STORMWATER MANAGEMENT PLAN

PROPOSED RESIDENTIAL SUBDIVISION LOT 31 & PART LOT 32 DP 778111

MCFARLANES ROAD CHISHOLM

ALLAM LAND NO.1 PTY LTD
MAY 2023

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Document Control Sheet

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A	Initial Issue	10/05/23	CC	AL

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Executive Summary

ADW Johnson has been engaged by Allam Property Group to prepare a Stormwater Management Plan (SMP) to accompany the Development Application for the residential subdivision of Lots 31 & 32 DP 778111.

Maitland City Council (Council) requires stormwater runoff from developments to be assessed for potential impacts on water quality, water quantity, and erosion and sediment control.

This SMP should be read in conjunction with *Addendum #5* of the *TNURA Eastern Precinct SMP* submitted with this Development Application. This addendum addresses the stormwater management requirements for the southern catchment of this development that drains towards the existing Sophia Waters development.

This SMP addresses both stormwater quantity and quality requirements for the northern catchment of the proposed development. The development includes one (1) permanent bio-retention basin designed to meet Council's quality requirements.

Stormwater runoff has been modelled using XPRAFTS software and assessed to ensure the peak runoff from the post developed catchment to less than or equal to the peak runoff of the pre developed catchments. Peak flows were monitored at the culverts that cross under Steamcruiser Drive immediately to the north-west of the development site. A wholistic approach to the stormwater detention strategy was undertaken to reduce the number and size of drainage facilities required to be handed over to Council, reducing maintenance requirements whilst still meeting Council's objectives.

A MUSIC model was used to simulate pollutant source elements for the proposed development. A water quality system consisting of gross pollutant traps and a bioretention basin at the north-western discharge point from the site was modelled to control pollutants discharging from the proposed development. The water quality pollutant reduction targets specified by Council have been met at all discharge points prior to runoff leaving the site.

The results from this report and the aforementioned addendum demonstrate that the proposed stormwater management system and approach satisfies Council's requirements in relation to stormwater runoff and water quality.

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1.0 Introduction

ADW Johnson has been engaged by Allam Property Group to prepare a Stormwater Management Plan (SMP) to accompany the Development Application for the proposed residential subdivision of Lots 31 & 32 DP 778111. The development will contain 264 residential lots and covers an area of approximately 27.4ha.

The site location is shown below in ***Figure 1.1***: Site Location. The site fronts McFarlanes Road and is situated to the east of Chisholm Town Centre.

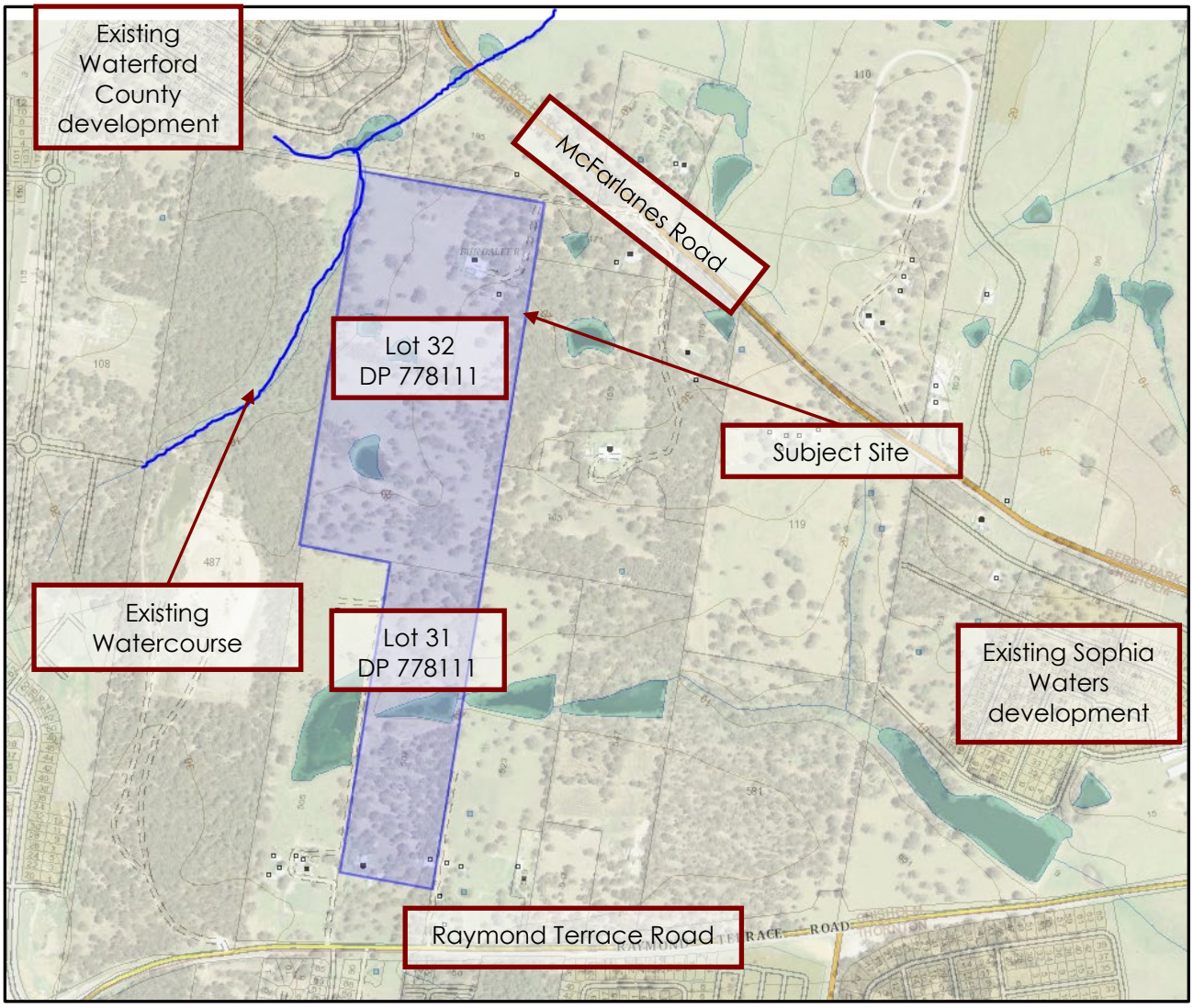

Figure 1.1: Site Location.

1.1 EXISTING SITE

The site is bound by future development sites to the East and South, McFarlanes Road to the North, and a first-order watercourse and environmental conservation land to the West. The Waterford County residential development is situated beyond the conservation land to the west and north-west.

The existing site can be considered fully pervious. Site slopes within the development area are in the range of 3-9%. The existing site is primarily cleared open pasture with the exception of a homestead, some scattered trees and vegetation along the existing extents of the three (3) existing manmade dams. Scattered vegetation and a manmade dam is also present in the southern part of the site.

