 BACKGROUND INVESTIGATION

1.3.1 SITE FEATURES

The existing survey has been taken in the location of the proposed development and its immediate surroundings; it does not include the road south of the building. The survey shows that there is an existing netball court, playground area and seating along with footpaths and carparks located within the proposed development area which are to be demolished and removed prior to construction of works.

The proposed development area contains a fall from south to north. The highest elevation according to the feature survey provided by Smith Land Surveyors Pty Ltd, dated April 26, 2024, is near the existing water tank on the western boundary which is at RL 31.25 which appears to be an isolated high point. The lowest elevation is located at the north-western corner with an RL of 24.6.

Road access is located to the east of the site via Selby Rd and the south also via Selby Rd.

Refer to appendix A for the site survey information.

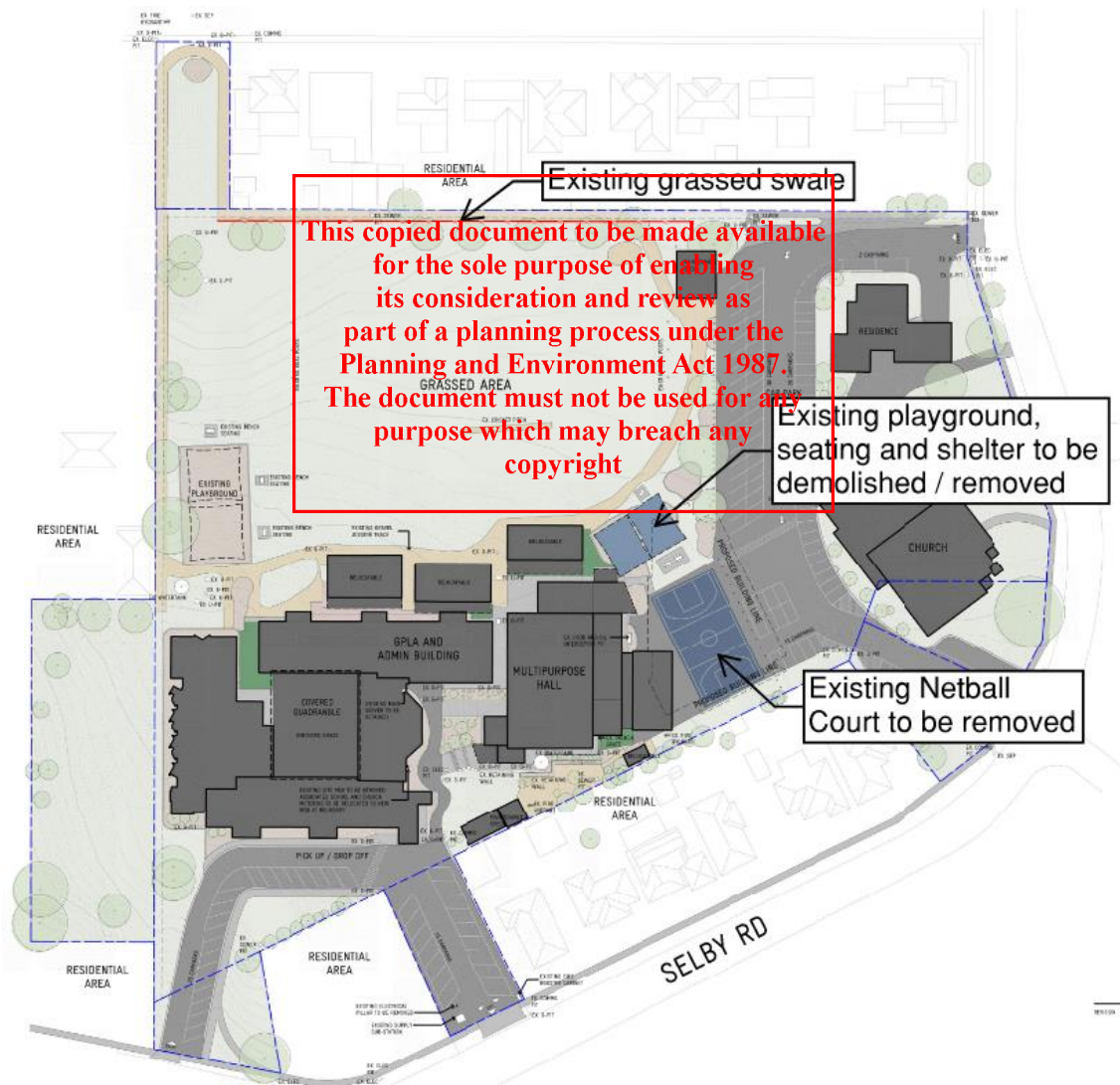


Figure 2 - Site Features

1.3.2 FLOOD DATA

An online flood map (VICPLAN) was used to determine if any flood overlays were present in or around the proposed site. The results show that the proposed development site is not within a flood overlay based on a 1% annual exceedance probability and the land is not subject to inundation. The local catchment management authority also contains data which confirms the information obtained from VICPLAN.

1.3.3 CULTURAL HERITAGE

The proposed development area sits within the Our Lady Help of Christians Primary School site and lies within an area of Aboriginal Cultural Heritage Sensitivity as seen in figure 3 below.

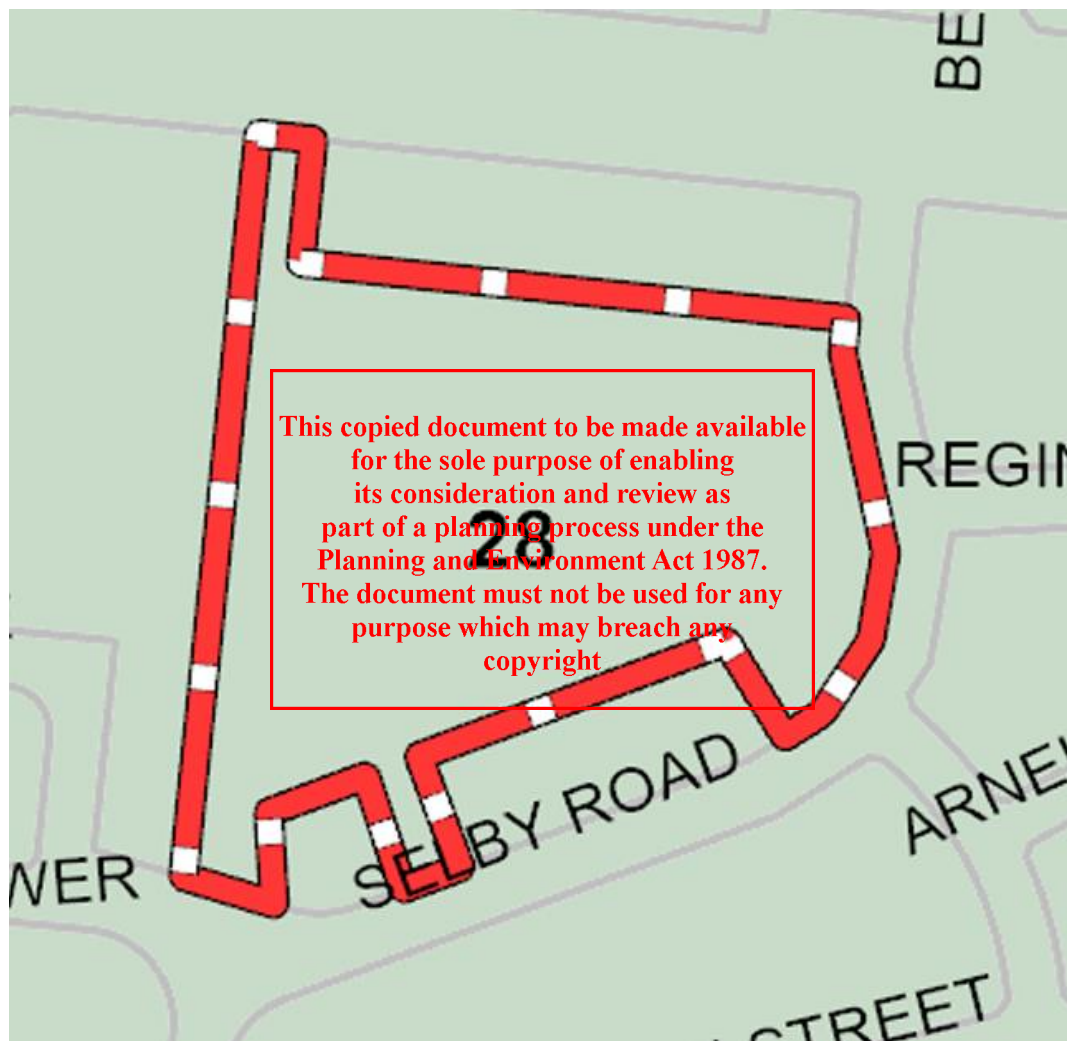


Figure 3 – Environmental Overlays and Zoning

1.3.4 ENVIRONMENTAL OVERLAYS

An analysis was undertaken for the site regarding any environmental overlays, and none were discovered within the proposed development area.

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2. PROPOSED DEVELOPMENT

The proposed development consists of a new building to be constructed between the existing classrooms and existing road/carparks, replacing the existing netball court, part of the multipurpose hall and some carparks. Additionally, a new netball court will be constructed over a portion of the existing grassed area in the Northwest corner of the school. Refer to Figure 4/Appendix B for the proposed development layout.

The stormwater drainage from the proposed netball court will be detained within a pit and pipe system containing a slow-release orifice which discharges to an existing grassed swale along the northern boundary of the site which will receive minor grading works. The proposed building will use a pit and pipe network that discharges to the existing grassed swale. The existing swale dissipates as it approaches the western boundary and, as such, the swale will be redirected north where a proposed bioretention swale will collect water and discharge to the council owned pit and pipe network in the road reserve.

The bioretention swale, swale drain, and onsite detention storage will treat the proposed development's stormwater runoff to meet best practice requirements, as noted in section 6, prior to discharging into the council network.

Refer to Figure 4 below and appendix B for the proposed development layout.

