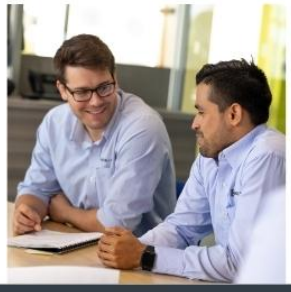
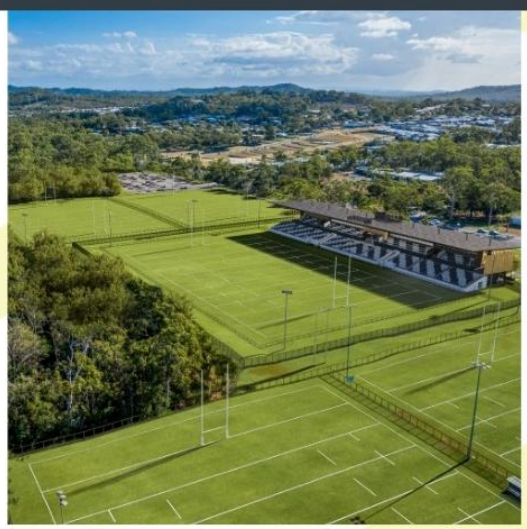
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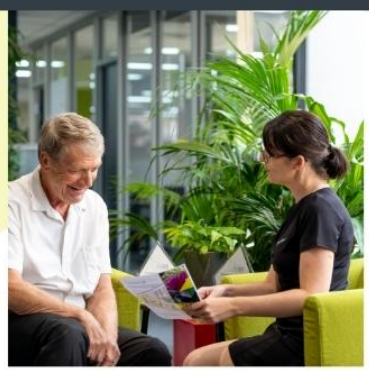




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1-63 Bryants Road & 101 Jackson Court, Ripley DA1
Conceptual Stormwater Management Plan

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Executive Summary

KDL Property Group has engaged Burchills Engineering Solutions to prepare a Conceptual Stormwater Management Plan (CSMP) for the proposed development located at 1-63 Bryants Road & 101 Jackson Court, Ripley.

This CSMP has been prepared in accordance with Ipswich City Council requirements and is to accompany the reconfiguration of approximately 37.39 ha of land described as Lots 359 & 360 on S3173 into 162 residential lots and a balance lot, together with new roads, open space areas, drainage reserves, utility infrastructure and associated civil works. The CSMP has referenced relevant guidelines relating to stormwater management to form the conceptual basis of the stormwater plan. The following conclusions have been made as a result of this study.

Stormwater Quantity

- As a result of the proposed development and the associated increase in impervious area, the magnitude of peak stormwater discharge from the developed portion of the site will increase without mitigation.
- Five (5) Lawful Points of Discharge (LPDs) are identified across the overall site; however, only LPD A2 and LPD A3 are directly affected by the proposed development and have therefore been assessed as part of the stormwater quantity assessment. LPD A2 is located at the north-eastern corner of the site, while LPD A3 is located along the eastern site boundary at Wensley Road.
- In the developed case, runoff from Catchment A2 will be directed to an on-site bioretention and detention system prior to controlled discharge to LPD A2, while runoff from Catchment A3 will be conveyed via overland flow and a proposed swale to LPD A3. The proposed detention basin provides a conceptual 1% AEP detention volume of approximately 2,478 m³, with XP-SWMM modelling confirming that post-development peak discharges are maintained at or below pre-development peak discharges for assessed storm events up to and including the 1% AEP event.

Stormwater Quality

- To achieve the Ipswich City Council Water Quality Objectives, the proposed stormwater treatment train will utilise a bioretention basin to treat runoff from the developed catchment prior to discharge from the site.
- MUSIC modelling confirms that the proposed treatment train achieves the required pollutant load reductions for Total Suspended Solids, Total Phosphorus, Total Nitrogen and Gross Pollutants. The proposed bioretention basin requires a conceptual filter media area of 550 m².

Erosion and Sediment Control

- An Erosion Hazard Assessment has identified that the proposed construction catchments require high-risk erosion and sediment control treatment, with further details to be developed during detailed design in response to site conditions and staging.

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Appendix A – Proposed Plans of Development
Appendix B – Time of Concentration and Rational Method Calculations
Appendix C – XP-SWMM Input Parameters
Appendix D – MUSIC Input Parameters

Appendix E – Burchills Engineering Solutions Conceptual Stormwater Management Drawings

Appendix F – Burchills Engineering Solutions Preliminary Civil Engineering Drawings

1. Introduction

KDL Property Group Pty Ltd has engaged Burchills Engineering Solutions to prepare a Conceptual Stormwater Management Plan (CSMP) in support of a Development Application (DA) to be lodged with Economic Development Queensland (EDQ). The application seeks a Development Permit for Reconfiguring a Lot to facilitate a residential subdivision comprising 162 residential lots together with new roads, open space areas, drainage reserves, utility infrastructure and associated civil works. The development also incorporates land identified for a future railway corridor resumption in accordance with the current planning framework.

The land subject to this application is formally described as Lots 359 & 360 on S3173 located at 1-63 Bryants Road and 101 Jackson Court, Ripley. The site has a total area of approximately 37.39 ha and is bounded by Jackson Court to the north, Wensley Road to the east, future Bryants Road to the south, and undeveloped land to the west.

1.1 Background

1.1.1 Regulatory Requirements and Technical Guidelines

The strategies proposed in this CSMP have been developed to address the requirements of the Ipswich City Planning Scheme (ICC, 2025), and have also been prepared in accordance with the following guidelines:

- *State Planning Policy July 2017* (DSPIP, 2017)
- Queensland Urban Drainage Manual (QUDM) 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, 2019);
- WSUD Technical Guidelines for South East Queensland – Version 1 (Healthy Waterways, BCC, MBWCP, 2006); and
- Best Practice Erosion and Sediment Control (IECA, 2016)

1.2 Purpose

The main objectives of this CSMP have been established from the criteria set out in the Ipswich City Planning Scheme (CoI, 2006) and are summarised as follows:

- Avoid the creation of nuisance flow or hazard problems;
- Protect the quality of surface and ground waters during construction and operation of new development;
- Maintain the natural hydraulic behaviour of catchments;
- Protect existing natural features and ecological processes;
- Integrate stormwater management infrastructure carefully in the urban and natural landscape; and
- Assess the proposed development design and ensure safety for end users with respect to flooding.

1.3 Scope

To achieve the above mentioned objectives, this CSMP details the following:

- Site description including:
  - Topography;
  - Land Use; and
  - Vegetation.
- Stormwater Quantity:
  - Control measures to ensure no net increase in peak discharge from the subject site (up to the 1% Annual Exceedance Probability (AEP)).
- Stormwater Quality:
  - Address requirements of the SPP 2017.

To minimise the impact of the proposed development on the external environment and to avoid significant and / or sustained deterioration in downstream water quality the proponent shall implement this CSMP. This CSMP may be amended as required, in response to a monitoring and maintenance program.

2. Site Detail

2.1 Location

The subject site is located at 1-63 Bryants Road & 101 Jackson Court, Ripley is formally described as Lots 359 & 360 on S3173.

The site is located within the Ripley Valley Priority Development Area (PDA). It is bounded by Jackson Court to the north, Wensley Road to the east, future Bryants Road to the south, and undeveloped land to the west. Primary vehicular access to the development is proposed via Jackson Court along the northern frontage of the site.

Figure 2.1 below identifies the location of the subject site.



Figure 2.1 Site Locality Map

2.2 Existing Land Uses and Topography

The site comprises two existing parcels of land with a combined area of approximately 37.39 ha. The land is characterised by undulating to steep terrain, with several ridgelines, drainage gullies and established vegetation across the site. The site also contains a combination of existing dwellings, access tracks, cleared corridors and extensive vegetation cover. Existing dwellings and access tracks are located within the site and will be removed or integrated as part of future development works.