A natural ridgeline splits the site into a northern catchment and southern catchment. The northern catchment is within a tributary of Saltwater Gully which flows to the Hunter River. The southern catchment is within a tributary of Francis Greenway Creek which also flows to the Hunter River. *Addendum #5* of the *TNURA Eastern Precinct SMP* addresses the stormwater management requirements for the southern catchment.

1.2 PROPOSED DEVELOPMENT

The proposed residential subdivision is comprised of 264 residential lots, one future local park, and one stormwater bioretention basin across Lots 31 & 32 DP 778111 as depicted in ***Figure 1.2*** and shown in ***Appendix E.***

This SMP should be read in conjunction with *Addendum #5* of the *TNURA Eastern Precinct SMP* submitted with this Development Application. This addendum addresses the stormwater management requirements for the southern catchment of this development that drains towards the existing Sophia Waters development.

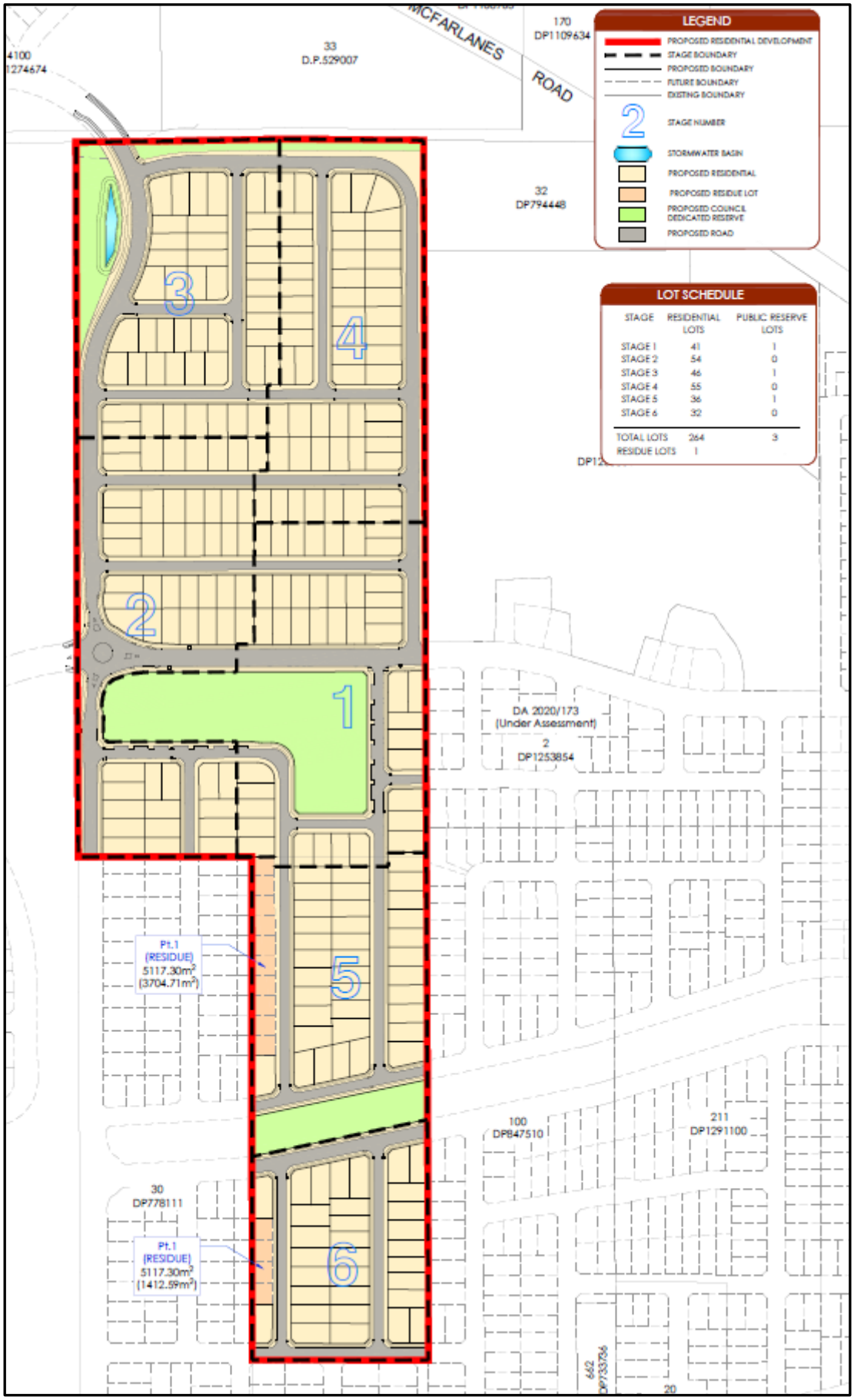

Figure 1.2: Proposed Development.

2.0 Council Requirements

Council outlines their engineering requirements for stormwater management within their 'Manual of Engineering Standards' (MOES).

2.1 CONCEPT STORMWATER DESIGN

A concept stormwater design is required to demonstrate that stormwater runoff can be effectively conveyed from the proposed development to the proposed discharge locations. The stormwater design is required to consider upstream catchments, drainage of both the lots and roads, and dispersal of flows via stabilized outlets to prevent scour of existing creek beds.

In accordance with MOES Section 3.2 "Recurrence Interval" - the pit and pipe network will need to be designed to cater for the minor storm event (10% AEP) without any surcharging within the system and minimising flow widths and ponding. Overland flow paths are to be designed to cater for the 1% AEP storm event.

The concept stormwater layout can be found in the concept engineering plans submitted with this Development Application.

2.2 STORMWATER DETENTION

Where post-development peak runoff exceeds pre-development peaks, on-site stormwater detention systems may be required to reduce flooding of downstream. These detention devices attenuate peak post-development flow rates to pre-development peak flow rates for the critical duration for design storms with annual exceedance probabilities (AEPs) ranging from 63.2% to 1%.

2.3 STORMWATER QUALITY / WATER SENSITIVE URBAN DESIGN

The proposed development will include water quality treatment devices within the catchment to reduce pollutant loads to the downstream watercourse. Council's stormwater quality targets are shown in ***Table 2.1***.

Table 2.1: Stormwater Treatment Objectives

Pollutant	Stormwater Treatment Objectives
Total Suspended Solids (TSS)	80% of average annual load
Total Phosphorus (TP)	45% of average annual load
Total Nitrogen (TN)	45% of average annual load
Gross Pollutants (GP)	(>5mm) 70% of average annual load
Litter (>50mm)	Retention up to the 3-month ARI peak flow
Oil and Grease	90% of average annual load

2.4 EROSION AND SEDIMENTATION CONTROL

Erosion and sedimentation control measures need to be implemented during any construction activities on the proposed subdivision to minimise the risk of erosion to disturbed areas and limit the transport of sediments from the construction site to downstream drainage. A sediment and erosion control plan has been prepared and can be found within the concept engineering plans.

3.0 Stormwater Management Strategy

The stormwater strategy aims to formalise site runoff whilst incorporating WSUD principles. This section describes the adopted stormwater strategy in relation to the objectives outlines in ***Section 2***.

