

# 61 SYDNEY ROAD GOULBURN—

## WATER CYCLE MANAGEMENT STUDY

FOR / NDCO Goulburn

DOCUMENT NO / 23309-01 REV / 2 DATE / 15/02/2024

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### Document Control

Revision	Date	Description	Prepared	Reviewed	Approved
1	02/02/2024	For Review	LA		TMc
2	15/02/2024	Final	LA	TMc	TMc

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# 1 INTRODUCTION

This report has been prepared for NDCO Goulburn to accompany a Development Application to Goulburn Mulwaree Council for 61 Sydney Road, Goulburn.

This report addresses the requirements of Goulburn Mulwaree Council's development control plan (DCP) 2009 including the Engineering Design Requirements P09, and the requirements by WaterNSW 'Developments in the Sydney Drinking Water Catchment' Feb 2023.

This report refers to the civil engineering plans prepared by ROC Engineering Design Pty Ltd, Reference 23309 submitted for assessment with this report.

## 1.1 EXISTING SITE

The existing site is approximately 6000m<sup>2</sup> and slopes gently from south to north. The site is located within the Goulburn-Mulwaree Council Area and is zoned as 'E3 – Productivity Support'. The site is surrounded by a service station to the west and another motel to the east. An undeveloped lot abuts the site to the south.

The site currently contains a single storey 18 room motel. The motel is aged and in disrepair and appears to be mainly used by truckers. The northern section of site has a concrete forecourt that used to be used as a service station. The southern portion consists of a gravel carpark surrounded by accommodation units.



Figure 1 - Site Locality

Table 1 below summarises the relevant site hydrologic characteristics.

**Table 1 - Site Characteristics**

<b>Site characteristics</b>	<b>Detail</b>
Site Location	Goulburn
Drinking Water Catchment	Upper Wollondilly River subcatchment
Rainfall and PET zone	Zone 1
Total site area	6000m <sup>2</sup>
Pre-developed site gradient	3.5%
Post-developed site gradient	2.1%
Existing watercourses through site?	No
Overland flow upstream tributary area	5710m <sup>2</sup>
Existing development characteristics	Two existing commercial buildings, one with an attached motel, one stand-alone motel building and stand-alone shed.
Existing land uses and areas	Largely cleared with four large trees. Sealed access and unsealed carpark.
Proposed development Characteristics	New commercial development.

## 1.2 PROPOSED DEVELOPMENT

The proposed development consists of a 32 key single level motel with a gymnasium to the east of the entry driveway. The proposed site plan is provided in Appendix A.

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## 2 DESIGN OBJECTIVES

### 2.1 OBJECTIVES

The stormwater management for the site has been designed with the following objectives:

- Demonstrate that ‘post development’ overland water flows will not exceed ‘pre-development’ flows in terms of:
  - Volume
  - Quality (including nutrient content)
  - Direction
- Demonstrate that the development meets the objectives of the Goulburn DCP Common Street Plan with regards to
  - Protecting against flooding
  - Not exacerbating flood risk
  - Ensure stormwater quality controls are applied

### 2.2 STORMWATER QUANTITY MANAGEMENT

The stormwater runoff from site has been designed to comply with the following criteria:

- Limit site runoff from the site to a maximum of predeveloped levels for all storm events ranging from the 20% event up to the 1% AEP event

### 2.3 STORMWATER QUALITY MANAGEMENT

The development has been designed to satisfy the requirements outlined in Australian Runoff Quality given below.

- Total Suspended Solids (TSS) – 80% reduction in average annual load.
- Total Phosphorous (TP) – 45% reduction in average annual load.
- Total Nitrogen (TN) – 45% reduction in average annual load.
- Gross Pollutants (GP) – 90% reduction in average annual load.

As the development lies within a Sydney Drinking Water Catchment, it has also been designed to satisfy the following criteria to achieve Neutral or Beneficial Effect (NorBE) compliance.

1. *“The mean annual pollutant loads for the post development case should aim for 10% less than the pre-development case for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN). For gross pollutants (GP), the post development load only needs to be equal or less than pre-development load.”*
2. *“Pollutant concentrations for TP and TN for the post-development case must be equal or better compared to the pre-development case for between the 50<sup>th</sup> and 98<sup>th</sup> percentile over the five-year modelling period when runoff occurs.”*

---

## 3 STORMWATER QUANTITY MANAGEMENT

### 3.1 EXISTING SITE

The existing site is fully developed and slopes gently from south to north and drains to Sydney Road via piped drainage. Overland flow entering the site from the east and south and is directed around the site via a swale.

### 3.2 PROPOSED DESIGN

The stormwater design allows for a majority of the roof and concrete pavement to drain to a below ground OSD tank via stormwater filter cartridges and pit inserts. The gutters and stormwater lines have been sized for the 1% ARI event. The OSD then drains into the drainage system which runs along the front boundary of the development, and outlets into the rear of the existing kerb inlet pit.

The remainder of the impervious areas are drained via piped system towards Sydney Road. Pervious areas generally drain towards the respective boundaries via overland flow. The diversion of overland flow from uphill properties is maintained by formalising the existing grassed swale.

### 3.3 ON-SITE DETENTION

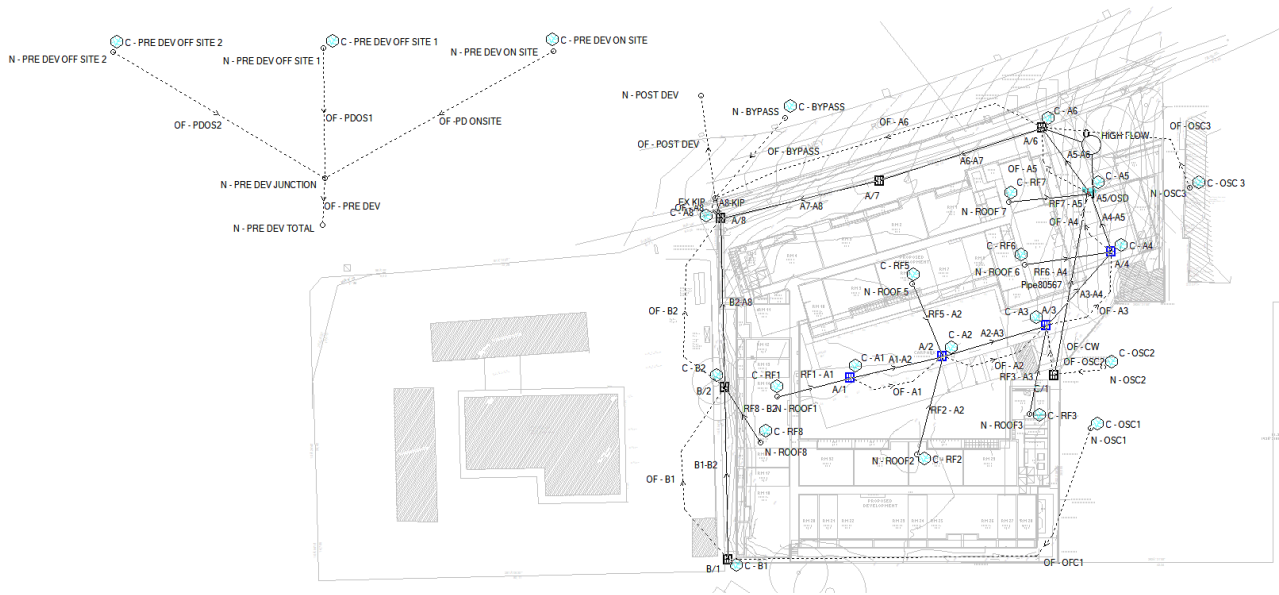
On site detention is required for the development in order to attenuate flows. This storage is proposed to be provided by an underground OSD tank.

### 3.4 DRAINS MODEL

The stormwater system was modelled in the runoff routing software DRAINS. The catchment layout is provided in Figure 2 with key inputs shown in Table 2. The inputs for the DRAINS model are also summarised in Appendix C.

Table 2 - DRAINS Inputs

Drains Parameters	
Model	ILSAX
Paved area depression storage (mm)	1
Supplementary area depression storage (mm)	1
Grassed area depression storage (mm)	5
Soil type	3
Storm durations analysed	5min – 12hr
Overland flow paths general	Kinematic Wave
Overland flow paths minor	Dummy links
Overland flow safe depth 1% ARI	0.3m
Overland flow safe depth 10% ARI	0.15m
Safe depth x velocity	0.4
On-grade pit blockage factor	30%
Sag pit blockage factor	50%



**Figure 2 - DRAINS Schematic**

The drains model was run for various design storms ranging from the 20% AEP event to the 1% AEP event. The results have been compared to the predeveloped flows for the total site and for each existing catchment as shown in Table 3. The outputs for the 5yr, 10yr and 100 yr models are shown in Appendix D.

**Table 3 - Pre/Post Developed Flow**

<b>AEP</b>	<b>Pre-developed Peak Site Runoff (m<sup>3</sup>/s)</b>	<b>Post Developed Peak Site Runoff with OSD (m<sup>3</sup>/s)</b>
<b>20%</b>	0.094	0.088
<b>10%</b>	0.151	0.140
<b>5%</b>	0.204	0.174
<b>1%</b>	0.318	0.230



## 4 WATER QUALITY

A MUSIC model has been developed to simulate the pollutant loads contained in the stormwater runoff from site for both the predevelopment and post developed case. Catchment areas were defined considering the drainage flow paths, reshaped site and location of existing and proposed stormwater structures and treatment measures.

### 4.1 PREDEVELOPED CATCHMENT DETAILS

The pre-development case was modelled in detail by subdividing the site into sub catchments based upon the surface types. Figure 3 below shows the total areas of the different surface types.



Figure 3 – Existing Surface Type Plan

Table 4 – Predevelopment EIA

Pre-Development Source Nodes			
Surface type	Adopted Parameters	Total area (m2)	Effective impervious area
Roofs	Roofs	1184	1184
Paved areas	Sealed roads	2752	2752
Pervious area	Commercial	2060	103

Figure 4 below shows the predeveloped music model.

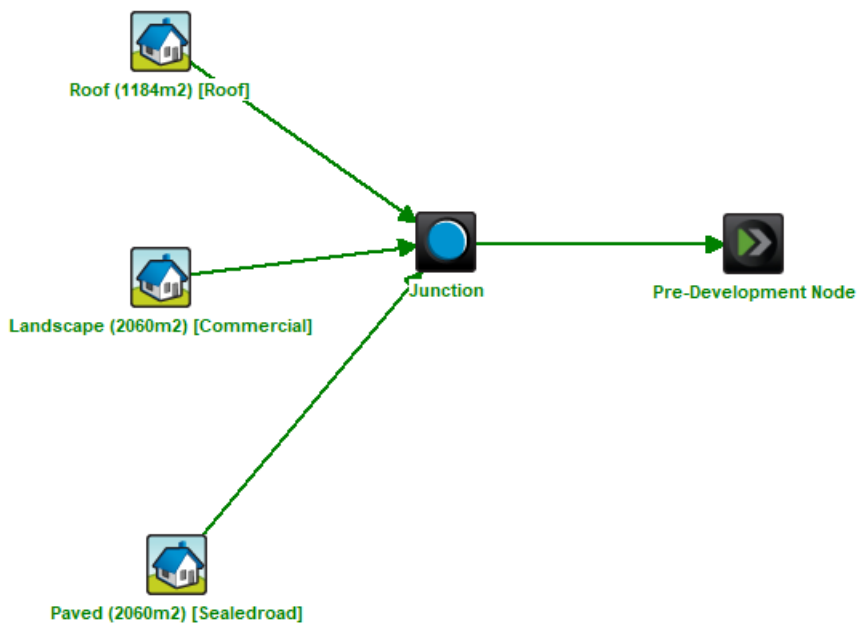


Figure 4 – Pre Development Treatment Model

## 4.2 POST-DEVELOPED CATCHMENT DETAILS

The post development case was modelled in detail by subdividing the site into sub catchments based upon the surface types and drainage infrastructure. Figure 5 below shows the total areas of the different surface types.