Two existing Energex easements traverse the site in a generally northwest to southeast direction and are occupied by overhead electricity infrastructure. These easements have been considered in the preparation of the proposed development layout.

The site adjoins the following existing roads and land uses:

- **North**: Jackson Court
- **South**: Unformed Bryants Road

- **East**: Wensley Road
- **West**: Undeveloped Land

2.3 Downstream Environment

Under existing conditions, stormwater runoff is conveyed via overland flow and natural drainage paths to five identified lawful points of discharge (LPDs) along the northern, eastern and south-eastern site boundaries. Runoff from Catchments A1a and A1b, together with contributing external Catchments EXT_1 and EXT_2, drains towards LPD A1 at the existing culvert beneath Jackson Court along the central portion of the northern site boundary.

Catchment A2 drains generally north-east towards LPD A2, where runoff discharges via a culvert to Lot 191 on SL18, located east of the site. Catchments A3 and A4 drain eastwards to Wensley Road via LPD A3 and LPD A4, respectively. Runoff from Catchment A5 drains south-east towards LPD A5 and discharges to Bryants Road via overland flow.

The existing and proposed flow conveyance arrangements are detailed in Section 3.2.1, with the pre-development catchments shown in Figure 3.1.

2.4 Rainfall

The mean annual rainfall for the site has been estimated at 948.9 mm from the data set obtained from the nearest Bureau of Meteorology (BOM) station number 40873 at the Bundamba School Alert, Queensland.

2.5 Proposed Development

The proposal comprises a residential subdivision containing 162 residential lots, together with drainage reserves, open space areas, pedestrian connections, and an internal road network.

The internal road network comprises approximately 2.174 ha of roads including a 20.0 m wide Collector Street 15.5 m wide Access Streets. External connectivity will be provided via a new intersection with Jackson Court.

The development will be supported by a range of external infrastructure works, including:

- Road upgrades to Jackson Court
- Construction of a new external gravity sewer
- Construction of a new water connection

The proposed concept layout for the total site extent as well as the developing area is shown below in Figure 2.2 and Figure 2.3 respectively, and on the Proposed Plans of Development within Appendix A.

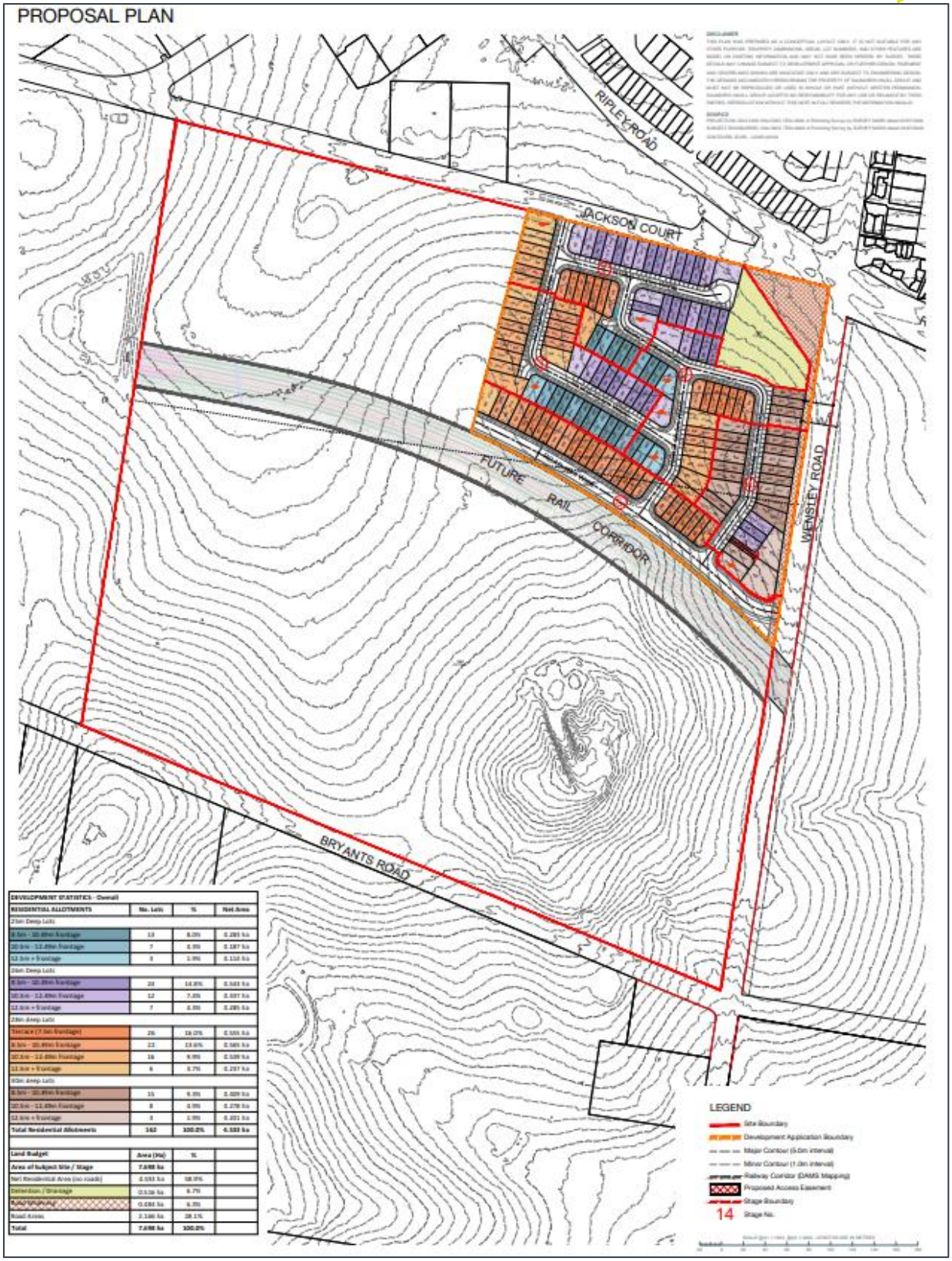


Figure 2.2 Site Layout Plan (Total Site Extent)


PROPOSAL PLAN
JACKSON COURT
ROAD 15.5m WIDE
ROAD 15.5m WIDE
ROAD 15.5m WIDE

3. Stormwater Quantity Assessment

3.1 Overview

The following section of this report outlines the measures required to meet the above-mentioned objective in regard to stormwater quantity. In order 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) (IPWEAQ, 2017).

Due to the increase in impervious areas within the proposed development, peak stormwater flow rates will increase. In order to mitigate these flow rates from the developed site it is proposed to implement an On Site Detention (OSD) system. OSD systems temporarily store stormwater runoff and release flows at a controlled rate that is no greater than the pre-developed peak rate.

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 E.

Table 3.1 Catchment Parameters

Scenario	Catchment ID	Total Area (ha)	Impervious (%)
Pre-developed	EXT_1	5.792	0
	EXT_2	0.741	0
	A1a	13.278	0
	A1b	7.957	0
	A2	8.06	0
	A3	3.525	0
	A4	1.509	0
	A5	3.335	0
Post-developed	A2a	1.889	0
	A2b	7.747	70
	A3	1.753	0

3.2.1 Conveyance of Flows

Important information about the conveyance of flows for the pre-development and post-development scenarios are included in Table 3.2 below.

