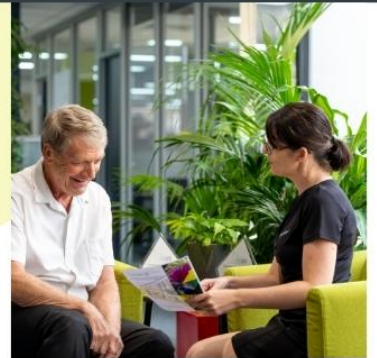




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**806-818 Greenbank Road, North Maclean
Conceptual Stormwater Management Plan**

Client:	Northrock Marulan P/L
Project Number:	BE240612
Document Number:	BE240612-RP-CSMP-00

Date of Issue:	February 2026
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Document Control Record

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Date:	27/02/2026

Version No.	Description	Date	Prepared	Approved
00	DA Submission	27/02/2026	JZC	TB

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Appendices

Appendix A – Burchills Engineering Solutions Preliminary Civil Engineering Drawings

Appendix B – Rational Method Calculations

Appendix C – Catchment Plans

Appendix D – XPSWMM Input Parameters

Appendix E – Music Input Parameters





1. Introduction

1.1 Background

Northrock Marulan P/L has engaged Burchills Engineering Solutions to prepare a Conceptual Stormwater Management Plan (CSMP) to be considered part of a Development Application to Economic Development Queensland (EDQ). The proposal involves reconfiguring the site into 9 industrial lots.

This CSMP has been developed with reference to the approved Civil Engineering Report prepared by Michael Bale & Associates (Report No. R001-G24079) associated with the downstream northern development (Lot 2 RP868726). The reference number of this adjacent development approval is DEV2025/1661.

1.2 Purpose

The main objectives of this CSMP have been established with considerations of the criteria set out in the Greater Flagstone Urban Development Area Development Scheme (Amendment No.1, 28 February 2025) and are summarised as follows:

- incorporates total water cycle management and water sensitive urban design principles to appropriately manage floodwater and stormwater;
- development ensures that stormwater runoff at the site's boundaries does not exceed that which presently exists, and there is 'no net worsening' of flood conditions at the site's boundaries.

1.3 Scope

To achieve the objectives of the approved stormwater strategy, this CSMP details the following:

- Site description including:
 - Topography;
 - Land use;
 - Vegetation;
 - Receiving environment; and
 - Proposed development details.
- Stormwater quantity management including:
 - Management of site runoff; and
 - Management of external runoff through the subject site.
- Stormwater quality Management, including:
 - Address the requirements of the SPP 2017.

1.4 Regulatory Requirements and Technical Guidelines

The strategies proposed in this CSMP have been prepared in accordance with the following guidelines and statutory documents:

- *Greater Flagstone Urban Development Area Development Scheme (Amendment No.1, 28 February 2025) (EDQ, 2025)*
- *Logan Planning Scheme Version 9.2 (LCC, 2025);*
- *State Planning Policy July 2017 (DSPIP, 2017);*
- *Queensland Urban Drainage Manual Fourth Edition (IPWEAQ, 2017);*
- *Australian Rainfall & Runoff: A Guide to Flood Estimation (Ball J, 2016);*
- *Australian Government – Bureau of Meteorology (Bureau of Meteorology, n.d.);*
- *MUSIC Modelling Guidelines (Water By Design, 2010); and*
- *WSUD Technical Guidelines for South East Queensland – Version 1 (Healthy Waterways, BCC, MBWCP, 2006).*





2. Site Details

2.1 Location

The subject site is located at 806-818 Greenbank Road, North Maclean and is formally described as Lot 3 on RP900179.

The development site is defined as “Industry and Business Zone” under the Greater Flagstone Urban Development Area Development Scheme. The site fronts Greenbank Road. The location of the subject site is shown in Figure 2.1.



Figure 2.1 Site Locality (Queensland Globe, 2025)





2.2 Existing Land Use and Topography

The site has an area of 2.974 ha and generally falls from west to east. The site includes part of the ridge of a hill. The land is mostly covered with light grass and scattered trees. The lot is occupied with existing buildings and gravel roads.

The site adjoins the following existing land uses:

- **North:** Adjacent Property (Lot 2 RP868726)
- **South:** Greenbank Road
- **West:** Adjacent Property (Lot 1 RP136420)
- **East:** Adjacent Property (Lot 2 RP868726)

2.3 Downstream Environment

Runoff is conveyed across the existing terrain predominately in the form of overland flow. The majority of stormwater runoff produced over the site discharges to the adjacent property (Lot 2 RP868726) with a small portion of runoff discharging to Greenbank Road.

2.4 Proposed Development

The proposed development is to subdivide the subject Lot into 9 industrial lots. The proposed development intends to facilitate stormwater infrastructure joining the stormwater network of the adjacent development on Lot 2 RP868726.

The Lot layout plan is shown below in Figure 2.2.

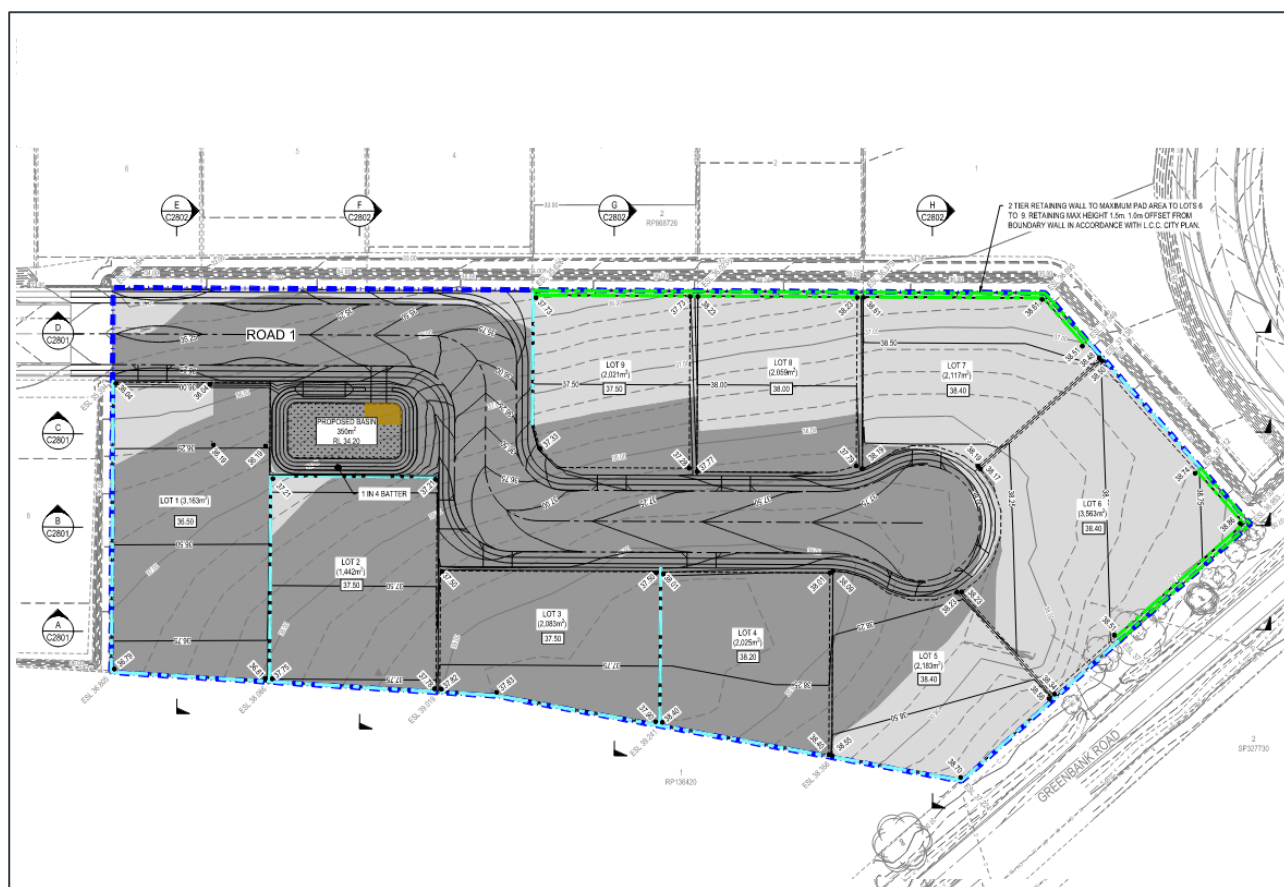


Figure 2.2 Concept Layout Plan (Burchills, 2026)





2.5 Flood Assessment

The Logan Flood Portal website indicates that the site is located outside the mapped flood risk areas. The proposed development is not subject to flood risk and will not have an impact on flood conveyance. Assessment against the hazard has therefore been omitted from the study. Refer to Figure 2.3 below.

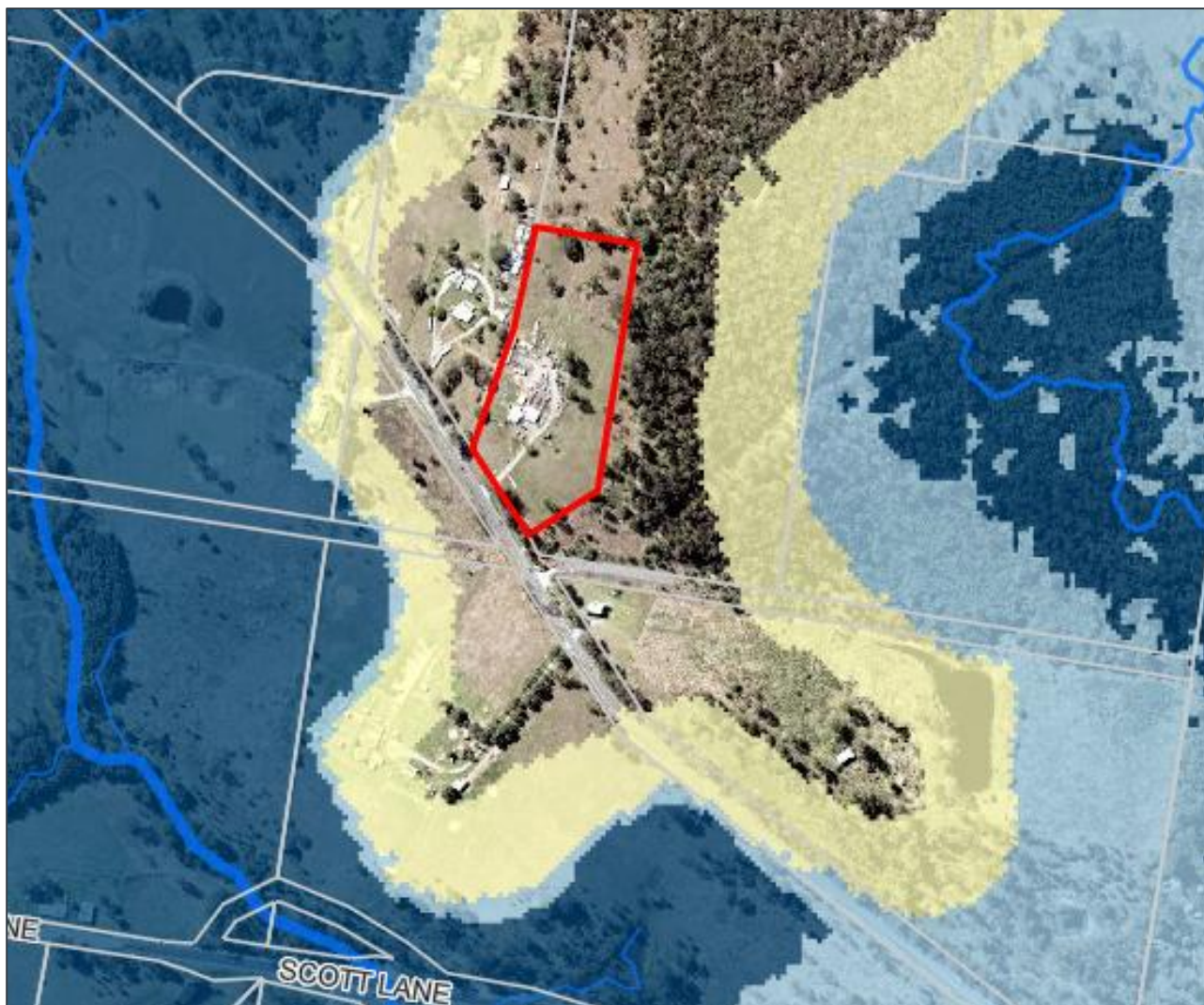


Figure 2.3 Flood Risk Mapping (Logan City Council)





3. Stormwater Quantity Assessment

3.1 Overview

The following section of this report outlines the measures required to meet the above-mentioned objectives regarding stormwater quantity. To meet these objectives, it is necessary to ensure that post-development discharge from the site will not create a worse situation for downstream property owners than that which existed prior to the development (i.e. non-worsening) (QUDM, 2017).

Due to the increase in impervious areas within the proposed development, peak stormwater flow rates will increase. However, it is considered that the site peak flows have been accounted for in the drainage infrastructure proposed in the downstream neighbouring development.

Further discussion is provided in the following sections of this report.

3.2 Drainage Catchment Parameters

Drainage catchments have been delineated using site survey, aerial imagery and development plans in the post developed scenario. Pre and post development catchment parameters are summarised in Table 3.1. Catchment plans are provided in Appendix C. Further catchment parameters used within the XPSWMM model are included in Appendix D.