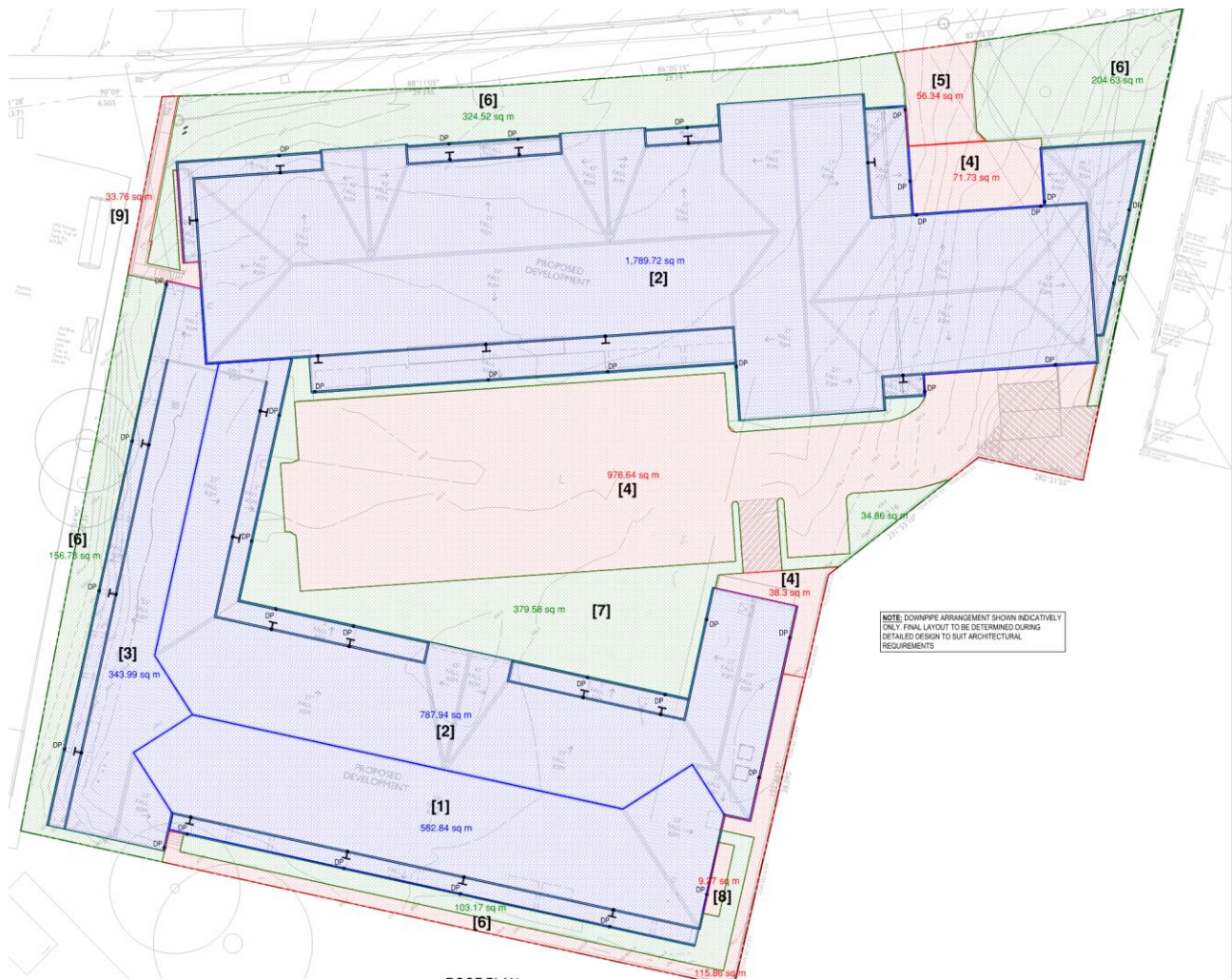


Figure 5 - Proposed Surface Type Plan

Table 5 below summarises the Catchments.

Table 5 – Post-Developed Catchments

Post Development Catchments					
Surface type	Adopted Parameters	Total area (m <sup>2</sup> )	Catchment A (into RW tank)	Catchment B (to OSD)	Catchment C (to street)
Roofs	Roofs	3484	563	2578	343
Pavement	Sealed roads	1142	0	1086	56
Pervious	Commercial	1211	0	415	796
Footpath	Commercial	159	0	0	159

## 4.3 WATER QUALITY IMPROVEMENT DEVICES

### **Pit Inserts**

Ocean Guard pit inserts have been employed as a preliminary form of treatment for each pit in the driveway of the development.

### **Stormwater Filter Cartridges**

Seven 690 PSORB Stormfilter cartridges have been provided within a chamber in the OSD. Table 6 below summarises the StormFilter cartridge and associated StormFilter chamber inputs.

The node layout of the treatment train is provided in Figure 6.

**Table 6 - Stormfilter Cartridge and Chamber Inputs**

<b>StormFilter Chamber Parameters</b>	
Low flow bypass (cubic metres per sec)	0
High flow bypass (cubic metres per sec)	100L/s (Manufacturer specification)
Surface area (square metres)	3.1
Extended Detention Depth (metres)	0.77
Permanent Pool Volume (cubic metres)	0.00
Initial Volume (cubic metres)	0.00
Exfiltration Rate (mm/hr)	0.00
Evaporative Loss as % of PET	0.00
Equivalent Pipe Diameter (mm)	58
Overflow Weir Width (metres)	2.00
<b>StormFilter Chamber Parameters</b>	
Low flow bypass (cubic metres per sec)	0
High flow bypass (cubic metres per sec)	0.00540

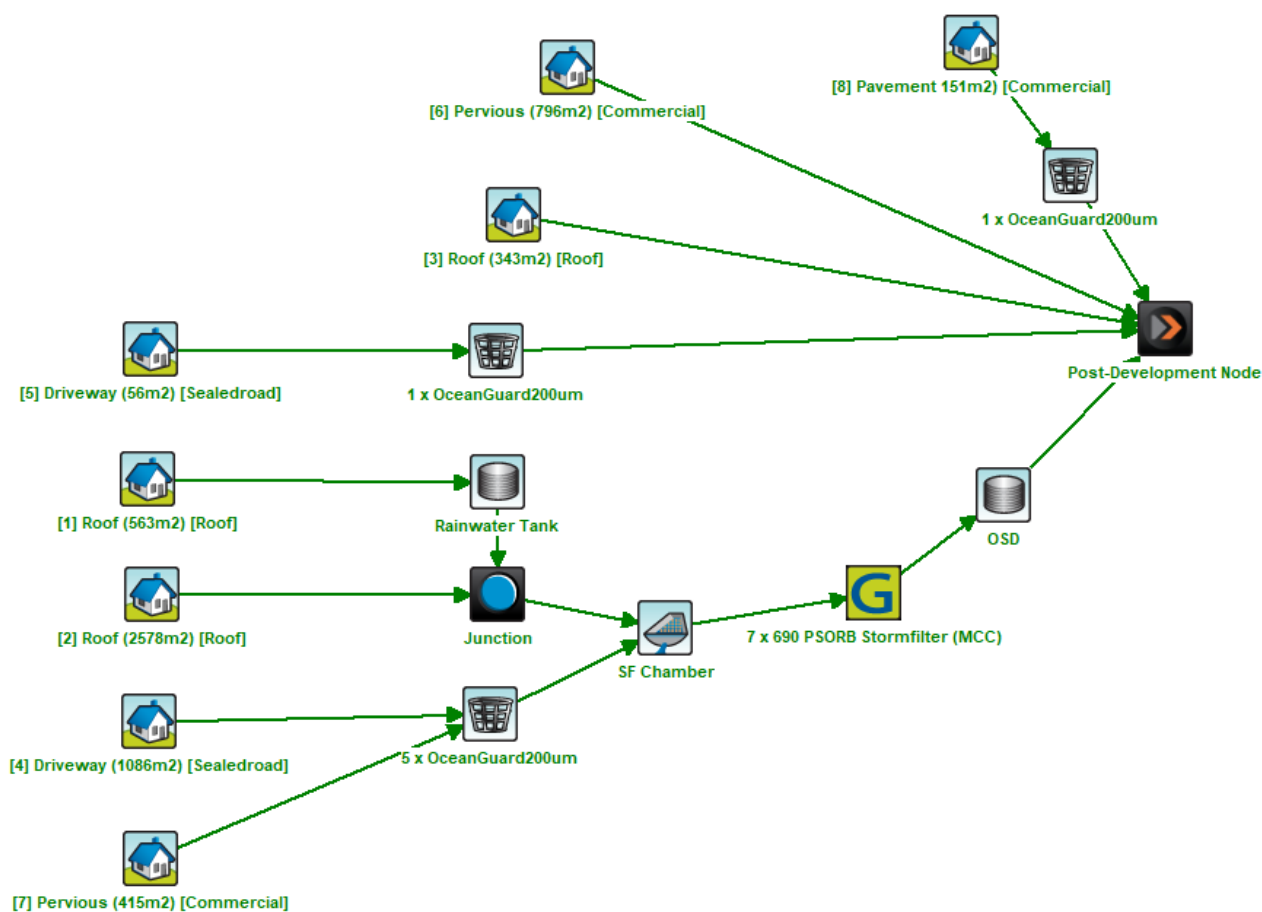


Figure 6 - Post-development Treatment Model

#### 4.4 MUSIC MODEL RESULTS

Pollutant load estimates are provided for TSS, TP, TN and GP. The treatment train effectiveness, expressed as a percentage reduction from untreated runoff is summarised in Table 7. This table demonstrates compliance with the pollution reduction targets.

Table 7 - Proposed Treatment Performance

	Sources	Residual Load	% Reduction	Water Quality Target Reduction %
<b>Total Suspended Solids (kg/yr)</b>	315.0	37.4	88.1	80
<b>Total Phosphorus (kg/yr)</b>	0.8	0.284	64.1	45
<b>Total Nitrogen (kg/yr)</b>	7.2	3.91	45.3	45
<b>Gross Pollutants (kg/yr)</b>	100.0	7.5	92.5	90

The treatment train effectiveness results above demonstrate the pollutant reduction targets of Australian Runoff Quality, 2006 has been met by the treatment train.