3.1 NORTHERN CATCHMENT

The existing drainage regime, as outlined in ***Section 1.1***, conveys stormwater runoff towards the north-west corner of the site for the northern catchment.

It is proposed that the stormwater flows from the site are captured in a pit and pipe network, treated with a gross pollutant trap (GPT) and conveyed towards a bioretention basin.

The stormwater detention strategy for the northern catchment is to assess peak flows at the culverts that cross under Steamcruiser Drive (constructed in Stage 41 & 42 of the neighbouring Waterford County development – DA/18/1148), immediately to the north-west of the subject site. Existing stormwater controls constructed and approved under DA/18/1148 and DA/18/2022 of the Waterford County development were included in this XPRAFTS modeling to assess the peak flows at this location. Details on the stormwater quantity modelling are provided in ***Section 4.***

Water quality requirements are addressed through a treatment train consisting of rainwater tanks, a GPT and bioretention basin. Further details on the proposed treatment train are provided in ***Section 5***.

3.2 SOUTHERN CATCHMENT

This stormwater strategy and stormwater management requirements for the southern catchment are described in *Addendum #5* of the *TNURA Eastern Precinct SMP* submitted with this Development Application. It is proposed that the combination of the 'Munro Basin' and existing 'Basin 1' are used to satisfy stormwater detention requirements for the southern catchment. A treatment train of rainwater tanks, gross pollutant trap and pond is proposed to treat runoff from the southern catchment.

4.0 Stormwater Quantity

As described in ***Section 3***, the stormwater detention strategy for the northern catchment is to wholistically assess peak flows at the culverts that cross under Steamcruiser Drive (constructed in Stage 41 & 42 of the neighbouring Waterford County development – DA/18/1148). Existing stormwater basins constructed under DA/18/1148 (refer to the approved *Stormwater Management Plan – Residential Subdivision (Waterford County North East Precinct)* for further details on these controls) and under DA/18/2022 (refer to the approved *Stormwater Management Plan – Residential Subdivision (Waterford Southern Precinct)* for further details on these controls). Refer to the catchment plan provided in ***Appendix A*** for the peak flow monitoring location.

4.1 MODELLING PARAMETERS

Modelling parameters, including catchment areas, impervious percentages, and basin details, were adopted from the aforementioned approved SMPs to ensure consistency between results. Catchment runoff hydrology was simulated using the IL/CL and rational method.

4.1.1 Rainfall Intensity

The Rainfall Intensity Frequency Duration (IFD) data adopted was sourced from the Bureau of Meteorology website. This was then checked against the IFD data contained in Appendix C of MOES.

4.1.2 XPRAFTS Parameters

The key parameters utilised within the XPRAFTS model are summarised in ***Table 4.1***.

Table 4.1: Pre-Development Catchment Details

Parameter	Pervious Area	Value
Manning's 'n'	0.035 – Natural	0.013
	0.035 – Developed	
Initial Loss (IL)	5.0mm	1.0mm
Continuing Loss (CL)	2.5mm/hr	0mm/hr

4.1.3 Subcatchments

Impervious fractions have been adopted from MOES and have been determined based on the proposed land usage. These impervious percentages can be found in ***Table 4.2***.

Table 4.2: Fraction Impervious Rates for Land Uses

Land Use	Percentage Impervious (%)
Residential Lot – Roof	100
Residential Lot - Remainder	25
Road Reserve	70
Public Recreation Areas	10

The pre-development catchment areas were determined via an assessment of the existing site topography sourced from detailed survey, Lidar contours, and site inspection.

The post-development catchment areas for the site were determined based on the topography of the site, proposed subdivision layout and discharge locations. The pre-developed and developed catchment plans are provided in ***Appendix A***. Catchment details for the surrounding approved sites were obtained from their respective approved SMPs.

Catchment areas and parameters for the post-developed scenario for the subject site are shown in ***Table 4.3***. Details on all catchments, including predeveloped and those external to the subject site are provided in ***Appendix B***. A screenshot of the pre-developed and developed XPRAFTS models are provided in ***Appendix C***.

Table 4.3: Post-Development Catchment Details

Catchment	Area (Ha)	Impervious Area (Ha)	Pervious Area (Ha)	Percentage Impervious (%)	Slope (%)	Roughness Coefficient n*	
						Perv.	Imperv.
DEV HAR2	13.91	8.84	5.07	64	6	0.35	0.02
DEV HAR1	8.01	3.94	4.07	49	6	0.35	0.02
Total Developed	21.92	12.78	9.14	-	-	-	-

4.1.4 Basins

As discussed above, existing stormwater basins constructed under DA/18/1148 (refer to the approved *Stormwater Management Plan – Residential Subdivision (Waterford County North East Precinct)* for further details on these controls) and under DA/18/2022 (refer to the approved *Stormwater Management Plan – Residential Subdivision (Waterford Southern Precinct)* for further details on these controls) are included in this assessment.

No detention basins are proposed as part of the proposed development.

4.2 RESULTS

A summary of the results for the pre- and post-development peak flows at the peak flow monitoring location (culverts under Steamcruiser Drive) can be seen in the ***Table 5.4***.

Table 4.4: XPRAFTS Peak Flows for Discharge Point A

Storm Event (ARI)	Peak Runoff (m^3/s)	
	Pre-Developed	Post-Developed
1	6.119	5.067
2	9.030	7.662
5	13.236	11.045
10	15.619	13.256
20	18.773	16.373
50	21.775	19.538
100	24.990	23.194

From the results, it can be seen that the post-development flows for all storm events are less than the pre-developed flows at the monitoring location. Therefore, the wholistic approach to assessing peak flow runoff from the catchment successfully demonstrates that peak development flows are less than pre-developed levels.

5.0 Water Quality / Water Sensitive Urban Design

The proposed stormwater system, as detailed in ***Section 3***, uses a combination of pit and pipe networks and water sensitive urban design elements to convey stormwater runoff from the site. It is intended to use a combination of treatment devices within the drainage system to remove nutrients and sediments from the stormwater prior to the runoff leaving the site.

5.1 MUSIC MODELLING PARAMETERS

The software used for the water quality modelling is MUSIC. MUSIC (Model for Urban Stormwater Improvement Conceptualisation) is the industry standard model for prediction of stormwater quality outcomes from proposed development. The modelling approach is based on continuous simulation, operating at time steps to match the scale of the catchment.

5.1.1 Time Step

A time step of five (5) minutes was specified prior to any modelling. This is recommended by the software to increase reliability and output sensitivity.

5.1.2 Rainfall and Evapotranspiration

The rainfall data from Tocal, Paterson weather station was input into the MUSIC model. Six (6) minute rainfall information for the year 1989 was analysed and deemed to be a reasonable representation of the average yearly rainfall and rainfall event distribution.

The rainfall data file was reviewed and it was noted that the rainfall for 1989 (904.6mm) was comparable to the annual average for the 47-year period from 1967 to 2015 being 930.4mm. During 1989, there were 89 days of rainfall which is equivalent to the long-term average of 89.9.