Table 3.1 Catchment Parameters – Pre Developed

Scenario	Catchment ID	Total Area (ha)	Impervious %	Catchment Slope (%)
Pre-developed	A	2.19	0	2
	B	0.784	0	2

Table 3.2 Catchment Parameters – Post Developed

Scenario	Catchment ID	Total Area (ha)	Impervious %	Catchment Slope (%)
Post-developed	A	2.974	90	2

3.3 Conveyance of Flows

In the current scenario, stormwater runoff that is produced over the site flows overland as sheet flow to the site's respective points of discharge. No external catchments to the site are identified as the subject site is on a ridge of a hill.

In the post-development scenario, stormwater runoff from the whole development site will be conveyed by the internal road and drainage infrastructure. The minor flows will be conveyed by the pits and pipe networks. The major flows will be conveyed via the internal road network.

The post-development runoff will eventually discharge into the drainage infrastructure of the adjacent development on Lot 2 RP868726.





3.4 Lawful Point of Discharge

In the current scenario, two (2) Lawful Points of Discharge (LPD) have been identified for the subject site. The LPDs are defined as the multiple points along the site boundaries. The pre-developed catchment map is shown below in Figure 3.1.

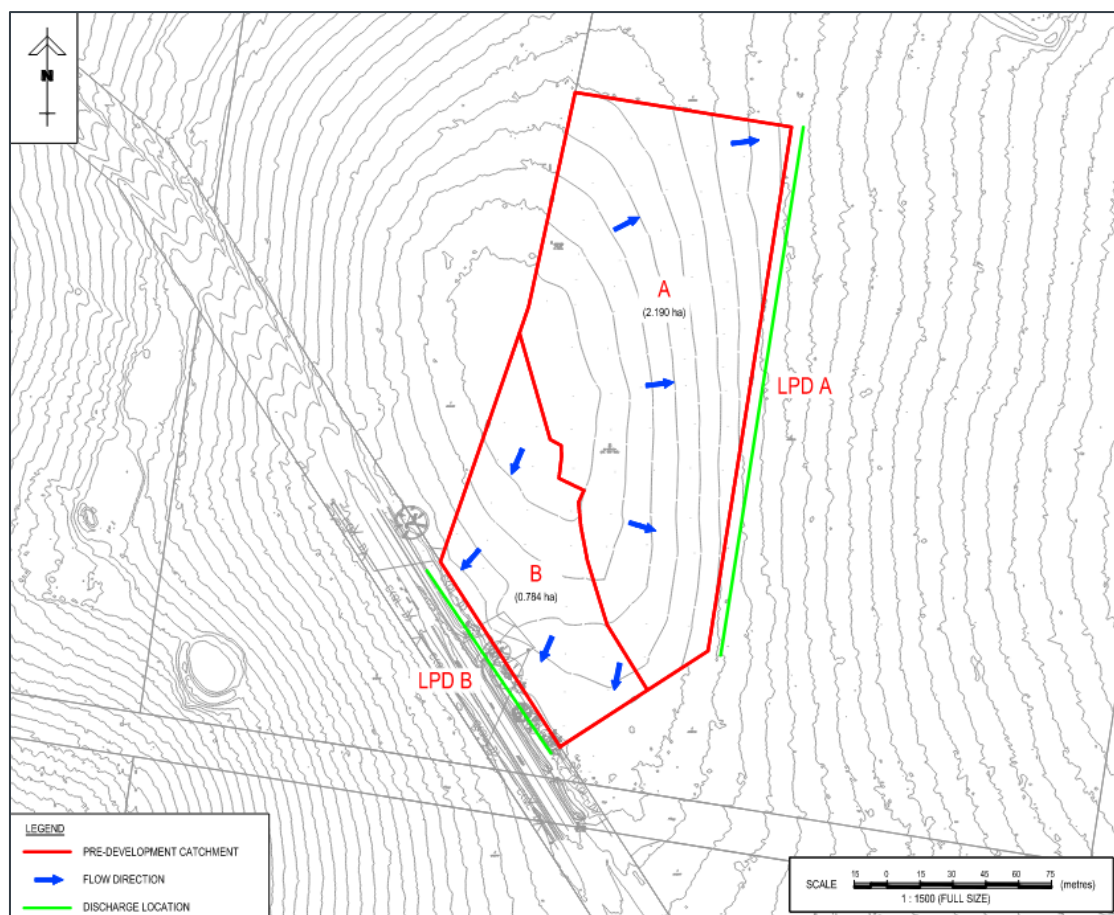


Figure 3.1 Pre-Developed Catchment Map





In the post-development scenario, only one Lawful Point of Discharge (LPD) remains and its location is different from the pre-development LPD A and LPD B. The proposed development will create a new LPD location at the northern property boundary. The post-developed catchment map is shown below in Figure 3.2.

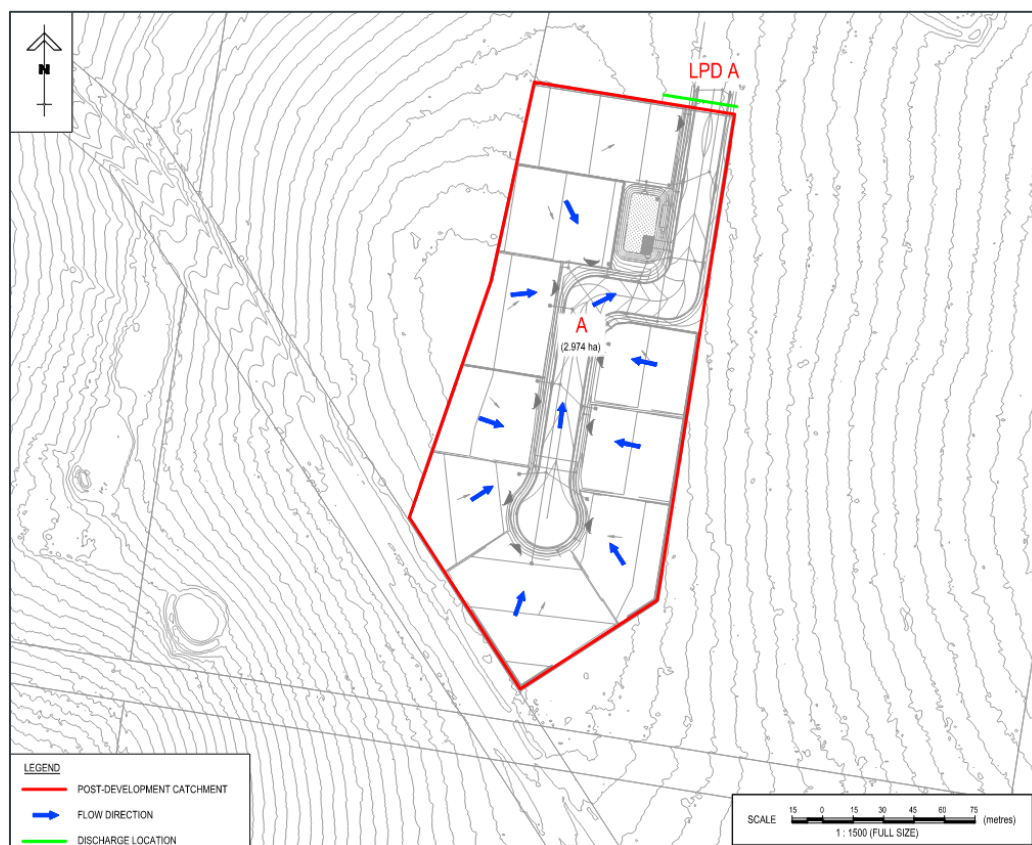


Figure 3.2 Post-Developed Catchment Map

3.5 XPSWMM Analysis

XPSWMM (version 2026) software was utilised to determine the site peak flows. This modelling software is a link-node model capable of performing hydrology and hydraulics of stormwater drainage systems simultaneously.

Laurenson's Hydrology has been adopted as the runoff routing method within XPSWMM. Sub-catchment routing in this method is carried out using the Muskingum procedure, which is a storage routing method based on the storage equation.

Details of the assumptions and input parameters used within the XPSWMM model inputs are included in Appendix D.

3.5.1 Rational Method Comparison

The Rational Method has been used to gain an initial understanding of the relative impact of the proposed development on peak flow rates at the site's LPD. The Rational Method is a basic method for assessing peak flow rates and is considered suitable given the catchment area is less than 500 ha and the time of concentration within the contributing catchments is less than 30 minutes (IPWEAQ, 2017).

It should be noted that although the Rational Method has been used as an initial estimate of site peak flows, it has not been used for the design of any mitigation measures nor has been used for calibration of the runoff XP-SWMM model.





A comparison between the peak discharge values obtained using the Rational Method and the XP-SWMM model for the 1% AEP event at the Lawful Point of Discharge is contained in Table 3.3 below.

Table 3.3 Rational Method vs XPSWMM Generated Peak Discharges

Scenario	Catchment ID	Rational (m ³ /s)	XP-SWMM (m ³ /s)	Difference (%)
Pre-developed	A	0.72	0.67	7
	B	0.27	0.27	0
Post-developed	A	1.96	2.03	3

The peak discharges generated by XPSWMM, and the Rational Method compare well (within 20%) and are considered acceptable for this assessment.

3.5.2 XPSWMM Results

A pre and post-development model was constructed to assess the difference in peak flows. These models compare the discharge hydrographs for a range of storm durations at the internal catchment points of discharge. A full range of events have been simulated for critical events.

A summary of the modelling results for different ARI events is contained in Table 3.4.

Table 3.4 Pre-Development vs Post-Development Peak Discharges at LPD A

AEP Event (%)	Pre-Development		Post-Development	
	Median Critical Event	Peak Discharge (m ³ /s)	Median Critical Event	Peak Discharge (m ³ /s)
1%	30 mins TP4	0.67	10 mins TP8	2.03
2%	30 mins TP4	0.56	10 mins TP8	1.81
5%	45 mins TP7	0.46	10 mins TP3	1.58
10%	45 mins TP4	0.35	10 mins TP3	1.37
0.2 EY	1.5 hrs TP3	0.26	10 mins TP7	1.18
0.5 EY	1.5 hrs TP9	0.18	10 mins TP7	0.94

3.5.3 Peak Flow Management

As the proposed development will cause an increase in impervious area over the subject site, the magnitude of peak runoff produced over the site will also increase.

However, with reference to the approved Civil Engineering Report for the downstream northern development (Lot 2 RP868726) prepared by Michael Bale & Associates (Report No. R001-G24079), the 1% AEP peak flow from the subject site (referred to as “catchment 4” in the report) was assessed as 2.519 m³/s, larger than the post-development value of 2.03 m³/s from XPSWMM as shown in the table above.

It is considered that the proposed drainage infrastructure of the downstream northern development (pipe and detention basin) has sufficient capacity to accommodate the runoff from the fully developed site, without need for peak flow mitigation measures such as on-site detention.

Based on the above, it is considered that the proposed development will not create any adverse drainage impacts on downstream properties.





4. Stormwater Quality Assessment

4.1 Water Quality Objective (WQO)

In accordance with the State Planning Policy (SPP), the total effect of permanent water quality control measures is to achieve reductions in the mean annual load generated by the development site at a minimum of:

- 90% for Gross Pollutants (>5mm).
- 80% for Total Suspended solids (TSS);
- 60% for Total Phosphorus (TP); and
- 45% for Total Nitrogen (TN).

This will ensure the environmental values of the downstream receiving waters are maintained and have been chosen as the WQO for the development.

4.2 Treatment Train

To ensure the above WQOs can be met at site's LPD, a treatment train was proposed for the developed site and modelled using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software.

4.2.1 Bioretention Basins

The parameters of the proposed bioretention basins are presented in Table 4.1 and further detail of the input parameters used within MUSIC are included in Appendix E.

Table 4.1 Proposed Bio-Retention Basin Parameters

Basin ID	Filter Area (m ²)	Extended Detention Depth (m)	Filter Media Depth (m)
1	350	0.3	0.5

Typical sections of a bioretention basin have been included in Figure 4.1 and Figure 4.2. The bioretention systems will be designed in accordance with the Water by Design Technical Guidelines (Water by Design, 2014) during the detailed design phase of the development.