## 4.5 NORBE ASSESSMENT

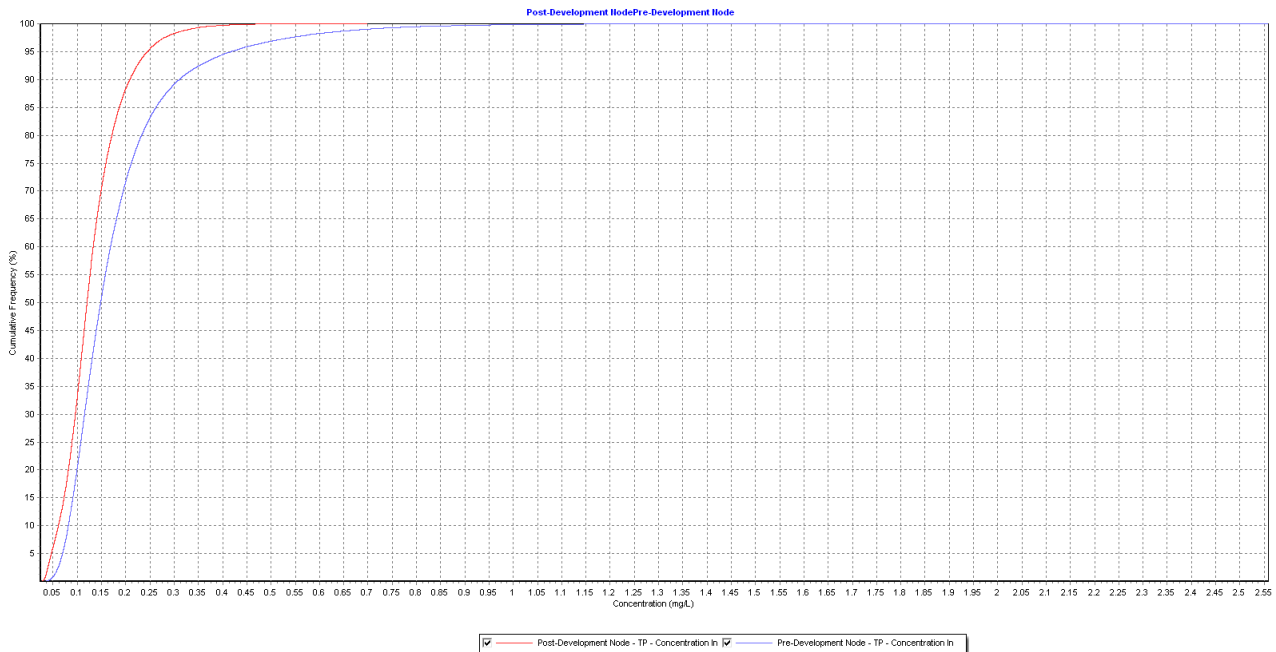
The MUSIC model was developed in accordance with WaterNSW’s publication “Using MUSIC in Sydney Drinking Water Catchment”.

The treatment train effectiveness, expressed as a percentage reduction from existing conditions is summarised in Table 8. This table demonstrates compliance with condition 1 for NorBE compliance.

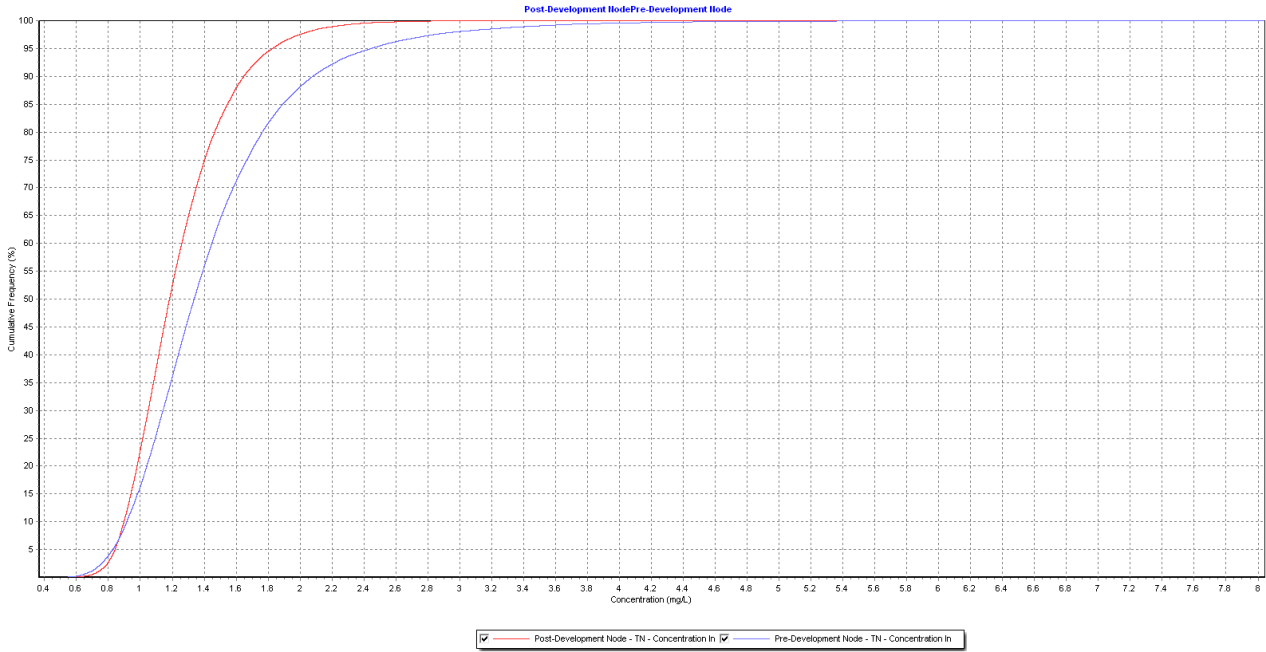
**Table 8 - Proposed Treatment Performance**

	Predeveloped Load	Post Developed Load	% Reduction	Water Quality Target Reduction %
<b>Total Suspended Solids (kg/yr)</b>	444.0	37.4	91.6	10
<b>Total Phosphorus (kg/yr)</b>	0.9	0.284	66.7	10
<b>Total Nitrogen (kg/yr)</b>	5.0	3.91	22.0	10
<b>Gross Pollutants (kg/yr)</b>	64.3	7.5	88.3	-

The existing and proposed development comparison for pollutant concentration is summarised in Figures 7 and 8, the pollutant concentration for TP and TN are reduced between the 50<sup>th</sup> and 98<sup>th</sup> percentile demonstrating compliance with condition 2 for NorBE compliance.



**Figure 7 - Cumulative Frequency Graph - Total Phosphorus (TP)**



**Figure 8 - Cumulative Frequency Graph - Total Nitrogen (TN)**

## 5 COMMON ST PLAN

The site is subject to the site specific provisions of the Common Street plan as part Goulburn Councils DCP 2009. The plans objectives are to:

- To facilitate industrial development on Common Street.
- To ensure that new development is protected from flood risk.
- To ensure that new development does not exacerbate flood risk.
- To ensure appropriate stormwater management and water quality controls are applied.

It can be shown that that the proposed development meets the relevant flooding and water quality objectives of the Common Street plan despite having a site coverage greater than 70%.

### 5.1 Flood Risk to Site

The site is not affected by mainstream flooding. Figure 9 below shows the extract from the WMA Water Wollondilly and Mulwaree Rivers flood study. This shows that the site is not affected by mainstream flooding up to the PMF flood event.

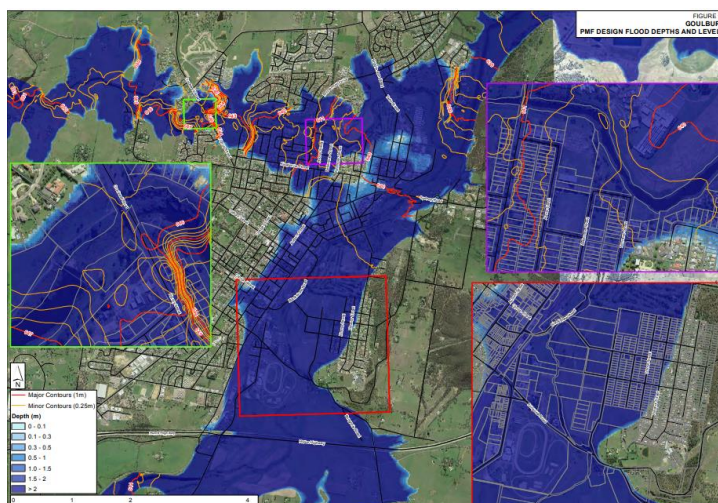


Figure 9 – PMF Flood Levels

A WSUD study for the Common St Business Park was undertaken by Storm Consulting in 2003 for Goulburn City Council. The study identified drainage and vegetation constraints and undertook local flood modelling up the 1% AEP event using RAFTS. Figure 10 shows the vegetation constraints in green and overland flow/drainage constraints in grey identified in the Storm report. As can be seen from Figure 10, the site is not located near any identified overland flow channels or drainage constraints.

Due to the distance from of the site from any identified overland flow channels and an inspection of the site contours shown in Figure 11, it is assessed that the site will not be disproportionately impacted by a PMF flood event in comparison to a 1% AEP event.





Figure 10 – Common Street Drainage Constraints

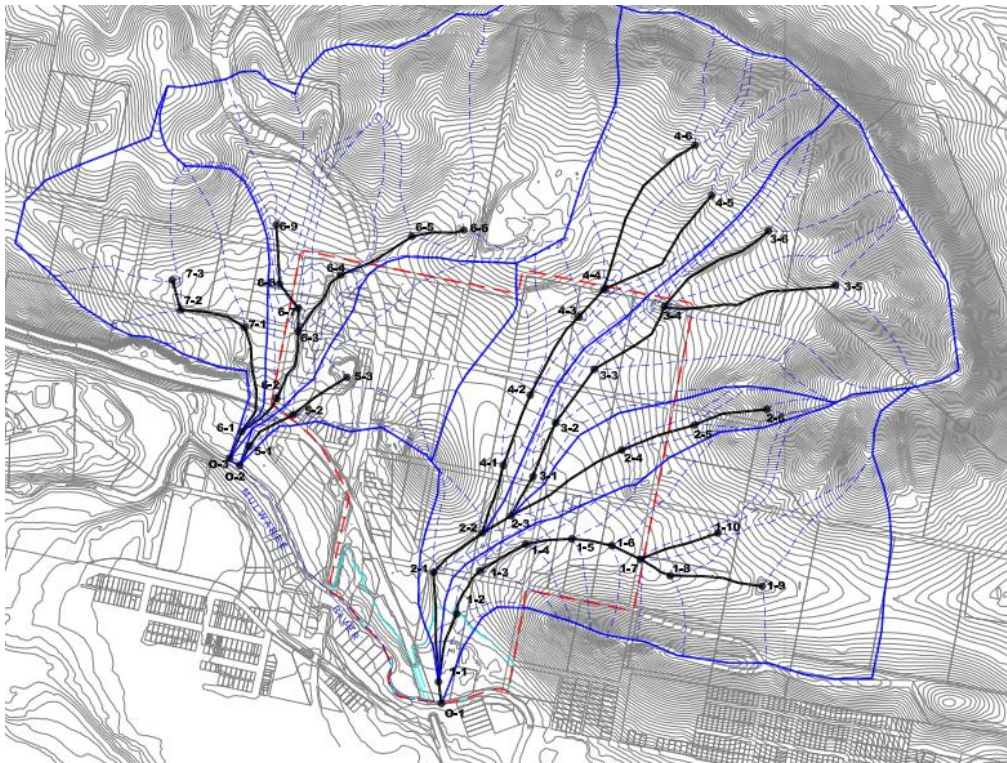


Figure 11 – Storm RAFT's Catchment Plan

## 5.2 Flood Risk Downstream

The results from the Drains model as shown in Table 3 earlier in the report, shows that the post developed site runoff for the proposed development is significantly lower than the existing runoff. The 5yr ARI storm event is the critical event driving the OSD design. As the ARI increases the beneficial impact of the development on site runoff increases with a 25% reduction in runoff for the 100yr ARI storm event. The development will not therefore increase the flood risk due to increased runoff.