The average monthly area Potential Evapotranspiration (PET) rates for the site were sourced from Bureau of Meteorology. The PET values for the model are summarised in ***Table 5.1***.

Table 5.1: Monthly Average Area Potential Evapotranspiration

Month	Average PET (mm/month)
January	180
February	155
March	150
April	115
May	75
June	70
July	65
August	95
September	125
October	150
November	175
December	200

The annual rainfall and evapotranspiration time series graph for 1989 is shown in ***Figure 5.1.***

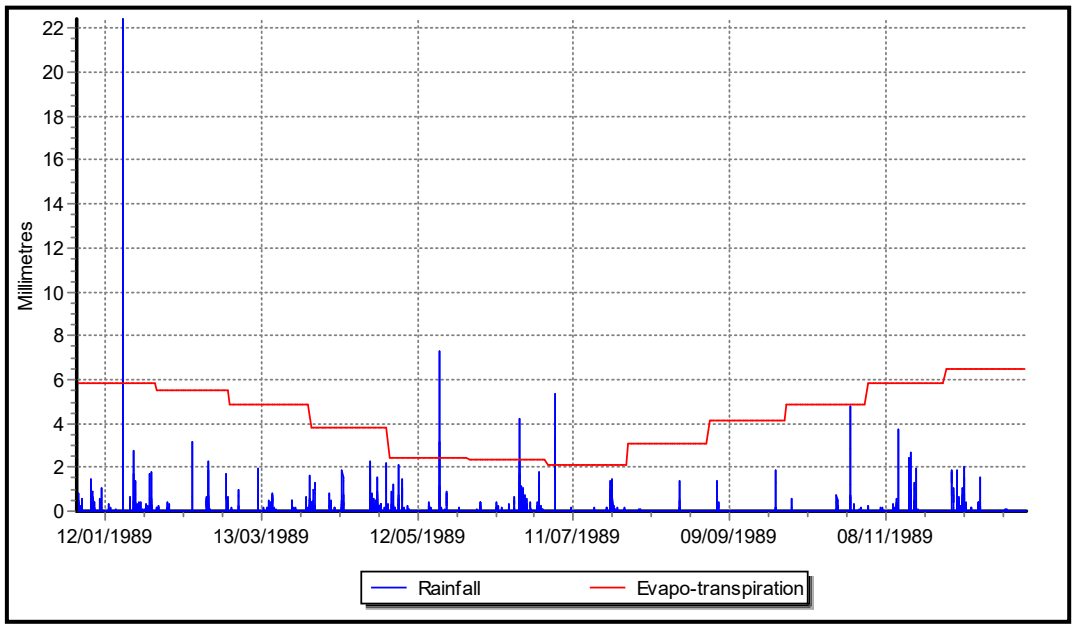

Figure 5.1: Rainfall and Evapotranspiration Graph.

5.1.3 Source Nodes

The MUSIC model defined the following land uses:

- Roof (Urban) – This land use defines the impervious roof area of each lot, estimated as 50% per lot, of which has been assumed to be 100% impervious;
- Lots (Urban) – This land use defines the lot area after the removal of the roof area. The impervious percentage of this node has been calculated so that the sum of the roof and lot equivalates to a total lot impervious percentage of 60%;
- Road (Urban) – This land use defines the road reserve area. It has been assumed to be 70% impervious accounting for pervious road verge (as dictated in MOES); and
- Open Space – this land use defines the proposed regional park area. It has been assumed to be 10% impervious.

5.1.4 Rainfall-Runoff Parameters

Pollutant source inputs were obtained from the '*Using MUSIC in the Sydney Drinking Water Catchment*' (Water NSW, 2012). The parameters adopted for the varying land uses were implemented in accordance with Table 3-2 and 3-7 of the above stated document assuming a 'clay' soil description.

The parameters used within the MUSIC model are presented in ***Table 5.2*** and ***Table 5.3***.

Table 5.2: MUSIC Rainfall-Runoff Parameters

PARAMETER	VALUE
Impervious Area Properties	
Rainfall Threshold (mm/day)	1
Pervious Area Properties	
Soil Storage Capacity (mm)	120
Initial Storage (% of Capacity)	30
Field Capacity (mm)	80
Infiltration - a	200
Infiltration - b	1

Groundwater Properties	
Initial Depth (mm)	10
Daily Recharge Rate (%)	25
Daily Baseflow Rate (%)	5
Daily Deep Seepage Rate (%)	0

Table 5.3: MUSIC Model Baseflow and Stormflow Pollutant Concentrations

Land Use		Mean Concentration		
		TSS	TP	TN
		mg/L	mg/L	mg/L
Roof	Baseflow	12.59	0.15	2.09
	Stormflow	19.95	0.13	2.00
Lot	Baseflow	12.85	0.15	2.03
	Stormflow	137.40	0.39	2.58
Road	Baseflow	12.85	0.15	2.03
	Stormflow	254.68	0.26	2.13
Basin	Baseflow	12.59	0.15	2.09
	Stormflow	158.49	0.35	2.63
Open Space	Baseflow	12.59	0.15	2.09
	Stormflow	158.49	0.35	2.63

5.1.5 Catchment Data

The catchments and associated parameters used for the model were based on the node parameters as detailed in ***Table 5.4***. Water quality modelling was limited to the catchments that drain through the proposed treatment devices.

Table 5.4: MUSIC Node Sub-catchment Details

Catchment	Sub Catchment	Area (Ha)	Impervious Area (Ha)	Pervious Area (Ha)	Percentage Impervious (%)
DEV HAR2	Roof	4.418	4.418	0.00	100
	Lots area	4.418	1.037	3.111	25
	Roads	5.521	3.865	1.656	70
	Grassland	-	-	-	-
Total		**13.816**	**9.050**	**4.858**	**64**
DEV HAR1	Roof	2.093	2.093	0.00	100
	Lots area	2.093	0.523	1.570	25
	Roads	2.616	1.831	0.785	70
	Parkland	1.859	0.186	1.673	10
Total		**8.66**	**4.634**	**4.302**	**51**

5.1.6 Rainwater Tank Details

The proposed subdivision is to incorporate water retention or reuse measures to reduce the demand on potable water.

As part of the stormwater management for the future development, there will be a requirement to install a rainwater tank to capture roof runoff. This tank will be connected to toilet cisterns and be used for laundry and landscaping to minimise the demand on potable water supply. In addition, future dwellings are to have AAA+ fixtures and appliances, dual flush toilets, water efficient gardens and rainwater tanks. These are BASIX requirements, imposed upon the proponent of the new dwellings on the lots.

To ensure the future development does adequately reduce the demand on potable water, the building consent should be conditioned with water saving requirements.

The input parameters of the MUSIC model are shown below in ***Table 5.5.***

Table 5.5: MUSIC Model Rainwater Tank Parameters

Rainwater Tank Properties	
Volume below overflow pipe (L)	2,000
Depth above overflow pipe (m)	0.2
Surface Area (m2)	2.5
Overflow Pipe diameter (mm)	50
Daily reused (kL/day/dwelling)	0.3

Note: The daily reuse is based on the assumption of two (2) people per lot reusing water for laundry, toilets and outdoor uses.