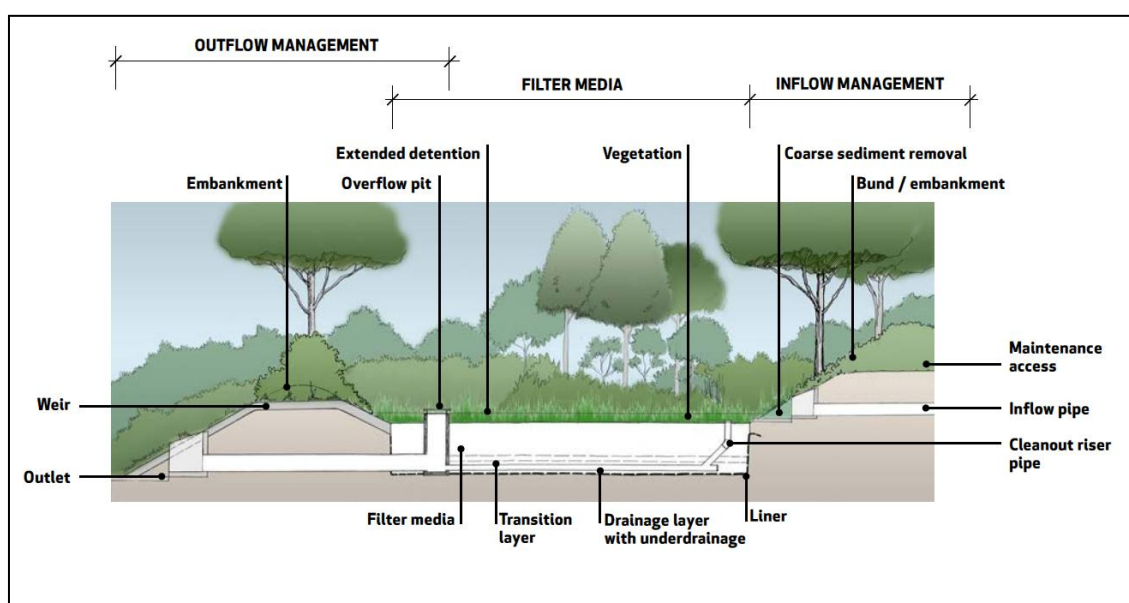


Figure 4.1 Typical Bioretention Basin (Water By Design, 2014)



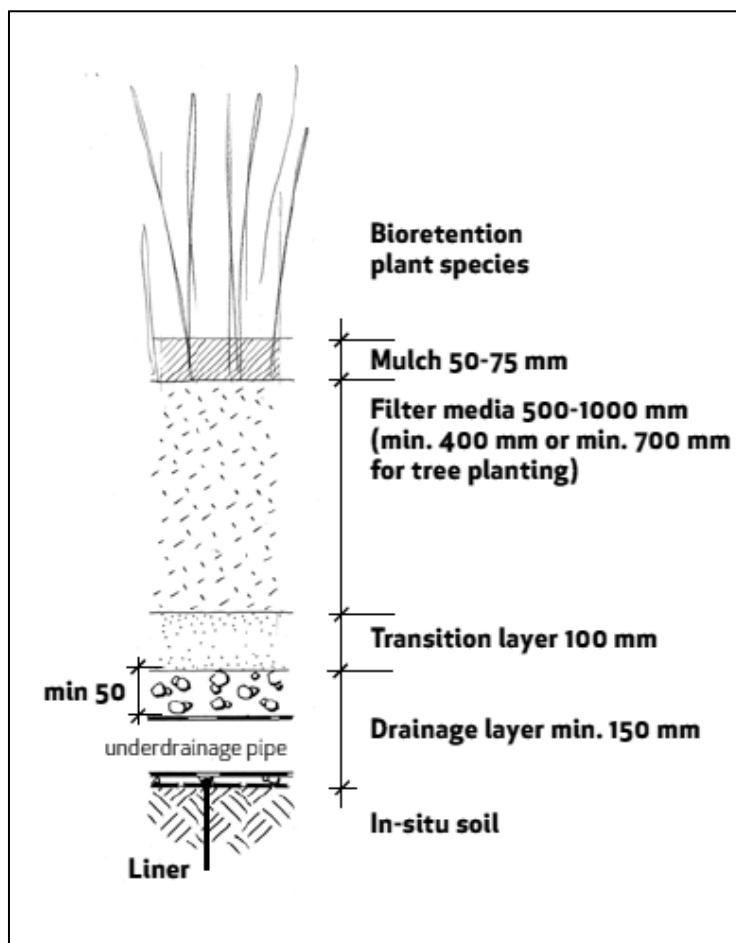


Figure 4.2 Typical Bioretention Drainage Profile (Water By Design, 2014)

4.3 Sediment Removal

Coarse sediment is required to be removed from stormwater before the water is discharged to the bioretention basin for further treatment. They also function to regulate and dissipate the flows into the bioretention basins.

It is noted that the Bioretention Design Guidelines (Water by Design 2014), specify that for contributing catchments greater than 2ha but smaller than 5ha require coarse sediment removal via coarse sediment forebay as pre-treatment to bioretention.

4.3.1 Sediment Forebay

A sediment forebay is intended to remove 80% of coarse sediment before the stormwater is discharged into the bioretention basin for further treatment.

The parameters of the proposed sediment forebay are presented in table below.

Table 4.2 Proposed Sediment Forebay Parameters

Catchment	Basin ID	Surface Area (m ²)	Sediment Storage Depth (m)	Storage Volume (m ³)
A	1	28.8	0.1	2.86





Figure 4.3 shows a typical section of a sedimentation forebay. The sedimentation basin will be designed in accordance with the Water by Design Technical Guidelines (Water by Design, 2014) during the detailed design phase of the development.

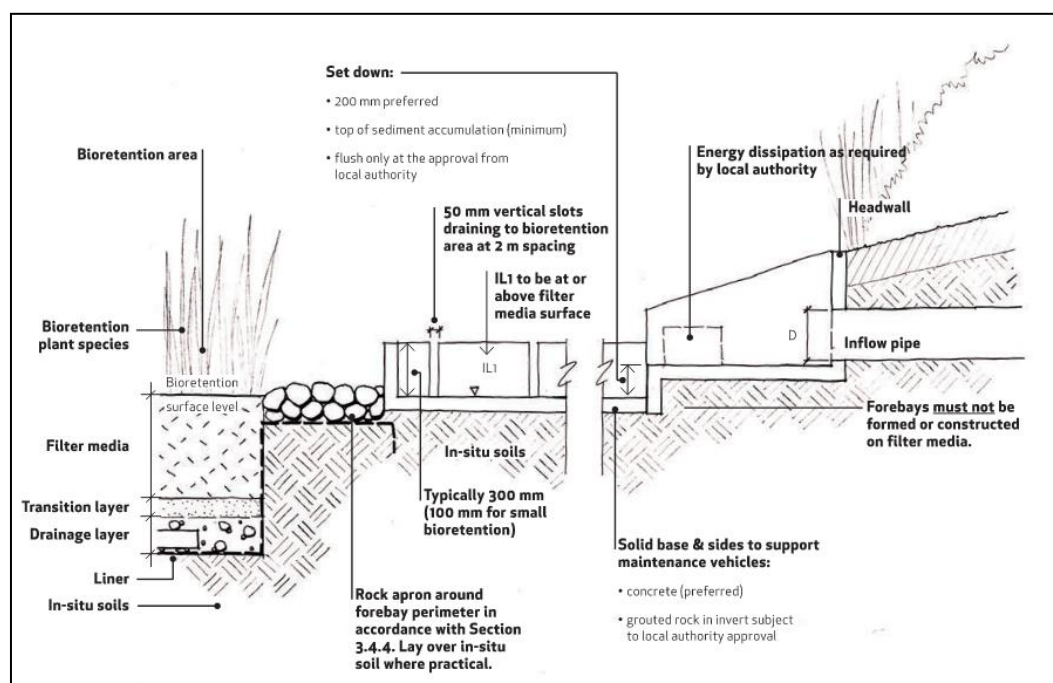


Figure 4.3 Typical Sediment Forebay (Water By Design, 2014)

4.4 MUSIC Results

Results of the MUSIC modelling for the treatment train effectiveness for the proposed development is summarised in Table 4.3. The results indicate the WQOs are achieved for the rainfall data set simulated.

Table 4.3 Treatment Train Effectiveness

LPD	Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction Achieved (%)	Water Quality Objective (%)
A	TSS	2635	449.8	82.93	80
	TP	6.957	1.734	75.07	60
	TN	44.95	21.09	53.09	45
	GP	493.8	0	100	90

NOTE: All simulations have been run with pollutant export estimation set to 'stochastic generation'.





A screen capture of the MUSIC model and treatment train effectiveness results is presented in Figure 4.4.

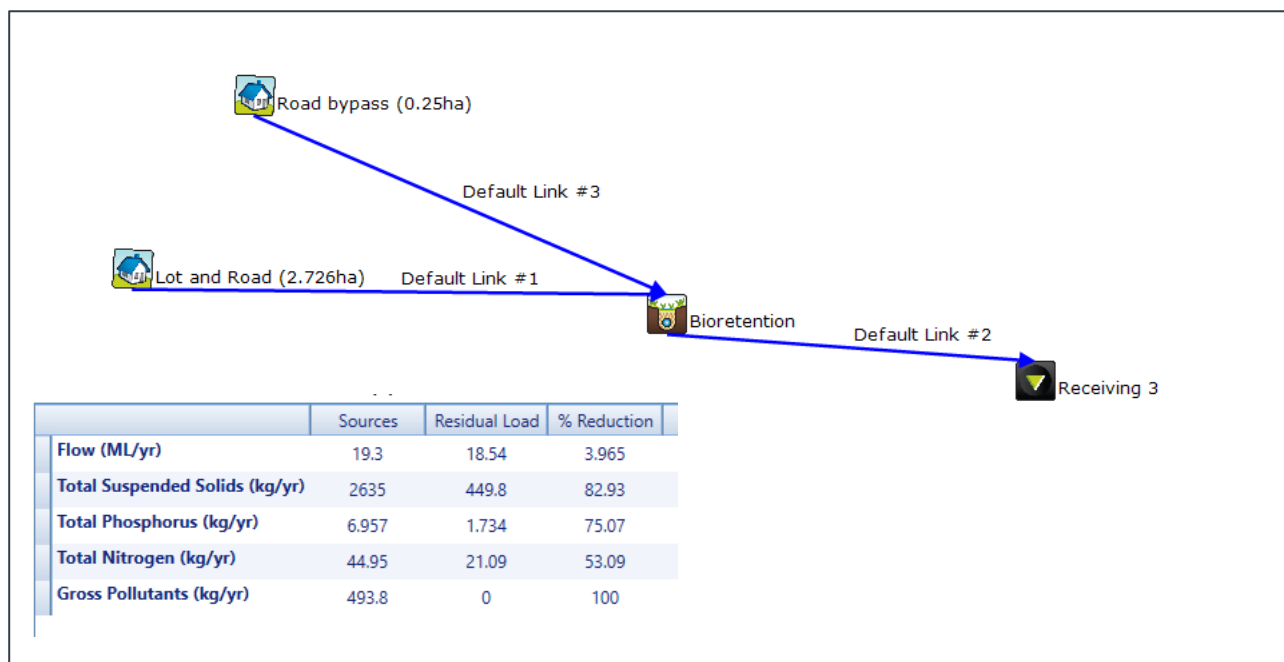


Figure 4.4 Treatment Train Layout and Treatment Effectiveness





5. Conclusion

This Conceptual Stormwater Management Plan (CSMP) has been prepared to support a Development Application to EDQ for the reconfiguring of a Lot for a 1 into 9 lot subdivision, located at Lot 3 on RP900179 in North Maclean. The following conclusions have been made as a result of this report:

- **Stormwater Quantity:** Post-development peak discharges have been accounted for in the drainage infrastructure design of the downstream development (Lot 2 RP868726), therefore on-site detention is not required;
- **Stormwater Quality:** Permanent treatment measures, including a bioretention basin and sediment forebay, will meet or exceed pollutant load reduction targets for gross pollutants, suspended solids, phosphorus, and nitrogen.



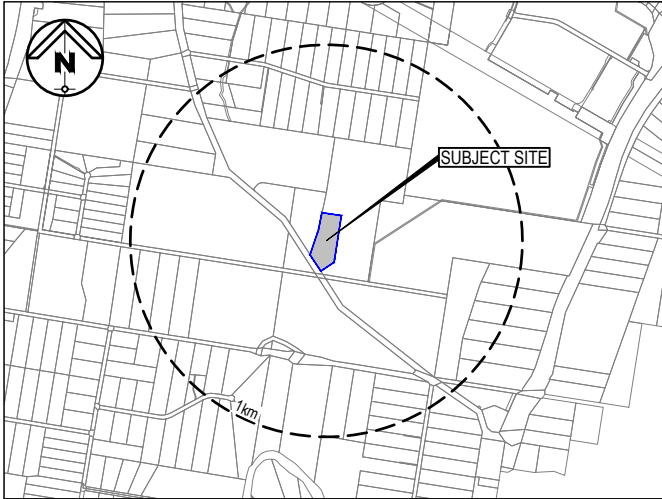


Appendix A – Burchills Engineering Solutions Preliminary Civil Engineering Drawings



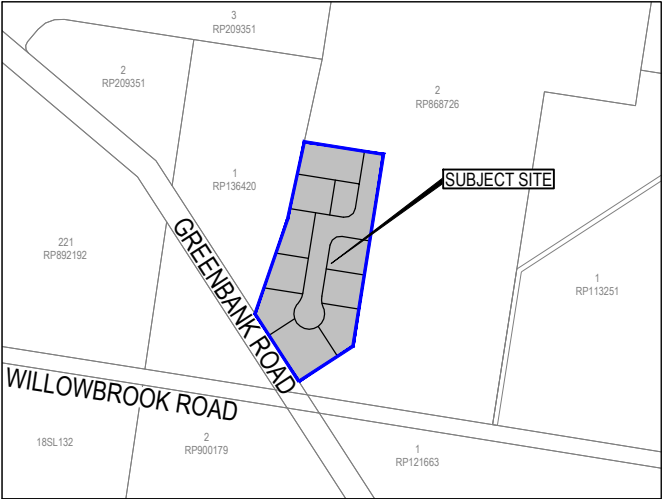
PROPOSED INDUSTRIAL DEVELOPMENT
AT 806-818 GREENBANK ROAD,
NORTH MACLEAN, QUEENSLAND

ROADWORKS & CIVIL SERVICES
DEVELOPMENT APPROVAL
CONTRACT BE240612-DA



LOCALITY PLAN
N.T.S.