Table 3.2 Conveyance of Flows

Subject	Description
Lawful Points of Discharge	Five (5) Lawful Points of Discharge (LPDs) are proposed for the developed site. LPD A1 is located along the central portion of the northern site boundary, by the existing culvert beneath Jackson Court. LPD A2 is located at the north-eastern

Subject	Description
	corner of the site, discharging via a culvert to Lot 191 SL18 which is located east of the subject site. LPD A3 and LPD A4 are located along the eastern site boundary discharging to Wensley Road. LPD A5 is located on the southeast corner of the site discharging to neighbouring lots via overland flow.
Pre-Development	In the existing case, runoff from catchments A1a and A1b, together with the contributing external catchments Ext_1 and Ext_2, are conveyed via overland flow toward LPD A1 along the site's northern boundary. Runoff from catchment A2 is conveyed via overland flow generally northeast to LPD A2 near the northeastern corner of the site. Catchments A3 and A4 drain eastward to LPD A3 and LPD A4 respectively, along the site's eastern boundary, while runoff from catchment A5 is conveyed southeast to LPD A5 near the site's southeastern corner. Refer to Figure 3.1 for more information.
Post-Development	In the developed case, catchments A2 and A3 are the only existing catchments directly affected by the proposed development. All other pre-development catchments remain unchanged and are therefore not discussed further in this stormwater management plan. Accordingly, two (2) LPD's, being LPD A2 and LPD A3, are assessed as part of the stormwater quantity assessment. Catchment A2 has been divided into catchments A2a and A2b in the developed scenario. Flows from catchment A2a are directed north via overland flow to the southern boundary of catchment A2b, where they are captured by the proposed A2b internal drainage network. Flows from catchment A2b, including runoff from the proposed lots, are conveyed via the proposed roadway drainage to an on-site bioretention and detention system located in the northeastern corner of the catchment, which proceeds to discharge to LPD A2. Minor flows from within the bypass area in catchment A2b will be conveyed to quality treatment, however in higher events will bypass, discharging into Wensley Road. Flows from catchment A3 are conveyed via overland flow northeast where they are then diverted by a proposed swale along the proposed roadway extent to LPD A3. Further discussion of the management of catchments A2a and A3 are provided in section 3.7 of this report.

