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ENGINEERS
MANAGERS
INFRASTRUCTURE PLANNERS
DEVELOPMENT CONSULTANTS

Our Reference: NS220988
Your Reference:

11th August 2023

James Goode
McCloy Project Management Pty Ltd
PO Box 2214
DANGAR NSW 2309

Attention: James Goode

Dear James,

Re: Brocklesby Road Subdivision – 39, 39A and 41 Brocklesby Road, Medowie
Rezoning Stormwater Report

ACOR Consultants have been engaged by McCloys Project Management Pty Ltd to prepare an Engineering Report to support the rezoning application for the future development of Lot 2 DP 508780, Lot 301 DP 625002 and Lot 300 DP 625002, Brocklesby Road, Medowie. The developments will front and access Brocklesby Road and off Macadamia Circuit in the subdivision known as “The Gardens”.

Stormwater quantity items addressed in this report include:

- Stormwater conveyance/network
- Stormwater detention

Stormwater quality items to be addressed in this report include:

- Operational water quality management incorporating Water Sensitive Urban Design principles (WSUD).
- Construction water quality management incorporating soil and water management.

1 Stormwater Quantity

1.1 Standards and References

The stormwater quantity measures implemented in this design have been designed in accordance with the following documents:

- 0074 Stormwater Drainage (Design) Development Design Specification Rev 3 Nov 2022
- NSW MUSIC Modelling Guidelines (WBM, 2015).
- Australian Rainfall and Runoff 2019
- Stormwater Management Report - NSW210351_R01_Stormwater Management Report_REV B

1.2 Stormwater Detention

The criteria for the stormwater drainage design were adopted from the Port Stephens Council 0074 Stormwater Drainage (Design) Development Design Specification. Stormwater detention has been provided for the development. DRAINS modelling was undertaken adopting the ILSAX modelling procedure with ARR 2019 Data.

1.2.1 Previous Modelling

Previous Modelling of the upstream catchments for the neighbouring subdivision “The Gardens” has changed to suit the development of this proposed subdivision. The differences can be seen by reviewing Appendix C and Appendix D which show the external catchments of the subdivision and the proposed development's catchments. The differences between these two catchment plans have been accounted for within the modelling of Basin S-C1, to ensure that there are no adverse impacts on the downstream subdivision or its piped drainage network.

1.2.2 Pre-Development Site Catchment

The proposed site has two defined catchments named as C1 and C2 in the predeveloped scenario. The catchment areas have been determined by existing topography with a natural crest occurring in the middle of the site. The proposed layout of the site can be found in Appendix A. The site is currently rural residential, consisting mainly of vegetated pervious areas. An existing depression is located along the northern boundary of 41 Brocklesby Road where existing twin Ø525mm concrete culverts collect the existing flow.

External catchments EXT-C1 and EXT-C2 to the north and south of the site respectively, flow through a roadside swale at the front of the proposed site toward the previously mentioned, existing twin Ø525mm concrete culverts crossing below Brocklesby Road. These catchment boundaries have been determined using a combination of detail survey and LiDAR contours. These catchments have been included in the hydraulic analysis of the site. The predeveloped catchment areas and fraction impervious are shown in Table 1. Refer to Appendix B for Pre-Development Stormwater Catchment Plans.

Table 1: Predeveloped Catchments

Catchment	Area (ha)	Predeveloped % Impervious	Predeveloped % Pervious	Pervious Flow Length (m)	Pervious Flow Slope %	Pervious Roughness	Pervious Additional Timing (min)	Impervious Flow Length (m)	Impervious Flow Slope %	Impervious Roughness	Pervious Additional Timing (min)
C1	2.60	0	100	100	0.8	0.21	4.8	100	0.8	0.013	4.8
C2	2.50	2	98	100	1.5	0.21	3.6	100	1.5	0.013	3.6
EXT-C1	4.59	24	76	100	4.3	0.21	4.5	100	4.3	0.013	4.5
EXT-C2	3.50	4	96	100	1.2	0.21	6	100	1.2	0.013	6

The pervious additional timing was determined using the QUDM additional flow path timing graphs with the use of a 3x multiplier for natural channels.

1.2.3 Post Development Catchment

The site has three defined catchments in the Post Developed scenario. The external catchment for the site remains unchanged between the predeveloped and post developed scenarios and will bypass on-site detention (OSD) and water quality measures as shown in Appendix C. EXT C1 and EXT C2 will drain to a headwall at the end of the swale currently running along Brocklesby Road and will be piped to the existing twin 525mm pipe culverts crossing Brocklesby Road. Refer to Appendix C for details.

The post developed catchment areas and fraction impervious are shown in Table 2. Refer to Appendix C for Post development Stormwater Catchment Plan.

Table 2: Postdeveloped Catchments

Catchment	Area (ha)	Post developed % Impervious	Impervious Time of Concentration	Pervious Time of Concentration	Supplementary Time of Concentration
S-C1	2.21	72	6	12	6
S-C2	2.20	68	6	12	6
S-C2 Bypass	0.3	80	6	12	6
C U-1	0.073	70	5	10	0
C V-1	0.162	70	5	10	0
C X-1	0.073	80	5	10	0
C Y-1	0.141	90	5	10	0
C Z-1	0.102	90	5	10	0

For the site developed model, fraction impervious of 70% was adopted for road catchments which is to be confirmed at the detailed design stage. A variable fraction impervious was adopted for lots, which was developed based of the 0074 Stormwater Drainage (Design) Development Design Specification. The calculations have been provided within Appendix E and the catchments that drain directly to the neighbouring development are shown within Appendix D.

1.2.4 Hydrology

The hydrology modelling for the development is in accordance with ARR 2019 and Port Stephens Council design requirements. ILSAX models have been adopted with the parameters shown in Table 3 and are in line with the previously approved Gardens Subdivision Stormwater Design

Table 3: Hydrological Parameters

ILAX	
Paved area depression storage (mm)	1
Supplementary area depression storage (mm)	1
Grassed area depression storage (mm)	5
Soil type	3

1.2.5 Legal Point of Discharge

There are two proposed points of discharge for the site. The western site discharge is to discharge directly into proposed pit on Macadamia Circuit within The Gardens Subdivision. The eastern site discharge drains to an existing swale and culvert on Brocklesby Rd.