Overland flow paths have been provided within and around the development to match existing overland flow paths. The flood risk due to redirected overland flow is therefore not increased.

## 5.3 Stormwater Quality

The stormwater quality improvement measures undertaken result in a 92% decrease in suspended solids, a 66% decrease in Phosphorus, a 22% decrease in Nitrogen and an 88% decrease in gross pollutants from the existing site, showing a clear positive impact on water quality.

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## 6 CONCLUSION

The stormwater management strategy proposed meets the stormwater quantity and pollution reduction targets of the approving authority. The post developed site discharge has been reduced to existing levels for each catchment. The pollution from the site has been reduced by the targets imposed and achieves the requirements outlined in the SEPP (Sydney Drinking Water Catchment) 2011 and Goulburn Mulwarree DCP and Design standards.

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## 7 REFERENCES

- *2019 Runoff in Urban Areas, Book 9 in Australian Rainfall and Runoff - A Guide to Flood Estimation, Commonwealth of Australia, © Commonwealth of Australia (Geoscience Australia), 2019.*
- *Australian Runoff Quality – A guide to Water Sensitive Urban Design, Engineers Australia, 2006.*
- *Using MUSIC in Sydney Drinking Water Catchment, WaterNSW, 2023*
- *Development Control Plan (DCP), Goulburn Mulwaree Council, 2009*
- *Standards for Engineering Works, Goulburn Mulwaree Council, 201*

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## APPENDIX A – SITE PLAN

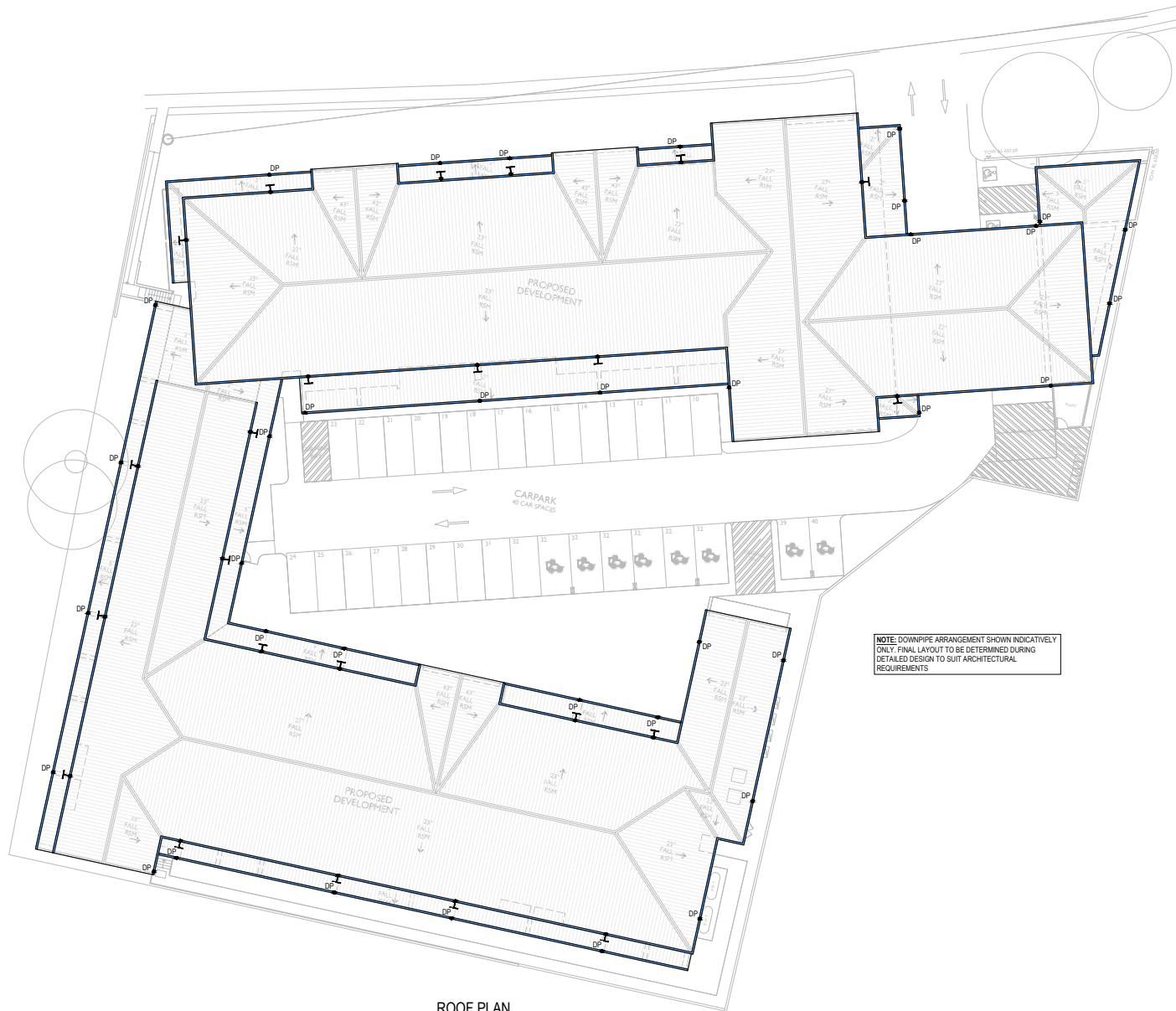


**LEGEND**

- BOUNDARY
- DP DOWNPIPE
- ⊥ DOWNPIPE WITH SPREADER

**NOTES**

1. PIPES TO BE Ø100 uPVC LAID AT GROUND SLOPE, 1% MINIMUM, CAPACITY = 8 L/s U.N.O.
2. INSPECTION OPENINGS TO BE PROVIDED AS PER AS3500.3 SECTION 7.4
3. THE EXTERNAL FINISHED SURFACE MUST BE GRADED TO SLOPE AWAY FROM ALL BUILDINGS A MINIMUM OF 50mm OVER THE FIRST 1m.
4. INTERNAL STRUCTURAL SLAB LEVELS TO BE A MINIMUM 150mm ABOVE EXTERNAL FINISHED SURFACE LEVELS. THIS MAY BE REDUCED TO 100mm FOR PAVED OR CONCRETE AREAS SLOPING AWAY FROM THE BUILDING.
5. DOWNPIPES AND GUTTERS TO BE DESIGNED FOR 1% AEP EVENT.



NOTE: DOWNPIPE ARRANGEMENT SHOWN INDICATIVELY ONLY. FINAL LAYOUT TO BE DETERMINED DURING DETAILED DESIGN TO SUIT ARCHITECTURAL REQUIREMENTS

**ROOF PLAN**  
SCALE: 1:200

**NOT FOR CONSTRUCTION**

REV	DESCRIPTION	TMC	RP	DATE
1	FOR APPROVAL			02.02.2024

ARCHITECT

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Email: info@rocengineering.com.au ABRN: 70 610 369 610

PROJECT

**PROPOSED MOTEL BUILDING WITH ON-GRADE PARKING 61 SYDNEY ROAD GOULBURN**

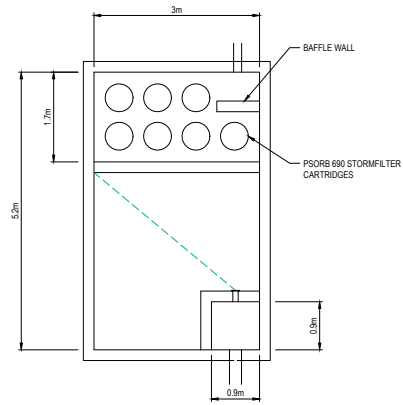
DRAWING TITLE

**ROOF DRAINAGE PLAN**

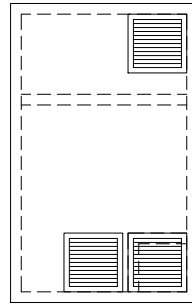
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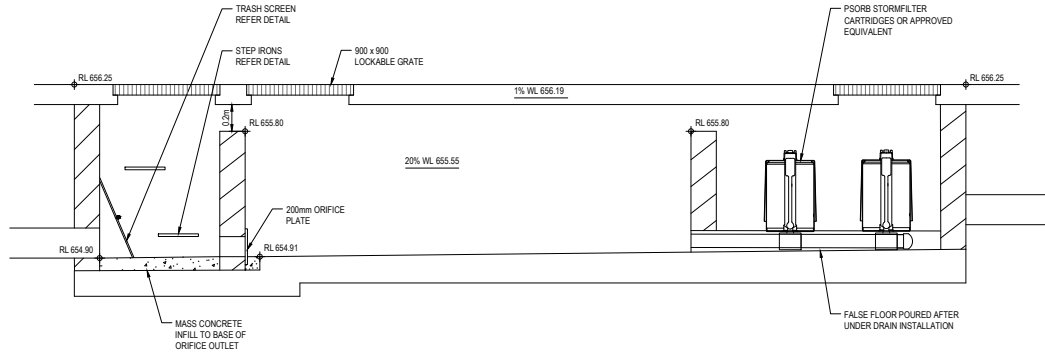
JOB NUMBER	DATUM	DRAWING NUMBER	REVISION
23309	AHD	C41	1



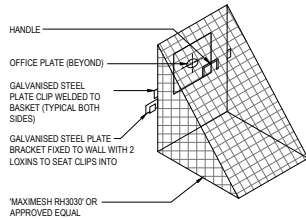
**OSD BASE SLAB PLAN**  
SCALE: 1:50



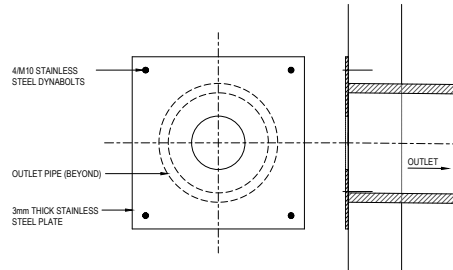
**OSD ROOF SLAB PLAN**  
SCALE: 1:50



**OSD SECTION**  
NOT TO SCALE



**TRASH SCREEN DETAIL**



**ORIFICE PLATE DETAIL**

5mm THICK ENGRAVED STAINLESS STEEL PLAQUE. PROVIDE 4 M4.5 STAINLESS STEEL DYABOLTS INTO CONCRETE P.T. PROVIDE FOR EACH OSD UNIT.

THIS STRUCTURE IS AN OSD FACILITY, BEING PART OF THE STORMWATER DRAINAGE NETWORK AND IS NOT TO BE TAMPERED WITH.  
IDENTIFICATION NUMBER DA2024/\_\_\_\_\_  
REFER TO MAINTENANCE SCHEDULE IN 889 INSTRUMENT FOR MAINTENANCE REQUIREMENTS.