DRAWING INDEX	
DRG. No.	DESCRIPTION
C1000	COVER SHEET & DRAWING INDEX
C1001	TYPICAL SECTIONS, NOTE AND DETAILS
C2601	CONCEPT EARTHWORKS LAYOUT PLAN
C2602	EARTHWORKS NOTES
C2801	CONCEPT EARTHWORKS SECTIONS - SHEET 1 OF 2
C2802	CONCEPT EARTHWORKS SECTIONS - SHEET 2 OF 2
C3101	CONCEPT ROADWORKS & STORMWATER DRAINAGE LAYOUT PLAN
C3501	ROADWORKS SWEPT PATH PLAN
C4501	CONCEPT BASIN LAYOUT PLAN
C5101	CONCEPT SERVICES LAYOUT PLAN
C9000	HAZARD RISK REGISTER - DESIGN RISKS



NEIGHBOURHOOD PLAN
N.T.S.

PREPARED FOR
NORTHROCK MARULAN P/L



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Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

FOR APPROVAL

PROJECT No.: BE240612-DA		DRAWING No.: C000	VERSION: A
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DATE: 03-03-26

1. BATTER SLOPES AND PAVEMENT CROSSFALLS SHOWN ON THIS DRAWING ARE TYPICAL ONLY. FOR VARIATION FROM THE STANDARD PROFILES REFER RELEVANT ROADWORKS DRAWINGS.
2. PAVEMENT DEPTHS SHOWN ON THIS DRAWING ARE DESIGN DEPTHS ONLY AND MAY BE VARIED ONCE SUBGRADE TESTS ARE TAKEN. TURNOUTS ARE TO BE PAVED WITH THE SAME MATERIAL AND COMPACTED TO THE SAME STANDARD AS THE ROAD ADJACENT.
3. KERB AND CHANNEL, MEDIAN KERB AND OTHER EDGE SECTIONS SHALL BE CONCRETE CLASS N32, AND THE MIX DESIGNED SPECIFICALLY FOR EXTRUSION.
4. REFER IPWEAQ STD. DRG. RS-080 FOR TYPICAL KERB DETAILS AND NOTES.
5. FOR DETAILS OF SIDE-DRAIN CONSTRUCTION REFER IPWEAQ STD. DRG. RS-140 AND RS-142.



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DRAWING TITLE :

TYPICAL SECTIONS, NOTE AND DETAILS

PROJECT :

PROPOSED INDUSTRIAL SUBDIVISION
AT
806-818 GREENBANK ROAD, NORTH MACLEAN

SCALE AT FULL SIZE (A1) :

0.1 0 0.1 0.2 0.3 0.4 0.5m
1 : 10 (FULL SIZE)

1 0 1 2m
1 : 50 (FULL SIZE)

DEVEL. APPLIC. No. :		DATE : 03-03-26
PROJECT LEADER : BLAKE HALL	DESIGNER : L.D.L.	
DRAFTSPERSON : H.A.	CHECKED : DALE MCINNES	
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365		
PROJECT No. :	DRAWING No. :	VERSION:
BE240612-DA	C1001	A



LEGEND

- 38.00 --- EXISTING SURFACE CONTOURS
- 38.00 --- DESIGN SURFACE CONTOURS (MAJOR)
- --- DESIGN SURFACE CONTOUR (MINOR)
- SW --- SW --- EXISTING STORMWATER
- W --- W --- EXISTING WATER
- S --- S --- EXISTING SEWER
- OH --- OH --- EXISTING OVERHEAD ELECTRIC
- C --- C --- EXISTING COMMS
- --- EXISTING ROAD CONTROL LINE
- --- EXISTING KERB
- --- DEVELOPMENT SITE BOUNDARY
- --- PROPOSED ROAD CONTROL LINE
- --- PROPOSED KERB (TYPE B2)
- --- PROPOSED SLEEPER RETAINING WALL (UP TO 1.5m SINGLE TIER)
- --- PROPOSED SLEEPER RETAINING WALL (1.5m - 3.0m DOUBLE TIER)
- --- PROPOSED EARTHWORKS PAD
- 37.50 PREFERRED BENCH LEVEL
- 37.50 FINISHED SURFACE LEVEL
- EARTHWORKS AREA OF FILL
- EARTHWORKS AREA OF CUT
- Y Y INDICATIVE HEAVY DUTY CROSSOVER IN ACCORDANCE WITH IPWEA RSD-102

NOTE:
THIS IS A GENERIC LEGEND. NOT ALL ITEMS WITHIN THIS LEGEND MAY BE PRESENT ON THIS PLAN AND THE SCALE OF ITEMS MAY BE DIFFERENT TO THE ITEMS PRESENTED ON THIS PLAN

CONCEPT BULK EARTHWORKS SUMMARY	
EXCAVATION	
AREA	NETT CUT
OVERALL FILLING	16,804 cu.m.
STRUCTURAL FILLING	
AREA	NETT SOLID FILL
OVERALL EXCAVATION	8,782 cu.m.
SUMMARY: TOTAL MATERIAL EXCAVATED (NETT CUT) = 8,022cu.m. i.e. 16,804 cu.m. - 8,782 cu.m. = 8,022 cu.m.	
NOTE: NO ALLOWANCES HAVE BEEN MADE FOR TOPSOIL STRIP, FOOTPATHS, LANDSCAPING, DRIVEWAY BOXING NOR ROAD BOXING.	

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VER.	DESCRIPTION	DATE
A	ISSUE FOR DA	03-03-26



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IPSWICH | MORETON BAY
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FAX: +61 7 5509 6411
EMAIL: ADMIN@BURCHILLS.COM.AU
COOTE BURCHILLS ENGINEERING PTY LTD
ABN 76 166 942 365

CLIENT :

NORTHROCK MARULAN P/L

DRAWING TITLE :

CONCEPT EARTHWORKS LAYOUT PLAN

PROJECT :

PROPOSED INDUSTRIAL SUBDIVISION
AT
806-818 GREENBANK ROAD, NORTH MACLEAN

FOR APPROVAL

SCALE AT FULL SIZE (A1) :
5 0 5 10 15 20 25m
1 : 500 (FULL SIZE)

DEVEL. APPLIC. No. :	DATE : 03-03-26
PROJECT LEADER : BLAKE HALL	DESIGNER : L.D.L.
DRAFTSPERSON : H.A.	CHECKED : DALE MCINNES
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365	
PROJECT No. : BE240612-DA	DRAWING No. : C2601
VERSION: A	



CONCEPT EARTHWORKS LAYOUT PLAN

GENERAL EARTHWORKS NOTES:

1.
- ALL EARTHWORKS CONSTRUCTION UNDER THIS CONTRACT IS TO BE PERFORMED STRICTLY IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL REPORT PREPARED BY THE PRINCIPAL'S GEOTECHNICAL CONSULTANT.
2.
- ALL COMPACTION TESTING UNDER THIS CONTRACT IS TO BE CARRIED OUT TO AS3798 LEVEL 1 STANDARD BY A NATA-ACCREDITED TESTING AUTHORITY. CERTIFICATION FOR ALL EARTHWORKS CONSTRUCTION AND TESTING IS TO BE PROVIDED BY A REGISTERED PROFESSIONAL ENGINEER QUEENSLAND (RPEQ) ENGAGED BY THE CONTRACTOR.
3.
- ALL DESIGN LEVELS SHOWN ON THE CONTRACT DRAWINGS ARE FINISHED SURFACE LEVELS FOLLOWING TOPSOIL REPLACEMENT.
4.
- ALL STRUCTURAL FILL MATERIAL PLACED SHALL BE COMPACTED TO THE FOLLOWING MINIMUM DENSITY IN ACCORDANCE WITH THE SPECIFICATION AND THE GEOTECHNICAL REPORT:

a) 95% DENSITY RATIO FOR GENERAL STRUCTURAL FILL (COHESIVE MATERIAL)

b) 98% DENSITY RATIO FOR THE TOP 300mm DEPTH BELOW PAVEMENT SUBGRADE LEVEL (COHESIVE MATERIAL)
5.
- FILL MATERIAL USED IN WETLAND BATTERS IS TO BE STIFF TO HARD CLAYS OR OTHER SUITABLE MATERIAL AS DIRECTED BY GEOTECHNICAL ENGINEER.
6.
- ALL EARTHWORKS BATTERS STEEPER THAN 1 IN 4 ARE TO BE LANDSCAPED IN ACCORDANCE WITH LANDSCAPE ARCHITECTS PLANS.
7.
- EXISTING DAMS ARE TO BE DE-WATERED AND CLEANED-OUT. ALL UNSUITABLE OR SATURATED MATERIAL IS TO BE REMOVED AND REPLACED WITH SELECTED ON-SITE STRUCTURAL FILL MATERIAL AND COMPACTED AS SPECIFIED.
8.
- PROVIDE CONDITION SURVEY OF ADJACENT RESIDENTIAL BUILDINGS FOR ALL PROPERTIES LOCATED WITHIN NOMINAL 100m OF EARTHWORKS OPERATIONS. CONDITION SURVEY TO BE UNDERTAKEN BY QUALIFIED PERSONNEL WITH BUILDING EXPERIENCE.

RETAINING WALL NOTES:

1.
- RETAINING WALLS, FOOTINGS, DRAINAGE, BACKFILL AND CONNECTION OF AGGREGATE DRAINS TO STORMWATER DRAINAGE SYSTEM TO BE DESIGNED AND CONSTRUCTED BY THE CONTRACTOR AND CERTIFIED BY AN SUITABLY QUALIFIED RPEQ
2.
- THESE DRAWINGS IDENTIFY SURFACE PROFILES, RETAINING WALL LOCATIONS, AND SETOUT INFORMATION ONLY. REFER TO CONTRACTOR SUPPLIED DRAWINGS FOR RPEQ STRUCTURAL DETAILS, WALL MATERIALS AND COMPACTION SPECIFICATIONS AND CONSTRUCTIBILITY INFORMATION.
3.
- RETAINING WALL DESIGN ENGINEER TO PROVIDE RPEQ FORM 15 STRUCTURAL CERTIFICATE INCLUDING GEOTECHNICAL GLOBAL STABILITY CERTIFICATION BY GEOTECHNICAL ENGINEER. WALL DESIGN TO ASSUME SURCHARGE LOADING BEHIND WALL. DESIGN TO BE IN ACCORDANCE WITH AS4678 INCLUDING ALL REQUIRED DESIGN LOAD CASES AND COMBINATIONS.
4.
- RETAINING WALLS TO BE DESIGNED TO CONSIDER ALL LOADS INCLUDING CONSTRUCTION LOADS AND OPERATIONAL LOADS.
5.
- ANY GEOTECHINCAL INFORMATION PROVIDED BY THE PRINCIPAL OR THE SUPERINTENDENT SHALL BE FOR INFORMATION PURPOSES ONLY. THE CONTRACTOR AND THE RETAINING WALL DESIGN ENGINEER SHOULD SATISFY THEMSELVES OF THE DESIGN SOIL PARAMETERS AND UNDERTAKE AND ADDITIONAL GEOTECHNICAL INVESTIGATION DEEMED NECESSARY BY THE DESIGN ENGINEER.
6.
- THE CONTRACTOR SHALL ENSURE THAT ANY CONFLICT BETWEEN THESE PROJECT DRAWINGS AND THE RETAINING WALL DRAWINGS PREPARED BY THE RETAINING WALL DESIGN ENGINEER IS RESOLVED WITH THE SUPERINTENDENT PRIOR TO CONSTRUCTION COMMENCING.
7.
- A COPY OF THE RETAINING WALL DESIGN DRAWINGS, INCLUDING CONNECTION OF AGGREGATE DRAINS TO THE STORMWATER DRAINAGE SYSTEM, DESIGN PARAMETERS AND CERTIFICATION BE PROVIDED TO THE SUPERINTENDENT AT THE PRE-START MEETING PRIOR TO CONSTRUCTION COMMENCING.
8.
- ANY RETAINING WALL AND BATTER EXCEEDING THE HEIGHT OF 1.5m, THE CONTRACTOR SHALL UNDERTAKE A THIRD PARTY RPEQ REVIEW OF THE PROPOSED DESIGN.
9.
- RETAINING WALL TYPES HAVE BEEN CONCEPTUALLY DETAILED AS CONCRETE SLEEPER WALLS. WALL DESIGN ENGINEER TO CONSIDER ALTERNATIVES IF REQUIRED, DUE TO PROXIMITY OF SERVICES (GAS MAIN).
10.
- RETAINING WALLS TO PERIMETER BIO BASINS ARE TO BE WATERPROOFED, AND CONSIDER UNDERSIDE OF BIO DRAINAGE, AND WATER LOADING RESULTING FROM THE BASIN. REFER STORMWATER CONSULTING REPORT FOR DETAILS.