1.2.6 Drains Catchment Modelling

DRAINS modelling was undertaken to determine the predeveloped and developed peak flows for a range of AEPs from 20% to 1%, for storm durations ranging from 5 minutes to 2 hours for the proposed development to confirm detention requirements. Comparisons have been undertaken at the two outlet points of discharge connecting to Macadamia Circuit and Brocklesby Road. Table 4 shows the peak flows at the Macadamia Circuit outlet and Table 5 shows the peak flows at the Brocklesby Road outlet. It is important to note that external catchments flowing to the outlet point on Brocklesby Road have also been included within the pre and post developed modelling.

Table 4: Macadamia Circuit - Predeveloped vs Developed (without Detention) Peak Flows

Storm Event AEP	Catchment S-C1 Peak Discharge m^3/s:			
	Pre-Development	Post Development	Difference	Difference %
20%	0.182	0.642	0.460	353%
10%	0.279	0.813	0.470	291%
5%	0.387	0.917	0.517	237%
2%	0.539	1.110	0.571	206%
1%	0.677	1.330	0.570	196%

Table 5: Brocklesby Road - Predeveloped vs Developed (without Detention) Peak Flows

Storm Event AEP	Catchment S-C2 - Peak Discharge m^3/s:			
	Pre-Development	Post Development	Difference	Difference %
20%	1.13	1.57	0.48	139%
10%	1.59	2.12	0.53	133%
5%	2.12	2.39	0.27	127%
2%	2.97	3.22	0.25	108%
1%	3.70	3.98	0.28	108%

As can be seen from Table 4 and Table 5, detention is required to reduce the peak flows from the development to the predeveloped peak flows. It is recommended by ACOR that detention to be provided on western corner of the site for sub catchment S-C1 before discharging to Macadamia Circuit. Detention is also required on sub catchment S-C2 prior to discharge on Brocklesby Road and is proposed via a single basin on eastern corner of the site.

1.2.7 DRAINS Detention Basin Parameters

Detention basins have been modelled to reduce the peak flow rates off a sub catchments S-C1 and S-C2 in accordance with Port Stephens Council's requirements. Detention basins with the attributes shown in table 6 and 7 were modelled to reduce the total peak flows leaving the site to below the existing peak flows:

Table 6: Detention Basin Details

Property	S-C1 Detention Basin Details	S-C2 Detention Basin Details
Basin Invert Level RL (m)	26	26
Basin Crest Level RL (m)	28	28.1
Emergency Weir Level RL (m)	27.5	27.6
Volume to Weir (m^3)	1,224	890
Volume to Crest (m^3)	1,989	1,105
Outlet		
Orifice Inlet size (mm)	300	280
Orifice Level RL (m)	26	26
Pit Weir Level RL (m)	27.3	27.1
Pit Weir Length (m)	3.6	2.4
Outlet Pipe (mm)	450 dia	375 dia

The outlet configuration from the basin caters for events up to and including the 1% AEP peak flow.

The stage storage for the basins is shown in Table 7.

Table 7: Basin Stage & Volume

S-C1 Detention Basin			S-C2 Detention Basin		
Height (m)	Surface Area (m^2)	Volume (m^3)	Height (m)	Surface Area (m^2)	Volume (m^3)
26	511	0	26	318	0
26.5	758	317	26.5	480	196
27	990	745	27	670	476
27.5	1298	1224	27.5	880	851
28	1530	1989	28	1085	1334

1.2.8 Overall Site DRAINS Post Development Modelling

Additionally, to the sub catchments meeting predevelopment vs post development flows, the flows at each stream outlet point must meet the predevelopment vs post development flows. A comparison of the predeveloped and the developed peak flows at the outlet point of each stream for each AEP from 20% through to 1% are shown in Table 8 and Table 9.

Table 8: Macadamia Circuit - Predeveloped vs Developed (with Detention) Peak Flows

Storm Event AEP	Peak Discharge m^3/s:			
	Pre-Development	Post Development	Difference	Difference %
20%	0.182	0.165	-0.017	-9.3%
10%	0.279	0.183	-0.096	-34.4%
5%	0.387	0.201	-0.186	-48.1%
2%	0.539	0.264	-0.275	-51 %
1%	0.677	0.490	-0.187	-27.6%

Table 9: Brocklesby Road - Predeveloped vs Developed (with Detention) Peak Flows

Storm Event AEP	Peak Discharge m^3/s:			
	Pre-Development	Post Development	Difference	Difference %
20%	1.13	1.12	-0.01	-0.8%
10%	1.59	1.58	-0.01	-0.6%
5%	2.12	2.02	-0.10	-4.7%
2%	2.97	2.97	0.00	0%
1%	3.70	3.68	-0.02	-0.5%

As can be seen from Table 8 and Table 9, by constructing the detention basins with the volume and outlet configurations discussed above, the peak flows at the outlet points of the development are reduced to below the predeveloped peak flows

1.3 Scour Protection

Headwall with scour protection shall be nominated on the design plans for the pipe outlets from the detention basin S-C2 connecting to existing swale along Brocklesby Road at detailed design. The scour protection design shall be in accordance with Council guidelines on rock sizing for both single, multi-pipe outlets and spillways.

2 Stormwater Quality - Operational Phase

2.1 Objectives

The objectives of the stormwater quality management for the site are:

Catchment C1
As Catchment C1 is within a drinking water catchment, Council has requested that both NorBE or Council's water quality stripping targets are confirmed to ensure that the best water quality outcomes are achieved.

NorBE requires that a development has no water quality impacts on the downstream system. Therefore, the development must reach its predeveloped runoff levels.

Councils Water Quality Objectives are listed below:

Meet the water quality objectives of Port Stephens Council for the operational phase of the site by using best practice stormwater treatment measures. The water quality stripping targets required by Port Stephens Council are % Reductions from the developed site of:

- 90% reduction in Total Suspended Solids (TSS)
- 60% reduction in Total Phosphorus (TP)
- 45% reduction in Total Nitrogen (TN)
- 90% reduction in litter/gross pollutants

Catchment C2

Catchment C2 is not within a drinking water catchment and as such needs only meet the water quality stripping targets outlined above.