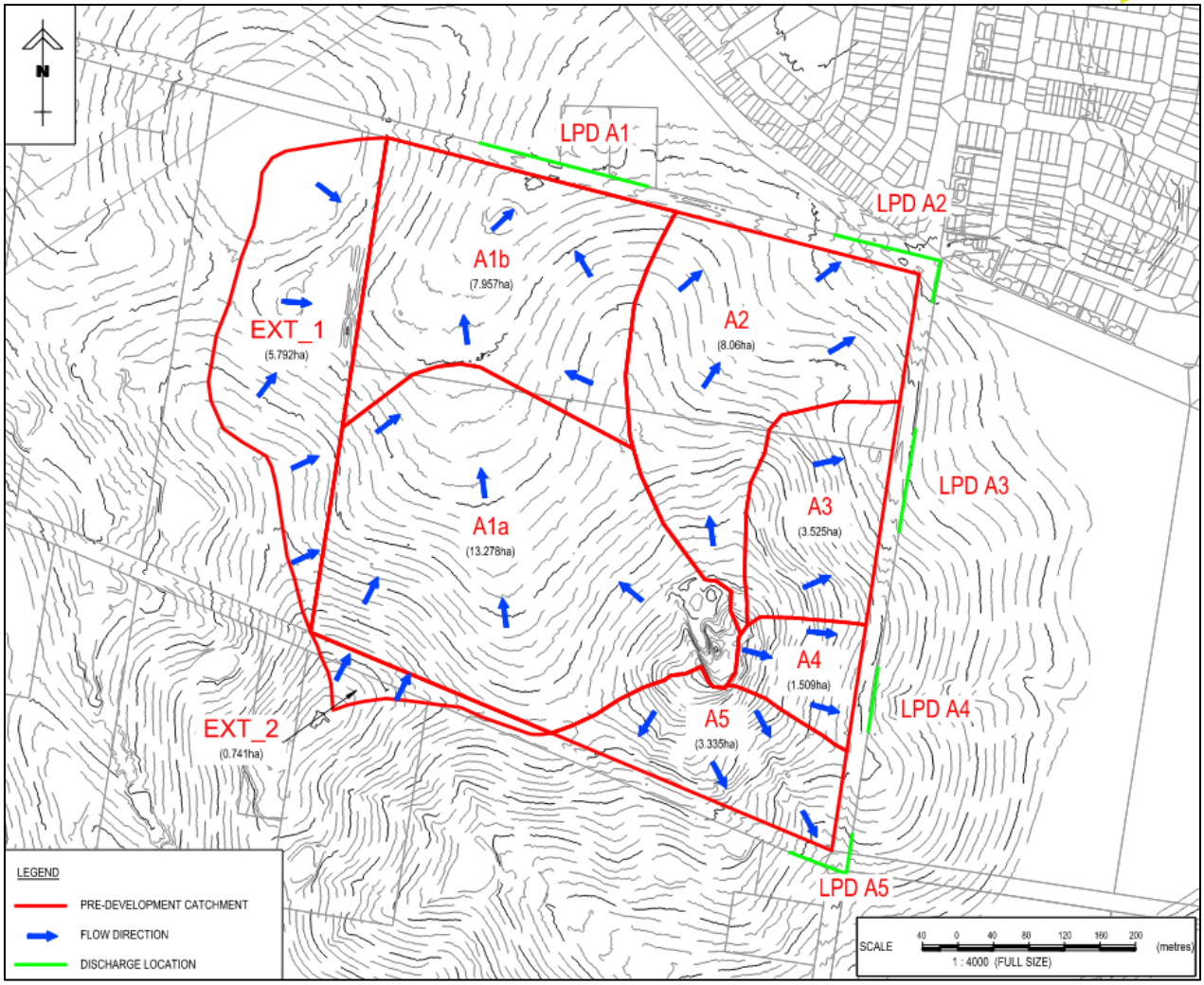


Figure 3.1 Pre-Development Catchments

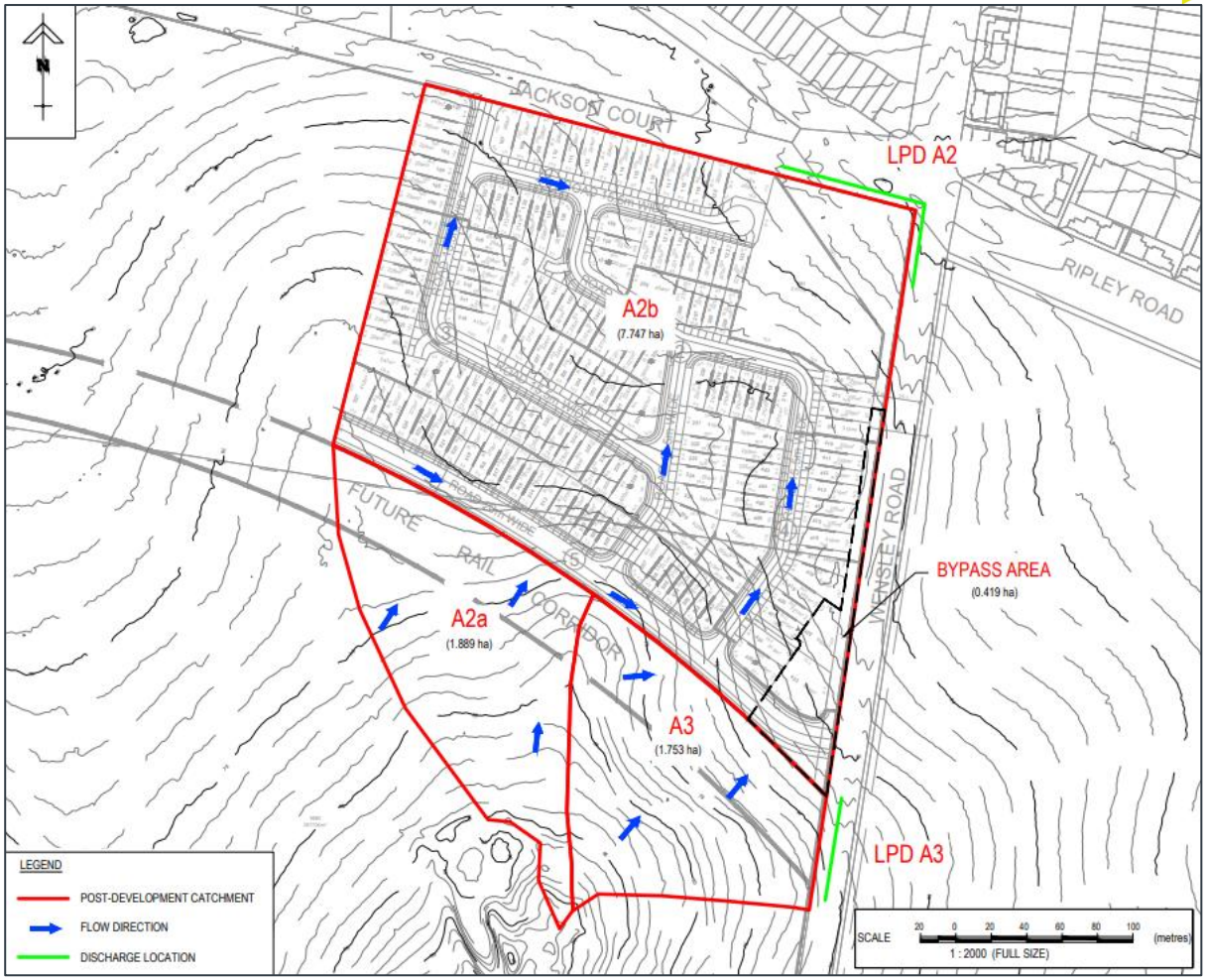


Figure 3.2 Post-Development Catchments

3.3 XP-SWMM Analysis

XP-SWMM (version 2026) software was utilised to model the performance of the proposed stormwater quantity control measures. 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 XP-SWMM. 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 XP-SWMM model inputs are included in Appendix C.

Shown below is a screen clip of the Post-developed (Mitigated) Model Schematic.

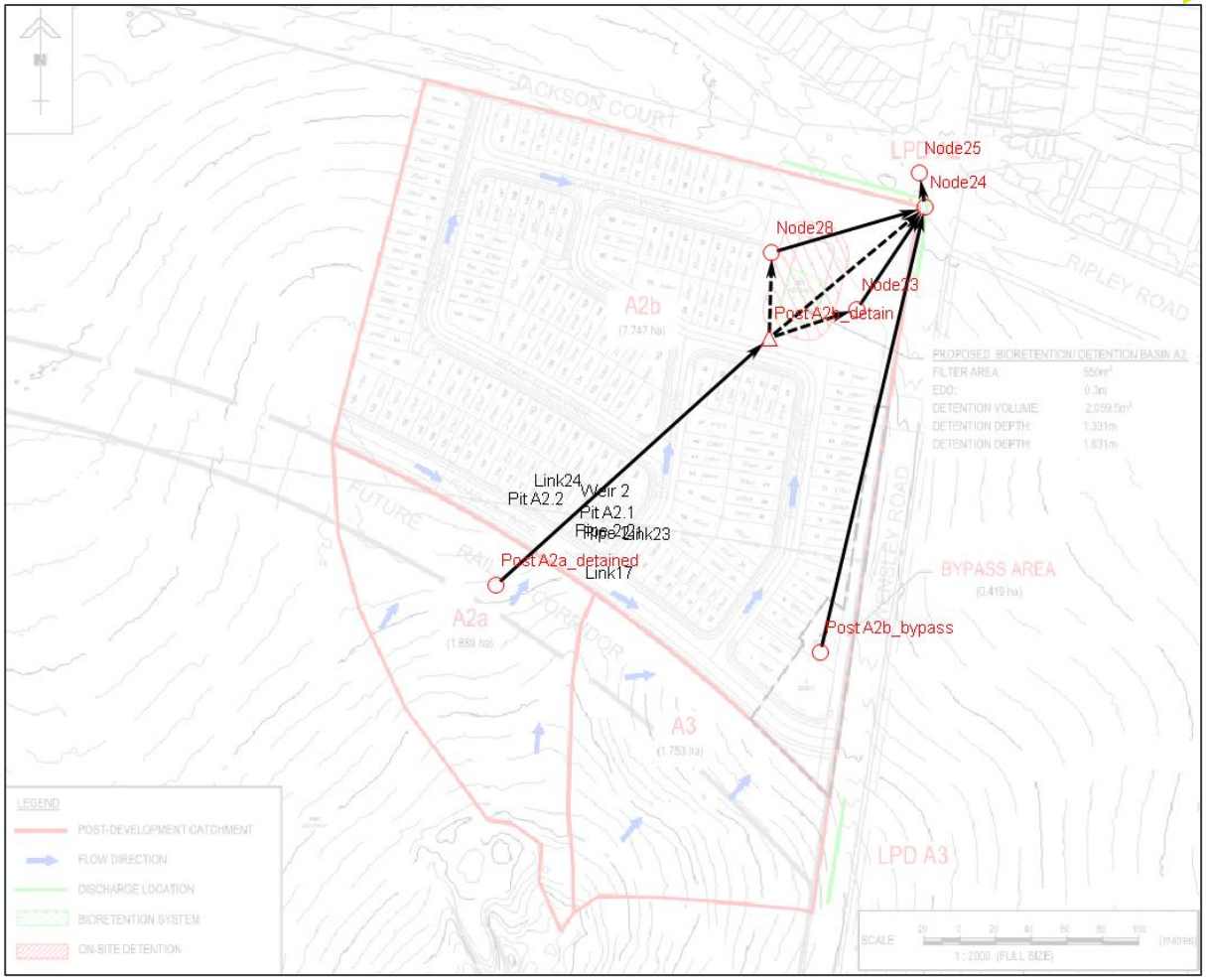


Figure 3.3 Post Developed (Mitigated) Model Schematic

3.4 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 validation 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 XP-SWMM Generated Peak Discharges

Scenario	Catchment ID	Rational (m^3/s)	XP-SWMM (m^3/s)	Difference (%)
Pre-Developed	EXT_1	2.08	2.14	3
	EXT_2	0.31	0.37	18
	PRE_A1a	4.14	4.05	2
	PRE_A1b	2.49	2.44	2
	PRE_A2	2.65	2.74	3
	PRE_A3	1.54	1.58	3
Post-Developed	Post_A2a	0.67	0.76	13
	Post_A2b	4.30	3.94	9

The peak discharges generated by XP-SWMM and the Rational Method are similar in comparison and are considered acceptable for this assessment.

3.5 XP-SWMM Results

3.5.1 Development Drainage Infrastructure

To confirm the performance of the proposed OSD system and that peak flow discharging the site has not been worsened, a pre- and post-development model was constructed. These models compare the discharge hydrographs for a range of storm durations at the existing Lawful Points of Discharge. A full range of events have been simulated for critical events.

A summary of the pre-development and post-development unmitigated peak discharges at LPD A2 is presented in Table 3.4. The corresponding pre-development and post-development mitigated peak discharges are presented in Table 3.5. The modelling results indicate that the proposed detention system is capable of maintaining post-development peak discharges at or below the corresponding pre-development peak discharges at LPD A2 for the assessed storm events up to and including the 1% AEP event.

The detention basin has been conceptually sized to achieve these peak discharge requirements. The pre-development and post-development mitigated 1% AEP hydrographs at LPD A2 are presented in Figures 3.4 and 3.5, respectively.

The critical temporal patterns for the XP-SWMM model are based off the 2019 AR&R Rainfall Data and the max median event of each duration is selected as the critical storm.