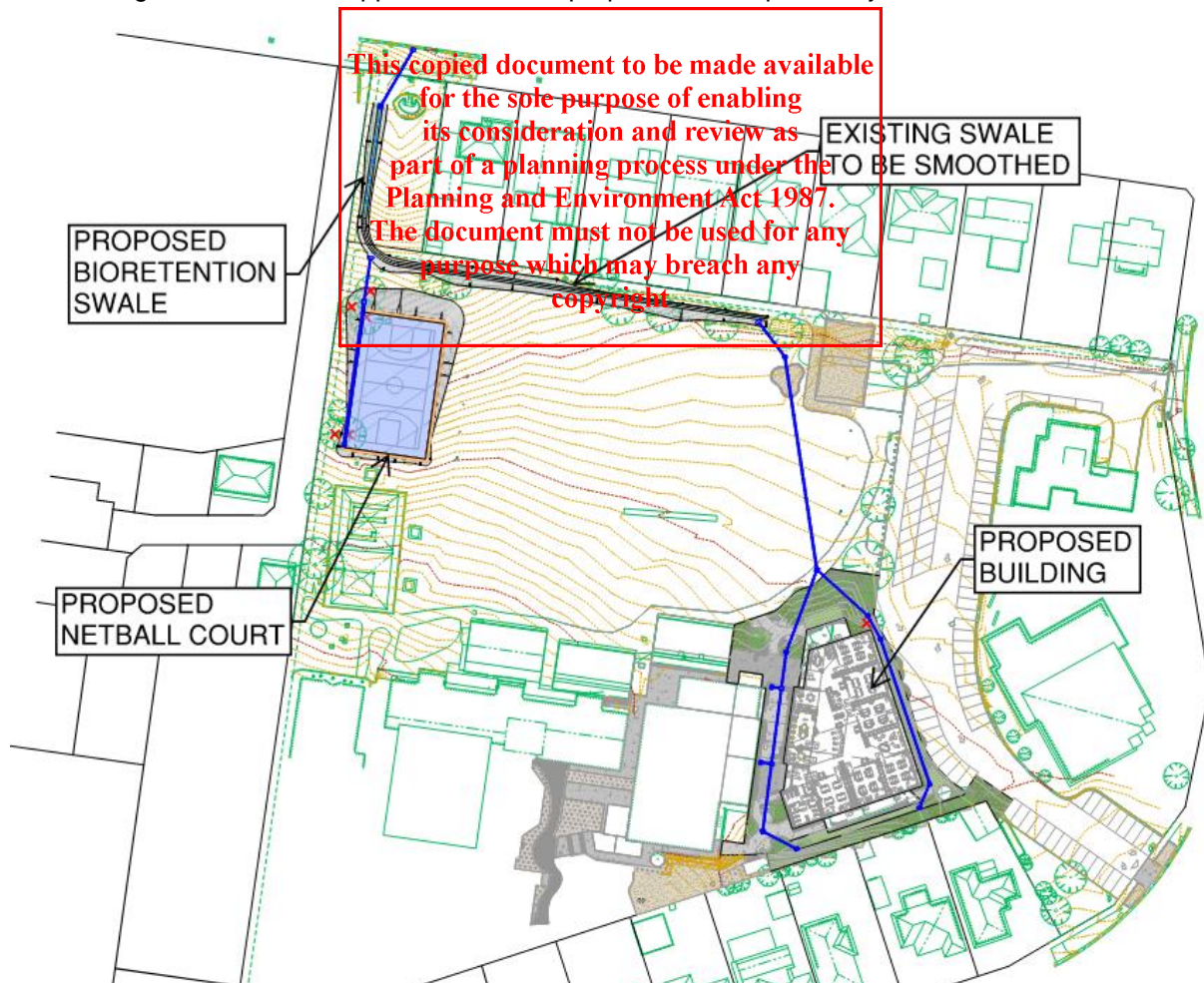


Figure 4 – Proposed Development

3. HYDROLOGY

3.1 CATCHMENTS

Runoff coefficients for the 1% and 20% AEP events were based on values for the different surface types from the Infrastructure Design Manual (IDM) and the calculation methods outlined in the Australian Rainfall and Runoff guidelines. The following runoff coefficients were used in the rational calculations and MUSIC modelling and can be seen in Table 1 below.

Table 1 - Runoff Coefficients

	Runoff Coefficient
Landscaped areas	0.40
Paved Areas	0.90
Roof Areas	0.90
External Catchment	0.70

3.1.1 PROPOSED NETBALL COURT

The netball court development was divided into catchment areas based on the proposed surface contours and proposed development layout and can be seen in Figure 5 below and Appendix C of this report. In the image below, blue and orange represents the paved area (665 m²)

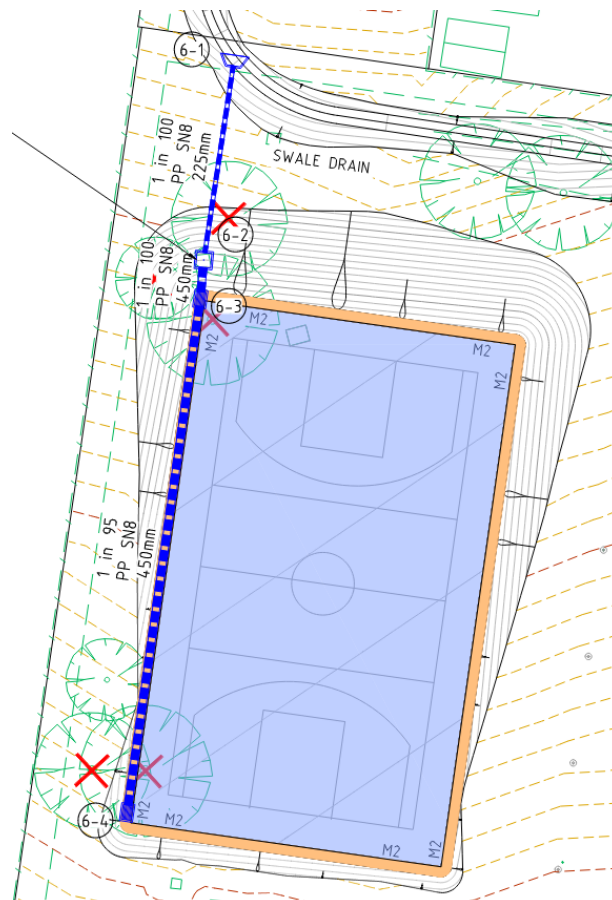


Figure 5 – Netball Court Catchment Plan

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3.1.2 PROPOSED BUILDING SITE

The proposed building site development was also divided into catchment areas based on the proposed surface contours and proposed development layout and can be seen in figure 6 below and Appendix C of this report. The proposed site contains a total of 1607 m² of pervious surface. In comparison, the existing site conditions of the development area is shown in Figure 7 below and divided into catchment areas to show a total pervious surface area of 1661 m². Therefore, the total pervious area decreases with the new development and detention storage is not required. In the images below, the colours refer to the following surface types:

1. Orange - Roof Area (proposed - 1150 m²) (existing – 232 m²)
2. Blue - Paved Areas (proposed - 457 m²) (existing – 1429 m²)
3. Green - Landscaped Areas (proposed - 797 m²) (existing – 743 m²)



Figure 6 – Proposed Catchment Plan

Figure 7 – Existing Catchment Plan

3.2 RAINFALL

Rainfall Intensity Frequency Duration (IFD) information was obtained from the Bureau of Meteorology website for the subject site. In accordance with the Infrastructure Design Manual (IDM), the 2016 IFD rainfall design information was adopted for the strategy. Refer to Appendix E for the IFD coefficients and weather station information.

3.3 DETENTION STORAGE

The proposed underground pipe running along the netball court will be utilised as an onsite detention storage using a baffle wall and orifice plate within the downstream pit. This allows stormwater to be stored within the underground pipe network in rain events up to the 5% AEP discharging at a rate equivalent to a 20% predeveloped AEP.

The volume required for the proposed development was determined to be 4.59 m³ using the Boyd's method of calculation for underground pit and pipe storage. The location of the pit holding the baffle wall and orifice plate can be seen in appendix D, denoted as pit 6-2. Refer to appendix G for detention storage calculations.

4. HYDRAULICS

4.1 LEGAL POINT OF DISCHARGE

The legal point of discharge for the site is likely to be located at the north-western corner of the site to an existing side entry pit within the road reserve.



Figure 8 – Legal Point of Discharge

4.2 MINOR DRAINAGE SYSTEM (20% AEP EVENT)

Flows less than the 20% AEP event from the developed site will be conveyed via an underground pit and pipe network through the development site. This includes runoff collected from the roof, landscaped areas, and paved areas. The minimum approximate size for the minor flows can be seen in Appendix F and Table 2. These sizes are subject to change following detailed design. Before reaching the legal point of discharge, the 4EY flows within the minor drainage system will be treated, as seen in Section 5.

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Table 2 - Minor Drainage Sizing

Minor Drainage	Catchment 1
Design flow (m³/s) (20% AEP)	0.025
Pipe Diameter (mm)	225
Pipe Grade	1 in 100
Pipe Capacity (m³/s)	0

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4.3 MAJOR DRAINAGE SYSTEM (1% AEP EVENT)

In the 1% AEP event, overland (gap) flows from the developed area are to be conveyed by the internal grading through the buildings and towards the large, grassed play area or to the pick up / drop off zone to the east and Selby Rd and will then follow natural overland flow paths. The overland flow paths can be seen in figure 9. The site grading will be designed to ensure 300mm of freeboard to the finished floor levels of the proposed buildings.



Figure 9 – Overland Flow Paths

5. STORMWATER TREATMENT

5.1 WATER QUALITY OBJECTIVES

The proposed development is required to meet stormwater quality objectives outlined in the Urban Stormwater – Best Practice Environmental Management Guidelines. The purposes of this guideline are listed in Table 5 below.

Table 5 - Pollution Reduction Targets

Pollutant	Performance Objective
Total Suspended Solids (TSS)	80% retention of the typical urban load
Total Phosphorus (TP)	45% retention of the typical urban load
Total Nitrogen (TN)	45% retention of the typical urban load
Gross Pollutants (GP)	70% retention of the typical urban load

5.2 RAINFALL AND TRANSPIRATION

Warrnambool Racecourse 2009-2024 daily rainfall meteorological data was taken from the Bureau of Meteorology and used for the MUSIC model in accordance with Melbourne Water MUSIC Guidelines.

The evapotranspiration distribution is also provided in the meteorological data, and the mean annual evapotranspiration is given as 1249mm. The distribution graph is shown in Figure 10 below.

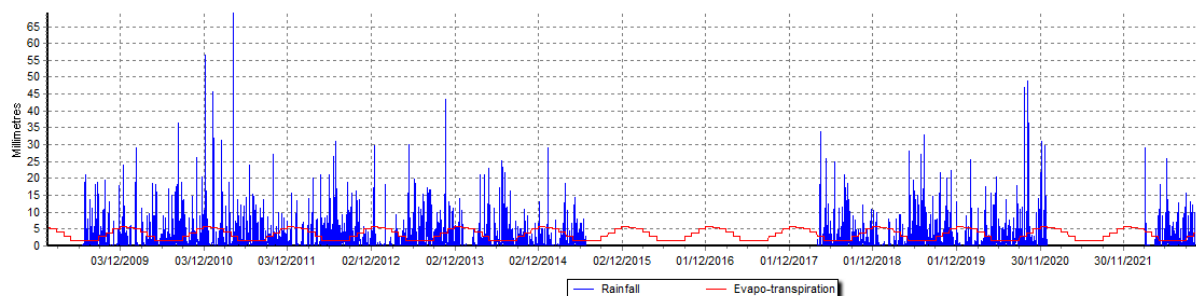


Figure 10 - Rainfall and Evapotranspiration Distribution Graph

Additionally, the soil storage and field capacity are 120mm and 50mm, respectively and pollution concentration data for source node base flows, and storm flows have been adjusted as recommended within the Melbourne Water MUSIC Guidelines.