2.2 Operational Phase Water Quality Management

2.2.1 General

To meet the water quality requirements of Port Stephens Council, a range of water quality improvement devices are proposed. The proposed water quality improvement devices for the site are:

- Rainwater Tanks
- Humegard GPT
- Bioretention Basin
-

The above water quality improvement devices act as a treatment train, progressively reducing pollutants as they pass through each one.

2.2.1.1 Introduction

The MUSIC model version 6 was used to assess the pollutant generation from the development and the performance of the stormwater quality treatment train. MUSIC modelling was undertaken in accordance with the Port Stephens Council MUSIC Link and the NSW MUSIC Modelling Guidelines (WBM, 2015).

2.2.1.2 Rainfall Data, Evaporation Data, and soil type

The Williamtown RAAF – Zone C Catchment MUSIC Link rainfall data and evapotranspiration data was adopted for this project.

2.2.1.3 Predeveloped S-C1 Catchment

Site sub catchment S-C1 discharges into a drinking water catchment. A predeveloped agricultural catchment node was adopted for NorBE analysis as the property was previously utilised for farm purposes.

2.2.1.4 MUSIC Model Source Inputs

The source data for the MUSIC model for the developed model were adopted from the Port Stephens Council's MUSIC Link and checked against NSW MUSIC Model Guideline values for urban residential. The roof area for each lot of 250 m^2 was adopted for the modelling. An overall lot fraction impervious of approximately 85% was adopted (including the roof area) for lots. A fraction impervious of 70% was adopted for the road catchments. Calculations for the fraction impervious of these areas can be found in Appendix E

completed in line with Councils lot impervious guidelines found within the table on page 8 of the Stormwater Drainage (Design) Development Specification (0074).

2.2.1.5 Catchments Pollutant Mean Concentrations

The pollutant Event Mean Concentration (EMC) values for the development were adopted from Stephens Council's MUSIC link (and checked against the NSW MUSIC Modelling Guideline values) for both base flows and storm flows. The catchments were divided into roofs, residential lots (remaining yards) and road areas.

2.2.1.6 Offline Bioretention Basin

Council has requested that any bioretention basins will need to be offline from any detention basins with a maximum extended detention depth of 150mm. Refer to Appendix A for the location of the Offline Bio Retention basins. The general arrangement of the basins can be seen below in Figure 1 where a maximum 150mm extended detention depth is achieved via a pit and pipe treatment outlet configuration which will bypass downstream detention basin and outlet at the legal discharge point.

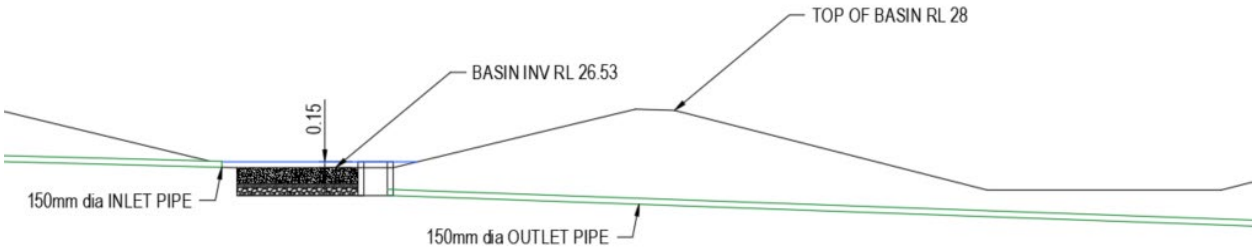

Figure 1 - Proposed Bioretention Basin Longsection

2.2.1.7 MUSIC Model Treatment Train

Modelling has been undertaken in accordance with Council MUSIC link with the developed site based on conceptual lot layout with water quality treatment devices included to achieve Council's objectives. The stormwater quality treatment train consist of three parts: rainwater tanks, a gross pollutant trap and an offline bioretention basins and a Swale for Catchment C-1.