**IDENTIFICATION PLAQUE**

REV	DESCRIPTION	TMC	RP	DATE
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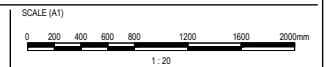
PROJECT

**PROPOSED MOTEL BUILDING WITH ON-GRADE PARKING  
61 SYDNEY ROAD  
GOULBURN**

DRAWING TITLE

**OSD DETAILS**

**NOT FOR CONSTRUCTION**



JOB NUMBER	DATUM	DRAWING NUMBER	REVISION
23309	AHD	C48	1





**LEGEND**

---	BOUNDARY
---	CONTROL LINE
---	EXISTING SPOT LEVEL
---	PROPOSED SPOT LEVEL
---	EXISTING CONTOUR
---	PROPOSED CONTOUR
---	PAVEMENT SAG LINE
---	PAVEMENT CREST LINE
---	FALL
---	RETAINING WALL
---	DEDICATED ACCESSIBLE PATH OF TRAVEL
---	KO
---	KORB ONLY. REFER DETAIL

- NOTES**
1. THE EXTERNAL FINISHED SURFACE MUST BE GRADED TO SLOPE AWAY FROM ALL BUILDINGS A MINIMUM OF 50mm OVER THE FIRST 1m.
  2. INTERNAL STRUCTURAL SLAB LEVELS TO BE A MINIMUM 150mm ABOVE EXTERNAL FINISHED SURFACE LEVELS. THIS MAY BE REDUCED TO 20mm FOR PAVED OR CONCRETE AREAS SLOPING AWAY FROM THE BUILDING.

**GRADING PLAN**  
SCALE: 1:200

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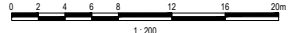
PROJECT

**PROPOSED MOTEL BUILDING WITH ON-GRADE PARKING**  
**61 SYDNEY ROAD**  
**GOULBURN**

DRAWING TITLE

**GRADING PLAN**

SCALE (A1)



1 : 200

JOB NUMBER	DATUM	DRAWING NUMBER	REVISION
23309	AHD	C50	1

---

## APPENDIX B – SITE SURVEY

IGN  
MGA SCMS  
DP1280250



Denotes Approximate Sewer Zone of Influence

**IMPORTANT NOTE**

1. This plan was prepared for the sole use of the client for the specific purpose of producing a detailed site survey for level purposes. This plan is strictly limited to that purpose and does not apply directly or indirectly and will not be used for any other application, use or matter. The plan is presented without the assumption of a duty of care to any other person (other than the Client) ("Third Party") and may not be relied on by Third Party.
2. Contours are interpolated from accurate spot levels as shown and should be used as a guide only. Do not re-interpolate contours.
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  - e. the Client or any Third Party not verifying information in this plan where recommended by Masters Surveying
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7. For reasons of plan presentation, not all of the information can be shown on this plan.

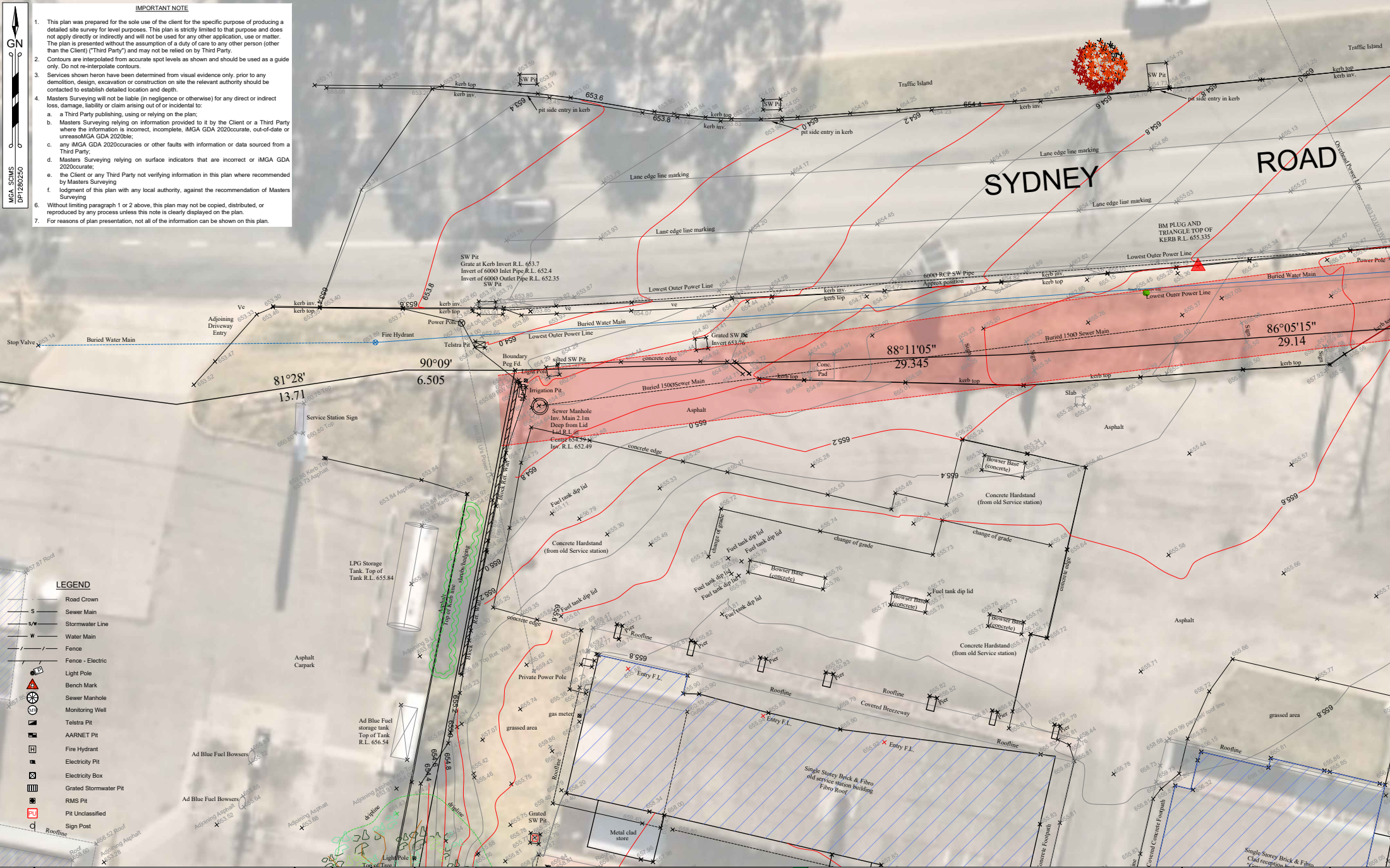
Rev.	Reason for Issue or Amendment	Date	Drawn	Checked	Surveyed
1	Issue for Information	08/11/2023	ZS/NB	NB	NB
0	DRAFT ISSUE	3/11/2023	ZS/MT/NB	NB	NB

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 Brisbane Gladstone Mackay Rockhampton Wollongong  
 CADASTRAL CONSTRUCTION ENGINEERING

Project: Lot 5 DP793066, 61 Sydney Road Goulburn	Masters Job No: 67173	Scale: 1:250 at A1
Title: Detail Site Survey - Overall Site Plan	Level Datum: AHD	Origin: PM58933
Client: NDCO	Masters Drawing No: 67173 - 1	Revision: 1
		Co-ord System: MGA GDA 2020
		Sheet: 1 of 5

**IMPORTANT NOTE**

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- Contours are interpolated from accurate spot levels as shown and should be used as a guide only. Do not re-interpolate contours.
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  - Masters Surveying relying on surface indicators that are incorrect or IMGA GDA 2020 accurate;
  - the Client or any Third Party not verifying information in this plan where recommended by Masters Surveying;
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**LEGEND**

- Road Crown
- Sewer Main
- Stormwater Line
- Water Main
- Fence
- Fence - Electric
- Light Pole
- Bench Mark
- Sewer Manhole
- Monitoring Well
- Telstra Pit
- AARNET Pit
- Fire Hydrant
- Electricity Pit
- Electricity Box
- Grated Stormwater Pit
- RMS Pit
- Pit Unclassified
- Sign Post

Rev.	Reason for Issue or Amendment	Date	Drawn	Checked	Surveyed
1	Issue for Information	08/11/2023	ZS/NB	NB	NB
0	Initial Release	28/07/2023	ZS	NB	ZS

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Project: Lot 5 DP793066, 61 Sydney Road Goulburn	Masters Job No: 67173	Scale: 1:100 at A1
Title: Detail Site Survey - Plan Sheet 2	Level Datum: AHD	Origin: PM58933
Client: ADM Architects	Masters Drawing No: 67173 - 1	Revision: 0
		Co-ord System: MGA GDA 2020
		Sheet: 2 of 5





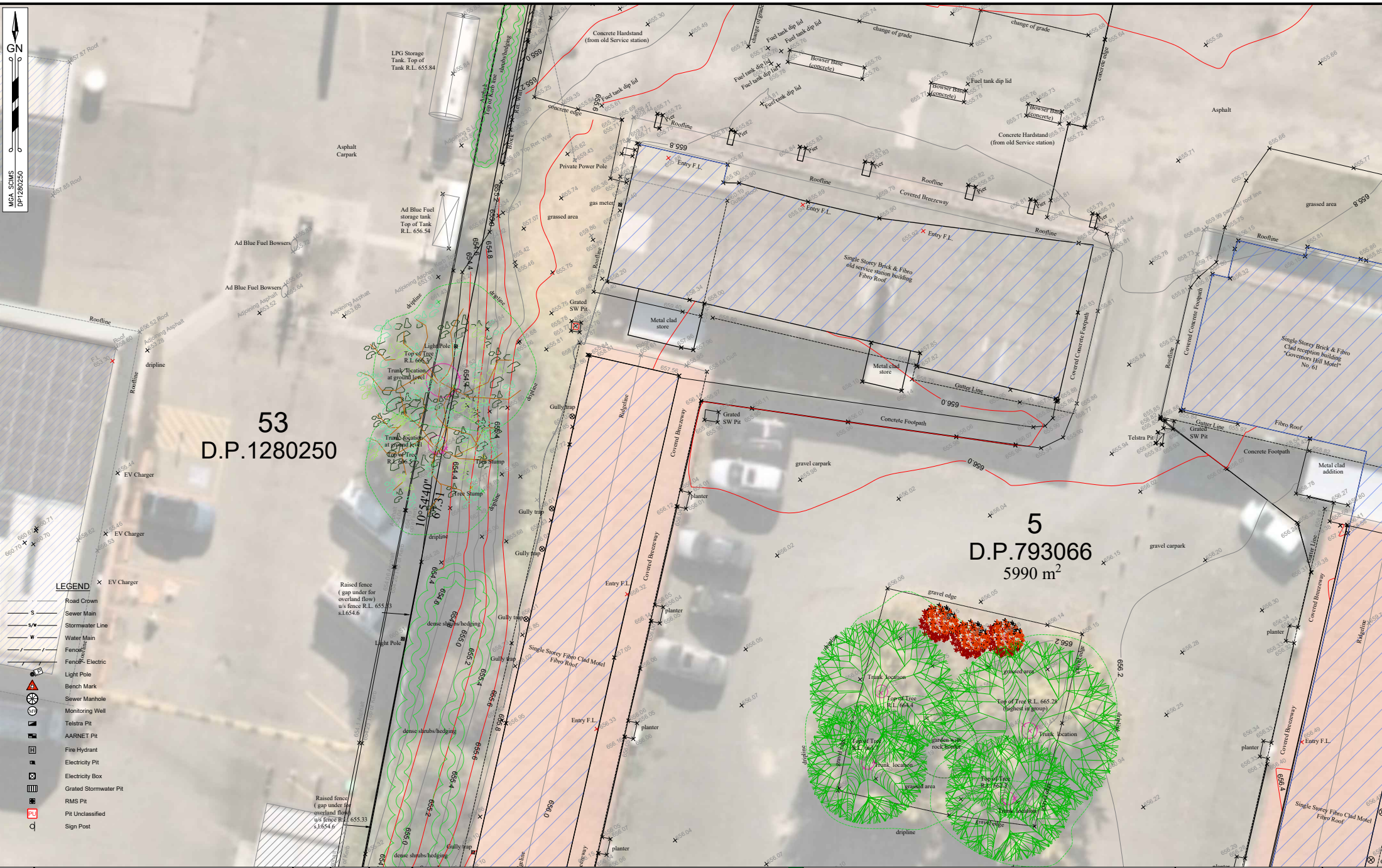
**LEGEND**

—	Road Crown
— S —	Sewer Main
— SW —	Stormwater Line
— W —	Water Main
— F —	Fence
— E —	Electric
⊙	Light Pole
⊙	Bench Mark
⊙	Sewer Manhole
⊙	Monitoring Well
⊙	Telstra Pit
⊙	AARNET Pit
⊙	Fire Hydrant
⊙	Electricity Pit
⊙	Electricity Box
⊙	Grated Stormwater Pit
⊙	RMS Pit
⊙	Pit Unclassified
⊙	Sign Post