5.1.7 Gross Pollutant Trap Details

Gross pollutant traps (GPTs) will be provided prior to stormwater discharging into the proposed bioretention. GPTs are designed to capture and retain gross pollutants, litter, grit and sediments from stormwater. The GPTs have been modelled as Humegard GPTs, depicted in ***Figure 5.2***. MUSIC nodes created by the manufacturer were used in the MUSIC model to ensure correct pollutant reduction efficiencies were modelled and high flow bypasses were adjusted to model specific treatable flow rates of the selected GPTs.

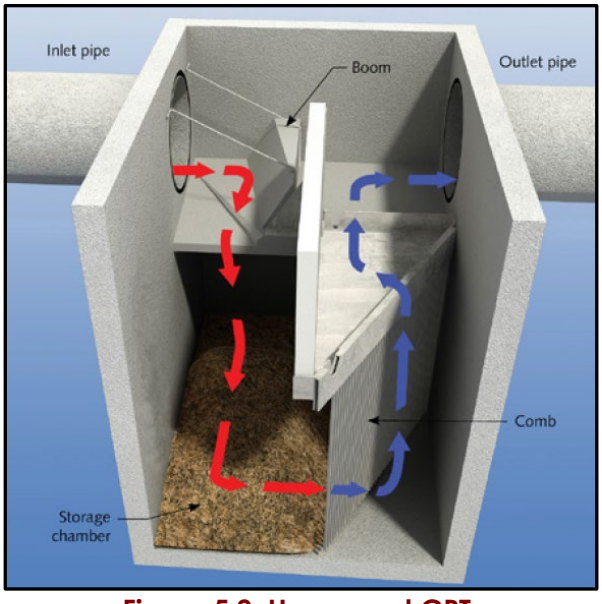

Figure 5.2: Humegard GPT.
(Source: HumeGard GPT Technical Manual)

5.1.8 Bioretention Basin Details

Bioretention basins allow infiltration of stormwater through suitable vegetation and a filter media to remove nitrogen, phosphorous and gross pollutants before discharging the stormwater from site. The inlet structures are a series of pipes and headwalls at the discharge locations. The inlet pipes convey flows through the GPT, located upstream of the outlets, before discharging to the basin through a headwall outlet.

It is proposed that a bioretention basin is provided in the north-west corner of the site to treat stormwater prior to discharging from the development site. Sizing has been undertaken using the MUSIC software to ensure that the treatment train adequately addresses pollutant removal. Details for the proposed bioretention basin are provided in ***Table 5.6.***

Table 5.6: MUSIC Model Bioretention Parameters

	Retention Properties	North Basin
Storage Properties	Surface Area (m^2)	480
	Extended Detention Depth (m)	0.3
Filter and Media Properties	Filter Area (m^2)	380
	Unlined Filter Media Perimeter (m)	78
	Saturated Hydraulic Conductivity (mm/hr)	150
	Filter Depth (m)	0.40
	TN Content of Filter Media (mg/kg)	800
	Orthophosphate Content of Filter Media (mg/kg)	55
	Base Lined	No
	Vegetated with Nutrient Removal Plants	Yes
	Underdrain Present	Yes
	Submerged Zone	no

The lowest outlet structure in the basin has been set 300mm above the invert of the basin to enable retention of flows during a three (3) month storm event. The inlet structures, outlet structures and overflow structures will be designed with scour protection to avoid scouring of the bioretention basin.

5.2 RESULTS

In accordance with Council requirements, modelling has been undertaken to demonstrate compliance with water quality objectives for stormwater runoff from the proposed development prior to discharge of stormwater into the downstream waterways. The results of the modelling are shown in ***Table 5.7***

Table 5.7: Pollutant Loads and Reductions

Pollutant	Sources	Residual Load	% Reduction	% Reduction Required
Total Suspended Solids (kg/yr)	17400	2970	**82.9**	80
Total Phosphorus (kg/yr)	37.1	12.1	**67.4**	45
Total Nitrogen (kg/yr)	270	118	**56.1**	45
Gross Pollutants (kg/yr)	4130	57.9	**98.6**	70

From the results it can be seen that the proposed treatment train has achieved the required target reductions. It is noted that MUSIC does not have the capacity to route litter and oil/grease pollutants, however they are qualitatively addressed by the proposed treatment train.

6.0 Erosion and Sedimentation Control

Council requires the use of erosion and sediment controls to manage and contain pollutant runoff, both during construction and as long-term permanent treatments thus, ensuring the minimisation of impact on the environment. All erosion and sediment controls and practices are to be in accordance with 'Managing Urban Stormwater' by Landcom/NSW Department of Housing.

Long term permanent treatments are outlined in ***Section 5***. The treatment train specified has been shown to sufficiently manage and control the pollutants leaving the development in accordance with Council's pollutant reduction targets. Treatment devices will be utilized to contain the generated pollutants for proposed development. These include but are not limited to:

- Sediment Basins;
- Silt Fencing;
- Haybale and Geotextile Fencing;
- Kerb Inlet Controls;
- Sandbag Kerb Inlet Sediment traps;
- Shaker Ramp; and
- Diversion Drains.

Due to the extents of disturbed areas, the use of sediment basins will be required (Landcom, 2004). During construction, the proposed basins will be utilised as sediment basins. These basins are to be constructed as the stormwater quality/quantity basins once the majority of construction works have occurred.

A Concept Erosion and Sediment Control Plan has been prepared and included in the Concept Engineering drawings associated with this development. A specific ESCP will be required for each stage of the development with the associated Construction Certificate.

7.0 Conclusion

This SMP has been prepared to accompany the Development Application for the proposed residential subdivision of Lots 31 & 32 DP 778111.

This SMP should be read in conjunction with *Addendum #5* of the *TNURA Eastern Precinct SMP* submitted with this Development Application. This addendum addresses the stormwater management requirements for the southern catchment of this development that drains towards the existing Sophia Waters development.

A stormwater routing model was created using the XPRAFTS software to calculate the peak runoff for the predeveloped and post developed catchment conditions up to and including the 1% AEP. Detention storage has been modelled to limit the peak runoff from the post developed catchment to less than or equal to the peak runoff of the predeveloped catchment.

Stormwater runoff was modelled using XPRAFTS software and assessed to ensure the peak development flows were less than or equal to peak pre-development flows. Peak flows were monitored at the culverts that cross under Steamcruiser Drive immediately to the north-west of the development site. A wholistic approach to the stormwater detention strategy was undertaken to reduce the number and size of drainage facilities required to be handed over to Council, reducing maintenance requirements whilst still meeting Council's objectives. The routing model considered the catchment areas of two adjacent developments within Waterford County. The analysis shows that there is an overall reduction in peak flow runoff at the monitoring location.