Table 3.4 Pre-Development vs Post-Development (Unmitigated) Peak Discharges at LPD A2

AEP Event (%)	Pre-Development		Post-Development	
	Critical Duration	Peak Discharge (m^3/s)	Critical Duration	Peak Discharge (m^3/s)
1	30min TP2	2.74	15min TP5	4.64
2	30min TP2	2.45	15min TP5	4.23
5	30min TP4	2.10	10min TP4	3.53
10	30min TP4	1.78	10min TP4	3.14
18	30min TP9	1.48	30min TP9	2.68
39	30min TP8	0.98	10min TP5	2.03

Table 3.5 Pre-Development vs Post-Development (Mitigated) Peak Discharges at LPD A2

AEP Event (%)	Pre-Development		Post-Development	
	Critical Duration	Peak Discharge (m^3/s)	Critical Duration	Peak Discharge (m^3/s)
1	30min TP2	2.74	30min TP2	2.61
2	30min TP2	2.45	30min TP4	2.30
5	30min TP4	2.10	45min TP6	1.98
10	30min TP4	1.78	45min TP7	1.63
18	30min TP9	1.48	60min TP7	1.27
39	30min TP8	0.98	30min TP9	0.81

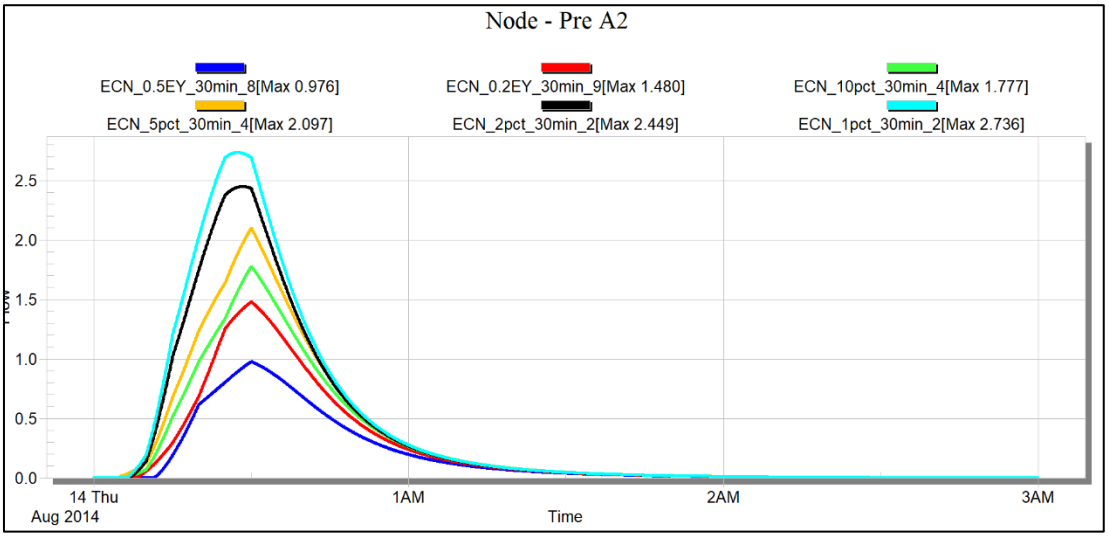


Figure 3.4 Plot of Pre-Development 1% AEP Hydrographs at LPD A2

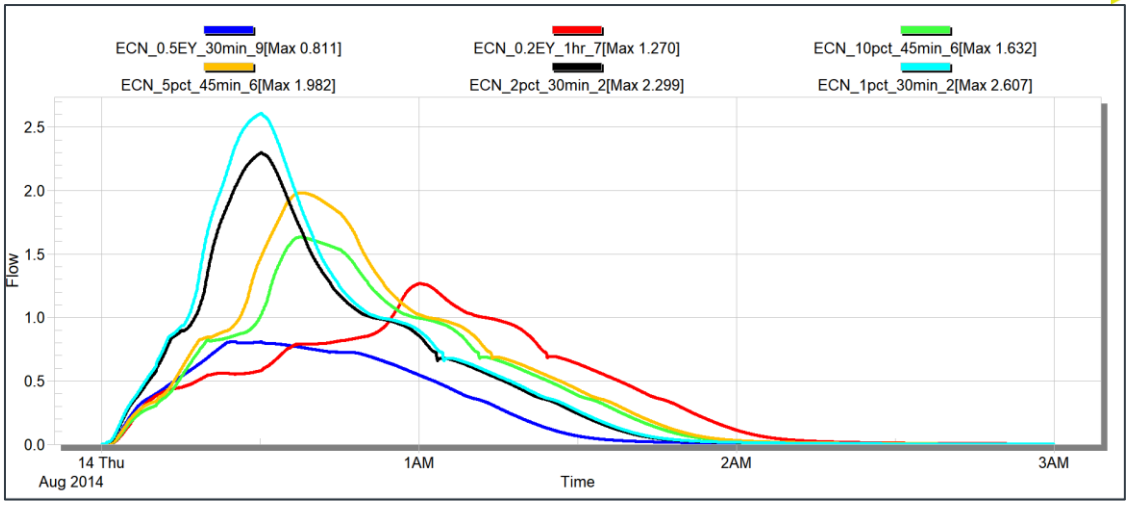


Figure 3.5 Plot of Post-Development Mitigated 1% AEP Hydrographs at LPD A2

3.6 On Site Detention (OSD) Details

The proposed OSD system are to be implemented to ensure a non-worsening of peak discharges at LPD A2.

Table 3.6 below contains the details of the proposed OSD systems within the subject site.

Table 3.6 OSD Details

Detention ID	Outlet Structures						1% AEP Total Detention Volume (m^3)
	Orifice 1a	Orifice 1b	Riser/pit 1	Riser/pit 2	Weir	Outlet Pipe (s)	
Detention Basin A2	1 x 700mm x 300mm @ base of detention	2 x 750mm x 300mm @ base of detention	1200mm x 1200mm @ 0.87m above base of detention	900mm x 900mm @ 1.1m above base of detention with 2 x 0.8m notches at 1m deep	8m length @ 1.32m above base of detention	2x750mm dia. @ base of pit	2,478

3.6.1 Detention Basin Configuration

Figure 3.6 below shows the configuration proposed Bioretention Detention Basin. Further details can be found in the civil engineering drawings contained in the appendix.