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COOTE BURCHILLS ENGINEERING PTY LTD
ABN 76 166 942 365

NORTHROCK MARULAN P/L

CLIENT :

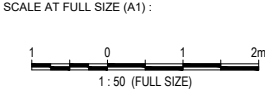
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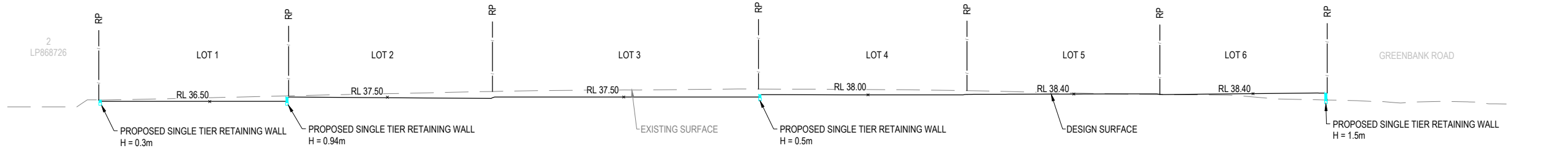
PROJECT :

PROPOSED INDUSTRIAL SUBDIVISION
AT
806-818 GREENBANK ROAD, NORTH MACLEAN

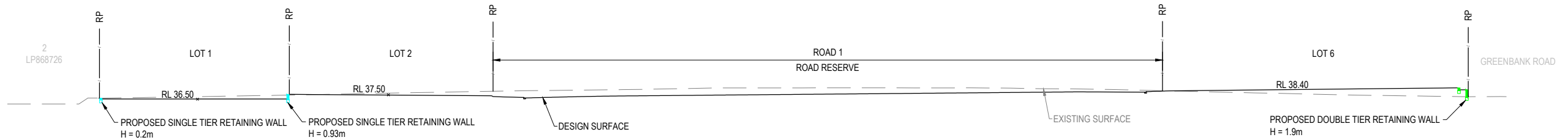
FOR APPROVAL



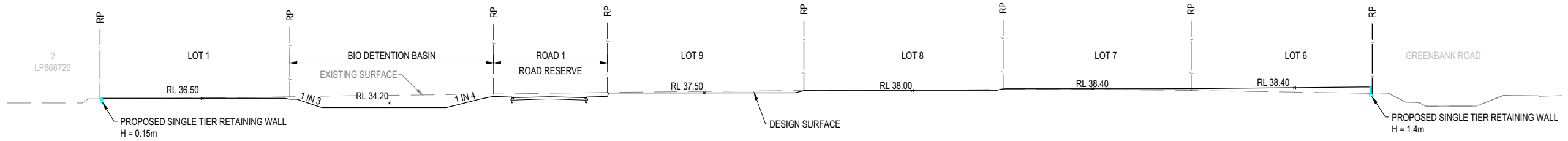
DEVEL. APPLIC. No. :		DATE : 03-03-26	
PROJECT LEADER : BLAKE HALL		DESIGNER : L.D.L.	
DRAFTSPERSON : H.A.		CHECKED : DALE MCINNES	
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365			
PROJECT No.:		DRAWING No. :	
BE240612-DA		C2602	
		VERSION:	
		A	



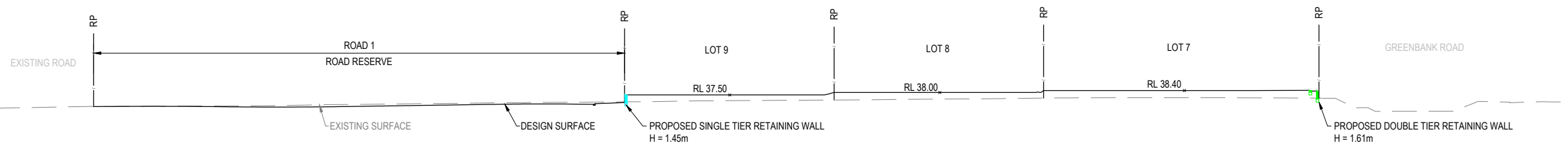
A SECTION
C2801 SCALE 1:500



B SECTION
C2801 SCALE 1:500



C SECTION
C2801 SCALE 1:500



D SECTION
C2801 SCALE 1:500

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ABN 76 166 942 365

CLIENT :

NORTHROCK MARULAN P/L

DRAWING TITLE :

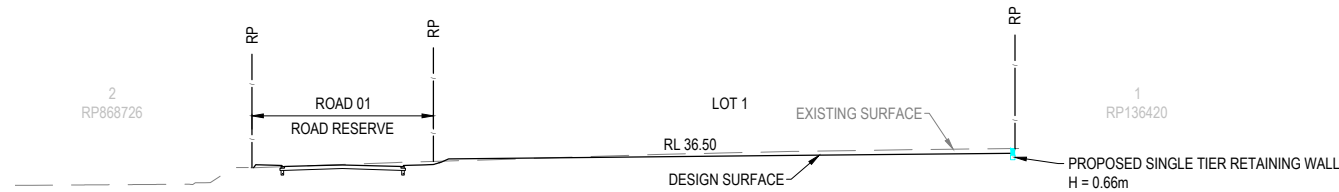
CONCEPT EARTHWORKS SECTIONS

PROJECT :

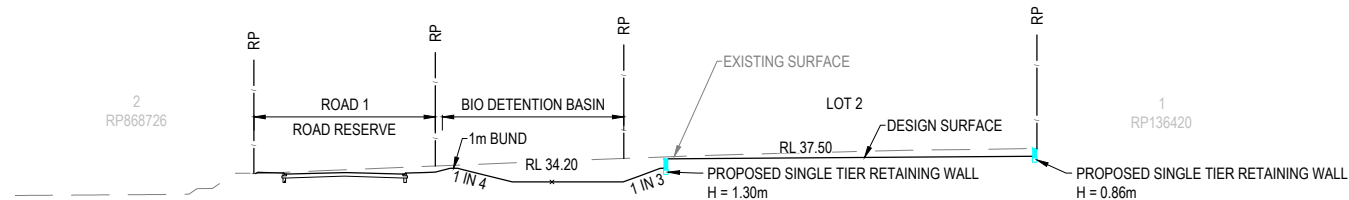
PROPOSED INDUSTRIAL SUBDIVISION
AT
806-818 GREENBANK ROAD, NORTH MACLEAN

FOR APPROVAL
SCALE AT FULL SIZE (A1) :
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1:500 (FULL SIZE)

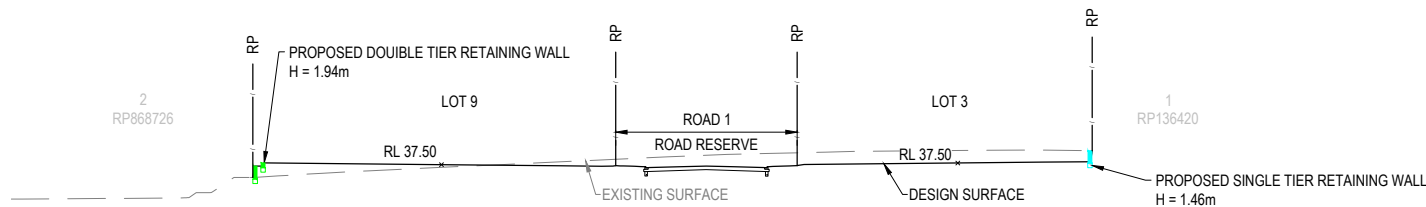
DEVEL. APPLIC. No. :		DATE : 03-03-26
PROJECT LEADER : BLAKE HALL		DESIGNER : L.D.L.
DRAFTSPERSON : H.A.		CHECKED : DALE MCINNES
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365		
PROJECT No. : BE240612-DA	DRAWING No. : C2801	VERSION: A



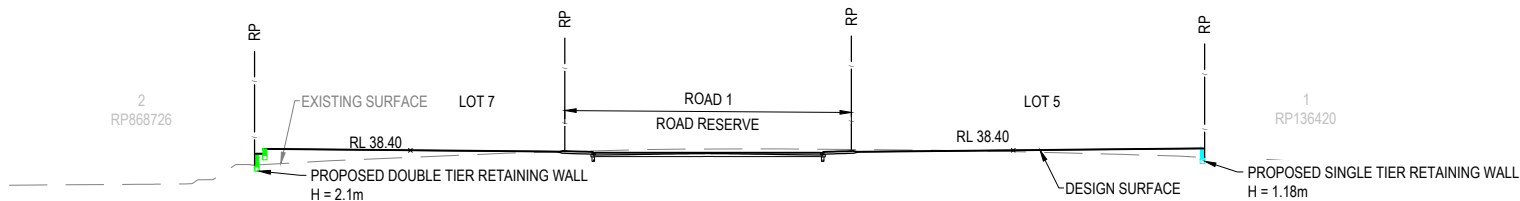
E SECTION
C2801 SCALE 1:500



F SECTION
C2801 SCALE 1:500



G SECTION
C2801 SCALE 1:500



H SECTION
C2801 SCALE 1:500

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CLIENT :

NORTHROCK MARULAN P/L

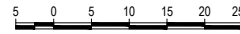
DRAWING TITLE :

CONCEPT EARTHWORKS SECTIONS

PROJECT :

PROPOSED INDUSTRIAL SUBDIVISION
AT
806-818 GREENBANK ROAD, NORTH MACLEAN

FOR APPROVAL

SCALE AT FULL SIZE (A1) :

1 : 500 (FULL SIZE)

DEVEL. APPLIC. No. :		DATE : 03-03-26
PROJECT LEADER : BLAKE HALL	DESIGNER : L.D.L.	
DRAFTSPERSON : H.A.	CHECKED : DALE MCINNES	
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365		
PROJECT No. : BE240612-DA	DRAWING No. : C2802	VERSION: A



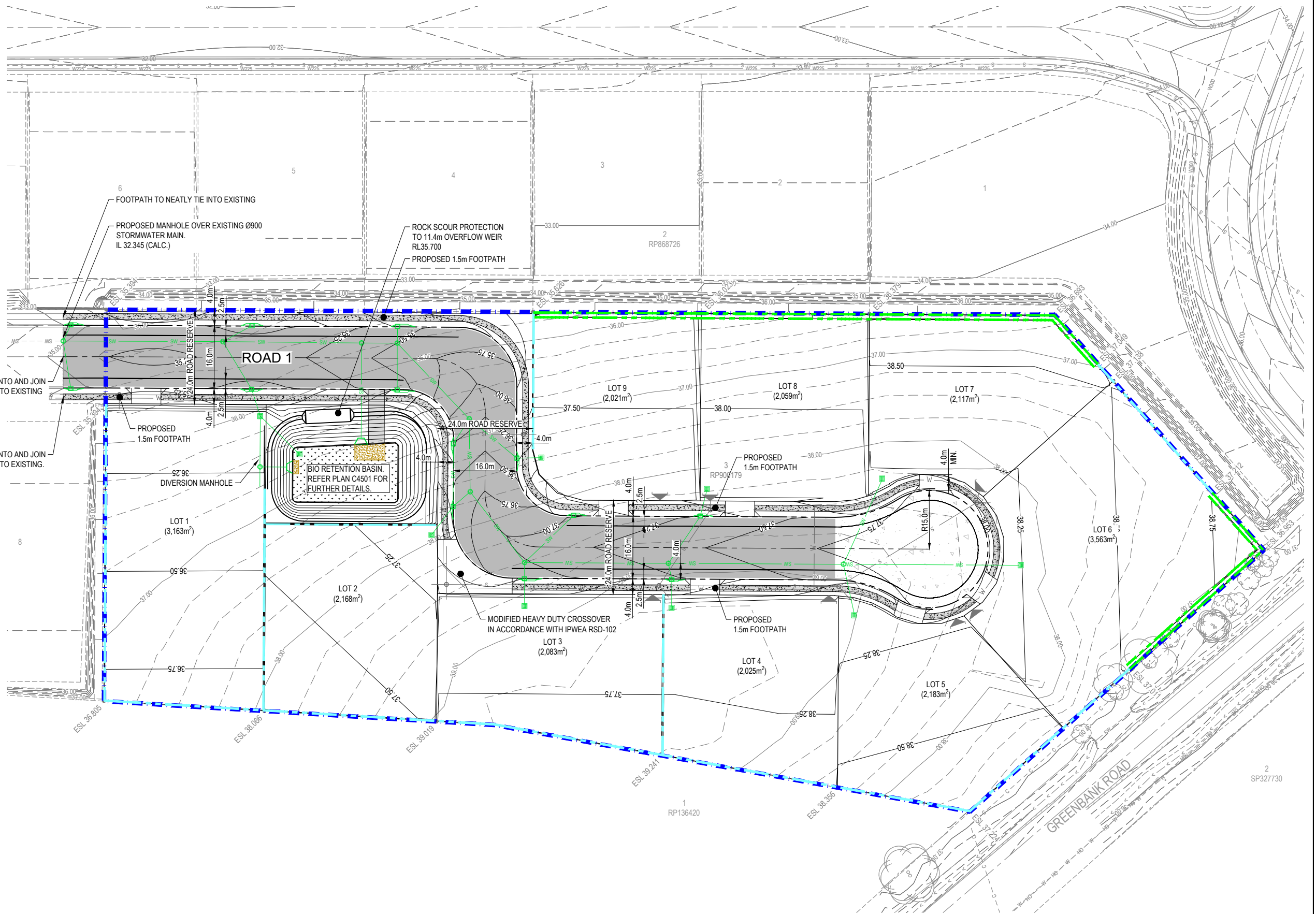
LEGEND

- 38.00 --- EXISTING SURFACE CONTOURS
- 38.00 --- DESIGN SURFACE CONTOURS (MAJOR)
- --- DESIGN SURFACE CONTOUR (MINOR)
- SW --- SW --- EXISTING STORMWATER
- W --- W --- EXISTING WATER
- S --- S --- EXISTING SEWER
- OH --- OH --- EXISTING OVERHEAD ELECTRIC
- C --- C --- EXISTING COMMS
- --- EXISTING ROAD CONTROL LINE
- --- EXISTING KERB
- --- EXISTING EDGE OF BITUMEN
- SW --- PROPOSED STORMWATER
- W --- PROPOSED WATER
- S --- PROPOSED SEWER
- --- PROPOSED ROAD CONTROL LINE
- --- PROPOSED KERB (TYPE B1)
- --- PROPOSED SLEEPER RETAINING WALL (UP TO 1.5m SINGLE TIER)
- --- PROPOSED SLEEPER RETAINING WALL (1.5m - 3.0m DOUBLE TIER)
- --- DEVELOPMENT SITE BOUNDARY
- --- PROPOSED PAVEMENT ASPHALTIC CONCRETE
- --- PROPOSED FOOTPATH
- --- PROPOSED REINFORCED CONCRETE CULDESAC
- Y Y INDICATIVE HEAVY DUTY CROSSOVER IN ACCORDANCE WITH IPWEA RSD-102

NOTE:
THIS IS A GENERIC LEGEND. NOT ALL ITEMS WITHIN THIS LEGEND MAY BE PRESENT ON THIS PLAN AND THE SCALE OF ITEMS MAY BE DIFFERENT TO THE ITEMS PRESENTED ON THIS PLAN

NOTE:
ALL DESIGN/SETOUT INFORMATION SHOWN ON THIS DRAWING IS AVAILABLE IN DIGITAL FORMAT FROM THE OFFICE OF THE SUPERINTENDENT UPON REQUEST BY THE CONTRACTOR.