A MUSIC model was used to simulate pollutant source elements for the proposed development. A water quality treatment train consisting of rainwater tanks, gross pollutant traps and a bioretention basin at the discharge point of the site was then modelled to control pollutants discharging from the proposed development. The MUSIC analysis shows that the proposed treatment train successfully reduces pollutant loading to satisfy Council's targets and reduce any negative impact on downstream environments.

An erosion and sedimentation control plan will be implemented to minimise the risk of erosion to disturbed areas and limit the transport of sediments from the development site to the receiving waters during construction.

The results from this report demonstrate that the proposed detention and water quality system satisfy Council's requirements in relation to anticipated stormwater runoff from the catchment post development. All relevant authority requirements have been met with this design.

Appendix A

CATCHMENT PLANS

PRE-DEVELOPMENT CATCHMENT PLAN

POST-DEVELOPMENT CATCHMENT PLAN

240294(70)-ESK-003(A)

LEGEND

- DCDB LOT BOUNDARIES
- PROPOSED/FUTURE LOT BOUNDARIES
- POST DEVELOPMENT CATCHMENT AREAS
- WATERCOURSE

N

OB PRE 1
19.61 Ha

OB PRE3
3.42 Ha

OBPRE2
2.51 Ha

J3 C2 PRE
3.00 Ha

J2 C2 PRE
1.72 Ha

J1 C2 PRE
2.04 Ha

J3 PRE C1
8.73 Ha

J2 PRE C1
10.64 Ha

J1 PRE C1
4.37 Ha

55 PRE
37.40 Ha

PEAK FLOW
MONITORING
LOCATION

• urban design • visualisation • development feasibility • surveying • town planning • civil engineering • infrastructure • superintendency • economic analysis • social impact • project management

drawing title:

PRE DEVELOPMENT CATCHMENTS

location:	McFARLANES ROAD, THORNTON
council:	MAITLAND
dwg ref:	240294(70)-ESK-002
client:	ALLAM PROPERTY GROUP

ver.	date	comment	drawn	pm	co-ordinate & level information	scale (A3 original size)
A	09.05.23	INITIAL ISSUE	J.C.	C.MO	CO-ORDINATE SYSTEM: N/A DATUM: N/A CONTOUR INTERVAL: N/A	0 125 250m SCALE: 1:5000 (FULL)

working beyond expectations

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Plotted By: Jerson Filho Plot Date: 09/05/23 5:15:15PM Cad File: N:\240294\240294(70)\DWG\ENGINEERING\ESK\240294(70)-ESK-003(A).DWG

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240294(70)-ESK-003(A)

LEGEND

- PROPOSED BASIN
- DCDB LOT BOUNDARIES
- PROPOSED/FUTURE LOT BOUNDARIES
- POST DEVELOPMENT CATCHMENT AREAS
- WATERCOURSE

N

EXISTING STORMWATER BASIN APPROVED UNDER DA/18/1148. REFER TO STORMWATER MANAGEMENT PLAN "RESIDENTIAL SUBDIVISION (WATERFORD COUNTY NORTH EAST PRECINCT)" FOR DETAILS.

OB CATCH1
19.62 Ha

EXISTING CULVERTS CROSSING UNDER STEAMCRUISER DRIVE

PEAK FLOW MONITORING LOCATION

OB UNDEV2
3.42 Ha

J3 C2 POST
3.00 Ha

OB UNDEV1
2.51 Ha

J3 POST C1
1.08 Ha

DEV HAR2
13.93 Ha

J2 C2 POST
1.72 Ha

J1 C2 POST
2.04 Ha

J2 POST C1
2.25 Ha

J1 POST C1
2.10 Ha

DEV HAR1
8.01 Ha

55 POST
44.78 Ha

EXISTING STORMWATER BASINS APPROVED UNDER DA/18/2022. REFER TO STORMWATER MANAGEMENT PLAN "RESIDENTIAL SUBDIVISION (WATERFORD COUNTY NORTH EAST PRECINCT)" FOR DETAILS.

• town planning • surveying • development feasibility • visualisation • urban design
• project management • civil engineering • infrastructure • superintendency • economic analysis • social impact

ver.	date	comment	drawn	pm	co-ordinate & level information	scale (A3 original size)
A	09.05.23	INITIAL ISSUE	J.C.	C.MO	CO-ORDINATE SYSTEM: N/A DATUM: N/A CONTOUR INTERVAL: N/A	0 125 250m SCALE: 1:5000 (FULL)

working beyond expectations

drawing title:

POST DEVELOPMENT CATCHMENTS

location:	McFARLANES ROAD, THORNTON
council:	MAITLAND
dwg ref:	240294(70)-ESK-002
client:	ALLAM PROPERTY GROUP

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Appendix B

XPRAFTS CATCHMENT DATA

Predeveloped XPRAFTS Catchment Data

Subcatchment	Subcatchment Number	Total Area [ha]	Init/Cont Rainfall Loss	Catchment Slope [%]
OB PRE2	1	2.51	5 2.5	6
OB PRE3	1	3.42	5 2.5	6
OB PRE 1	1	19.61	5 2.5	8
J1 C2 PRE	1	2.05	5 2.5	6.2
J2 C2 PRE	1	1.72	5 2.5	4
J3 C2 PRE	1	3.00	5 2.5	4.3
55 PRE	1	37.40	5 2.5	10
J1 PRE C1	1	4.37	5 2.5	5.5
J2 PRE C1	1	10.64	5 2.5	4.1
J3 PRE C1	1	8.73	5 2.5	5.8