Rev.	Reason for Issue or Amendment	Date	Drawn	Checked	Surveyed
1	Issue for Information	08/11/2023	ZS/NB	NB	NB
0	Initial Release	28/07/2023	ZS	NB	ZS

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 CADASTRAL CONSTRUCTION ENGINEERING

Project: Lot 5 DP793066, 61 Sydney Road Goulburn	Masters Job No: 67173	Scale: 1:100 at A1
Title: Detail Site Survey - Plan Sheet 4	Level Datum: AHD	Origin: PMS58933
Client: ADM Architects	Masters Drawing No: 67173 - 1	Revision: 0
		Co-ord System: MGA GDA 2020
		Sheet: 4 of 5



53  
D.P.1280250

5  
D.P.793066  
5990 m<sup>2</sup>

- LEGEND**
- ✕ EV Charger
  - Road Crown
  - S Sewer Main
  - SW Stormwater Line
  - W Water Main
  - F Fence
  - E Electric
  - Light Pole
  - Bench Mark
  - Sewer Manhole
  - Monitoring Well
  - Telstra Pit
  - AARNET Pit
  - Fire Hydrant
  - Electricity Pit
  - Electricity Box
  - Grated Stormwater Pit
  - RMS Pit
  - Pit Unclassified
  - Sign Post

Rev.	Reason for Issue or Amendment	Date	Drawn	Checked	Surveyed
1	Issue for Information	08/11/2023	ZS/NB	NB	NB
0	Initial Release	28/07/2023	ZS	NB	ZS

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 CADASTRAL CONSTRUCTION ENGINEERING

Project: Lot 5 DP793066, 61 Sydney Road Goulburn	Masters Job No: 67173	Scale: 1:100 at A1
Title: Detail Site Survey - Plan Sheet 5	Level Datum: AHD	Origin: PMS58933
Client: ADM Architects	Masters Drawing No: 67173 - 1	Revision: 0

Co-ord System: MGA GDA 2020	Sheet: 5 of 5
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# APPENDIX C – DRAINS INPUTS



PIT / NODE DETAILS															Version 15									
Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	Part Full Shock Loss	Inflow Hydrograph	Pit is New	Internal Width (mm)	Inflow is Misaligned (m)	Minor Safe Pond Dept (m)	Major Safe Pond Depth (m)					
B/1	OnGrade	SI	450x450		3.3	654.8		0	0.3	-65078.6	685.482	No	14	1 x Ku	No	New	No							
B/2	OnGrade	SI	450x450		2.3	654.6		0	0.3	-65730.2	34566.16	No	15	1 x Ku	No	New	No							
A/8	OnGrade	SI	450x450		1.5	654.5		0	0.3	-66512.1	67795.28	No	12	1 x Ku	No	New	No							
EX KIP	Node					653.8		0		-67554.5	71834.9		13		No									
N - BYPASS	Node							0		-53872	87602.44		223		No									
N - PRE DE	Node					666		0		-99428.4	100659.5		228		No									
N - ROOF1	Node					660		0		-55435.7	32611.5		232		No									
A/1	Sag	SI	450x450	32	1.9	656.3	0.2	0	0.5	-40945.2	36390.5	No	5	1 x Ku	No	New	450	No	0.2	0.2				
A/2	Sag	SI	450x450	37	1.5	656.25	0.2	0	0.5	-22806	40612.55	No	6	1 x Ku	No	New	450	No	0.2	0.2				
A/3	Sag	SI	600x600	13	2	656.2	0.2	0	0.5	-2321.21	46711.08	No	7	1 x Ku	No	New	600	No	0.2	0.2				
A/4	Sag	SI	600x600	10	1.6	656.2	0.15	0	0.5	10501.32	61253.7	No	8	1 x Ku	No	New	600	No	0.15	0.15				
A/6	OnGrade	SI	450x450		1.8	656.2		0	0.3	-3181.26	85647.79	No	10	1 x Ku	No	New	No							
A/7	OnGrade	SI	450x450		0.2	655.3		0	0.3	-35237.6	75222.97	No	11	1 x Ku	No	New	No							
N - ROOF2	Node					660		0		-27809.9	21274.51		237		No									
N - ROOF3	Node					660		0		-5657.15	29223.43		246		No									
N - ROOF5	Node					660		0		-28722.1	54894.56		271		No									
N - ROOF6	Node					660		0		-6569.32	58673.56		279		No									
N - ROOF7	Node					660		0		-9696.77	71053.04		282		No									
N - ROOF8	Node					660		0		-58693.4	23620.09		293		No									
N - POST D	Node					652		0		-70427.4	91880.36		7077027		No									
N - OSC1	Node					656.6		0		6461.705	26486.92		8194667		No									
N - OSC3	Node					660		0		26008.25	73796.79		8194680		No									
N - PRE DE	Node					666		0		-144776	101285		8717438		No									
N - PRE DE	Node					666		0		-186340	100628.3		8717455		No									
N - PRE DE	Node					665		0		-144589	75765.06		8717462		No									
N - PRE DE	Node					664		0		-145058	66539.09		8717469		No									
N - OSC2	Node					664		0		8814.53	38413.93		8194675		No									
C/1	OnGrade	SI	450x450		1.5	656.6		0	0.3	-763.855	36855.85	No	25510090	1 x Ku	No	New								
DETENTION BASIN DETAILS																								
Name	Elev	Surf. Area	Not Used	Outlet Typ	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Leng	id									
AS/OSD	654.9	16		Orifice		200	655.05			6279.271	72668.88	No				9								
	656	16																						
	656.01	1																						
	656.21	1																						
SUB-CATCHMENT DETAILS																								
Name	Pit or Node	Total Area (ha)	Paved Area (%)	Grass Area (%)	Supp Area (%)	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope (%)	Grass Slope (%)	Supp Slope (%)	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope (%)				
C - B1	B/1	0.0243	48	52	0	5	7	2												0				
C - B2	B/2	0.0084	0	100	0	5	7	2												0				
C - A8	A/8	0.0114	31	69	0	5	7	2												0				
C - BYPASS	N - BYPASS	0.0461	0	100	0	5	7	2												0				
C - PRE DE	N - PRE DE	0.599	43.6	56.4	0	0	0	0	70	50	-1	1.2	10	-1	0.01	0.1	-1		0	0				
C - RF1	N - ROOF1	0.062	100	0	0	5	7	2											0	0				
C - A1	A/1	0.0482	70	30	0	5	7	2											0	0				
C - A2	A/2	0.0558	63	37	0	5	7	2											0	0				
C - A3	A/3	0.0259	87	13	0	5	7	2											0	0				
C - A4	A/4	0.0139	100	0	0	5	7	2											0	0				
C - A5	AS/OSD	0.0075	100	0	0	5	7	2											0	0				
C - A6	A/6	0.0095	52	48	0	5	7	2											0	0				
C - RF2	N - ROOF2	0.0277	100	0	0	5	7	2											0	0				
C - RF3	N - ROOF3	0.0666	100	0	0	5	7	2											0	0				
C - RF5	N - ROOF5	0.0412	100	0	0	5	7	2											0	0				
C - RF6	N - ROOF6	0.0186	100	0	0	5	7	2											0	0				
C - RF7	N - ROOF7	0.0996	100	0	0	5	7	2											0	0				
C - RF8	N - ROOF8	0.0323	100	0	0	5	7	2											0	0				
C - OSC1	N - OSC1	0.4537	0	100	0	0	2.8	0	-1	50	-1	-1	7.2	-1	-1	0.1	-1		0	0				
C - OSC3	N - OSC3	0.0275	100	0	0	5	7	2											0	0				
C - PRE DE	N - PRE DE	0.4537	0	100	0	0	2.88	0	-1	50	-1	-1	6.6	-1	-1	0.1	-1		0	0				
C - PRE DE	N - PRE DE	0.1167	0	100	0	0	0	0	-1	20	-1	-1	11	-1	-1	0.1	-1		0	0				
C - OSC2	N - OSC2	0.0892	10	90	0	0	0	0	0	10	20	-1	3.9	3.9	-1	0.01	0.1	-1	0	0				
PIPE DETAILS																								
Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	RI (m)	Chg (m)	RL (m)	etc (m)					
B1-B2	B/1	B/2	33.1	654.35	654	1.06	uPVC, undr	150	150	154	0.012	New	1	B/1	0									
B2-A8	B/2	A/8	33.1	653.97	653.64	1	uPVC, undr	150	150	154	0.012	New	1	B/2	0									
A8-KIP	A/8	EX KIP	4.6	653.61	652.8	17.61	uPVC, undr	300	303	303	0.012	New	1	A/8	0									
RF1 - A1	N - ROOF1	A/1	10	656.83	655.83	10	uPVC, undr	150	154	154	0.012	New	1	N - ROOF1	0									
A1-A2	A/1	A/2	20.2	655.8	655.58	1.09	uPVC, undr	225	242	242	0.012	New	1	A/1	0									
A2-A3	A/2	A/3	19.7	655.55	655.33	1.12	uPVC, undr	225	242	242	0.012	New	1	A/2	0									
A3-A4	A/3	A/4	16.3	655.3	655.13	1.04	uPVC, undr	300	303	303	0.012	New	1	A/3	0									
A4-A5	A/4	AS/OSD	10.4	655.1	654.93	1.63	uPVC, undr	300	303	303	0.012	New	1	A/4	0									
A5-A6	AS/OSD	A/6	12.2	654.9	654.53	3.03	uPVC, undr	225	242	242	0.012	New	1	AS/OSD	0									
A6-A7	A/6	A/7	32	654.5	654.18	1	uPVC, undr	225	242	242	0.012	New	1	A/6	0									
A7-A8	A/7	A/8	34	654.15	653.81	1	uPVC, undr	225	242	242	0.012	New	1	A/7	0									
RF2 - A2	N - ROOF2	A/2	10	656.58	655.58	10	uPVC, undr	150	154	154	0.012	New	1	N - ROOF2	0									
RF3 - A3	N - ROOF3	A/3	10	656.33	655.33	10	uPVC, undr	150	154	154	0.012	New	1	N - ROOF3	0									
RF5 - A2	N - ROOF5	A/2	10	656.58	655.58	10	uPVC, undr	150	154	154	0.012	New	1	N - ROOF5	0									
RF6 - A4	N - ROOF6	A/4	10	656.13	655.13	10	uPVC, undr	150	154	154	0.012	New	1	N - ROOF6	0									
RF7 - A5	N - ROOF7	AS/OSD	10	657	656	10	uPVC, undr	150	154	154	0.012	New	1	N - ROOF7	0									
RF8 - B2	N - ROOF8	B/2	10	655	654	10	uPVC, undr	150	154	154	0.012	New	1	N - ROOF8	0									
Pipe80567	C/1	AS/OSD	40	656	655.6	1	uPVC, undr	150	154	154	0.012	New	1	C/1	0									
DETAILS OF SERVICES CROSSING PIPES																								
Pipe	Chg (m)	Bottom Elev (m)	Height of S Chg (m)	Bottom Elev (m)	Height of S Chg (m)	Bottom Elev (m)	Height of S etc (m)																	
CHANNEL DETAILS																								
Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed											
OVERFLOW ROUTE DETAILS																								
Name	From	To	Travel Time	Spill Level	Crest Length	Weir Coeff. C	Cross Section	Safe Major Depth	Safe Minor Stor	Safe Depth Stor	Bed Slope	D/S Area Contributing	id	U/S IL	D/S IL	Length (m)								