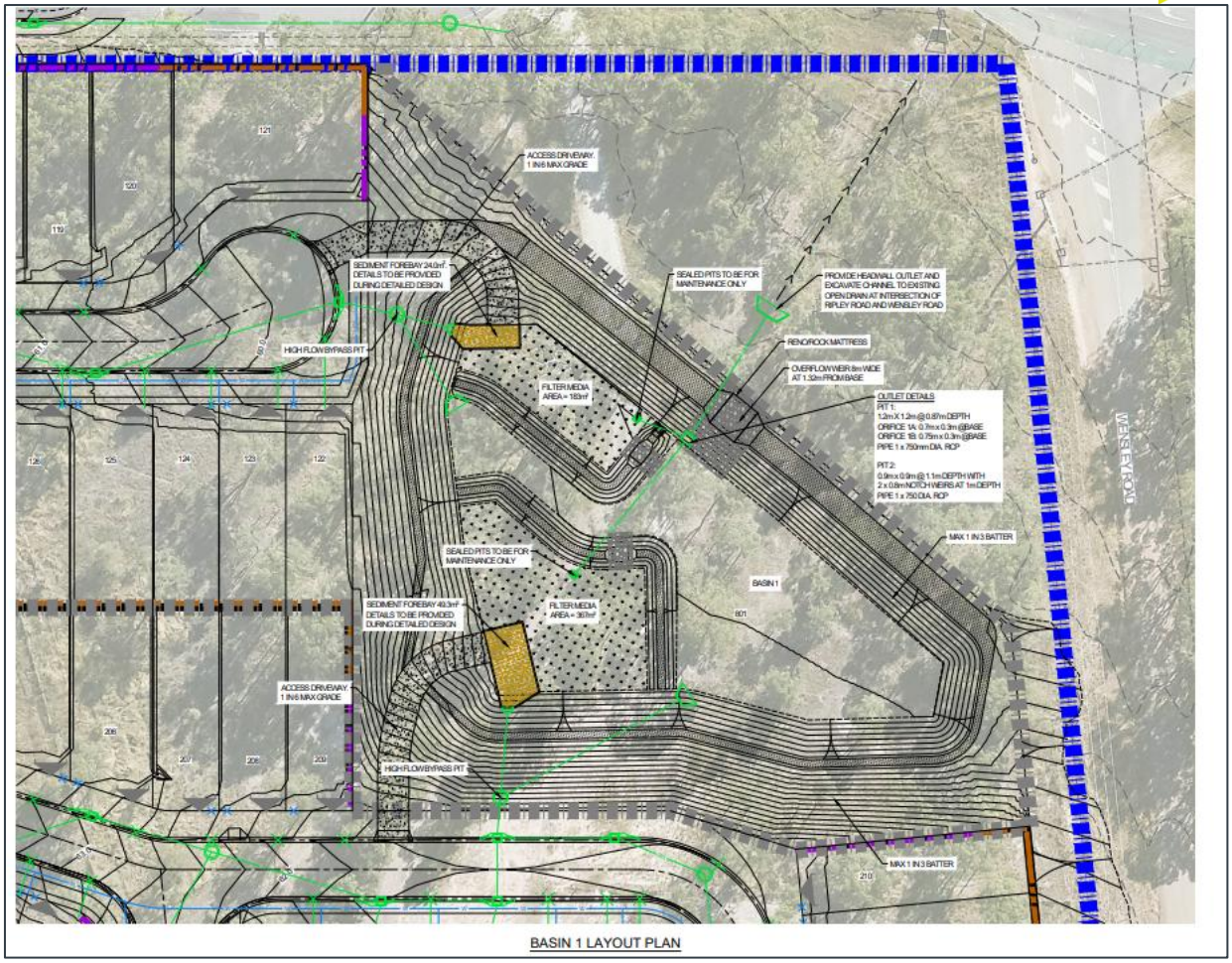


Figure 3.6 OSD Details

Basin Depths

QUDM specifies the maximum depth of water in the detention basin shall not exceed 1.2 m during the 5% AEP storm event. The results demonstrate that the depth of water within the proposed basin does not exceed 1.2m, with a peak water depth of 1.18m in the critical 5% AEP event.

Table 3.7 Detention Basin Depths 1% and 5% AEP Event

Detention ID	Detention Base Level (m AHD)	Event	Peak Water Surface (m AHD)	Peak Depth of Water (m)
A2	57.2	5% AEP	58.38	1.18
		1% AEP	58.52	1.32

An assessment of basin freeboard has also been completed in accordance with QUDM. The critical 1% AEP storm event was simulated to confirm the freeboard level achieved.

Sensitivity Analysis

In accordance with the requirements of QUDM Section 5.8, consideration has been given to the consequences of a fully blocked low-level outlet. A summary of the results observed during the 1% AEP event is provided below.

Table 3.8 Detention Basin Blockage Scenario

Detention ID	Peak 1% AEP Water Level (m AHD)	Freeboard Achieved to detention Basin Top of Bund (m)	Peak Flow Over Weir (m^3/s)	Depth of Flow Over Weir (mm)
A2	58.88	0.02	3.05	360

3.7 Design Flows and Conveyance Catchments A2a & A3

The 1% AEP peak flows from Catchments A2a and A3 are summarised in Table 3.9. Runoff from Catchment A2a is proposed to be conveyed through the internal drainage network to the proposed bioretention and detention system. Runoff from Catchment A3 is proposed to bypass the basin and be conveyed via overland flow and the proposed swale to LPD A3.

Table 3.9 1% AEP Peak Flows and Proposed Conveyance

Catchment	Post Developed 1% AEP peak flow (m^3/s)	Proposed conveyance arrangement	Discharge point
A2a	0.76	Internal drainage network to the proposed bioretention and detention system.	LPD A2
A3	0.72	Overland flow and proposed bypass swale.	LPD A3

Detailed design will confirm that the internal drainage network, including the major overland flow system, and the proposed bypass swale have sufficient capacity to safely convey the nominated flows.

4. Stormwater Quality Assessment

4.1 Water Quality Objective (WQO)

In accordance with the Ipswich City Planning Scheme, 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 the site's LPDs, a treatment train was proposed for the developed site and modelled using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software.

The proposed stormwater treatment train will utilise bioretention basin. The conceptual parameters of the proposed bioretention are presented below, and further detail of the input parameters used within MUSIC are included in Appendix D. The location of the proposed treatment train elements is included in the Civil Plans within Appendix F.

Table 4.1 Typical Bio-Retention Basin Parameters

Parameter	Modelled Value
Extended Detention Depth	0.30 m
Filter Media Depth	0.50 m
Transition Layer	0.10 m
Drainage Layer	0.2 m

Table 4.2 Proposed Bio-Retention Basin Parameters

Basin ID	Filter Media Area
A2	550 m^2

A typical section of a bioretention basin has been included in the below figures.

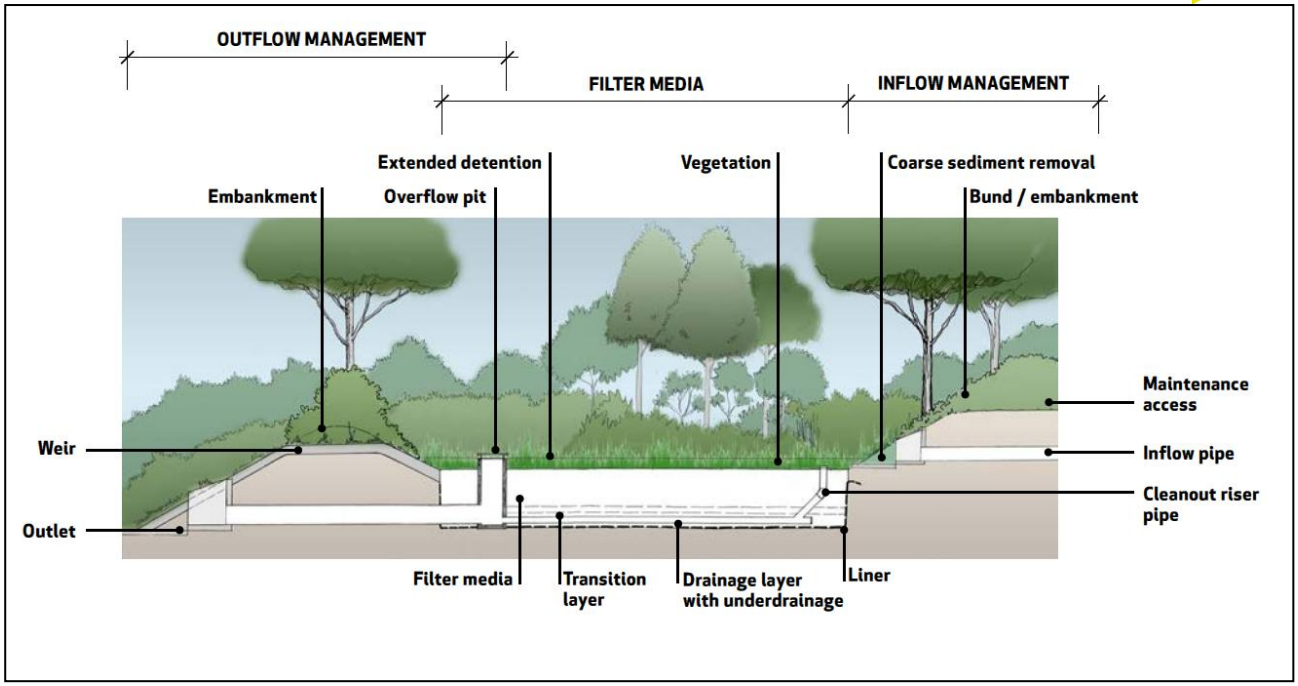


Figure 4.1 Typical Bioretention Basin (Water by Design, 2014)