5.3 TREATMENT

The treatment for the site will utilise a bioretention swale and grassed swale as well as underground onsite detention storages for the proposed netball court and building development. This has been modelled in MUSIC using the appropriate treatment nodes.

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5.4 MODELLING AND RESULTS

Figure 11 shows the MUSIC model layout. The fraction impervious for each area was based on surface types of the corresponding urban node.

The subject site has been separated into 5 different urban nodes which are depicted by each surface type. The urban nodes used in the model are as follows:

- Roof areas
- Landscaped areas
- Paved areas (footpaths and pavements)
- Asphalt roads
- External catchment (combined surface types within the assumed catchment with a calculated fraction impervious)

The treatment train has been modelled based on the civil design drawings (refer appendix D) dated 07/06/2024.

The results of the MUSIC modelling are shown in Figure 12 below. As shown below, the model achieves the treatment objectives listed in Section 5.1 of this report.

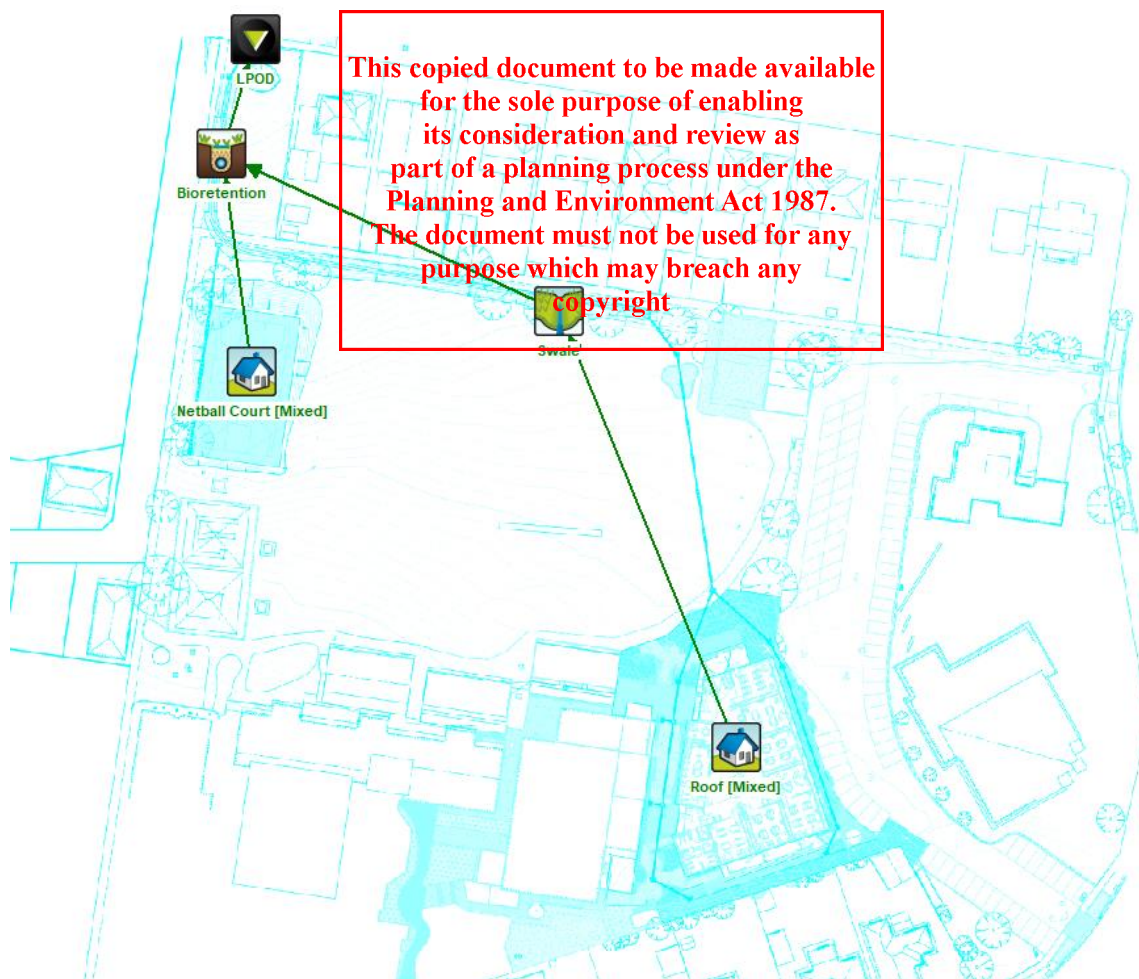


Figure 11 – MUSIC Model Layout

	Sources	Residual Load	% Reduction
Flow (ML/yr)	0.812	0.791	2.5
Total Suspended Solids (kg/yr)	168	1.68	99
Total Phosphorus (kg/yr)	0.332	0.0943	71.6
Total Nitrogen (kg/yr)	2.32	0.483	79.2
Gross Pollutants (kg/yr)	33	0	100

Figure 12 – Treatment Train Effectiveness

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6. SUMMARY/CONCLUSION

As detailed in the above report, the proposed drainage strategy for Our Lady Help of Christians PS is to be as follows:

- Minor drainage flows (20% AEP) will be conveyed via underground pits and pipes to the existing stormwater network.
- Overland flows will be conveyed via the internal site grading and discharged to the swale and consequentially, road reserve where flows will then follow natural overland flow paths.
- A bioretention swale is to be constructed in the north-western corner of the proposed works extent to provide stormwater treatment prior to discharging to the legal point of discharge.
- Existing swale is to be reshaped to smooth over any natural deformations and ensure swale is operating at optimal capacity.
- A detention system for the proposed building and surrounding works is not required since the impermeability of the proposed works is less than that of the predeveloped state.
- A detention system will be required for the netball court works and is calculated to be 4.59 m3.
- A pit with an orifice plate and baffle wall is to be installed within the underground stormwater network running along the proposed netball court to allow detention storage within the pipe network. Oversized pipes are to be used in order to meet site storage requirements.

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Appendix A

EXISTING SITE LAYOUT & FEATURE SURVEY

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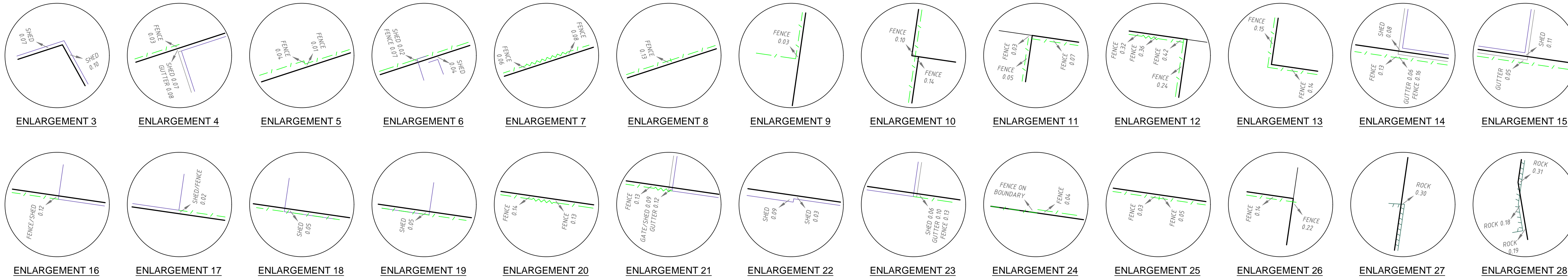
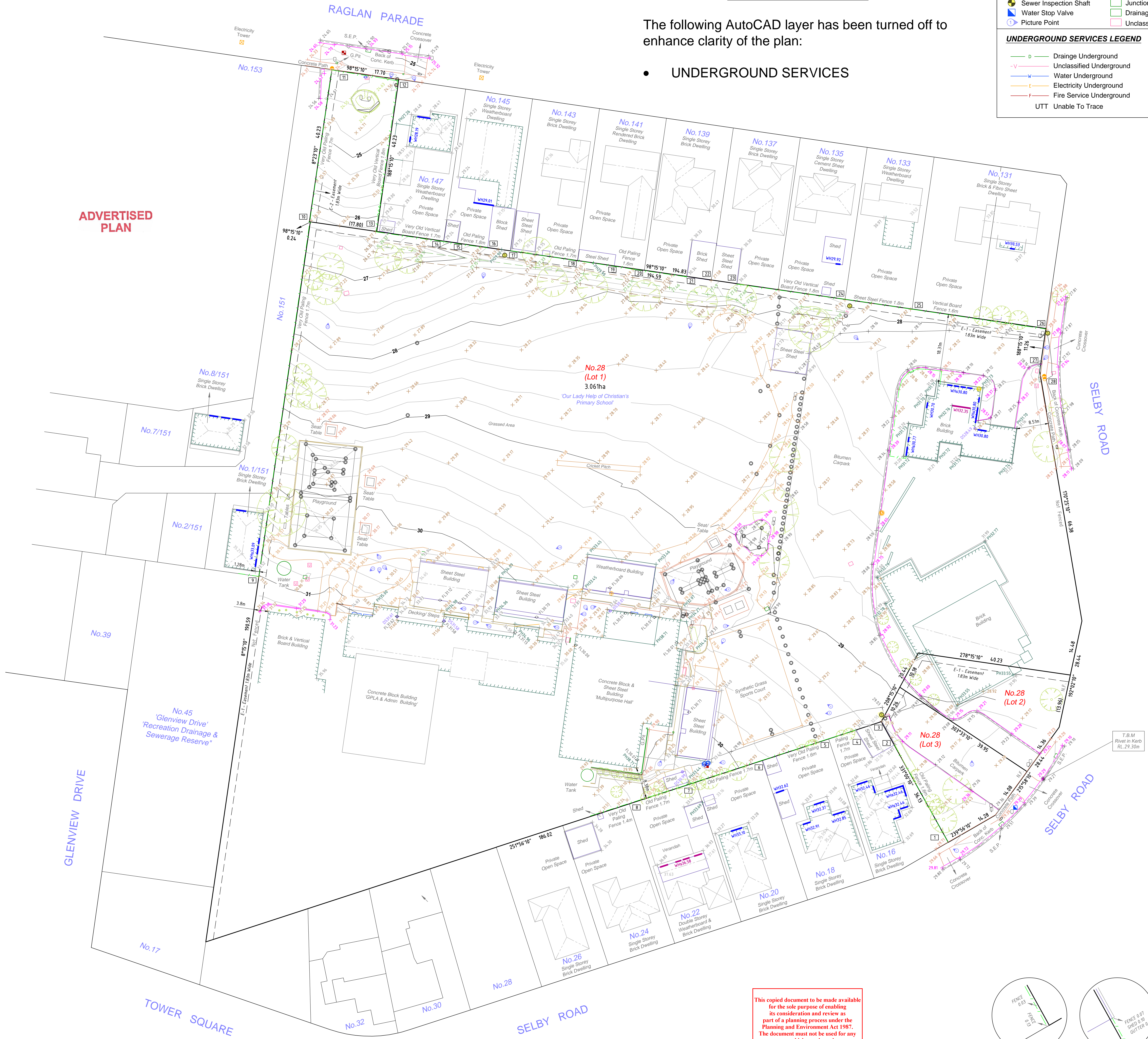
MEASUREMENT ZONE 54