WARNING: UNDERGROUND SERVICES:
UNDERGROUND SERVICES EXIST IN THIS VICINITY. THE CONTRACTOR IS TO CONTACT THE RELEVANT AUTHORITIES TO CONFIRM EXACT LOCATION OF SERVICES ON SITE PRIOR TO ANY EXCAVATION OR CONSTRUCTION COMMENCING.



CONCEPT ROADWORKS & STORMWATER DRAINAGE LAYOUT PLAN

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COOTE BURCHILLS ENGINEERING PTY LTD
ABN 76 166 942 365

CLIENT :

NORTHROCK MARULAN P/L

DRAWING TITLE : CONCEPT ROADWORKS & STORMWATER DRAINAGE LAYOUT PLAN
PROJECT : PROPOSED INDUSTRIAL SUBDIVISION AT 806-818 GREENBANK ROAD, NORTH MACLEAN

FOR APPROVAL

SCALE AT FULL SIZE (A1) :
1 : 500 (FULL SIZE)

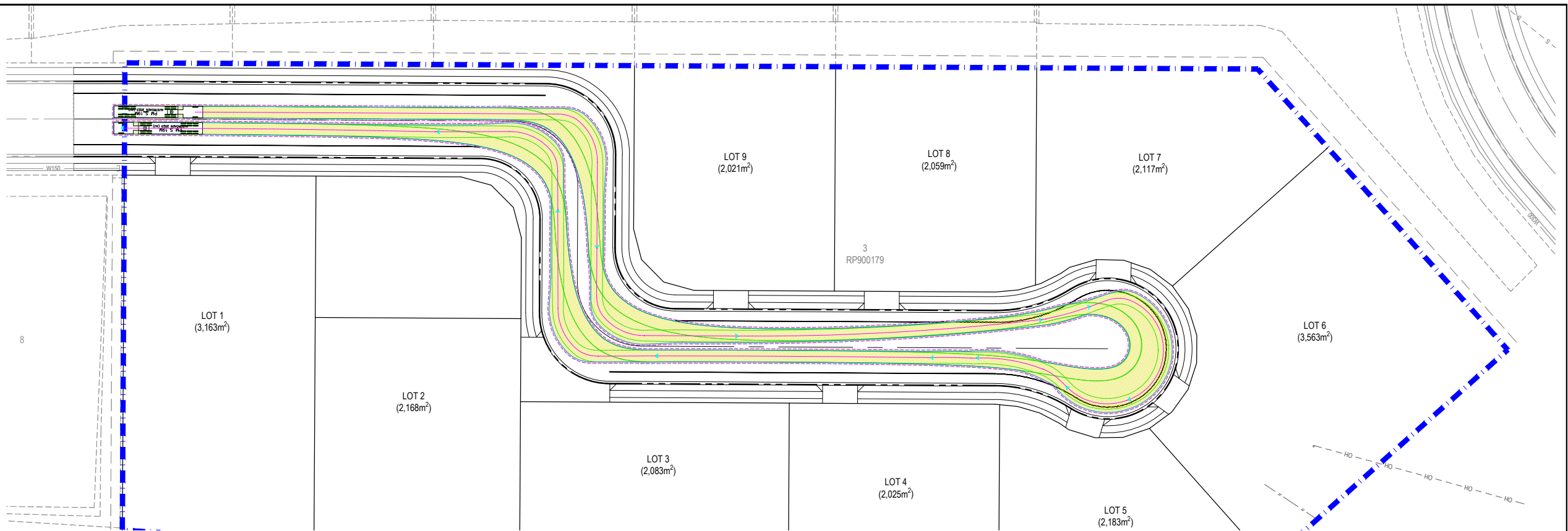
5 0 5 10 15 20 25m

DEVEL. APPLIC. No. :		DATE : 03-03-26
PROJECT LEADER : BLAKE HALL		DESIGNER : L.D.L.
DRAFTSPERSON : H.A.	CHECKED : DALE MCINNES	
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365		
PROJECT No.:	DRAWING No. :	VERSION:
BE240612-DA	C3101	A

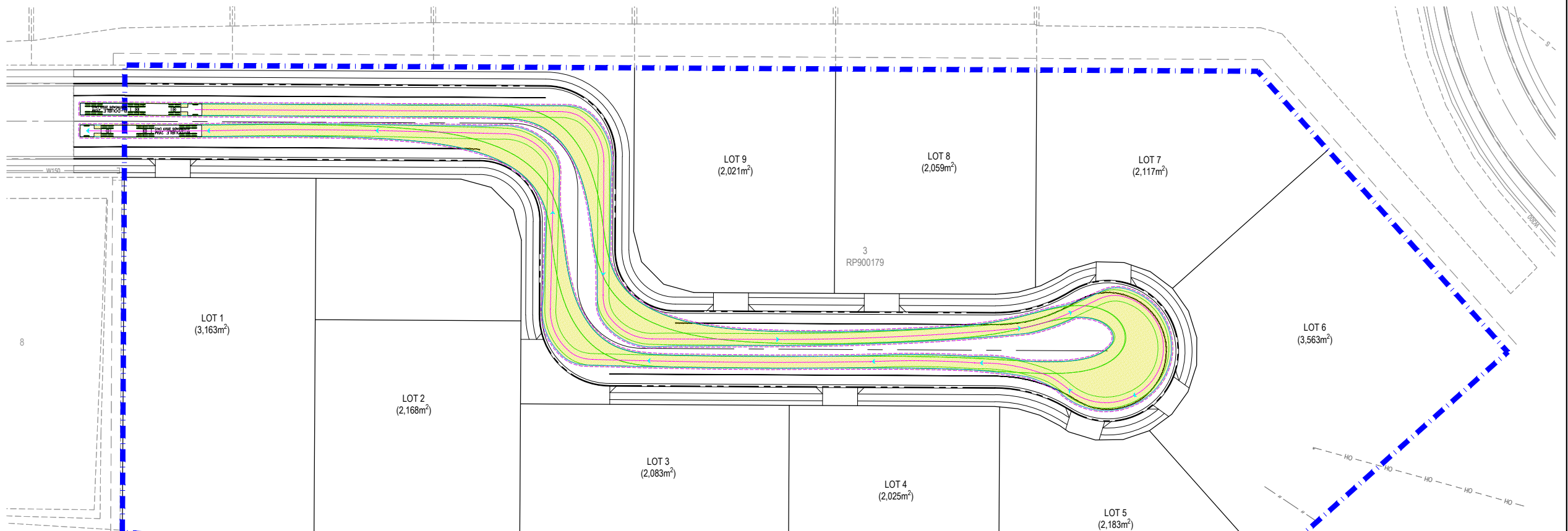


LEGEND

- PROPOSED CROSSOVER WHEELS
- BODY
- 0.3m BODY CLEARANCE
- PROPOSED BARRIER
- KERB & CHANNEL (TYPE B1)



SWEPT PATH PLAN
19.0m PRIME MOVE & SEMI TRAILER



SWEPT PATH PLAN
26.0m B-DOUBLE

NOTE:
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ABN 76 166 942 365

CLIENT :

NORTHROCK MARULAN P/L

DRAWING TITLE :

ROADWORKS SWEPT PATH PLAN

PROJECT :

PROPOSED INDUSTRIAL SUBDIVISION
AT
806-818 GREENBANK ROAD, NORTH MACLEAN

FOR APPROVAL

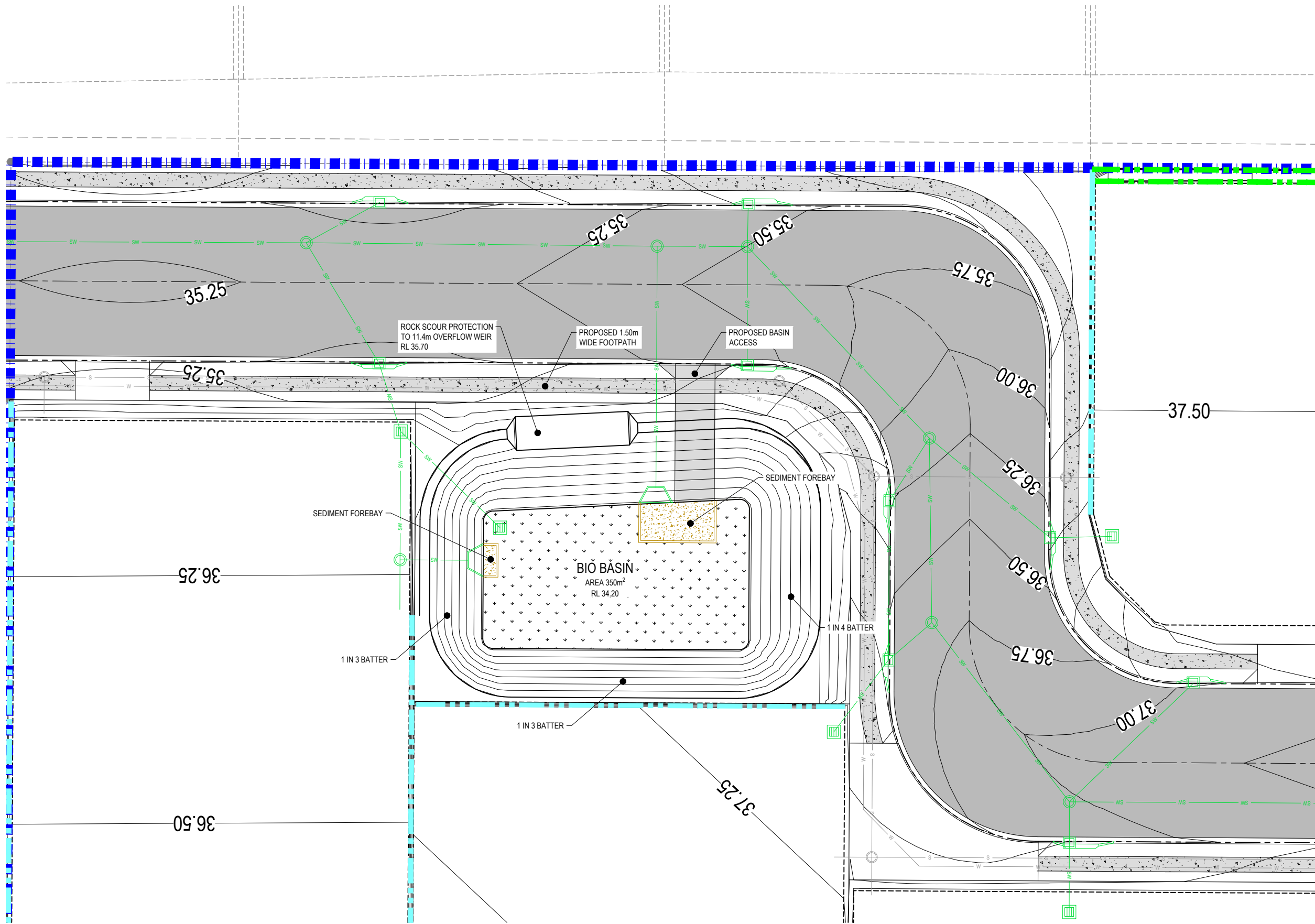
SCALE AT FULL SIZE (A1) :
5 0 5 10 15 20 25m
1 : 500 (FULL SIZE)

DEVEL. APPLIC. No. :	DATE : 03-03-26
PROJECT LEADER : BLAKE HALL	DESIGNER : L.D.L.
DRAFTSPERSON : H.A.	CHECKED : DALE MCINNES
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365	
PROJECT No. : BE240612-DA	DRAWING No. : C3501
VERSION: A	



LEGEND

- 38.00 — DESIGN SURFACE CONTOURS
- SW — PROPOSED STORMWATER
- PROPOSED SLEEPER RETAINING WALL (UP TO 1.5m SINGLE TIER)
- PROPOSED SLEEPER RETAINING WALL (1.5m - 3.0m DOUBLE TIER)
- DEVELOPMENT SITE BOUNDARY
- PROPOSED PAVEMENT ASPHALTIC CONCRETE
- PROPOSED FOOTPATH
- PROPOSED DRIVEWAY
- Y Y INDICATIVE HEAVY DUTY CROSSOVER IN ACCORDANCE WITH IPWEA RSD-102



CONCEPT BASIN LAYOUT PLAN

NOTE:
FINAL LEVELS SUBJECT TO DETAILED DESIGN.