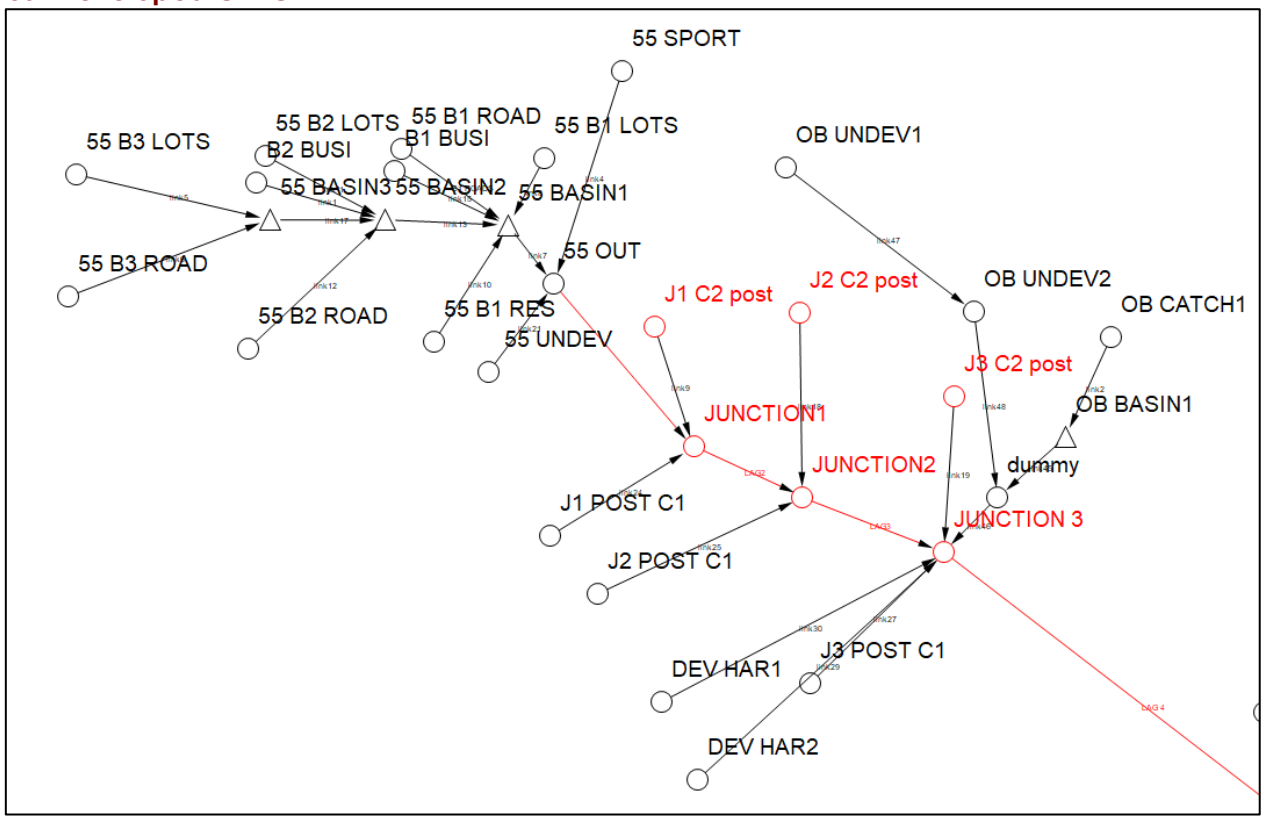
Developed XPRAFTS Catchment Data

Subcatchment	Subcatchment Number	Total Area [ha]	Catchment Mannings 'n' [n value]	Percentage Impervious [%]	Init/Cont Rainfall Loss	Catchment Slope [%]
55 B3 LOTS	1	5.29	0.035	0	5 2.5	4
	2	7.94	0.013	100	1 0	15
55 B3 ROAD	1	2.21	0.045	0	5 2.5	4
	2	5.15	0.013	100	1 0	3
55 B2 LOTS	1	1.3	0.045	0	5 2.5	4
	2	1.95	0.013	100	1 0	5
B2 BUSI	1	0.59	0.035	0	5 2.5	5
	2	0.07	0.013	100	1 0	5
55 B2 ROAD	1	0.17	0.035	0	5 2.5	4
	2	0.39	0.013	100	1 0	3
55 B1 ROAD	1	1.27	0.035	0	5 2.5	4
	2	2.97	0.013	100	1 0	4
B1 BUSI	1	1.76	0.035	0	5 2.5	5
	2	0.2	0.013	100	1 0	5
55 B1 RES	1	1.49	0.035	0	5 2.5	20
	2	0.17	0.013	100	1 0	2
55 B1 LOTS	1	2.56	0.035	0	5 2.5	4
	2	3.84	0.013	100	1 0	15
55 SPORT	1	3.65	0.035	0	5 2.5	2
	2	0.41	0.013	100	1 0	3
55 UNDEV	1	1.400	0.035	0	5 2.5	12
OB UNDEV1	1	2.510	0.08	0	5 2.5	6
OB UNDEV 2	1	3.42	0.08	0	5 2.5	6
OB CATCH1	1	6.864	0.025	0	5 2.5	4
	2	12.747	0.035	100	1 0	14
J1 POST C1	1	2.096	0.035	0	5 2.5	5.5
J2 POST C1	1	2.25	0.035	0	5 2.5	4.1
J3 POST C1	1	1.080	0.035	0	5 2.5	5.8
DEV HAR1	1	4.068	0.035	0	5 2.5	5
	2	3.942	0.013	100	1 0	5
DEV HAR2	1	5.085	0.035	0	5 2.5	5
	2	8.843	0.013	100	1 0	5