LEGEND	
	Permanent Marker
	Title Peg
	Aluminum Rivet
	Texter Mark
	Etch Mark
	Rod
	Pipe
	Star Picket
	Dumpy Peg
	Nail
	Spike
	Tree
	Pipe Invert
	Sign
	Letter Box
	Bollard
	Electricity Main
	Light Pole
	Electricity Pole
	Electricity Pole/Light
	Electricity Pit
	Telstra Pit
	Gas Meter
	Gas Meter Post
	Sewer Pit
	Sewer Unclassified
	Sewer Vent/Pipe
	Sewer Inspection Shaft
	Water Stop Valve
	Picture Point
	Fire Plug
	Fire Hydrant
	Water Meter
	Water Unclassified
	Stay for Pole
	Unclassified Pit
	Fence
	Gate
	Toe of Bank
	Top of Bank
	Electricity Line Overhead
	Telcomm Line Overhead
	Lower Storey Window
	Upper Storey Window
	Lower Storey Door
	Upper Storey Door
	Highlight Window
	Window Head
	Non Habitable Window Head
	Window Sill
	Door Head
	Door Sill
	Parapet Height
	Floor Level
	Side Entry Pit - S.E.P.
	Grated Pit - G.Pit
	Junction Pit - J.Pit
	Drainage Pit - D.Pit
	Unclassified Pit - U.Pit
UTT Unable To Trace	

NOTE TO CAD USERS

The following AutoCAD layer has been turned off to enhance clarity of the plan:

- UNDERGROUND SERVICES



CERTIFICATE BY LICENSED SURVEYOR

I, Glenn Graham Smith of Smith Land Surveyors Pty. Ltd., 142a Fyans Street, South Geelong 3220, certify that this plan has been prepared from a survey made under my direction and supervision in accordance with the Surveying Act 2004 and completed on 26/04/2024, that this plan is accurate and correctly represents the adopted boundaries and that the survey accuracy accords with that required by regulation 7(1) of the Surveying (Cadastral Surveys) Regulations 2015.

Date: 06/05/2024

Glenn Graham Smith
Licensed Surveyor,
Surveying Act 2004.

Smith Land Surveyors Pty Ltd
Office - 142a Fyans Street, South Geelong, Vic. 3220
P (03) 5222 1234 F (03) 5223 3141
E survey@smiths.com.au
W www.smithlandsurveyors.com.au
ABN 72 142 046 964

GENERAL NOTES:

- Please refer to Certificate of Title for any easements or encumbrances.
- Where occupation including fences and buildings around the perimeter of a property encroach onto the subject site, the land beyond the occupation may not be recoverable as rights of possession may have passed to adjoining owners. Full title dimensions should not be assumed for design purposes / re-fencing until these issues have been resolved with adjoining landowners.
- Where occupation including fences and buildings around the perimeter of a property encroach onto the neighbouring site, the land beyond the title may not be utilized until a formal application with Land Registry is approved. Until this time you must limit any future building works to the current title position.
- The position of fencing and other occupation in relation to the title boundaries has been exaggerated for the purposes of clarity, and only applies at the natural surface level on the date of the survey and does not show any encroachments that may exist below the natural surface. If no offsets are shown, the fencing is in the correct position.

- Before proceeding with any design, construction or use of the land adjoining neighbours must be consulted to resolve any differences between fencing and the title position shown on this plan.
- Feature and levels shown on this plan are intended to aid in general design works only. Any critical dimensions required should be requested independently of this plan.
- Services that were not visible at the time of survey may not be shown on this plan. Prior to any demolition, excavation, or construction on this site the relevant Authorities should be contacted to ascertain detailed locations of all existing services and the possible locations of future services.
- The title boundaries shown beyond the subject land have been imported from the digital Cadastral Map Base (DCMB) and are approximate only.
- Location of buildings beyond site boundaries is indicative only. Information relating to abutting properties has only been shown where visible or accessible.
- Assume any windows shown are for habitable rooms unless stated otherwise. A site visit to determine the exact status of each room should be carried out before proceeding.

TITLE INFORMATION

Title Reference: Vol.8351 Fol.162
Last Plan Reference: LP 53987 (LOTS 1, 2 & 3)
Title Reference: Vol.8155 Fol.837
Last Plan Reference: LP 29755 (LOT 1)

LAND SUBJECT TO EASEMENT:

E-1 - Drainage & Sewerage Easement
E-2 - Drainage Easement

DATUM:

- Levels are based on A.H.D. v. WANGOOM PM 386 with registered RL 29.967m.
- Contour interval is 0.20m.
- Refer to frozen layer 'TRIANGLE' for 3D triangles.

Client	Y2 ARCHITECTURE		
Project	28 SELBY ROAD WARRNAMBOOL 3280		
Details	PARTIAL RE-ESTABLISHMENT & LEVEL & FEATURE SURVEY		
Sheet	1 of 1	Drawn	C.H. Original sheet size A0
Job No.	2024-0167	Scale	A0 = 1:400
AMENDMENTS			
VERSION	DESCRIPTION	SURVEY DATE	SURVEYOR
1	ORIGINAL SURVEY PLAN	26/04/2024	L.E.

Appendix B

PROPOSED SITE LAYOUT

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PROPOSED SITE WORKS LEGEND

- EXISTING BUILDING AND STRUCTURE TO BE RETAINED
- PROPOSED NEW BUILDING & STRUCTURE
- PROPOSED CONCRETE PAVING
- PROPOSED PAVING AND LANDSCAPING
- PROPOSED PAVING AND LANDSCAPING
- PROPOSED TOPPINGS AND LANDSCAPING
- PROPOSED LAWN
- PROPOSED GARDEN BEDS
- INDICATIVE LOCATION OF EXISTING VEGETATION TO BE RETAINED
- INDICATIVE LOCATION OF PROPOSED VEGETATION
- DENOTES SITE BOUNDARY

DENOTES SITE HOARDING. (NOTE: 2.1M HIGH WIRE MESH FENCING) PROVIDE SHADECLOTH TO AREAS AS DIRECTED. ALLOW TO MODIFY LOCATION OF HOARDINGS AS REQUIRED DURING THE COURSE OF THE WORKS

TOTAL PROPOSED CARPARKS: 94

GENERAL NOTES:

- REFER TO CIVIL AND LANDSCAPE DRAWINGS FOR DETAIL RELATING TO LEVELS, PITS, PAVING, ASPHALT, KERBS ETC.
- ARCHITECTURAL DRAWINGS TO BE READ IN CONJUNCTION WITH CIVIL AND LANDSCAPE DRAWINGS AND SPECIFICATIONS FOR EXTENT OF:
- NEW PAVING, PATHS, STEPS AND CROSS-OVERS,
- CONCRETE SAW CUTS AND PAVEMENT TYPE,
- REFER ALSO TO PROPOSED PART SITE PLAN FOR PAVEMENT LAYOUT.
- NOTE: CONCRETE PITS AND PIT COVERS WITHIN COLOURED CONCRETE PAVED AREAS ARE TO BE CONSTRUCTED IN COLOURED CONCRETE TO MATCH PROPOSED PAVEMENT COLOURS WHERE PITS CROSS AREAS OF DIFFERENT COLOURS, CONSTRUCT PIT LIDS WITH VARYING COLOURS TO SUIT.
- SITE CUT & BATTER NOT TO ENDOUR TITLE BOUNDARY. PROVIDE AGGI DRAINS TO BASE OF CUTS. REFER TO CIVIL ENGINEERS' AND LANDSCAPE DRAWINGS FOR DETAILS RE: STORMWATER & AGRICULTURAL DRAINS.
- CUT, REMOVE & GRUB OUT ALL ROOTS TO EXISTING TREES WHERE REQUIRED. REFER TO LANDSCAPE ARCHITECTS DRAWINGS.
- BUILDER TO ENSURE & MAINTAIN PROTECTION TO ADJOINING TREES DURING WORKS.
- SOIL CLASSIFICATION - REFER TO GEOTECH REPORT.
- ALLOW TO MAKE GOOD ALL AREAS OF THE SITE AFFECTED BY THE PROPOSED WORKS. REFER TO ALL DOCUMENTATION AND SPECIFICATION FOR WORKS PROPOSED.

1 225 PROPSD SITE PLAN SCALE 1 : 500

ARCHITECTURE
INTERIOR DESIGN
URBAN PLANNING

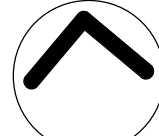
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Issue: DESIGN DEVELOPMENT
NOT FOR CONSTRUCTION

Project: OUR LADY HELP OF CHRISTIANS
WARRNAMBOOL

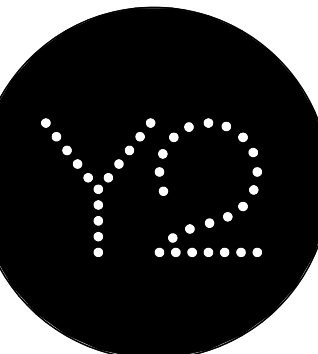
Title: GRADE 5-6 GPLA CENTRE
PROPOSED SITE PLAN