	(min)	(m)	(m)	(m)	(m)	(sq.m/sec)	(%)	%						
OF - B1	B/1	B/2	0.3		4 m wide p	0.3	0.15	0.4	0.6	0	407	654.8	654.6	33.1
OF - B2	B/2	A/8	0.4		4 m wide p	0.3	0.15	0.4	0.3	0	408	654.6	654.5	33.1
OF - A8	A/8	EX KIP	0.1		4 m wide p	0.3	0.15	0.4	1	0	5974201	654.5	653.8	4.6
OF - POST I EX KIP	N - POST D		0.1		4 m wide p	0.3	0.15	0.4	17	0	7077030	652.8	652	10
OF - BYPAS N - BYPASSEX KIP			0.1		4 m wide p	0.3	0.15	0.4	3	0	426	654	653.7	10
OF - PD ON N - PRE DE' N - PRE DE'			0.1		4 m wide p	0.3	0.15	0.4	10	0	8717468	666	665	10
OF - A1	A/1	A/2	0.2		4 m wide p	0.3	0.15	0.4	1.24	0	409	656.5	656.25	20.2
OF - A2	A/2	A/3	0.2		4 m wide p	0.3	0.15	0.4	1.27	0	410	656.45	656.2	19.7
OF - A3	A/3	A/4	0.1		4 m wide p	0.3	0.15	0.4	1.23	0	412	656.4	656.2	16.3
OF - A4	A/4	A5/OSD	0.1		4 m wide p	0.3	0.15	0.4	1.44	0	413	656.35	656.2	10.4
OF - A5	A5/OSD	A/6	0.3	656.21	1.7 4 m wide p	0.3	0.15	0.4	0.08	0	414	656.21	656.2	12.2
OF - A6	A/6	EX KIP	0.4		4 m wide p	0.3	0.15	0.4	3.73	0	437	656.2	653.7	67
OF - OFC1	N - OSC1	B/1	0.1		4 m wide p	0.3	0.15	0.4	0.75	0	8194666	654.9	654.8	10
OF - OSC3	N - OSC3	A/6	0.1		4 m wide p	0.3	0.15	0.4	1	0	8194682	656.3	656.2	10
OF - PDOS; N - PRE DE' N - PRE DE'			0.1		4 m wide p	0.3	0.15	0.4	10	0	8717466	666	665	10
OF - PDOS; N - PRE DE' N - PRE DE'			0.1		4 m wide p	0.3	0.15	0.4	10	0	8717465	666	665	10
OF - PRE D N - PRE DE' N - PRE DE'			0.1		4 m wide p	0.3	0.15	0.4	10	0	8717471	665	664	10
OF - OSC2	N - OSC2	C/1	0.1		4 m wide p	0.3	0.15	0.4	2	0	8194692	656.8	656.6	10
OF - CW	C/1	A/3	0.1		4 m wide p	0.3	0.15	0.4	4	0	25510162	656.6	656.2	10

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover	Cover (m)	
B1-B2	uPVC, undt	154	0.5	0.29	Unsafe
B2-A8	uPVC, undt	154	0.5	0.47	Unsafe
A8-KIP	uPVC, undt	303	0.5	0.58	
RF1 - A1	uPVC, undt	154	0.5	0.31	Unsafe
A1-A2	uPVC, undt	242	0.5	0.25	Unsafe
A2-A3	uPVC, undt	242	0.5	0.45	Unsafe
A3-A4	uPVC, undt	303	0.5	0.59	
A4-A5	uPVC, undt	303	0.5	0.79	
A5-A6	uPVC, undt	242	0.5	1.06	
A6-A7	uPVC, undt	242	0.5	0.87	
A7-A8	uPVC, undt	242	0.5	0.44	Unsafe
RF2 - A2	uPVC, undt	154	0.5	0.51	
RF3 - A3	uPVC, undt	154	0.5	0.71	
RF5 - A2	uPVC, undt	154	0.5	0.51	
RF6 - A4	uPVC, undt	154	0.5	0.91	
RF7 - A5	uPVC, undt	154	0.5	0.05	Unsafe
RF8 - B2	uPVC, undt	154	0.5	0.44	Unsafe
Pipe80567	uPVC, undt	154	0.5	0.44	Unsafe

This model has no pipes with non-return valves

---

## APPENDIX D – DRAINS OUTPUTS

DRAINS results prepared from Version 2023.11.8726.15750

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
B/1	654.81		0.053		0	0.034	Outlet System
B/2	654.62		0.041		0	0.026	Outlet System
A/8	653.91		0.033		0.59	0.018	Inlet Capacity
EX KIP	652.83		0.032				
N - BYPASS	654.01		0.007				
N - PRE DE	666.02		0.137				
N - ROOF1	656.89		0.021				
A/1	656.25	656.33	0.013	2.9	0.05	0	Inlet Capacity
A/2	656.2	656.28	0.015	3.1	0.05	0	Inlet Capacity
A/3	656.08	656.23	0.018	0.9	0.12	0	Inlet Capacity
A/4	655.98	656.21	0.005	0.4	0.22	0	Inlet Capacity
A/6	655.79		0.011		0.41	0.004	Inlet Capacity
A/7	654.79		0		0.51		None
N - ROOF2	656.62		0.009				
N - ROOF3	656.39		0.022				
N - ROOF 5	656.63		0.014				
N - ROOF 6	656.16		0.006				
N - ROOF 7	657.07		0.033				
N - ROOF8	655.04		0.011				
N - OSC1	654.93		0.049				
N - OSC3	656.31		0.009				
N - PRE DE	666.01		0.049				
N - PRE DE	666.01		0.03				
N - PRE DE	665.03		0.209				
N - OSC2	656.81		0.018				
C/1	656.08		0.018		0.52	0.008	Inlet Capacity

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
C - B1	0.004	0.003	0.001	5	7	7	2 10% AEP, 20 min burst, Storm 3
C - B2	0.001	0	0.001	5	7	7	2 10% AEP, 15 min burst, Storm 7
C - A8	0.002	0.001	0.001	5	7	7	2 10% AEP, 20 min burst, Storm 3
C - BYPASS	0.006	0	0.006	5	7	7	2 10% AEP, 15 min burst, Storm 7
C - PRE DE <sup>1</sup>	0.101	0.063	0.039	3.57	6.15	6.15	0 10% AEP, 10 min burst, Storm 7
C - RF1	0.016	0.016	0	5	7	7	2 10% AEP, 5 min burst, Storm 1
C - A1	0.011	0.009	0.002	5	7	7	2 10% AEP, 15 min burst, Storm 5
C - A2	0.011	0.01	0.002	5	7	7	2 10% AEP, 15 min burst, Storm 3
C - A3	0.006	0.006	0	5	7	7	2 10% AEP, 15 min burst, Storm 4
C - A4	0.004	0.004	0	5	7	7	2 10% AEP, 5 min burst, Storm 1
C - A5	0.002	0.002	0	5	7	7	2 10% AEP, 5 min burst, Storm 1
C - A6	0.002	0.001	0.001	5	7	7	2 10% AEP, 20 min burst, Storm 10
C - RF2	0.007	0.007	0	5	7	7	2 10% AEP, 5 min burst, Storm 1
C - RF3	0.018	0.018	0	5	7	7	2 10% AEP, 5 min burst, Storm 1
C - RF5	0.011	0.011	0	5	7	7	2 10% AEP, 5 min burst, Storm 1
C - RF6	0.005	0.005	0	5	7	7	2 10% AEP, 5 min burst, Storm 1
C - RF7	0.026	0.026	0	5	7	7	2 10% AEP, 5 min burst, Storm 1
C - RF8	0.009	0.009	0	5	7	7	2 10% AEP, 5 min burst, Storm 1
C - OSC1	0.044	0	0.044	0	10.6	10.6	0 10% AEP, 20 min burst, Storm 8
C - OSC 3	0.007	0.007	0	5	7	7	2 10% AEP, 5 min burst, Storm 1
C - PRE DE <sup>1</sup>	0.043	0	0.043	0	10.89	10.89	0 10% AEP, 20 min burst, Storm 9
C - PRE DE <sup>1</sup>	0.019	0	0.019	0	3.45	3.45	0 10% AEP, 10 min burst, Storm 7
C - OSC2	0.014	0.002	0.012	0.78	4.7	4.7	0 10% AEP, 10 min burst, Storm 7

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
B1-B2	0.011	0.61	654.751	654.621	10% AEP, 20 min burst, Storm 1
B2-A8	0.023	1.25	654.451	653.913	10% AEP, 10 min burst, Storm 7
A8-KIP	0.12	5.28	653.87	652.907	10% AEP, 15 min burst, Storm 6
RF1 - A1	0.016	2.61	656.887	656.249	10% AEP, 5 min burst, Storm 1
A1-A2	0.021	0.46	656.229	656.204	10% AEP, 15 min burst, Storm 4
A2-A3	0.041	0.9	656.156	656.083	10% AEP, 15 min burst, Storm 4
A3-A4	0.063	0.87	656.023	655.98	10% AEP, 10 min burst, Storm 7
A4-A5	0.07	0.97	655.923	655.89	10% AEP, 10 min burst, Storm 7
A5-A6	0.065	1.41	655.864	655.79	10% AEP, 15 min burst, Storm 8
A6-A7	0.086	1.87	655.468	654.795	10% AEP, 15 min burst, Storm 6
A7-A8	0.086	1.95	654.753	654.032	10% AEP, 15 min burst, Storm 6
RF2 - A2	0.007	2.08	656.618	656.204	10% AEP, 5 min burst, Storm 1
RF3 - A3	0.018	2.66	656.389	656.083	10% AEP, 5 min burst, Storm 1
RF5 - A2	0.011	2.33	656.626	656.204	10% AEP, 5 min burst, Storm 1
RF6 - A4	0.005	1.85	656.161	655.98	10% AEP, 5 min burst, Storm 1
RF7 - A5	0.026	2.96	657.074	656.074	10% AEP, 5 min burst, Storm 1
RF8 - B2	0.009	2.17	655.041	654.621	10% AEP, 5 min burst, Storm 1
Pipe80567	0.006	0.57	656.08	655.89	10% AEP, 15 min burst, Storm 4

#### CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
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#### OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF - B1	0.034	0.034	0.703	0.035	0.02	4	0.44	10% AEP, 20 min burst, Storm 4
OF - B2	0.026	0.026	0.497	0.031	0.01	4	0.4	10% AEP, 20 min burst, Storm 4
OF - A8	0.018	0.018	0.908	0.017	0.02	1.73	1.18	10% AEP, 20 min burst, Storm 4
OF - POST	0.14	0.14	1.314	0.038	0.06	4	1.53	10% AEP, 15 min burst, Storm 5
OF - BYPAS	0.006	0.006	1.431	0.015	0.01	1.53	0.48	10% AEP, 15 min burst, Storm 7
OF - PD ON	0.101	0.101	1.355	0.033	0.05	4	1.41	10% AEP, 10 min burst, Storm 7
OF - A1	0	0	1.011	0	0	0	0	
OF - A2	0	0	1.023	0	0	0	0	
OF - A3	0	0	1.007	0	0	0	0	
OF - A4	0	0	1.09	0	0	0	0	
HIGH FLOW	0.059	0.059						10% AEP, 15 min burst, Storm 6
OF - A5	0	0	0.257	0	0	0	0	
OF - A6	0.004	0.003	1.409	0.013	0.01	1.33	3	10% AEP, 10 min burst, Storm 6
OF - OFC1	0.044	0.044	0.787	0.036	0.02	4	0.52	10% AEP, 20 min burst, Storm 10
OF - OSC3	0.007	0.007	0.908	0.022	0.01	4	0.26	10% AEP, 5 min burst, Storm 1
OF - PDOS:	0.043	0.043	1.355	0.025	0.03	4	1.06	10% AEP, 20 min burst, Storm 8
OF - PDOS:	0.019	0.019	1.355	0.021	0.02	4	0.77	10% AEP, 10 min burst, Storm 7
OF - PRE D	0.151	0.151	1.355	0.038	0.06	4	1.64	10% AEP, 10 min burst, Storm 7
OF - OSC2	0.014	0.014	1.284	0.023	0.01	4	0.42	10% AEP, 10 min burst, Storm 7
OF - CW	0.008	0.008	1.412	0.016	0.01	1.63	0.57	10% AEP, 10 min burst, Storm 7

#### DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
A5/OSD	655.89	15.8	0.123	0.065	0.059

Run Log for DRAINS v2023.11.8726.15750 - 23309 - DRAINS

{\color{red}\green0\blue0;}Run Log for DRAINS v2023.11.8726.15750 - 23309 - DRAINS.drn run at 20:42:4

No water upwelling from any pit.

Freeboard was less than 0.15m at B/2, B/1, A/3, A/2, A/1

Flows were safe in all overflow routes.

DRAINS results prepared from Version 2023.11.8726.15750

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
B/1	654.85		0.138		0	0.097	Outlet System
B/2	654.67		0.127		0	0.091	Outlet System
A/8	653.93		0.134		0.57	0.073	Inlet Capacity
EX KIP	652.84		0.145				
N - BYPASS	654.01		0.016				
N - PRE DE	666.03		0.263				
N - ROOF1	656.9		0.032				
A/1	656.39	656.39	0.022	10.1	0	0	Outlet System
A/2	656.37	656.36	0.025	12	0	0	Outlet System
A/3	656.3	656.3	0.041	5.4	0	0	Outlet System
A/4	656.25	656.23	0.007	1.8	0	0	Outlet System
A/6	656.19		0.028		0.01	0.007	Inlet Capacity
A/7	654.98		0		0.32		None
N - ROOF2	656.63		0.014				
N - ROOF3	656.48		0.034				
N - ROOF 5	656.64		0.021				
N - ROOF 6	656.27		0.009				
N - ROOF 7	657.1		0.051				
N - ROOF8	655.05		0.016				
N - OSC1	654.95		0.128				
N - OSC3	656.31		0.014				
N - PRE DE	666.02		0.125				
N - PRE DE	666.01		0.052				
N - PRE DE	665.05		0.441				
N - OSC2	656.82		0.041				
C/1	656.53		0.041		0.07	0.017	Inlet Capacity

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
C - B1	0.008	0.004	0.003	5	7	7	2 1% AEP, 10 min burst, Storm 7
C - B2	0.002	0	0.002	5	7	7	2 1% AEP, 10 min burst, Storm 9
C - A8	0.003	0.001	0.002	5	7	7	2 1% AEP, 10 min burst, Storm 7
C - BYPASS	0.012	0	0.012	5	7	7	2 1% AEP, 10 min burst, Storm 4
C - PRE DE <sup>1</sup>	0.189	0.094	0.095	3.03	5.23	5.23	0 1% AEP, 10 min burst, Storm 7
C - RF1	0.025	0.025	0	5	7	7	2 1% AEP, 10 min burst, Storm 8
C - A1	0.016	0.014	0.004	5	7	7	2 1% AEP, 10 min burst, Storm 1
C - A2	0.018	0.013	0.006	5	7	7	2 1% AEP, 10 min burst, Storm 7
C - A3	0.01	0.009	0.001	5	7	7	2 1% AEP, 10 min burst, Storm 1
C - A4	0.006	0.006	0	5	7	7	2 1% AEP, 10 min burst, Storm 8
C - A5	0.003	0.003	0	5	7	7	2 1% AEP, 10 min burst, Storm 8
C - A6	0.003	0.002	0.001	5	7	7	2 1% AEP, 10 min burst, Storm 7
C - RF2	0.011	0.011	0	5	7	7	2 1% AEP, 10 min burst, Storm 8
C - RF3	0.027	0.027	0	5	7	7	2 1% AEP, 10 min burst, Storm 8
C - RF5	0.017	0.017	0	5	7	7	2 1% AEP, 10 min burst, Storm 8
C - RF6	0.008	0.008	0	5	7	7	2 1% AEP, 10 min burst, Storm 8
C - RF7	0.041	0.041	0	5	7	7	2 1% AEP, 10 min burst, Storm 8
C - RF8	0.013	0.013	0	5	7	7	2 1% AEP, 10 min burst, Storm 8
C - OSC1	0.103	0	0.103	0	9.02	9.02	0 1% AEP, 15 min burst, Storm 8
C - OSC 3	0.011	0.011	0	5	7	7	2 1% AEP, 10 min burst, Storm 8
C - PRE DE <sup>1</sup>	0.102	0	0.102	0	9.27	9.27	0 1% AEP, 15 min burst, Storm 8
C - PRE DE <sup>1</sup>	0.039	0	0.039	0	2.7	2.7	0 1% AEP, 5 min burst, Storm 1
C - OSC2	0.026	0.003	0.023	0.66	4	4	0 1% AEP, 10 min burst, Storm 4

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
B1-B2	0.012	0.62	654.789	654.667	1% AEP, 5 min burst, Storm 1
B2-A8	0.024	1.28	654.492	653.933	1% AEP, 5 min burst, Storm 1
A8-KIP	0.139	5.44	653.882	652.917	1% AEP, 10 min burst, Storm 7
RF1 - A1	0.025	2.92	656.903	656.393	1% AEP, 10 min burst, Storm 8
A1-A2	0.026	0.57	656.382	656.367	1% AEP, 5 min burst, Storm 1
A2-A3	0.054	1.18	656.342	656.304	1% AEP, 5 min burst, Storm 1
A3-A4	0.087	1.2	656.271	656.246	1% AEP, 5 min burst, Storm 1
A4-A5	0.096	1.34	656.222	656.208	1% AEP, 5 min burst, Storm 1
A5-A6	0.066	1.43	656.204	656.192	1% AEP, 10 min burst, Storm 1
A6-A7	0.095	2.07	655.799	654.979	1% AEP, 10 min burst, Storm 7
A7-A8	0.095	2.12	654.929	654.039	1% AEP, 10 min burst, Storm 7
RF2 - A2	0.011	2.35	656.627	656.367	1% AEP, 10 min burst, Storm 8
RF3 - A3	0.027	1.49	656.476	656.304	1% AEP, 10 min burst, Storm 8
RF5 - A2	0.017	2.63	656.638	656.367	1% AEP, 10 min burst, Storm 8
RF6 - A4	0.008	0.44	656.268	656.246	1% AEP, 10 min burst, Storm 1
RF7 - A5	0.041	3.27	657.098	656.208	1% AEP, 10 min burst, Storm 8
RF8 - B2	0.013	2.46	655.051	654.667	1% AEP, 10 min burst, Storm 8
Pipe80567	0.012	0.63	656.481	656.208	1% AEP, 10 min burst, Storm 4

#### CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
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#### OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF - B1	0.097	0.097	1.494	0.054	0.03	4	0.62	1% AEP, 15 min burst, Storm 8
OF - B2	0.091	0.091	1.519	0.053	0.03	4	0.61	1% AEP, 10 min burst, Storm 7
OF - A8	0.073	0.073	1.479	0.028	0.04	4	1.39	1% AEP, 10 min burst, Storm 7
OF - POST	0.23	0.23	1.314	0.046	0.09	4	1.86	1% AEP, 10 min burst, Storm 4
OF - BYPAS	0.012	0.012	1.431	0.022	0.01	4	0.43	1% AEP, 10 min burst, Storm 7
OF - PD ON	0.189	0.189	1.355	0.041	0.07	4	1.82	1% AEP, 10 min burst, Storm 7
OF - A1	0	0	1.463	0	0	0	0	
OF - A2	0	0	1.464	0	0	0	0	
OF - A3	0	0	1.473	0	0	0	0	
OF - A4	0	0	1.472	0	0	0	0	
HIGH FLOW	0.082	0.082						1% AEP, 10 min burst, Storm 4
OF - A5	0	0	0.853	0	0	0	0	
OF - A6	0.007	0.007	1.409	0.016	0.02	1.63	2.94	1% AEP, 10 min burst, Storm 4
OF - OFC1	0.103	0.103	1.485	0.051	0.04	4	0.72	1% AEP, 15 min burst, Storm 8
OF - OSC3	0.011	0.011	1.479	0.024	0.01	4	0.3	1% AEP, 5 min burst, Storm 1
OF - PDOS:	0.102	0.102	1.355	0.033	0.05	4	1.42	1% AEP, 15 min burst, Storm 8
OF - PDOS:	0.039	0.039	1.355	0.025	0.02	4	0.96	1% AEP, 5 min burst, Storm 1
OF - PRE D	0.318	0.318	1.355	0.051	0.11	4	2.22	1% AEP, 10 min burst, Storm 7
OF - OSC2	0.026	0.026	1.442	0.028	0.01	4	0.49	1% AEP, 10 min burst, Storm 7
OF - CW	0.017	0.017	1.412	0.023	0.01	4	0.51	1% AEP, 10 min burst, Storm 7

#### DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
A5/OSD	656.21	17.9	0.148	0.066	0.082

Run Log for DRAINS v2023.11.8726.15750 - 23309 - DRAINS

{\color{red}\green0\blue0;}Run Log for DRAINS v2023.11.8726.15750 - 23309 - DRAINS.drn run at 20:40:3

Upwelling occurred at: B/2, A/4, A/3, A/2, A/1

Freeboard was less than 0.15m at C/1, B/1, A/6

Flows were safe in all overflow routes.