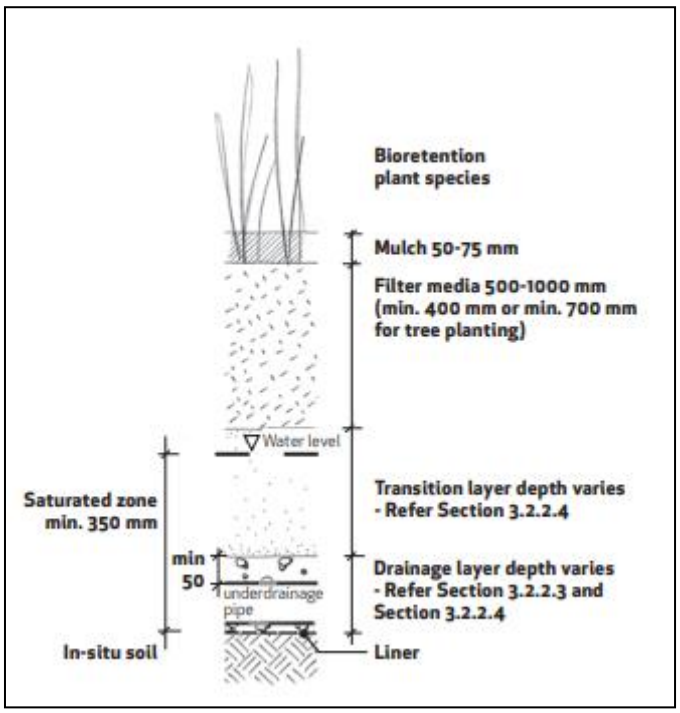


Figure 4.2 Typical Drainage Profile (Water by Design, 2014)

4.3 MUSIC Results

Results of the MUSIC modelling for the treatment train effectiveness are summarised in Appendix D. The results indicate the 80%, 60%, 45% and 90% reduction target for TSS, TP, TN and gross pollutants respectively are achieved for the rainfall data set simulated.

Table 4.3 Treatment Train Effectiveness

Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction Achieved (%)	Water Quality Objective (%)
TSS	5630	1070	80.9	80
TP	12.2	3.49	71.4	60
TN	78.1	39.9	48.9	45
GP	1050	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 are presented in Figure 4.3.

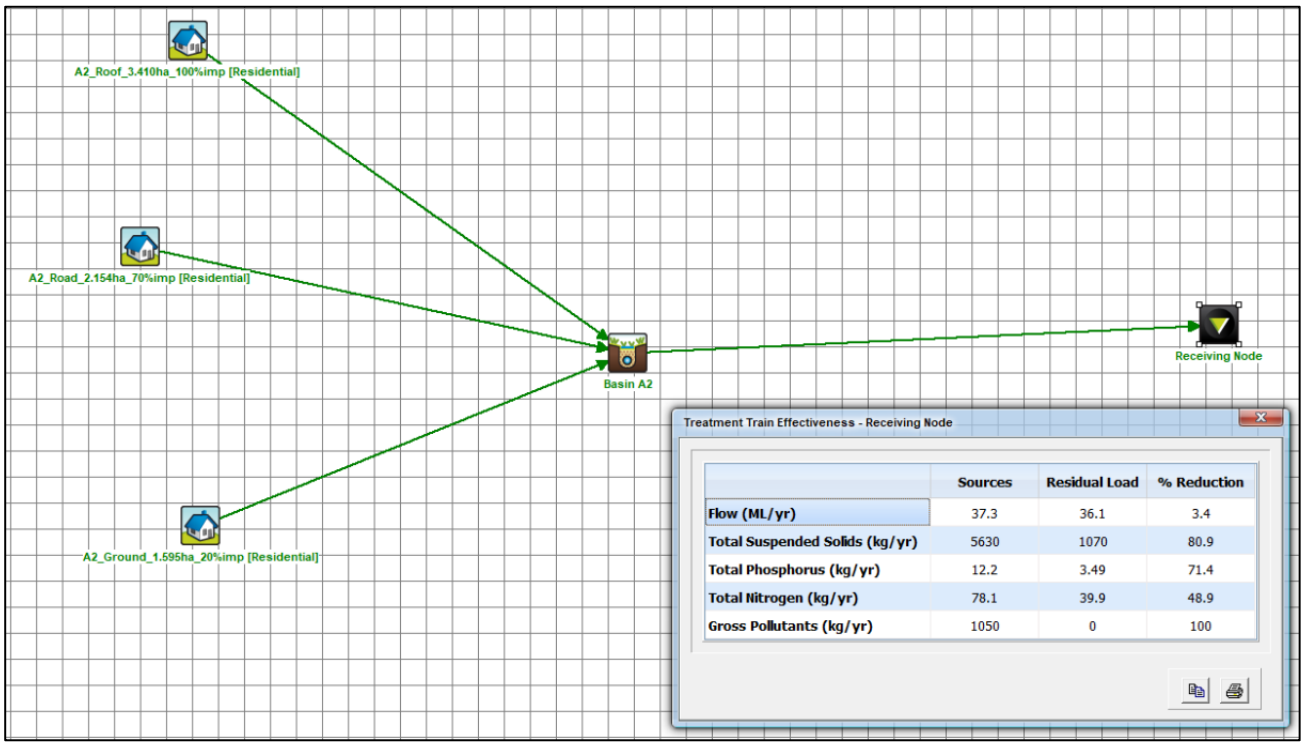


Figure 4.3 Treatment Train Layout & MUSIC Results

5. Erosion and Sediment Control

5.1.1 Best Management Practices

Stormwater runoff quality during the construction phase of this development shall be managed in accordance with Best Practice Erosion and Sediment Control (IECA, 2008), which is the current recognised construction industry best management practice (BMP) for erosion and sediment control.

Erosion and Sediment Control (ESC) plans are required to be implemented during the construction phase to minimise environmental harm to on-site stormwater treatment devices and downstream receiving waters.

It is important to note that the measures identified below are a generic approach to construction phase stormwater quality management. Erosion and sediment control is highly dependent on local site conditions and staging of the proposed earth disturbing activities. Therefore, further details of the erosion and sediment control systems and procedures will be provided for each development stage when more information is available regarding in-situ soils and development staging.

5.1.2 Erosion Hazard Assessment

As part of the IECA guidelines, an erosion hazard assessment is to be completed to identify low-risk and high-risk short-term land disturbances within a given region (IECA, 2008). This Erosion Hazard Assessment estimates a TASK number which triggers if a site should be treated as high or low risk in regard to erosion control measures. A trigger value for high-risk site of 200 will be adopted for future stage as recommended by IECA. High risk sites trigger further need for assessment.

Table 5.1 Erosion Hazard Assessment

Catchment ID	Area (m^2)	Duration of Disturbance (months)	Slope Factor	K Factor	TASK Number
A2b	77470	6	0.72	0.040	13,545

From Table 5.1 the results show that both catchments requires high-risk ESC treatment. Given the development proposal is at a conceptual phase, further details of the erosion and sediment control systems and procedures will be provided at the detailed design stage.

5.1.3 Erosion Control Standard

The best practice erosion control measures for high-risk development as detailed in Best Practice Erosion and Sediment Control (IECA, 2008) include the following:

- All reasonable and practical steps to be taken to apply best practice erosion control measures to completed earthworks, or otherwise stabilise such works, prior to anticipated rainfall - including existing unstable, undisturbed, soil surfaces under the management or control of the building/construction works;
- Land clearing limited to maximum 4 weeks work;
- Disturbed soil surfaces stabilised with minimum 75% cover within 10 days of completion of works within any area of a work site;
- Staged construction and stabilisation of earth batters; and
- Soil stockpiles and unfinished earthworks are suitably stabilised (covered) if disturbance is expected to be suspended for a period exceeding 10 days.

5.1.4 Sediment Loss Estimate

The potential volume of sediment loss from the subject site has been estimated using the Revised Universal Soil Loss Equation (RUSLE).