NOTE:
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COOTE BURCHILLS ENGINEERING PTY LTD
ABN 76 166 942 365

CLIENT :

NORTHROCK MARULAN P/L

DRAWING TITLE :

PRELIMINARY STORMWATER BASIN (QUALITY ONLY) ARRANGEMENT

PROJECT :

PROPOSED INDUSTRIAL SUBDIVISION
AT
806-818 GREENBANK ROAD, NORTH MACLEAN

FOR APPROVAL

SCALE AT FULL SIZE (A1):
2 0 2 4 6 8 10m
1:200 (FULL SIZE)

DEVEL APPLIC. No. :	DATE : 03-03-26
PROJECT LEADER : BLAKE HALL	DESIGNER : L.D.L.
DRAFTSPERSON : H.A.	CHECKED : DALE MCINNES
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365	
PROJECT No. : BE240612-DA	DRAWING No. : C4501
VERSION: A	



LEGEND

— SW — SW —	EXISTING STORMWATER
— W — W —	EXISTING WATER
— S — S —	EXISTING SEWER
— OH — OH —	EXISTING OVERHEAD ELECTRIC
— C — C —	EXISTING COMMS
---	EXISTING ROAD CONTROL LINE
---	EXISTING KERB
---	EXISTING EDGE OF BITUMEN
— SW —	PROPOSED STORMWATER
— W —	PROPOSED WATER
— S —	PROPOSED SEWER
---	PROPOSED ROAD CONTROL LINE
---	PROPOSED KERB
---	PROPOSED SLEEPER RETAINING WALL (UP TO 1.5m SINGLE TIER)
---	PROPOSED SLEEPER RETAINING WALL (1.5m - 3.0m DOUBLE TIER)
---	DEVELOPMENT SITE BOUNDARY
Y Y	INDICATIVE HEAVY DUTY CROSSOVER IN ACCORDANCE WITH IPWEA RSD-102

CONNECTION TO EXISTING SEWER MAIN PROVIDED BY ADJOINING DEVELOPMENT

CONNECTION TO EXISTING WATER MAIN PROVIDE BY BY ADJOINING DEVELOPMENT

NOTE:
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ABN 76 166 942 365

CLIENT :

NORTHROCK MARULAN P/L

DRAWING TITLE :

CONCEPT SERVICES LAYOUT PLAN

PROJECT :

PROPOSED INDUSTRIAL SUBDIVISION
AT
806-818 GREENBANK ROAD, NORTH MACLEAN

FOR APPROVAL

SCALE AT FULL SIZE (A1) :
5 0 5 10 15 20 25m
1 : 500 (FULL SIZE)

DEVEL. APPLIC. No. :	DATE : 03-03-26
PROJECT LEADER : BLAKE HALL	DESIGNER : L.D.L.
DRAFTSPERSON : H.A.	CHECKED : DALE MCINNES
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365	
PROJECT No. : BE240612-DA	DRAWING No. : C5101
VERSION: A	

QMS RISK & OPPORTUNITIES REGISTER							
SAFETY IN DESIGN – NORMAL DESIGN RISKS - CIVIL							
Design Element	Associated risks & opportunities	Raw risk assessment		Raw risk rating	Treatment Measures to avoid, minimize or treat the risk.	Responsibility	Residual risk rating
		Likelihood	Consequence				
CONSTRUCTION PHASE							
SITE ACCESS	Unsafe site access and egress point, restricted access, flooding, unauthorised access from persons or animals	L	M	L-M	Prepare site specific Construction Traffic Management Plan and Workplace Health and Safety Management Plan	Principal Contractor	L
CLEARING & DEMOLITION	Removal of existing structures, decommission of services, vegetation clearing and fauna management	M	H	M-H	Contractor to obtain Demolition Permit, arrange all service disconnections with asset ownerand carry out vegetation works in accordance with Vegetation and Fauna Management Plan	Principal Contractor	L
EXISTING SERVICES	Distrub or damage existing services and infrastructure, overhead powerlines, work adjacent to existing services, existing service relocations	M	H	M-H	Client to commission detailed site survey and service potholing at critical locations. Contractor to undertake Dial Before You Dig and service verification with service authority providers and undertake additional potholing prior to construction	Client and Principal Contractor	L-M
EXCAVATION & TRENCHING	Unstable existing slopes and landslip, steep cut profiles, deep trench excavations, working at heights, intercept water table, dispersive soils, acid sulphate soils	M	H	M-H	Client to commission a geotechnical investigation and contractors to undertake own investigations. Temporary and final earthworks profiles confirmed by client's geotechnical consultant. Tempory earthworks profile to be confirmed by Contractor's geotechnical consultant. Contractor to provide temporary benching, fencing, stabilisation and shoring.	Client and Principal Contractor	L
MATERIALS HANDLING	Manual handling, handling and disposal of sharps, repeative work processeds, hazardous substances	H	M	M-H	Contractor or provide a site specific Workplace Health and Safety Management Plan including Material Safety Data Sheets	Principal Contractor	L
PLANT & EQUIPMENT	Operation of plant and machinery, site access by visitors, material deliveries and waste removal	M	H	M-H	Contractor or provide a site specific Workplace Health and Safety Management Plan including register of operator machinery tickets. Contractor to maintain a site visitor register and provide site specific induction to all visitors	Principal Contractor	L
OPERATIONAL PHASE							
ROADS & PATHWAYS	General road safety, flood free access, pedestrian and cyclist injuries, inadequate signage	L	H	M	Design, approvals and construction undertaken in accordance with Australian, State Government and Local Authority standards, codes, guidelines and best practice	Asset Owner	L
STORMWATER / FLOODING	Hazard from storm and flood water depths and velocities, ponding and access to inlets, outlets and basins	M	H	M-H	Design, approvals and construction undertaken in accordance with Australian, State Government and Local Authority standards, codes, guidelines and best practice	Asset Owner	L
WATER & SEWER	Blockages, contamination, interruption to service, access to fittings, confined space access	L	M	L-M	Design, approvals and construction undertaken in accordance with Australian, State Government and Local Authority standards, codes, guidelines and best practice	Asset Owner	L
WALLS & FENCING	Risk of falls, unauthorised access from persons and animals, structural failure	M	M	M	Design, approvals and construction undertaken in accordance with Australian, State Government and Local Authority standards, codes, guidelines and best practice	Asset Owner	L
MAINTENANCE PHASE							
ROADS & PATHWAYS	All as for construction and operation phases					Asset Owner	
STORMWATER / FLOODING	All as for construction and operation phases					Asset Owner	
WATER & SEWER	All as for construction and operation phases					Asset Owner	
WALLS & FENCING	All as for construction and operation phases					Asset Owner	
REFURBISHMENT PHASE							
ROADS & PATHWAYS	All as for construction and operation phases					Asset Owner	
STORMWATER / FLOODING	All as for construction and operation phases					Asset Owner	
WATER & SEWER	All as for construction and operation phases					Asset Owner	
WALLS & FENCING	All as for construction and operation phases					Asset Owner	
DEMOLITION PHASE							
ROADS & PATHWAYS	All as for construction and operation phases					Asset Owner	
STORMWATER / FLOODING	All as for construction and operation phases					Asset Owner	
WATER & SEWER	All as for construction and operation phases					Asset Owner	
WALLS & FENCING	All as for construction and operation phases					Asset Owner	

DEVEL. APPLIC. No. :		DATE : 03-03-26
PROJECT LEADER : BLAKE HALL	DESIGNER : L.D.L.	
DRAFTSPERSON : H.A.	CHECKED : DALE MCINNIS	
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365		
PROJECT No. :	DRAWING No. :	VERSION:
BE240612-DA	C9000	A



Appendix B – Rational Method Calculations

Design storm event peak discharges were derived using the Rational Method in accordance with QUDM. This involved:

- Calculation of the Time of Concentration for each catchment / discharge point.
- Determination of a C10 value derived in accordance with QUDM and Council guidelines.
- Adoption of design rainfall using BoM IFD data; and
- Calculation of design flows for Q100, Q50, Q20, Q10, Q5, Q2, Q1 and Q3_{month}, where Q3_{month} is deemed to be 50% of Q1.

Summaries of the hydrologic calculations are contained in tables below for pre and post-development (un-mitigated) scenarios respectively.

Time of Concentration for Pre-Development Scenario

Catchment ID	Pre A	Pre B
Estimated Sheet flow Length (m)	100	70
Horton's Roughness Value	0.045	0.045
Slope (%)	4	4
tc (minutes)	16.91	15.02
TOTAL tc (minutes)	16.91	15.02

Time of Concentration for Post-Development Scenario

Catchment ID	Post A
Standard Inlet Time (minutes)	5
Length of Pipe Flow (m)	265
Velocity (m/s)	1
tc (minutes) – Pipe Flow Time	4.42
TOTAL tc (minutes)	9.42

Pre-Development Hydrology

Catch.	Area (ha)	tc (min)	I ₁₀₀ (mm/hr)	C	Q ₁₀₀ (m ³ /s)	I ₅₀ (mm/hr)	C	Q ₅₀ (m ³ /s)	I ₂₀ (mm/hr)	C	Q ₂₀ (m ³ /s)
Pre A	2.190	16.91	186.44	0.64	0.72	168.21	0.61	0.62	143.35	0.56	0.49
Pre B	0.784	15.02	195.91	0.64	0.27	176.92	0.61	0.23	150.93	0.56	0.18
Catch.	Area (ha)	tc (min)	I ₁₀ (mm/hr)	C	Q ₁₀ (m ³ /s)	I ₅ (mm/hr)	C	Q ₅ (m ³ /s)	I ₂ (mm/hr)	C	Q ₂ (m ³ /s)
Pre A	2.190	16.91	124.50	0.53	0.40	107.38	0.50	0.33	84.59	0.45	0.23
Pre B	0.784	15.02	130.94	0.53	0.15	112.95	0.50	0.12	89.06	0.45	0.09

Post-Development Hydrology

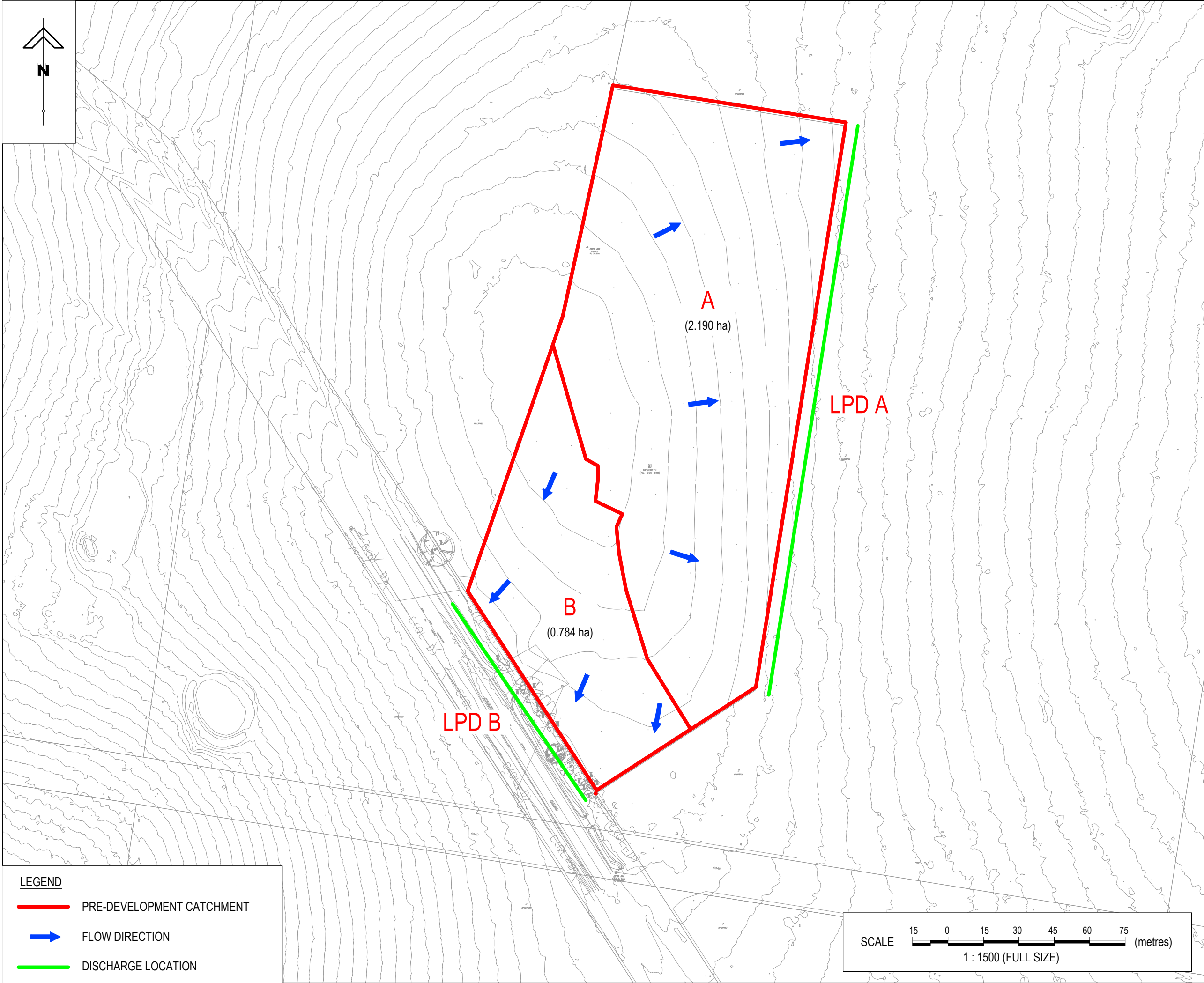
Catch.	Area (ha)	tc (min)	I ₁₀₀ (mm/hr)	C	Q ₁₀₀ (m ³ /s)	I ₅₀ (mm/hr)	C	Q ₅₀ (m ³ /s)	I ₂₀ (mm/hr)	C	Q ₂₀ (m ³ /s)
Post A	2.974	9.42	237.42	1.00	1.96	213.60	0.99	1.75	182.55	0.90	1.36
Catch.	Area (ha)	tc (min)	I ₁₀ (mm/hr)	C	Q ₁₀ (m ³ /s)	I ₅ (mm/hr)	C	Q ₅ (m ³ /s)	I ₂ (mm/hr)	C	Q ₂ (m ³ /s)
Post A	2.974	9.42	158.73	0.86	1.13	136.27	0.82	0.92	107.45	0.73	0.65