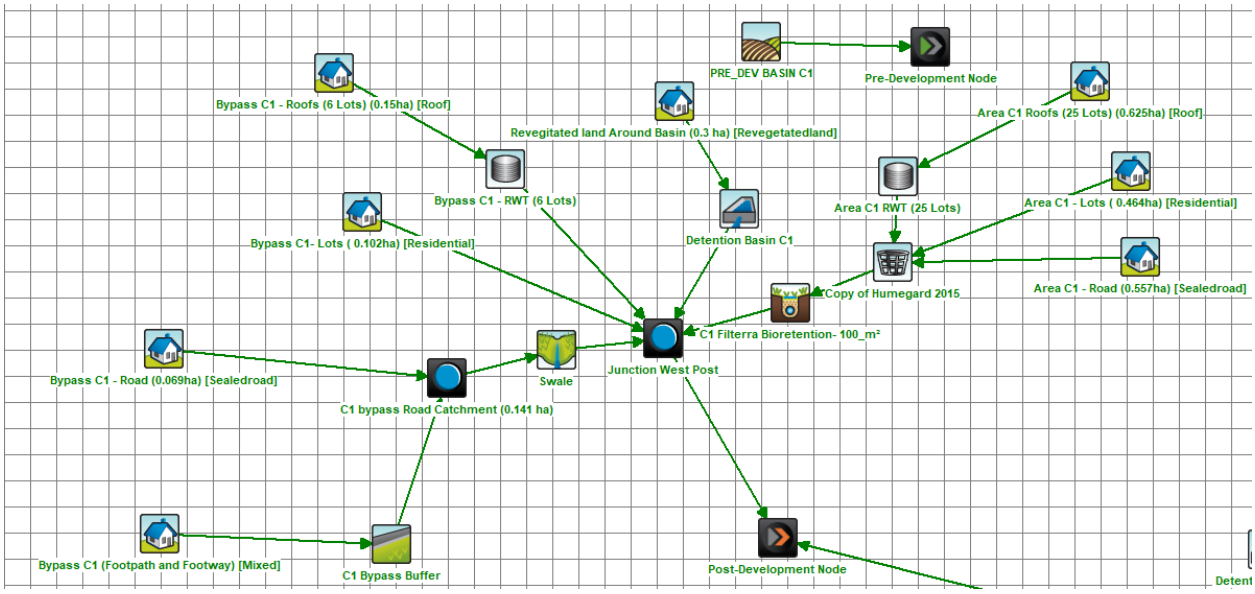

Figure 2 Screen shot of MUSIC treatment train for Catchment S-C1

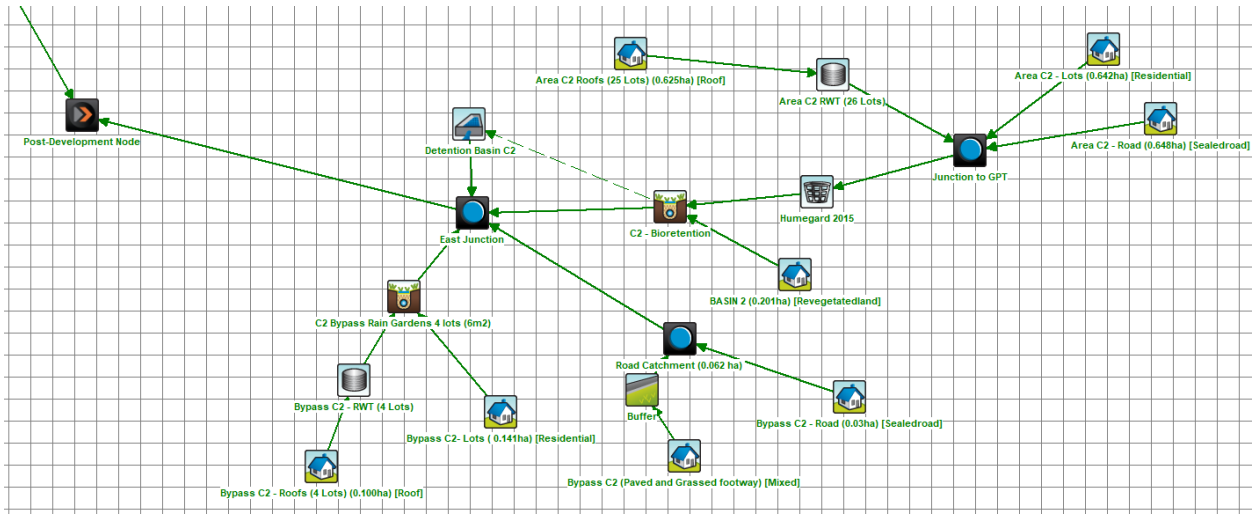

Figure 3 Screen shot of MUSIC treatment train for Catchment S-C2

A brief description on each treatment measure is listed below.

Rainwater Tanks

Rainwater tanks receive water from the roof area of each lot. A 4kL rainwater tank was assumed for each standard residential lot. Water captured in the rainwater tanks is expected to be reused for toilet flushing, clothes washing, hot water and garden irrigation. An average of 4 persons was assumed for each house. The reuse per house was adopted from the NSW MUSIC Modelling Guidelines, Table 6-1. The reuse adopted for each lot is shown in Table 10.

Table 10: Rainwater Tank Reuse (per lot)

Rainwater Reuse	
Internal (L/day/dwelling)	425
External (L/day/dwelling)	151

Rainwater Reuse	
High flow Bypass (m^3/s/dwelling)	0.005

Humegard GPT

A GPT will form part of the treatment train on western and eastern site that provide treatment prior to discharge into the basins. A Humegard GPT unit was adopted. Information on the GPTs can be found in Table 11. A splitter pit will be constructed immediately upstream of the GPT to divert at minimum the 4EY flow through the GPT.

Table 11: Humegard GPT Removal Efficiencies

Inflow (m^3/s)	Gross Pollutant Removal (%)	TSS Removal (%)	TP Removal (%)	TN Removal (%)
Varies	90	49	40	26

Drainage Swale

An existing drainage swale within Stage 6 of the Gardens with be maintained and act as a drainage swale for the upstream land as well as taking a small catchment of road flow which will subsequently treat this flow before entering the downstream system.

Bioretention Basin

A bioretention basin is the final part of the treatment train for the site catchments SC-1 and SC-2. Bioretention systems remove sediments (TSS) as well as nutrients (TN and TP) for the stormwater. The bioretention basin consists of a shallow dry basin with deep rooted vegetation and grass on the surface, over an infiltration/filtration area and an underdrain area. Vegetation in the bioretention basins will be in accordance with Port Stephens Council requirements.

There are two nominated bioretention basin for catchments S-C1 and S-C2. The location of the bioretention basin is shown in Appendix A and B. Details of the bioretention basins are shown in Table 12.

Table 12: Bioretention Basin Details

Property	S-C1 Bioretention Details	S-C2 Bioretention Details
Extended Detention Depth (m)	0.15	0.15
Surface Area (m^2)	150	120
Filter Area (m^2)	150	120
Unlined Filter Material (m)	0.01	0.01
Saturated Hydraulic Conductivity (mm/hr)	3550	3550
Filter Depth (m)	0.4	0.4
TN Content of Filter Media (mg/kg)	500	500
Orthophosphate of Filter Media (mg/kg)	1	1
Exfiltration Rate (mm/hr)	0	0
Base Lined	Yes	Yes
Vegetation Properties	Vegetated with Effective Nutrient Removal Plants	Vegetated with Effective Nutrient Removal Plants
Overflow Weir Width (m)	2.4	2.4
Under Drain Present	Yes	Yes
Submerged Zone with Carbon Present	No	No

Noting the High Saturated Hydraulic Conductivity and TN content of the Filter Media, Ocean protects **Filterra engineered bio-filtration media** or an approved equivalent has been specified for the bio retention basins of the proposed development.