Scale: 1 : 500 @ A1
Date: MAY 2024
Drawn: JO
Checked: Checker

Project: 2117
File:
Drawing: 203

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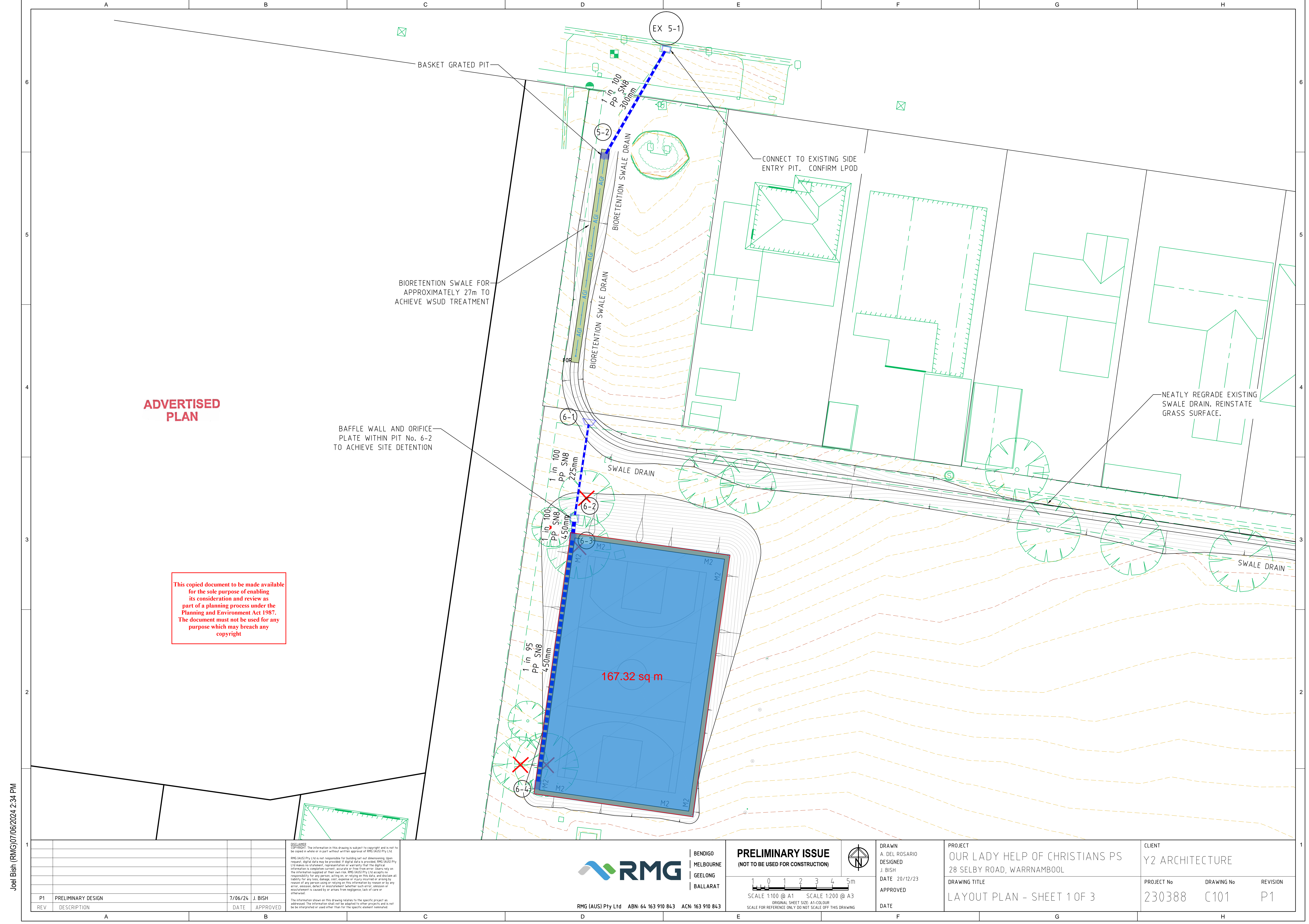
Appendix C

CATCHMENT PLAN

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REV	DESCRIPTION	DATE	APPROVED
P1	PRELIMINARY DESIGN	7/06/24	J BISH

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1 0 1 2 3 4 5m
SCALE 1:100 @ A1 SCALE 1:200 @ A3
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DRAWN A. DEL ROSARIO DESIGNED J. BISH DATE 20/12/23 APPROVED DATE

PROJECT
OUR LADY HELP OF CHRISTIANS PS
28 SELBY ROAD, WARRNAMBOOL
DRAWING TITLE
LAYOUT PLAN - SHEET 1 OF 3

CLIENT
Y2 ARCHITECTURE

PROJECT No	DRAWING No	REVISION
230388	C101	P1

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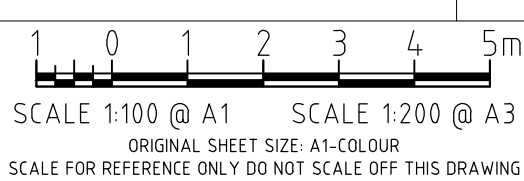
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LAYOUT PLAN - SHEET 3 OF 3

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DRAWING No
C103
REVISION
P1

Appendix D

CIVIL DESIGN DRAWINGS

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OUR LADY HELP OF CHRISTIANS PS

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CIVIL DRAWINGS

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DATE

PROJECT
OUR LADY HELP OF CHRISTIANS PS
28 SELBY ROAD, WARRNAMBOOL

DRAWING TITLE
COVER SHEET

CLIENT
Y2 ARCHITECTURE

PROJECT No	DRAWING No	REVISION
230388	C000	P1

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INDEX PLAN		
DWG No.	TITLE	SHEET No.
230388-C-000	COVER SHEET	000
230388-C-001	INDEX AND LOCALITY PLAN	001
230388-C-002	GENERAL NOTES	002
230388-C-010	TYPICAL DETAILS	010
230388-C-100	KEY PLAN	100
230388-C-101	LAYOUT PLAN 01	101
230388-C-102	LAYOUT PLAN 02	102
230388-C-103	LAYOUT PLAN 03	103
230388-C-104	LAYOUT PLAN 04	104
230388-C-300	PIPE LONG SECTION 1	300
230388-C-301	PIPE LONG SECTION 2	301
230388-C-302	PIT SCHEDULE	302

LEGEND	
	TITLE BOUNDARY
	PROPOSED CONTOURS
	EXISTING CONTOURS
	SPOT ELEVATION
	PROPOSED B2/B3 KERB
	PROPOSED B1 KERB
	PROPOSED SWALE DRAIN
	PROPOSED Ø100mm AG DRAINAGE PIPE WITH FILTER SOCK.
	PROPOSED STORMWATER PIPE
	PROPOSED STORMWATER PIT
	EXISTING STORMWATER PIPE
	EXISTING STORMWATER PIT
	EXISTING SEWER MAIN
	EXISTING OVERHEAD POWERLINE
	EXISTING WATER MAIN
	EXISTING TELSTRA
	EXISTING UNDERGROUND ELECTRICAL CABLE
	UNCLASSIFIED UNDERGROUND SERVICE

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LOCALITY PLAN

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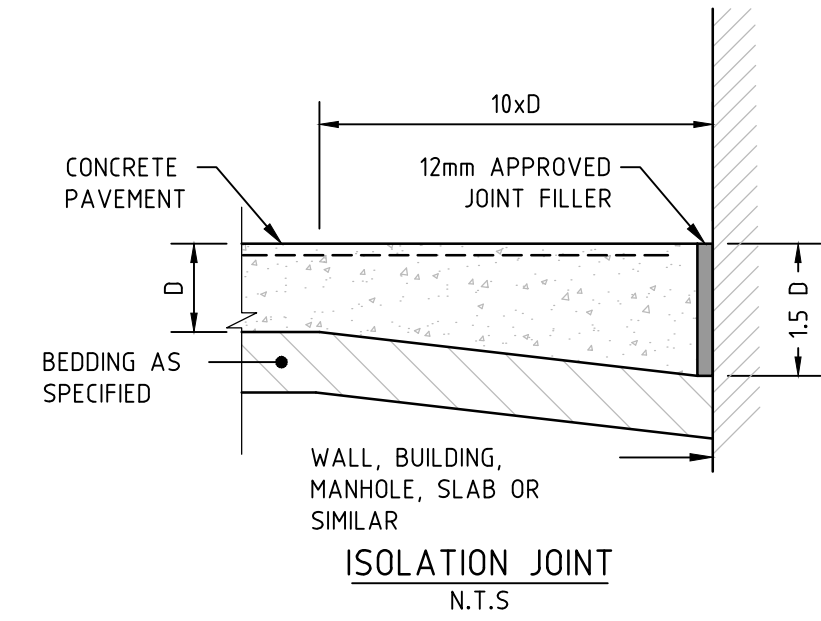


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DATE

PROJECT
OUR LADY HELP OF CHRISTIANS PS
28 SELBY ROAD, WARRNAMBOOL
DRAWING TITLE
INDEX AND LOCALITY PLAN

CLIENT
Y2 ARCHITECTURE

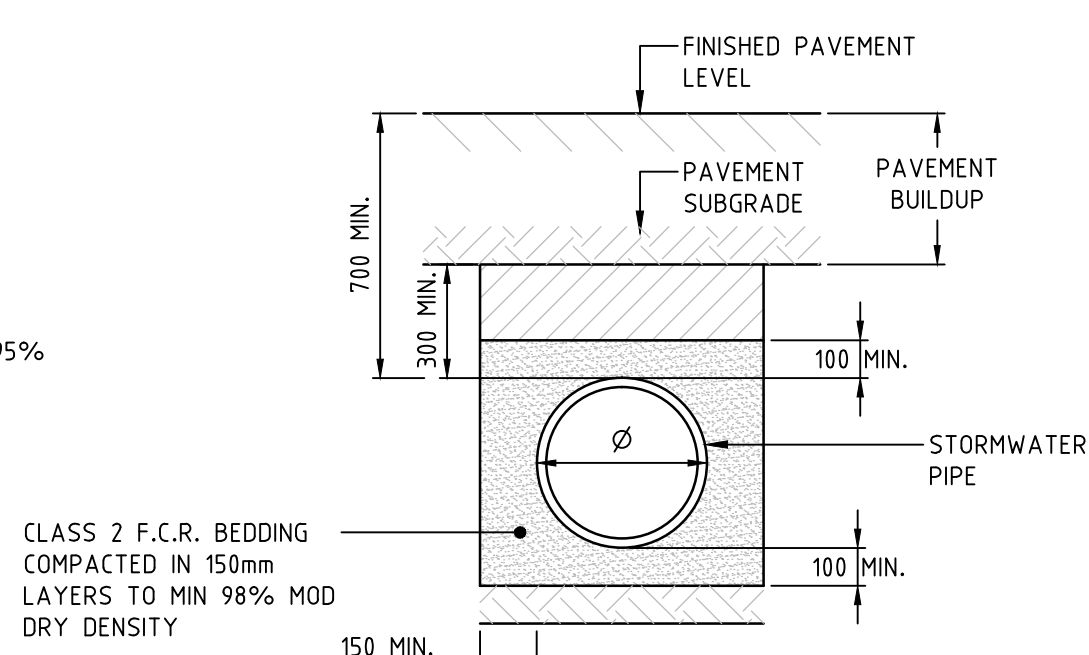
PROJECT No	DRAWING No	REVISION
230388	C001	P1



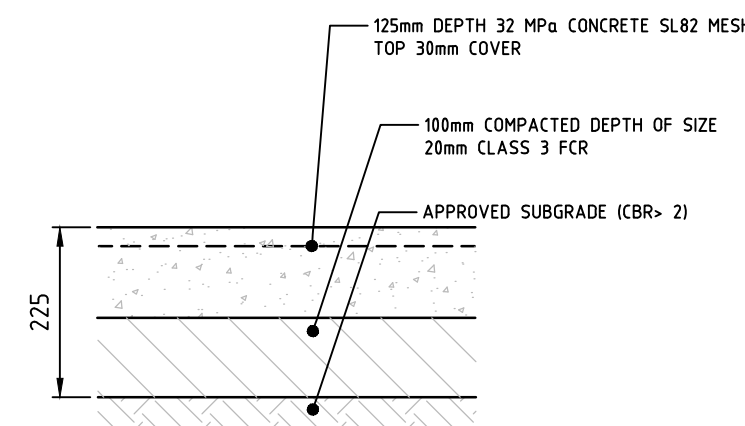
ATION JOINT
N.T.S

REINFORCEMENT DETAILS	
PIT LENGTH "D"	REINFORCEMENT
UP TO 1200	SL 92
1201 TO 1800	RL 918
1801 TO 2400	RL 1218
> 2400	AS DETAILED