Appendix C – Catchment Plans





PROPOSED DEVELOPMENT

806-818 GREENBANK ROAD, NORTH MACLEAN

FOR

STRATUM CIVIL

ORIGINAL SCALE BEFORE REDUCTION

A3

A	ORIGINAL ISSUE		26.02.26
VER.	DESCRIPTION	APPR.	DATE

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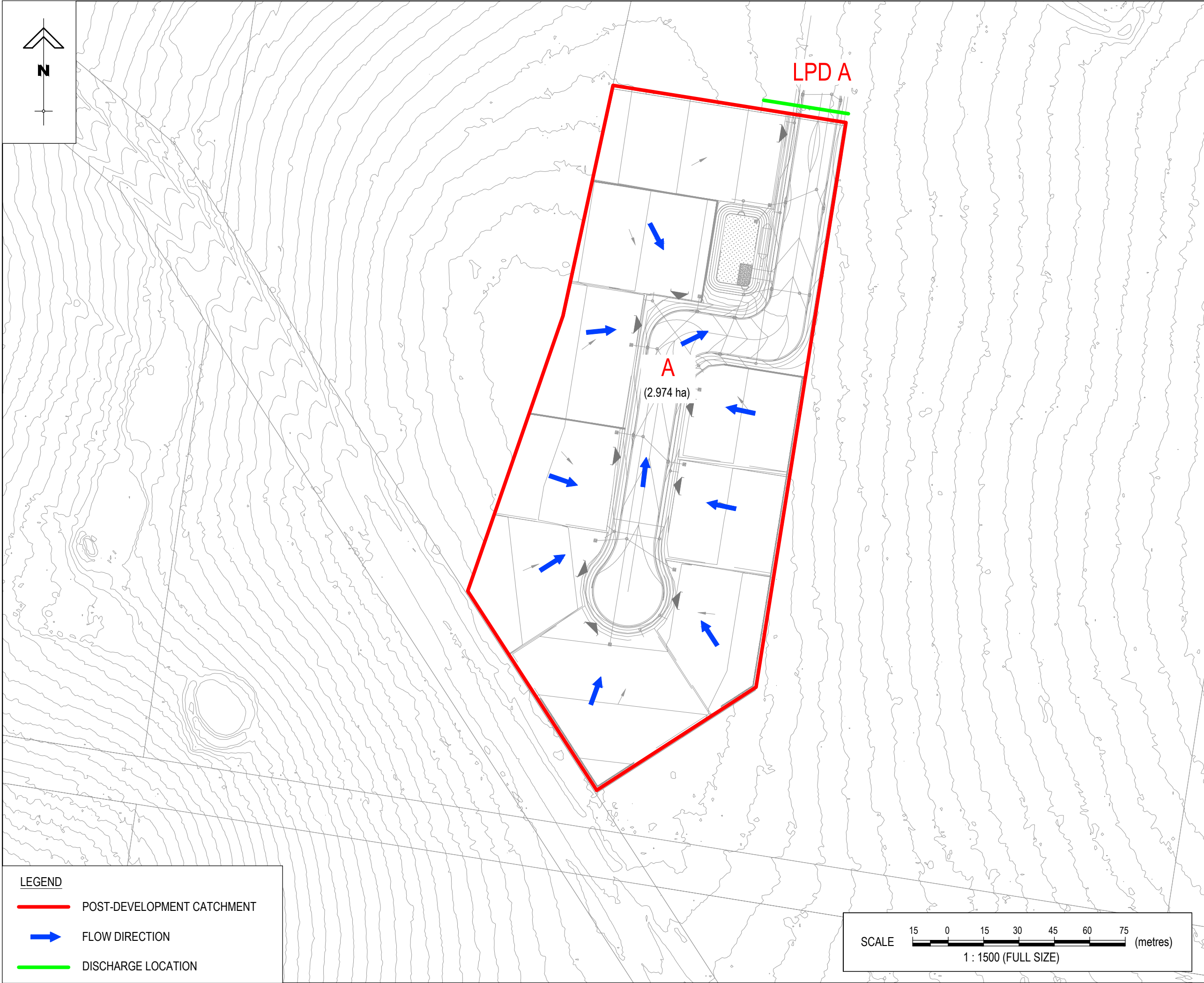
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DRAWING TITLE :

PRE-DEVELOPMENT CATCHMENT PLAN

DEVEL. APPLIC. No. :		DATE : 26.02.26
PROJECT LEADER : SAMUEL HUDDY		
DESIGNER : JOE CHEN		
DRAFTSPERSON : TUYEN KIM		
CHECKED : SAMUEL HUDDY		
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365		
RPEQ No. :		
SCALE : AS SHOWN	DATUM :	FULL SIZE : A3
PROJECT No.: BE240612	DRAWING No. : N200	VERSION: A



PROPOSED DEVELOPMENT

806-818 GREENBANK ROAD, NORTH MACLEAN

FOR

STRATUM CIVIL

ORIGINAL SCALE BEFORE REDUCTION

A3

0 10 20 30 40mm.

A	ORIGINAL ISSUE		26.02.26
VER.	DESCRIPTION	APPR.	DATE

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DRAWING TITLE :

POST-DEVELOPMENT CATCHMENT PLAN

DEVEL. APPLIC. No. :	DATE : 26.02.26
PROJECT LEADER : SAMUEL HUDDY	
DESIGNER : JOE CHEN	
DRAFTSPERSON : TUYEN KIM	
CHECKED : SAMUEL HUDDY	
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365	
RPEQ No. :	
SCALE : AS SHOWN	DATUM : FULL SIZE : A3
PROJECT No.: BE240612	DRAWING No. : N201
	VERSION: A



Appendix D – XPSWMM Input Parameters

Rainfall Parameters

BOM temporal patterns and IFD data has been utilised. The IFD data used in the hydrologic analysis for a range of storm events is presented below.

Adopted Intensity Frequency Duration Data (mm/hr)

Storm Duration (minutes)	Average Recurrence Interval - Years						
	1	2	5	10	20	50	100
5	99.6	114	158	187	217	256	286
10	82.9	94.6	131	155	178	208	231
15	70.3	80.3	111	131	151	177	196
20	60.9	69.6	96.4	114	131	154	171
25	53.8	61.5	85.3	101	117	137	152
30	48.3	55.2	76.6	91.0	105	123	137
45	37.2	42.4	59.1	70.4	81.6	96.6	108
60	30.5	34.8	48.5	58.0	67.5	80.2	90.2
90	22.8	26.0	36.4	43.7	51.0	61.1	69.1
120	18.5	21.1	29.6	35.6	41.7	50.2	56.9
180	13.9	15.8	22.2	26.7	31.5	38.0	43.3

To input the IFD information into XP-SWMM, rainfall multipliers are generated to represent the depth of rainfall for a given storm event and storm duration. The rainfall multipliers are then applied to the temporal patterns within XP-SWMM to generate hydrographs for use within the hydraulic analysis.

Design Rainfall Depths (mm)

Storm Duration (minutes)	Average Recurrence Interval - Years						
	1	2	5	10	20	50	100
5	8.30	9.47	13.1	15.6	18.1	21.3	23.8
10	13.8	15.8	21.8	25.8	29.7	34.7	38.5
15	17.6	20.1	27.8	32.9	37.8	44.1	48.9
20	20.3	23.2	32.1	38.1	43.8	51.3	56.9
25	22.4	25.6	35.5	42.2	48.6	57.0	63.3
30	24.1	27.6	38.3	45.5	52.5	61.7	68.7
45	27.9	31.8	44.3	52.8	61.2	72.4	81.1
60	30.5	34.8	48.5	58.0	67.5	80.2	90.2
90	34.2	39.0	54.6	65.5	76.6	91.6	104
120	37.1	42.3	59.2	71.2	83.5	100	114
180	41.6	47.4	66.5	80.2	94.4	114	130





Laurenson Routing Parameters

In this study, the “Laurenson” routing method was applied to XP-SWMM for hydrograph generation. To enable this method to be used, each catchment must be split into pervious (undeveloped) and impervious (developed) portions. Adopted parameters for the Laurenson routing method included:

The fraction impervious has been determined by analysis of aerial photographs and the proposed development layout;

- Manning Roughness coefficient (n):
 - Pervious portion: 0.035 to 0.045; and
 - Impervious portion: 0.015.

Initial Loss (IL) and Continuing Losses (CL) have been applied to the hydrologic model. Details of IL and CL parameters applied in the XP-SWMM model are presented in Table below.

Adopted Initial and Continuing Losses

Impervious Area		Pervious Area	
IL (mm)	CL (mm/hr)	IL (mm)	CL (mm/hr)
1	0	26	1.9

Analysis of the catchment has been undertaken to determine the average slope, with the results of this being applied to the model.

Catchment Parameters

Scenario	Catchment	Impervious Area			Pervious Area		
		Area (ha)	Fraction Impervious (%)	Slope (%)	Area (ha)	Fraction Impervious (%)	Slope (%)
Pre-Development	PRE-A	-	-	-	2.19	0	2
	PRE-B	-	-	-	0.784	0	2
Post-Development	POST-A	0.297	0	2	2.677	100	2





Appendix E – Music Input Parameters

Rainfall and Evapotranspiration Parameters

Input	Data Used in Modelling
Rainfall station	40312
Time step	6 minute
Modelling period	29-06-1990 to 31-03-2010
Rainfall runoff parameters	Industrial
Pollutant export parameters	Industrial

Land Use Parameters

Catchment	Area (ha)	Land use	Total Impervious (%)
A	2.974	Industrial	90

Rainfall Runoff Parameters

Parameter	All Nodes
Landuse	Industrial
Rainfall threshold (mm)	1
Soil storage capacity (mm)	18
Initial storage (% capacity)	10
Field capacity (mm)	80
Infiltration capacity coefficient a	243
Infiltration capacity exponent b	0.6
Initial depth (mm)	50
Daily recharge rate (%)	0
Daily baseflow rate (%)	31
Daily deep seepage rate (%)	0

Pollutant Load Parameters

Urban Residential	Total Suspended Solids (log mg/L)		Total Phosphorous (log mg/L)		Total Nitrogen (log mg/L)	
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Storm Flow Concentration	1.92	0.44	-0.59	0.36	0.25	0.32
Base Flow Concentration	0.78	0.45	-1.11	0.48	0.14	0.20





Bioretention Parameters

ID	1
Surface area (m ²)	350
Has the filter area been calculated appropriately? (Y / N / N/A)	Y
Extended detention depth (m)	0.3
Filter area (m ²)	350
Unlined filter media perimeter (m)	0.01
Saturated hydraulic conductivity (mm/hour)	200
Filter depth (m)	0.5
TN content of filter media (mg/kg)	400
Orthophosphate content of filter media (mg/kg)	30
Is the base lined? (Y/N)	Y
Effectiveness of plant TN removal (effective/ineffective/unvegetated)	Effective
Overflow weir width (m)	2
Exfiltration rate (mm/hr)	0
If an exfiltration rate has been used, have node water balance losses been used in calculation of treatment train effectiveness? (Y / N / N/A)	N/A
If exfiltration rate has been used, is the exfiltration rate justified? (Y / N / N/A)	N/A
Underdrain present? (Y/N)	Y
Submerged zone with carbon present?	No
Depth of submerged zone (m)	N/A
Confirmation that K and C* remain default? (Y/N)	Y