2.2.2 Stormwater Quality Modelling Result

2.2.2.1 NorBE Results for Catchment S-C1

The results of the MUSIC model for the catchment S-C1 showing the mean annual pollutant loads for the existing catchment vs the post developed catchment are shown below in Table 13. As per the NorBE requirements, the development must have a neutral or beneficial effect on water quality leaving the site.

Table 13: Predeveloped and Post developed Mean Annual Pollutant Loads

	Predeveloped Load	Post developed Load
TSS (kg/yr)	1140	305
TP (kg/yr)	3.26	0.993
TN (kg/yr)	23.2	15.9
Gross Pollutants (kg/yr)	10	22.6

As can be seen from the table above the post developed loads leaving the site have been reduced below the predeveloped loads for TSS, TP and TN. The gross pollutant loads have not been reduced below the predeveloped loads due to the bypass catchment which includes a small section of road and 6 lots draining to the existing road downstream and bypassing the proposed water quality treatment for this development. Additional treatment for the flows from this development will be provided downstream in the existing drainage system. This will ensure that gross pollutants from the bypass catchment are captured.

2.2.2.2 Treatment Train Reductions for Catchment S-C1

The results of the MUSIC model for the catchment S-C1 showing the mean annual pollutant loads for the existing and the developed catchment S-C1 are shown in Table 14.

Table 14: MUSIC Model Results

	Source Load	Residual Load	% Achieved Reduction	% Required Reduction
TSS (kg/yr)	3200	305	90.5	90
TP (kg/yr)	6.27	0.993	84.2	60
TN (kg/yr)	45.5	15.9	65	45
Gross Pollutants (kg/yr)	495	22.6	95.4	90

2.2.2.3 Treatment Train Reductions for Catchment S-C2

The results of the MUSIC model for the catchment S-C2 showing the mean annual pollutant loads for the existing and the developed catchment S-C2 are shown in Table 15.

Table 15: MUSIC Model Results

	Source Load	Residual Load	% Achieved Reduction	% Required Reduction
TSS (kg/yr)	3380	273	91.9	90
TP (kg/yr)	6.51	0.866	86.7	60
TN (kg/yr)	46.1	13.4	71	45
Gross Pollutants (kg/yr)	513	10.7	97.9	90

2.2.2.4 Water quality Results

Catchment C1

The treatment train proposed within the development meets the requirements of council's water quality reductions targets as shown in section 2.2.2.2.

The requirements of a neutral or beneficial effect where also reached for all but the gross pollutants as discussed in section 2.2.2.1. This was due to a bypass catchment which includes a small area of road and 6 residential lots not being able to be drained through the proposed GPT and bio retention basin. The development catchment C1 which includes this small bypass catchment will discharge into The Gardens subdivision and pass through the Stage 3 Basin and Humegard HG27 GPT currently installed within the Gardens Stage 3.

Table 16 below shows the gross pollutant loadings for Gardens Stage 3 from the original MUSIC model and with the added 6 lots from this development. As can be seen, the gross pollutant loads are only marginally increased with the 6 additional lots.

Table 16: Treatment of Bypassing lots In The Gardens Subdivision Gross Pollutant loads at the GPT in The Gardens Stage 3

	Source Load	Residual Load	% Achieved Reduction	% Required Reduction
Gross Pollutants (kg/yr) The Gardens Northern Catchment	1420	0	100	90
Gross Pollutants (kg/yr) The Gardens Northern Catchment	1480	0	100	90

The results above show that a 100% reduction in gross pollutants is still achieved within the additional 6 lots from the proposed development to the Gardens Music model. This satisfies the requirements of NorBE. This additional Music Model will be provided to Council for review.

Catchment C2

The treatment train proposed within the development meets the requirements of council's water quality reductions targets as shown in section 2.2.2.3.

3 Stormwater Quality - Construction Phase

3.1 General

During the construction phase of the development, an Erosion and Sediment Control Plan will be implemented to minimise the water quality impacts. The erosion and sediment controls will be in accordance with Landcom's Managing Urban Stormwater: Soils and Construction Volume 1, 4th Edition (Landcom, 2004) and the requirements of Port Stephens Council. Erosion and sediment controls will be required preconstruction, during construction and post construction until the site is stabilized. The expected erosion and sediment control measures will include stabilized site access, sediment fence, gully pit sediment barriers, rock outlet scour protection and a temporary sediment basin.

3.2 Pre-Construction Erosion and Sediment Control

Due to the topography of the site, the preconstruction erosion and sediment controls will be limited to stabilized site access, sediment fence and a temporary sediment basin until the initial bulk earthworks is undertaken. The proposed detention/water quality basin will be used as a sediment basin while construction is being undertaken.

3.3 During Construction Erosion and Sediment Control

During the construction phase of the development, the erosion and sediment controls will consist of installed sediment fence, a constructed sediment basin, gully pit sediment barriers and permanent rock outlet scour protection. Regular inspection and maintenance of the erosion and sediment controls is required during the construction process.

As the soils on site are clay, a sediment basin volume was calculated using the Blue Book for type F soils. During construction, if the soils are found to be dispersive, the contractor will need to provide a flocculating agent to ensure discharge from the basin meets the requirements of the Blue Book. Design of sediment basins will be carried out as part of detailed design and subject to staging of the development. The sediment basin

calculations are based upon a greater than 6month construction with a sensitive downstream receiver, resulting in a 6month, 5day 85th percentile storm depth of 31mm.

3.4 Post Construction Erosion and Sediment Control

The contractor/developer will be responsible for the maintenance of the erosion and sediment control devices from the practical completion of the works for a minimum of 6 months or until stabilization has occurred to the satisfaction of Port Stephens Council.

It is proposed to delay the construction of the bioretention filtration media in the basin until a significant proportion of the contributing lots are built on and established to avoid the system being filled with sediments and become ineffective.

4 Conclusion

This Civil Engineering Report addresses the concept civil design, stormwater quantity and quality of the residential development known as the Brocklesby Road Subdivision, Medowie

Detention modelling for the site determined that the peak flows from all AEPs from 20% to 1% AEP have been reduced to or below the predeveloped peak flows with the installation of detention basins.