PIT NOTE: STORMWATER PITS ARE TO BE 600mm (W) x 900mm (L)
UNLESS OTHERWISE SPECIFIED ON THE PLANS

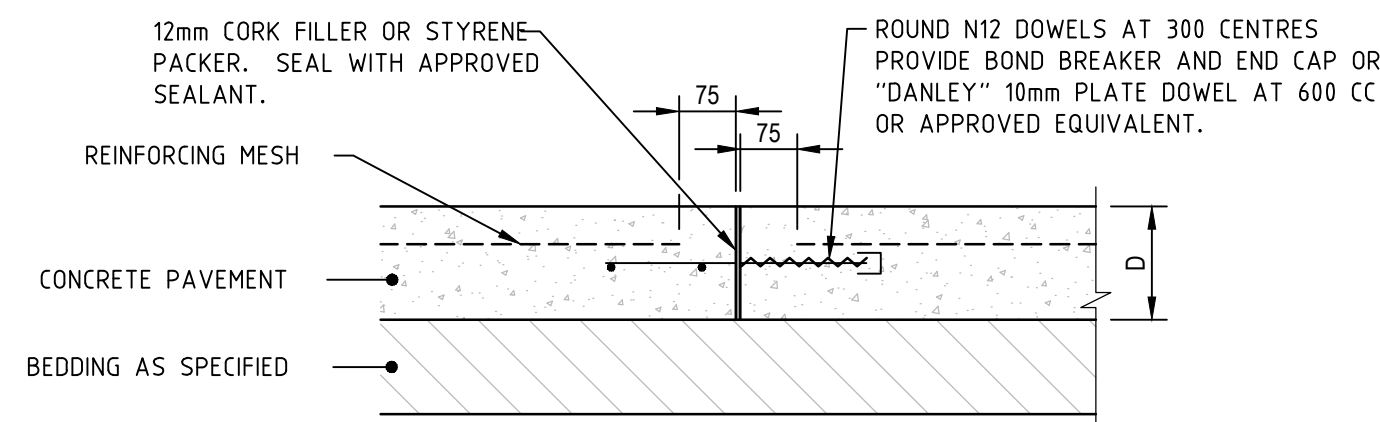


PIPE BEDDING DETAIL UNDER DRIVEWAY PAVEMENTS
SCALE 1:20

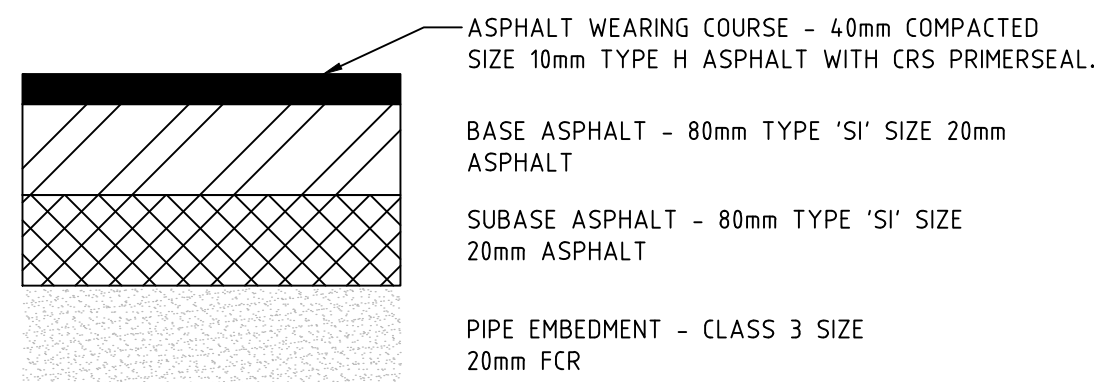


LIGHT/ DARK CONCRETE PAVEMENT
SCALE 1:10

PAVEMENT NOTE: REFER LANDSCAPE ARCHITECT DRAWINGS FOR EXTENT OF PAVEMENT WORKS



DOWELED EXPANSION JOINT (CJ)
REINFORCED CONCRETE
SCALE 1:10



ROAD REINSTATEMENT PAVEMENT DETAIL
SCALE 1:10

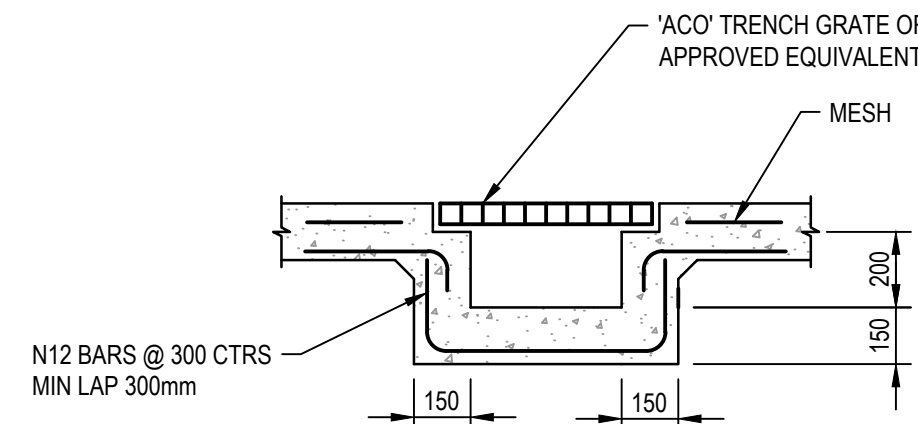
PAVEMENT NOTES

1. ALL PAVEMENT WORKS SHALL BE IN ACCORDANCE WITH THE SPECIFICATION UNLESS SPECIFIED OTHERWISE.
2. PAVEMENT DESIGN PARAMETERS.
 - DESIGN CBR = 3.5
 - HEAVY TRUCK PAVEMENT DESIGN TRAFFIC = 2.5×10^{15} ESA
 - CARPARK DESIGN TRAFFIC = 5×10^{13} ESA
3. AFTER COMPLETION OF EARTHWORKS TO NEAR SUBGRADE LEVEL THE CONTRACTOR SHALL CONFIRM THE SUBGRADE CBR IS AT OR ABOVE THE DESIGN CBR. THE CONTRACTOR SHALL NOTIFY THE SUPERINTENDENT IF IT IDENTIFIED THAT THE SUBGRADE CBR IS LESS THAN THE DESIGN CBR.
4. PRIOR TO PLACING THE PAVEMENT MATERIAL, THE EXPOSED SUBGRADE SHOULD BE PROOF ROLLED WITH A FULLY LOADED DUMP TRUCK OR WATER TRUCK. A SATISFACTORY PROOF ROLL IS WHERE THERE IS NO VISIBLE DEFORMATION OR SPRINGING/ HEAVING OF THE SURFACE. ANY AREAS THAT FAIL THE PROOF ROLL SHALL BE EITHER RECOMPACTED UNTIL SATISFACTORY OR EXCAVATED AND REPLACED WITH SUITABLY COMPACTED MATERIAL.
5. PAVEMENT TESTING TO BE COMPLETED IN ACCORDANCE WITH THE BELOW TABLES.
6. THE CONTRACTOR IS TO PROVIDE THE RATES OF APPLICATION FOR PRIME COAT TO BE USED FOR SPRAYED SEAL TREATMENTS.

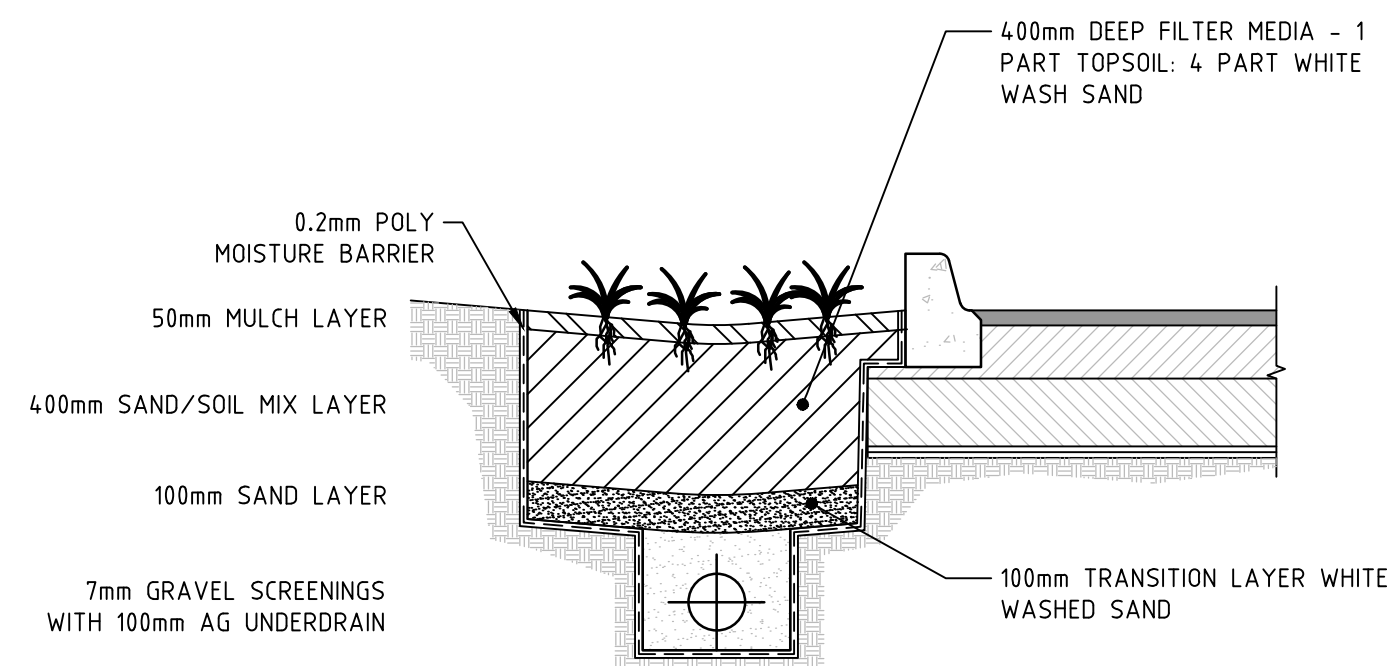
PAVEMENT COMPACTION REQUIREMENTS

- BASE COURSE - 98% (MMDD)
- SUBBASE - 97% (MMDD)
- SUBGRADE - 98% (SMDD)

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GRATED TRENCH DETAIL
SCALE 1:20