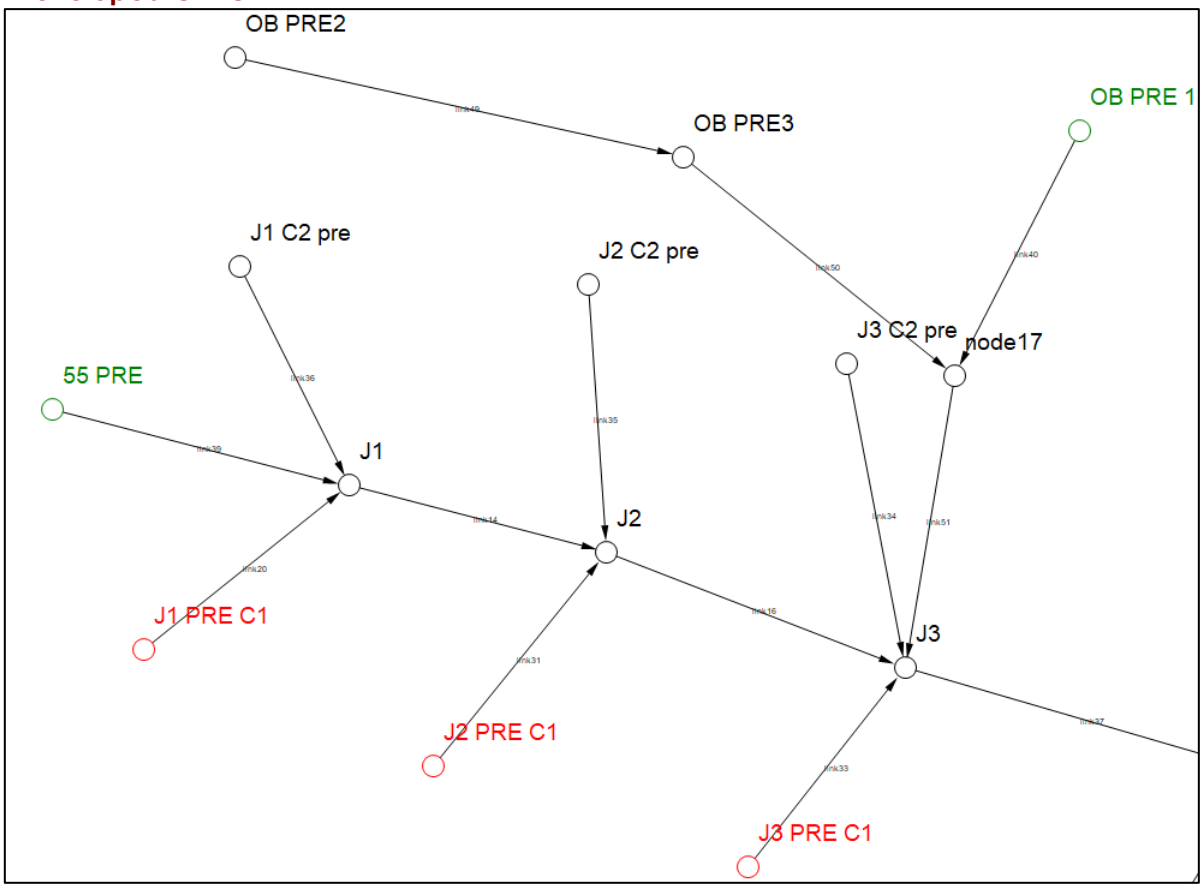
Appendix C

RAFTS MODEL

Post-Developed CATCHMENT

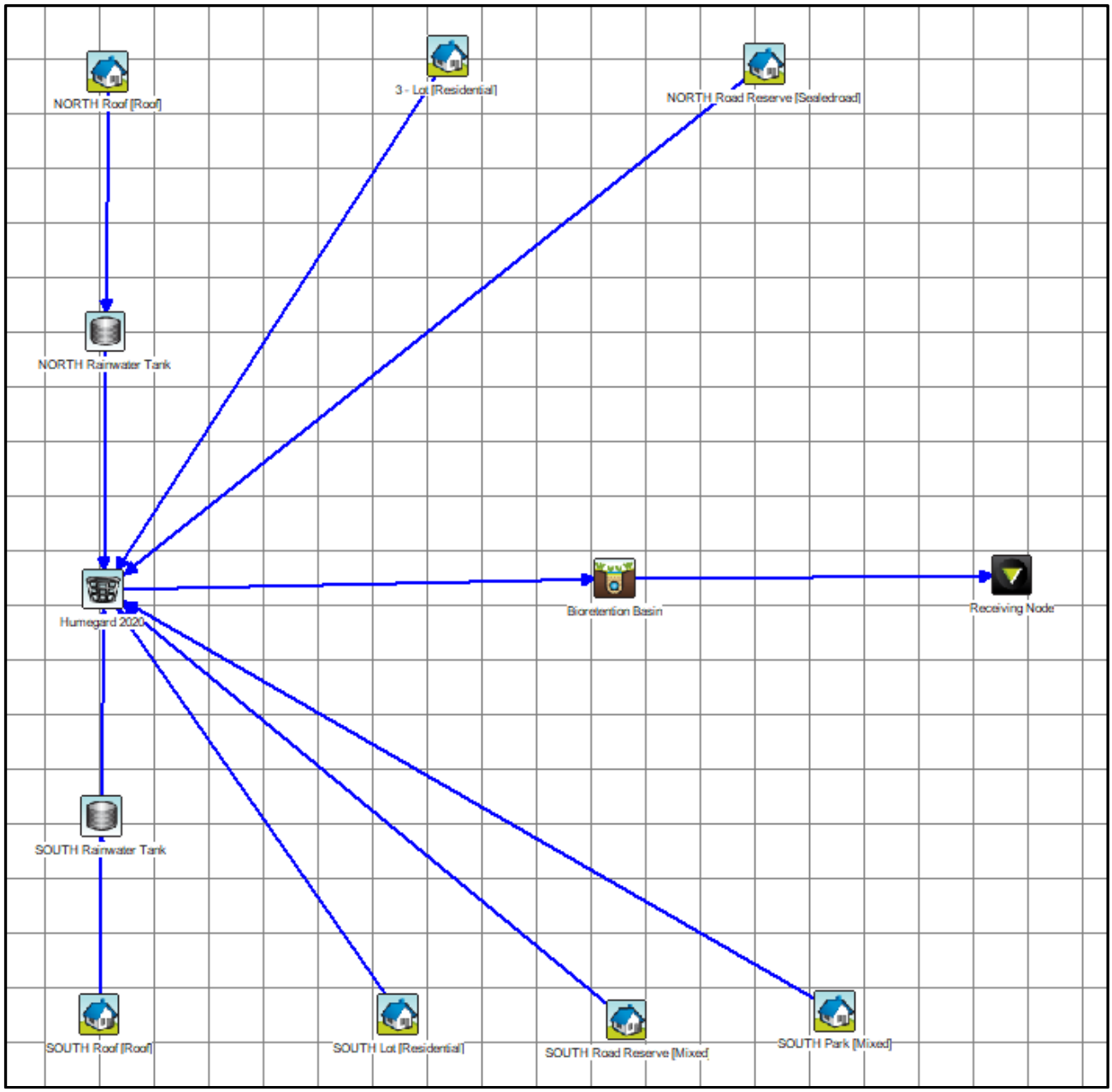


Pre-Developed CATCHMENT



Appendix D

MUSIC MODEL



Appendix E

PROPOSED SITE PLAN

240294(70)-DA-006

3860
DP1269997

4100
DP1274674

33
D.P.529007

1
DP1108963

MCFARLANES ROAD

170
DP1109634

32
DP794448

3098
DP1246288

4
DP1145348

5200
DP1247841

DA 2020/173
(Under Assessment)

2
DP1253854

100
DP847510

211
DP1291100

30
DP778111

662
DP733736

20
DP832786

Pt.1
(RESIDUE)
5117.30m^2
(3704.71m^2)

Pt.1
(RESIDUE)
5117.30m^2
(1412.59m^2)

1 INTO 2
SUBDIVISION
OF SOUTHERN
PORTION
OF LOT 31 DP778111
UNDER SEPARATE
CONSENT

RAYMOND TERRACE ROAD

LEGEND

- PROPOSED RESIDENTIAL DEVELOPMENT
- STAGE BOUNDARY
- PROPOSED BOUNDARY
- FUTURE BOUNDARY
- EXISTING BOUNDARY
- 2 — STAGE NUMBER
- STORMWATER BASIN
- PROPOSED RESIDENTIAL
- PROPOSED RESIDUE LOT
- PROPOSED COUNCIL DEDICATED RESERVE
- PROPOSED ROAD

LOT SCHEDULE

STAGE	RESIDENTIAL LOTS	PUBLIC RESERVE LOTS
STAGE 1	41	1
STAGE 2	54	0
STAGE 3	46	1
STAGE 4	55	0
STAGE 5	36	1
STAGE 6	32	0
TOTAL LOTS	264	3
RESIDUE LOTS	1	

DETAIL PLAN
SCALE 1:2000

SHEET 6 OF 13

ver.	date	comment	drawn	pm	co-ordinate information	level information	scale (A1 original size)	notes
A	20.04.2023	INITIAL ISSUE	LS	CMO	CO-ORDINATE SYSTEM: MGA56 GDA94	DATUM: N/A CONTOUR INTERVAL: N/A	A1 1:2000 — 0 50 100m — A3 1:4000	

working beyond expectations

drawing title:

OVERALL STAGE MASTER PLAN

location: 507 RAYMOND TERRACE RD & 173 MCFARLANES RD, CHISHOLM

council: MAITLAND CITY COUNCIL

dwg ref: 240294(70)-DA-006

client: ALLAM PROPERTY GROUP

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