Water quality management for the site will consist of a treatment train to reduce the pollutant runoff from the site in accordance with the requirements of Port Stephens Council.

Construction phase erosion and sediment control will be undertaken in accordance with Landcom's Managing Urban Stormwater and Port Stephens Council.

If you have any questions regarding the information provided in this Stormwater Rezoning Report, please call the undersigned or Greg Couch to discuss.

Yours faithfully,

ACOR Consultants (NSW) Pty Ltd

Caleb Davis
Civil Engineer

Appendix A - Site Layout Plan

SCHOOL

VACANT LAND
"SITE FOR POTENTIAL
MEDOWIE HIGH SCHOOL"

1
DP508780

"PLAYING FIELD"

MACADAMIA CIRCUIT

ROAD 2 (4.5 - 10.5 - 4.0)

ROAD 1 (4.5 - 8.0 - 4.0)

ROAD 4 (6.5 - 8.0 - 4.0)

ROAD 1 (4.5 - 8.0 - 4.0)

ROAD 1 (4.5 - 10.5 - 4.0)

BROCKLESBY ROAD

K&G

101 621m²	109 474m²	110 599m²	116 507m²	117 460m²	118 585m²	130 479m²	131 460m²	207 460m²	206 520m²	205 393m²	204 393m²	203 393m²	201 527m²	213 560m²	215 428m²	216 428m²	217 428m²	218 428m²	219 428m²	220 510m²	221 579m²
102 452m²					119 370m²								202 455m²	214 480m²							
103 362m²	108 362m²		115 363m²		120 357m²	129 351m²		208 363m²						229 557m²	228 734m²		223 737m²		222 567m²		
104 362m²	107 362m²		114 363m²		121 357m²	128 351m²		209 363m²													
105 362m²	154m²		113 413m²		122 406m²	127 400m²		210 413m²						226 552m²	227 725m²		224 723m²		225 546m²		
106 362m²			111 507m²	112 460m²	123 460m²	125 479m²	126 460m²	211 460m²	212 507m²												

DRAINAGE BASIN 1
3003m²

BIORETENTION AREA

DRAINAGE BASIN 2
3204m²
120m²

Ø375 Ø525 2xØ525

SCALE 1:500 @ A1
SCALE 1:1000 @ A3
0 5 10 20 30 40 50 metres

DIAL BEFORE YOU DIG www.1100.com.au

FOR INFORMATION
NOT FOR CONSTRUCTION

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
A	ISSUED FOR INFORMATION	15.08.23	MDM	GPC

North

Client
McCLOY PROJECT MANAGEMENT PTY LTD
PO BOX 2214
DANGAR, NSW 2309
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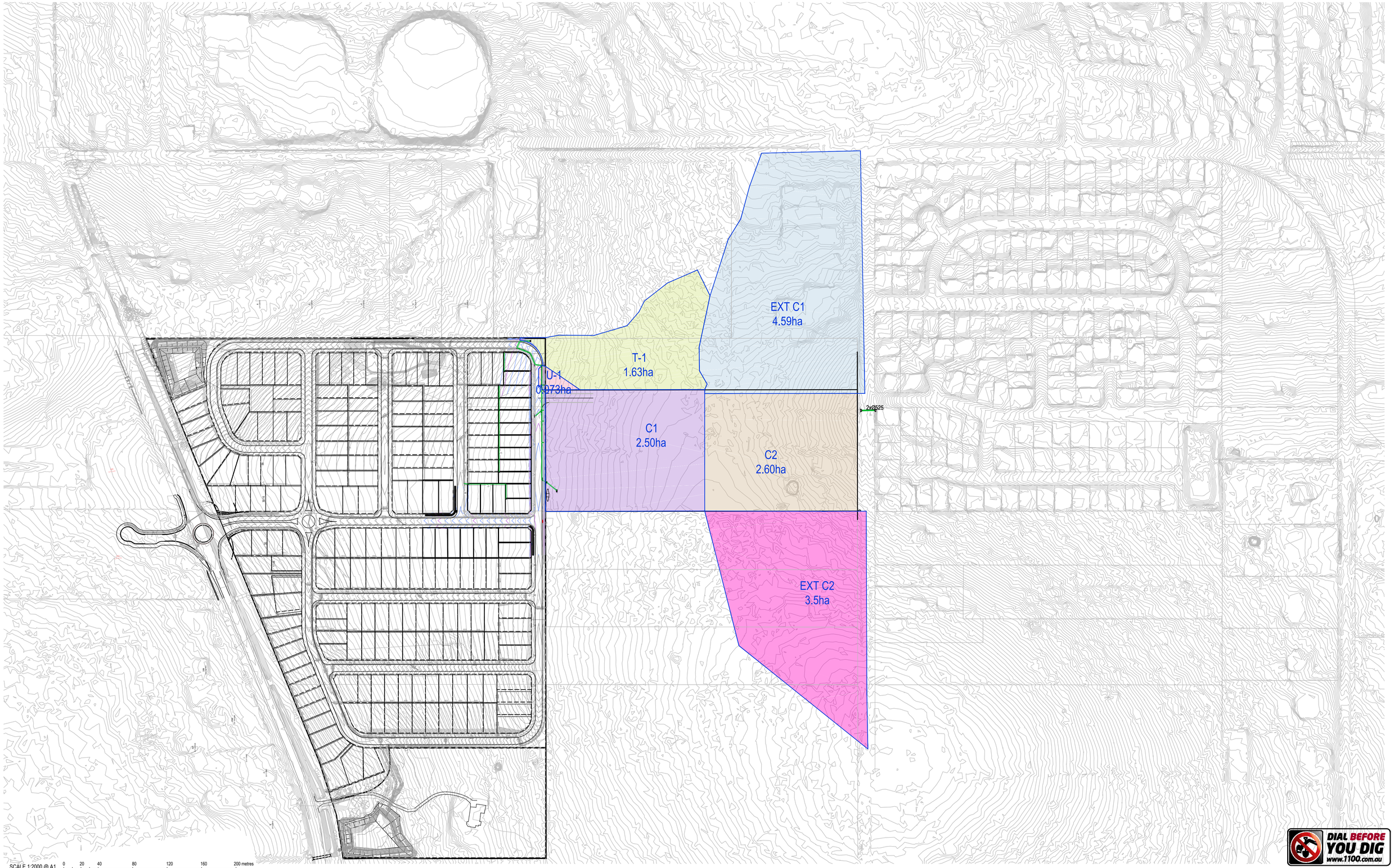
Project
BROCKLESBY ROAD SUBDIVISION
42 BROCKLESBY ROAD, MEDOWIE