BIORETENTION SWALE DETAIL
SCALE 1:20

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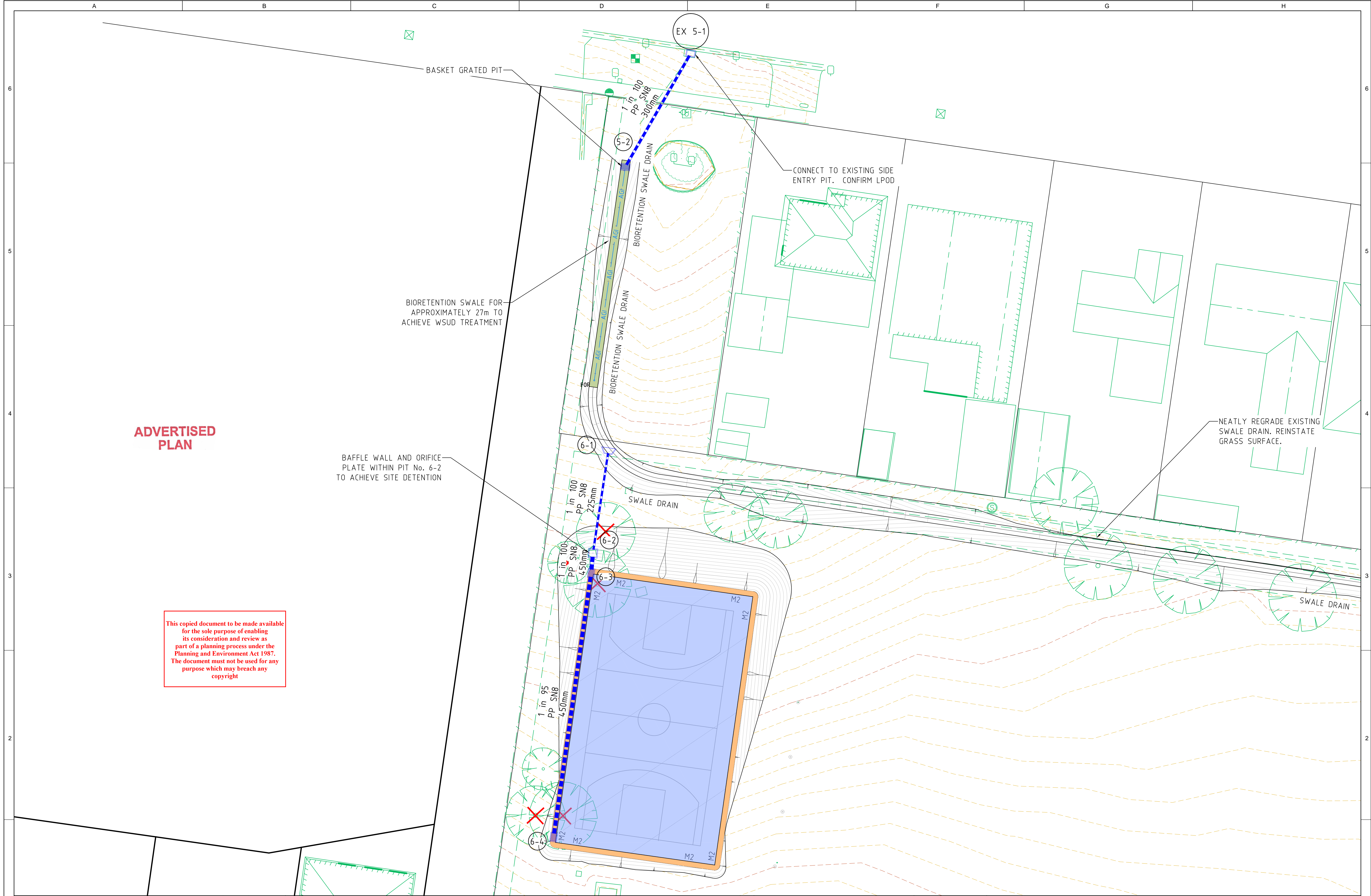
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J. BISH
DATE 20/12/23
APPROVED
DATE

PROJECT
OUR LADY HELP OF CHRISTIANS PS
28 SELBY ROAD, WARRNAMBOOL
DRAWING TITLE
KEY PLAN

CLIENT
Y2 ARCHITECTURE

PROJECT No 230388
DRAWING No C100
REVISION P1



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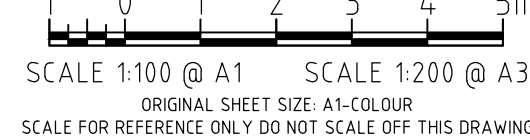
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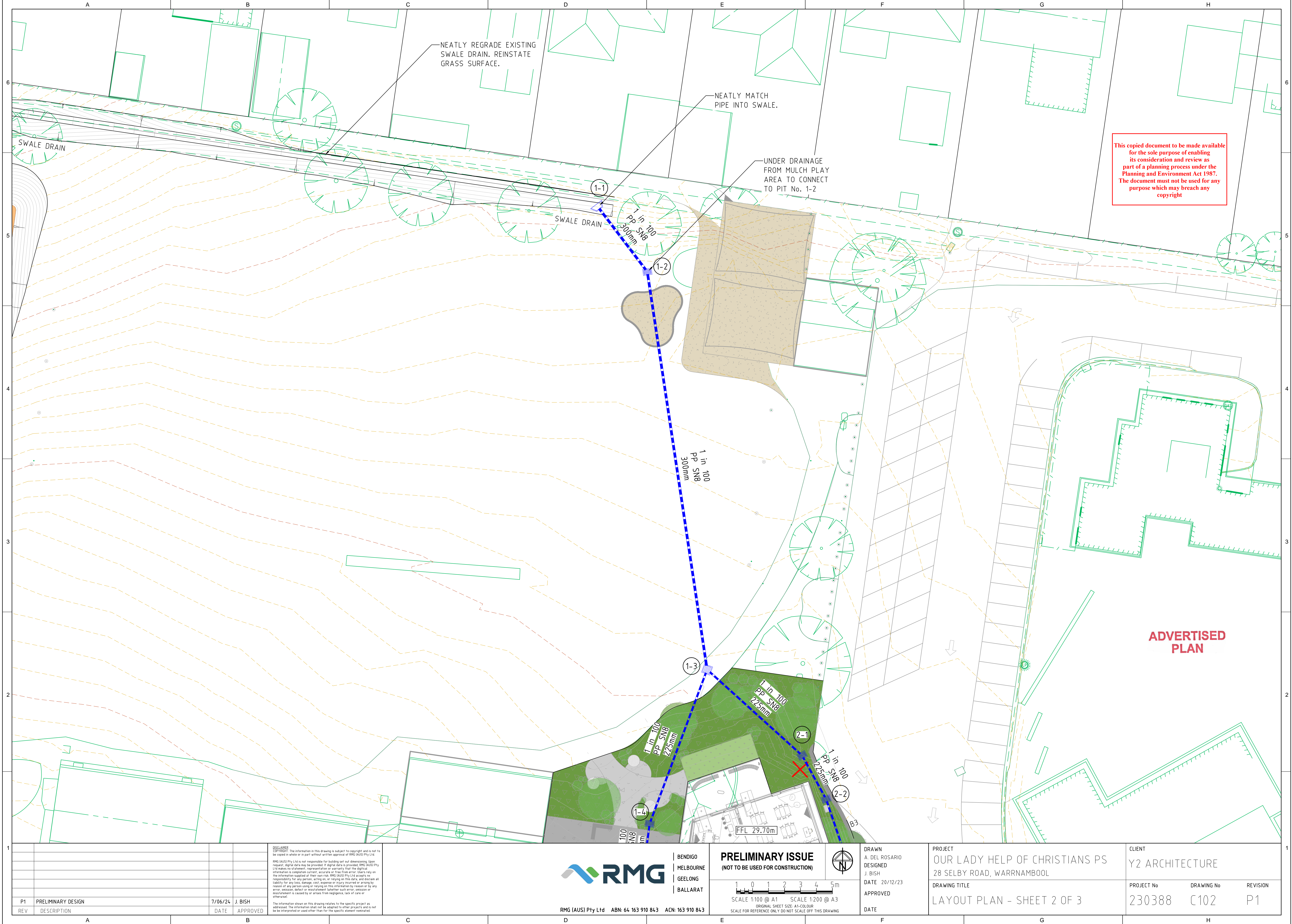
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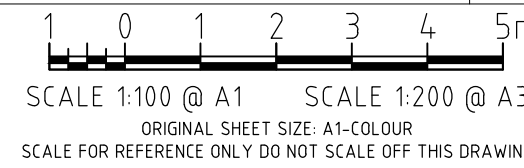
PROJECT
OUR LADY HELP OF CHRISTIANS PS 28 SELBY ROAD, WARRNAMBOOL
DRAWING TITLE
LAYOUT PLAN - SHEET 1 OF 3

CLIENT		
Y2 ARCHITECTURE		
PROJECT No	DRAWING No	REVISION
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DRAWING TITLE	LAYOUT PLAN - SHEET 2 OF 3

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Y2 ARCHITECTURE		
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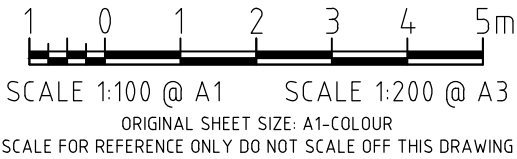
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28 SELBY ROAD, WARRNAMBOOL
DRAWING TITLE
LAYOUT PLAN - SHEET 3 OF 3

CLIENT
Y2 ARCHITECTURE

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Appendix E

INTENSITY-FREQUENCY-DURATION TABLE

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Nearest grid cell

Latitude: 38.3875 (S)

Longitude: 142.5125 (E)

IFD Design Rainfall Intensity (mm/h)

Issued: 18 June 2024

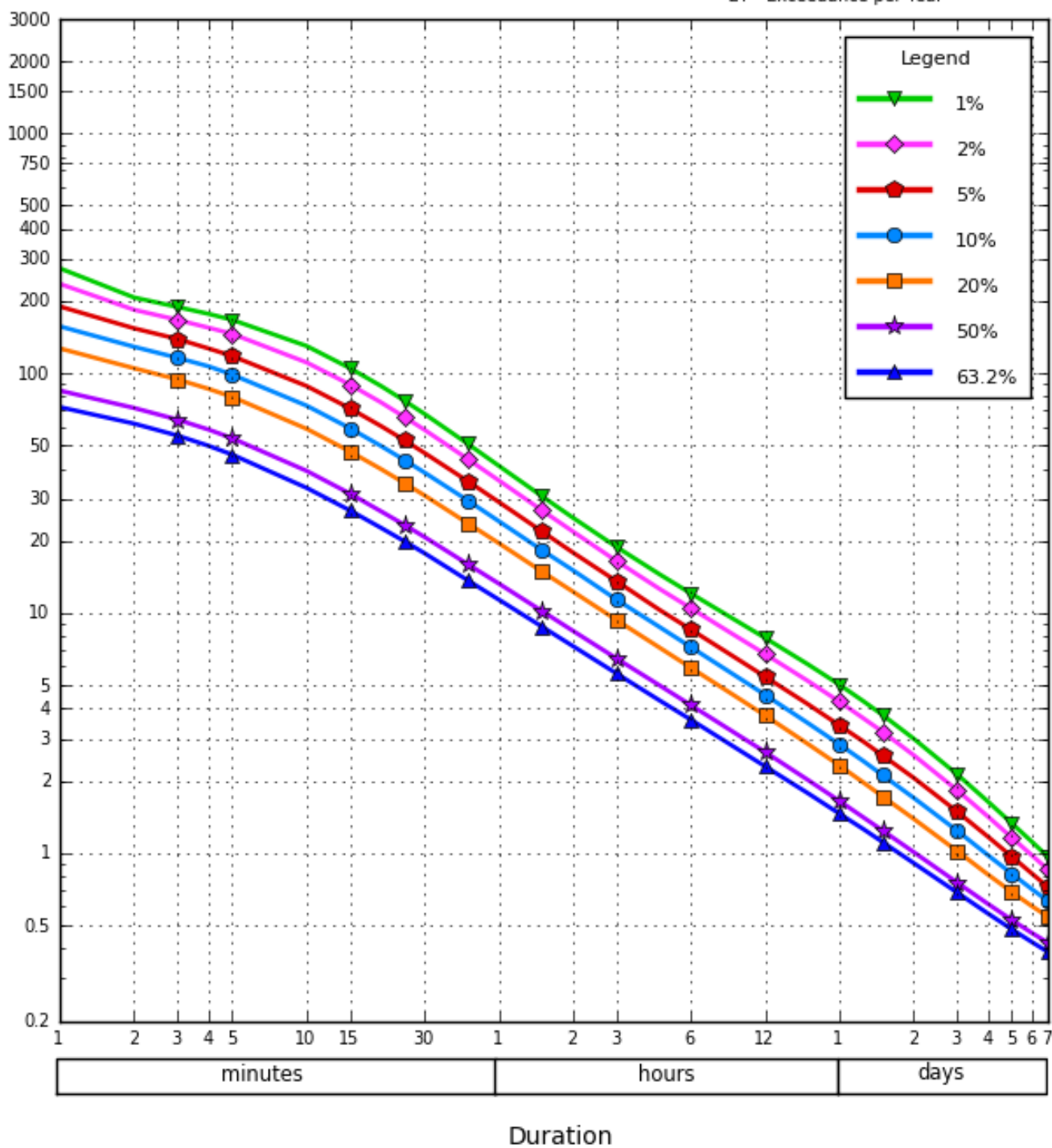
Rainfall intensity in millimetres per hour for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).