Drawing Title
PROPOSED BASIN LAYOUT

Drawn	Date	Scale A1	Q.A. Check	Date
MDM	MAY 2023	1:500	GPC	15.08.23
Designed	Project No.		Dwg. No.	Issue
CD	NSW210544		SKC-001	A

Appendix B - Predeveloped Catchments



SCALE 1:2000 @ A1
SCALE 1:4000 @ A3

0 20 40 80 120 160 200 metres

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NOT FOR CONSTRUCTION

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
A	ISSUED FOR INFORMATION	16.08.23	MDM	GPC

1cm at full size

North

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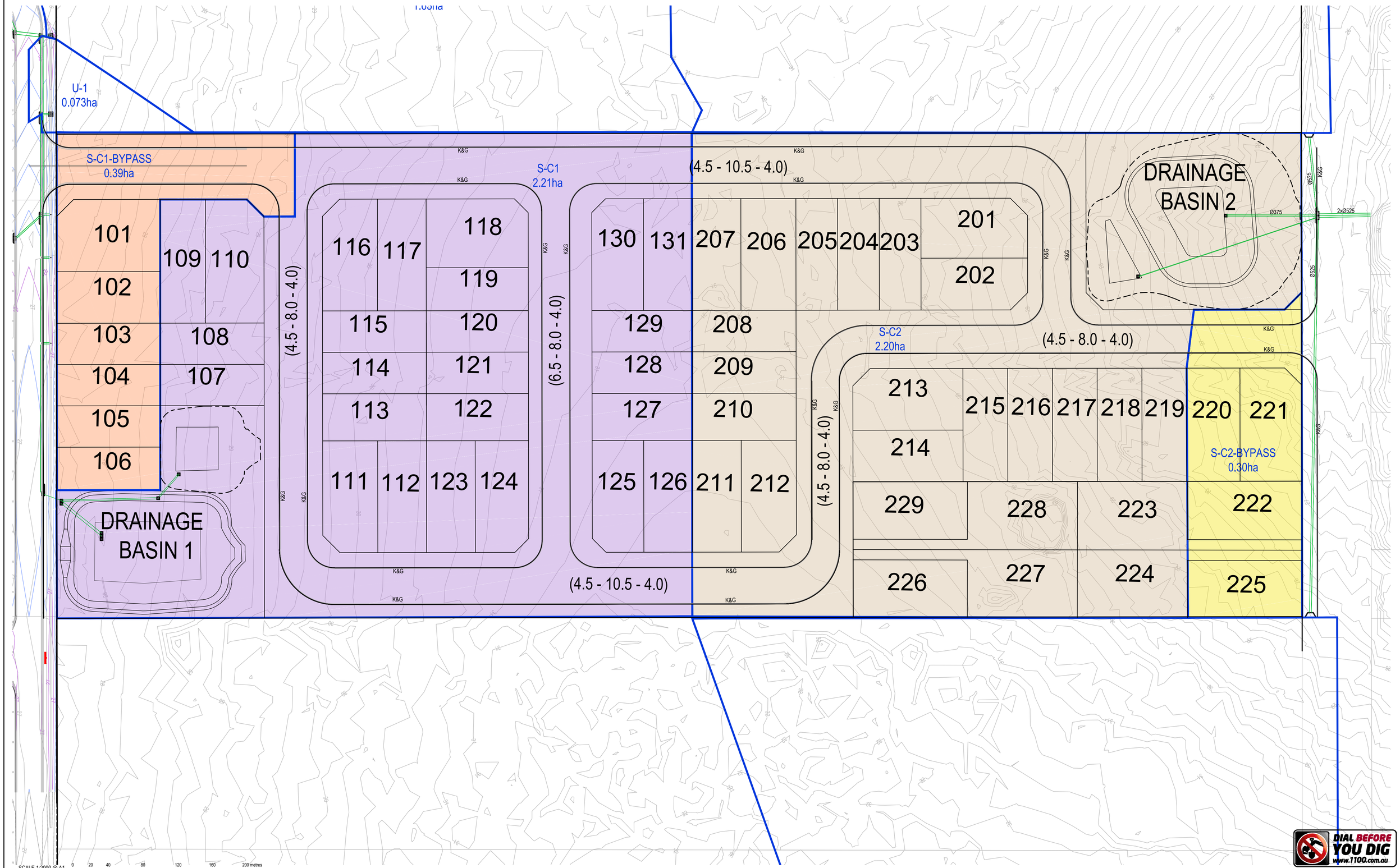
Project
BROCKLESBY ROAD SUBDIVISION

42 BROCKLESBY ROAD, MEDOWIE

Drawing Title
STORMWATER CATCHMENT

Drawn	Date	Scale A1	Q.A. Check	Date
MDM	MAY 2023	1:2000	GPC	16.08.23
Designed	Project No.		Dwg. No.	Issue
CD	NSW210544		SKC-002	A

Appendix C - Developed Site Catchments



FOR INFORMATION
NOT FOR CONSTRUCTION

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
A	ISSUED FOR INFORMATION	15.08.23	MDM	GPC

1cm at full size 10cm 20cm

North

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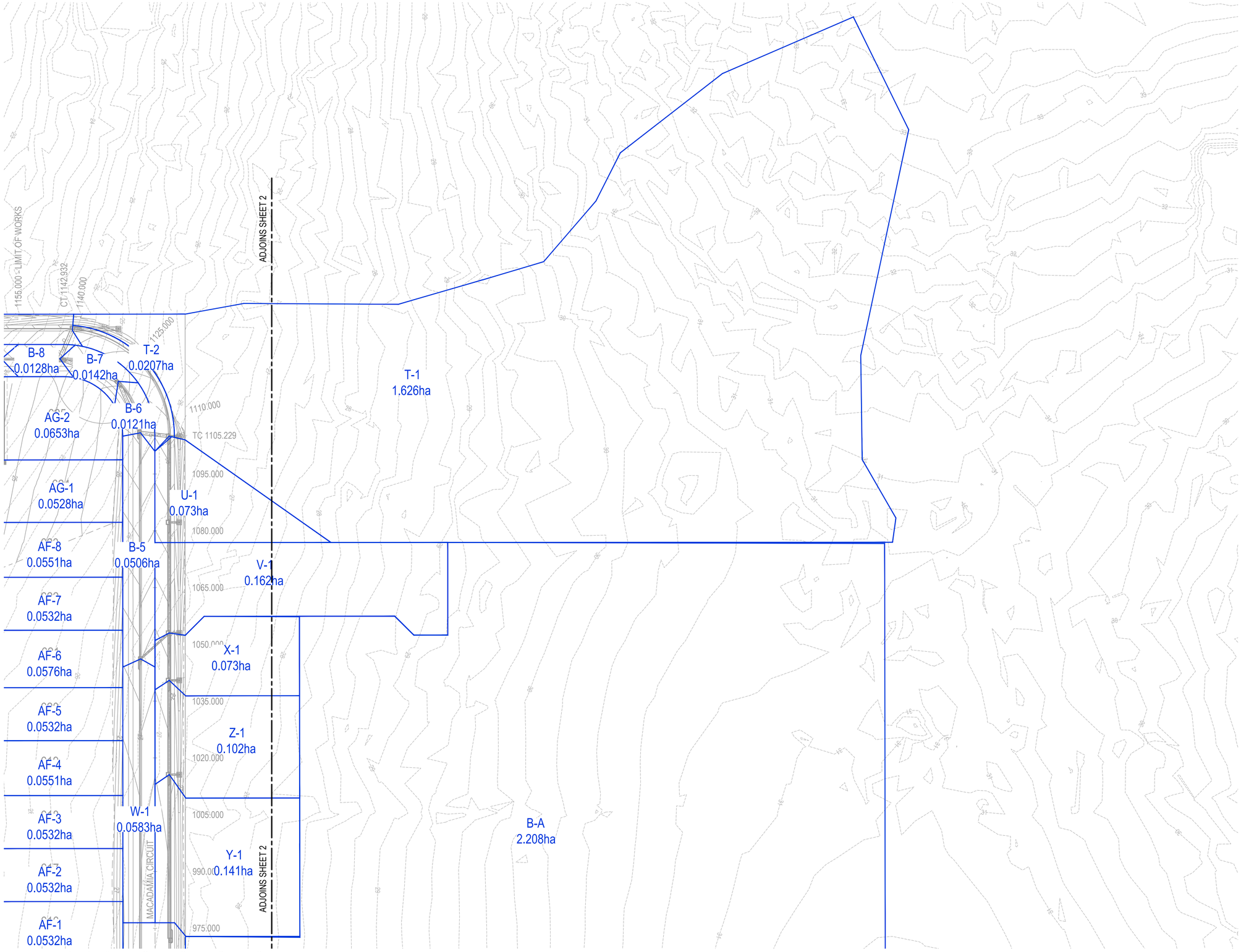
Project
BROCKLESBY ROAD SUBDIVISION

42 BROCKLESBY ROAD, MEDOWIE

Drawing Title
STORMWATER CATCHMENT

Drawn	Date	Scale A1	Q.A. Check	Date
MDM	MAY 2023	1:2000	GPC	15.08.23
Designed	Project No.		Dwg. No.	Issue
CD	NSW210544		SKC-003	A

Appendix D - Gardens Stage 6 Catchments



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FOR APPROVAL

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
F	STORMWATER ADJUSTMENTS - ISSUED FOR APPROVAL	19.05.23	MDM	GPC
E	NOT ISSUED	-	-	-
D	NOT ISSUED	-	-	-
C	NOT ISSUED	-	-	-

1cm at full size 0 10cm 20cm

North

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Project
THE GARDENS SUBDIVISION, MEDOWIE STAGE 6
688 - 730 MEDOWIE ROAD, MEDOWIE

Drawing Title
STORMWATER CATCHMENT 2 PLAN - SHEET 3

Drawn	Date	Scale A1	Q.A. Check	Date
JER	FEB 2022	1:500	GPC	19.05.23
Designed	Project No.		Dwg. No.	Issue
BG	NSW210544		C609-403	F

Appendix E - Impervious Area Calculations

Brocklesby Western Catchment Timing Calcs (S-C1)

	Area (m²)
Total Area	22115
	2636.03
90% Pervious Lot areas	1450.21
	1103.3985
total 90% Area	5189.6385
	1073.8
	1553.69
80% Pervious Lot areas	1924.63
	940.19
	940.19
total 80% Area	6432.5
Drainage Basin Reserve	2278.82
Total Roads Catchment @70 %	8213.91
Total Impervious Area	15794
ercentage Impervious of the site	71.4%
total % of Lots (C1)	84.5%

Brocklesby Eastern Catchment Timing Calcs (S-C2)

	Area (m²)
Total Area	21301.1
	2157.28
90% Pervious Lot areas	1141.22
	1103.3985
total 90% Area	4401.8985
	968.19
	980.69
80% Pervious Lot areas	982.5
	1596.27
	555.48
total 80% Area	5083.13
total 70% Area	2083.76
Drainage Basin Reserve	3172.48
Total Roads Catchment @70 %	6559.8315
Total Impervious Area	14396
Percentage Impervious of the site	67.6%
total % of Lots (C2)	82%

Road Percentage Impervious Calcs (19m)

1 footpath	1.5
Road width + additional kerb	10.8
Total Road Reserve Width	19
Percentage Impervious of Road Reserve	65%

Road Percentage Impervious Calcs (16.5)

1 footpath	1.5
Road width + additional kerb	8.3
Total Road Reserve Width	16.5
Percentage Impervious of Road Reserve	59%