Intensity

(mm/h)

*AEP - Annual Exceedance Probability

**EY - Exceedance per Year



Appendix F

HYDROLOGIC AND HYDRAULIC CALCULATIONS

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AEP %	ARI
63.20%	1
50%	1.44
20%	4.48
10%	10
5%	20
2%	50
1%	100

Coefficient	63.20%	50%	20%	10%	5%	2%	1%
C0	0.1871987	0.348927	0.7562963	0.97786999	1.1670797	1.387877	1.5396854
C1	0.7877834	0.755239	0.6781786	0.6359458	0.59826732	0.45705989	0.33377391
C2	0.0077147	0.048665	0.1386095	0.18315658	0.22031206	0.38305321	0.52572602
C3	-0.0492523	-0.067525	-0.1044235	-0.1203162	-0.1321238	-0.19917877	-0.2583265
C4	0.0123868	0.016075	0.0228452	0.02521255	0.0265848	0.03913255	0.05028877
C5	-0.0012263	-0.001576	-0.0021541	-0.0022986	-0.0023321	-0.003419411	-0.004394296
C6	-0.0012263	5.63E-05	7.485E-05	7.7305E-05	7.5198E-05	0.000110591	0.000142617

Catchment	Area (ha)	Σ Area (ha)	C5%	C20%	Ae 5% (ha)	ΣAe 5% (ha)	Ae 20% (ha)	ΣAe 20% (ha)	Flow Length (m)	Velocity 5% (m/s)	Velocity 20% (m/s)	Tc 5% (mins)	Tc 20% (mins)	Intensity 5% (mm/hr)	Intensity 20% (mm/hr)	Q5% (m³/s)	Q20% (m³/s)	Q gap (m³/s)	Comments
1	0.2404	0.2404	0.691	0.625	0.166	0.166	0.150	0.150	275.322	0.6	1	12.65	9.59	117.75	60.62	0.054	0.025	0.029	Full Proposed Catchment
1	0.2404	0.4808	0.691	0.625	0.166	0.332	0.150	0.301	275.322	0.6	1	12.65	9.59	117.75	60.62	0.109	0.051	0.058	Full Predeveloped Catchment

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Appendix G

ONSITE DETENTION AND ORIFICE CALCULATIONS

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Project Information

Client: Y2 Architecture
 Job Title: Our Lady Help of Christians PS
 Job Number: 230338
 Job Manager: J. Bish
 Discipline: CIVIL
 Date: 18/06/2024
 Designer: J. Bish
 Reviewed by: J. Bish

Intensity-Frequency-Duration Information

Locality = WARRNAMBOOL
 Latitude = 38.3333 (S)
 Longitude = 144.3167 (E)

Intensities are calculated with the following polynomial coefficients from Design Rainfall Data System (2016) of Bureau of Meteorology.

Coefficients	63.2%	50.0%	115mm	10.0%	5.0%	2.0%	1.0%
C0	0.18719865	0.34892741	0.75629628	0.97786999	1.1670797	1.387877	1.5396854
C1	0.78778344	0.75523871	0.67817855	0.6359458	0.59826732	0.45705989	0.33377391
C2	0.007714728	0.048664693	0.13860948	0.18315658	0.22031206	0.38305321	0.52572602
C3	-0.04925229	-0.06752487	-0.10442353	-0.12031616	-0.13212381	-0.19917877	-0.2583265
C4	0.012386833	0.016074823	0.022845227	0.025212552	0.026584797	0.03913255	0.05028877
C5	-0.00122632	-0.001576	-0.0021541	-0.00229861	-0.0023321	-0.00341941	-0.0043943
C6	-0.00122632	5.62559E-05	7.48472E-05	7.7305E-05	7.5198E-05	0.000110591	0.000142617

DepthP - $e^{(C0 + C1 \ln(T) + C2 \ln(2)^2 + C3 \ln(T)^3 + C4 \ln(T)^4 + C5 \ln(T)^5 + C6 \ln(T)^6)}$ (in mm)
 intensity (mm/hr) = depth (mm) / duration (hour)

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Job Number: 230338
Designer: J. Bish
Date: 18/06/2024

	AEP	
Coefficients	5%	10%
C0	1.1670797	0.97786999
C1	0.59826732	0.6359458
C2	0.22031206	0.18315658
C3	-0.13212381	-0.12031616
C4	0.026584797	0.025212552
C5	-0.002332097	-0.002298608
C6	7.5198E-05	7.7305E-05

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Rural Runoff Estimate 10% AEP									
Catchment	1								
C10%	0.3								
Area (ha)	0.1994								
tc (hr)	0.07								
tc (mins)	4.29								
I10% (mm/hr)	105.39								
Q10% (m3/s)	0.018								

[illegible]

Design Criteria

Location =	WARRNAMBOOL
Permissible Site Discharge AEP =	10%
Storage AEP =	5%
Catchment Area (A) =	0.1994 ha
Runoff Coefficient =	0.5
Restricted outflow requirement =	0.018 m ³ /s
100 Year Effective Catchment Area =	0.10 ha

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Boyd's Calculation Method

$$S_{max} = V_1 \left(1 - \frac{Q_p}{I_p} \right)$$

Where

S_{max} =

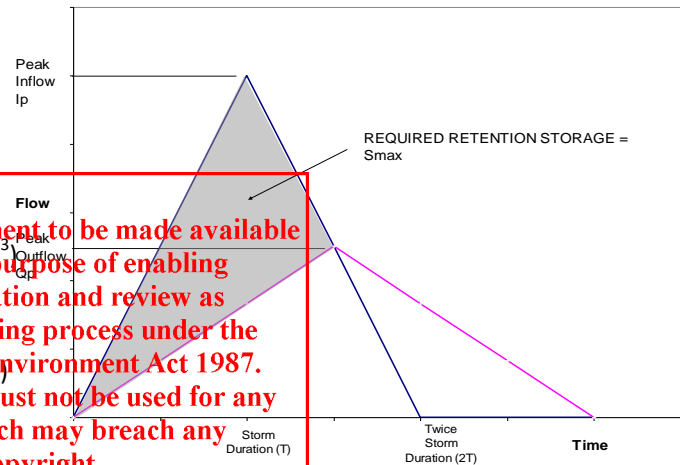
Maximum Volume of Temporary Storage (m³)

V_1 = Volume of inflow stormwater (m³)

Q_p = Peak discharge of inflow hydrograph (m³/s)

I_p = Peak discharge of outflow hydrograph (m³/s)

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Site Storage Requirement

Storage requirement is highest value of S_{max} calculated in the table below. Critical storm duration is the storm duration when S_{max} occurs

Tc (min)	Intensity (mm/hr)	I_p (m ³ /s)	Q_p (m ³ /s)	V_1 (m ³)	S_{max} (m ³)
5	120.2072	0.03	0.02	10	4.59
10	89.93235	0.02	0.02	15	4.14
15	72.60358	0.02	0.02	18	1.90
20	61.30038	0.02	0.02	20	-1.23
25	53.31562	0.01	0.02	22	-4.85
30	47.35852	0.01	0.02	24	-8.79
45	35.99999	0.01	0.02	27	-21.68
60	29.46416	0.01	0.02	29	-35.42
90	22.14868	0.01	0.02	33	-64.08
120	18.09731	0.01	0.02	36	-93.51

Therefore, the required storage volume for the site is = 4.59 m³

Overflow/Weir Wall Level = 27.8

Pipe Volume Equation

$$V_{pipe} = \pi \left(\frac{d}{2} \right)^2 h$$

Where

Q_u = Permissible Site Discharge

h = Length of Pipe

150mm Pipe

$d = 150$ mm

$h = 0$ m

$V = 0.00$ m³

225mm Pipe

$d = 225$ mm

$h = 0$ m

$V = 0.00$ m³

300mm Pipe

$d = 300$ mm

$h = 0$ m

$V = 0.00$ m³

375mm Pipe

$d = 375$ mm

$h = 0$ m

$V = 0.00$ m³

450mm Pipe

$d = 450$ mm

$h = 32.05$ m

$V = 5.10$ m³

525mm Pipe

$d = 525$ mm

$h = 0$ m

$V = 0.00$ m³

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Pit Volume Equation

$$V_{pit} = L \times W \times H$$

Where

L = Length of pit

W = Width of pit

H = Height of pit

900x900 Pit

$L = 900$ mm

$W = 300$ mm

$H = 1500$ mm

Number of pits = 1 units

$V = 0.405$ m³

900x600 Pit

$L = 900$ mm

$W = 600$ mm

$H = 500$ mm

Number of pits = 2 units

$V = 0.54$ m³

Total Volume Required = 4.59 m³

Total Volume Provided = 6.04 m³

OK

Orifice Equation

$$Q_u = C_d \times A_o \times \sqrt{2 \times g \times h}$$

Where

Q_u = Permissible Site Discharge

C_d = Orifice Coefficient

g = Gravitational Acceleration

h = Height above orifice

	C_d
Sharp Edge	0.61
Rounded Edge	0.98
Short Tube	0.80
Borda	0.51

Pit 1-2

Q_u = 18 L/s

C_d = 0.61 Sharp Edge

g = 9.81 m/s^2

h = 1500 mm to invert of outlet pipe

Solve for A_o = 5439.4 mm^2

Where
$$A_o = \frac{\pi D^2}{4}$$

Solve for D = 83.2 mm

Therefore, use an orifice of 80mm

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