RUSLE calculates annual soil loss rates based on:

$$A = R. K. LS. C .P$$

Where:

A = annual soil loss due to erosion (t/ha/yr)

R = rainfall erosivity factor

K = soil erodibility factor

LS = topographic factor derived from slope length and slope gradient

C = cover and management factor

P = erosion control practice factor

Table 5.2 Potential Sediment Loss (RUSLE)

Catch. ID	Area (ha)	Soil Type*	Slope Length (m)	Slope Grade (%)	Intensity $^{6}I_2$ (mm/hr)	R	K	LS	C	P	A (t/ha/yr)	Yield (m^3/yr)
A2b	7.747	silty clay loam	200	5	11.2	2717	0.04	2	1	1.3	282.6	1684

*Note soil testing will need to be carried out to confirm soil type

5.1.5 Sediment Control Standard

Table B1 of the guidelines (IECA, 2016) provides a method for determining the sediment control standard for construction activities based on the estimated soil loss rate. Based on the size of the development, it is likely that Type 1 sediment controls are required for this site as a minimum. A list of Type 1 and supplementary sediment control techniques is provided in Table 5.4 below based on Table 4.5.3 and Table 4.5.4 of the guidelines (IECA, 2008). These control techniques provide a guide that is recommended to be used to minimise the downstream effect of sediments.

Table 5.3 Sediment control standard (default) based on soil loss rate

Catchment Area (m^2) [1]	Soil loss (t/ha/yr) [2]			Soil loss (t/ha/month) [3]		
	Type 1	Type 2	Type 3	Type 1	Type 2	Type 3
250	N/A	N/A	[4]	N/A	N/A	[4]
1000	N/A	N/A	All cases	N/A	N/A	All cases
2500	N/A	> 75	75	N/A	> 6.25	6.25
>2500	> 150	150	75	> 12.5	12.5	6.25
> 10,000	> 75	N/A	75	> 6.25	N/A	6.25

Table 5.4 Sediment Control techniques

Techniques	Type 1	Supplementary
Sheet flow treatment	> Buffer Zone capable of infiltrating 100% of stormwater runoff or process water > Infiltration basin or sand filter bed capable of infiltrating 100% of flow	> Grass Filter Strips > Fibre Rolls

Concentrated flow treatment	> Sediment Basin	> Straw Bale Barrier > Kerb Inlet Sediment Traps (on-grade and sag inlet traps, including Gully Bags)
De-watering sediment control	> Type F/D sediment basin > Stilling pond	> Grass Filter bed
Instream sediment control	> Pump sediment-laden water to an off-stream Type F of Type D sediment basin or high filtration system	> Straw Bale Barrier (short-term device only)
Other		> Construction exits (Rock Pads, Wash Bays)

5.1.6 Sediment Pond Requirement

Sediment ponds are generally required during construction where:

The disturbed area is greater than 2,500m^2 and the expected sediment loss is greater than 150 t/ha/yr;
The disturbed soils are dispersive; and/or
Where there is a need to control runoff suspended solids/turbidity.

> As presented in Table 5.2, it is expected that the potential soil loss will exceed 150 t/ha/yr for both catchments to be designed during detailed design phase. Therefore a sediment pond will be required during the construction phase.

6. Conclusion

This Conceptual Stormwater Management Plan has been prepared for KDL Property Group Pty Ltd to support a Development Application to Economic Development Queensland for the proposed residential subdivision at 1–63 Bryants Road and 101 Jackson Court, Ripley. The proposed development comprises 162 residential lots, together with associated roads, open space, drainage reserves, pedestrian connections, utility infrastructure and associated civil works.

The stormwater quantity assessment has identified that the proposed development will increase the impervious area of the site and, without mitigation, would result in increased peak stormwater discharges from the developed catchments. The assessment has focused on Catchments A2 and A3, being the existing catchments directly affected by the proposed works. Catchment A2 is proposed to discharge via an on-site bioretention and detention system to LPD A2, while runoff from Catchment A3 is proposed to be conveyed via overland flow and a proposed swale to LPD A3.

To mitigate the increase in runoff from Catchment A2, an on-site detention basin with a conceptual 1% AEP storage volume of approximately 2,478 m³ is proposed. XP-SWMM modelling indicates that the proposed detention system is capable of maintaining post-development peak discharges at or below the corresponding pre-development peak discharges for the assessed storm events up to and including the 1% AEP event under the adopted design conditions. The detention basin configuration, outlet structures and overflow arrangements are to be further refined during detailed design, including confirmation of compliance with the applicable basin depth, freeboard, outlet and blockage requirements.

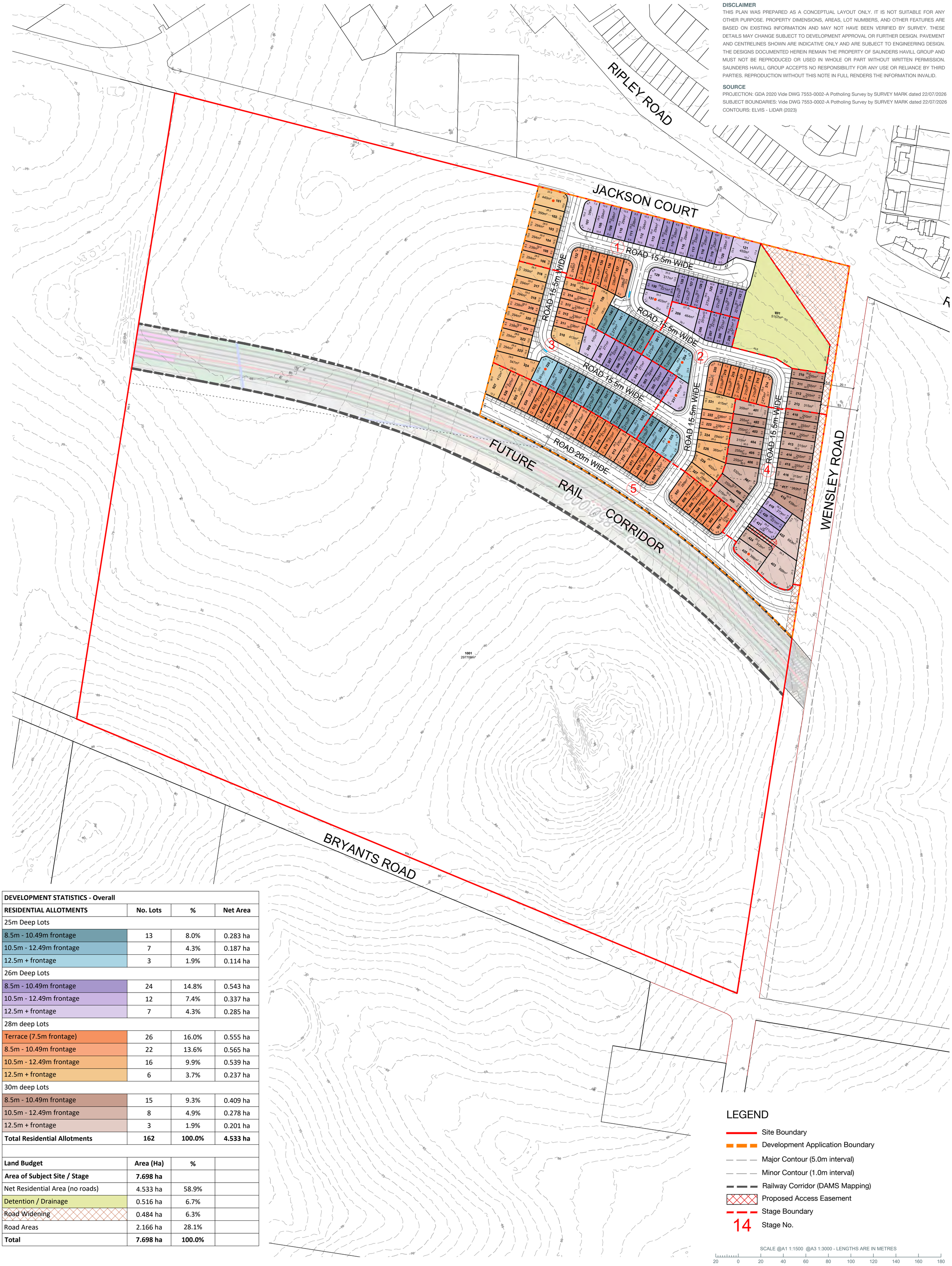
Stormwater quality treatment is proposed to be provided through a bioretention basin with a conceptual filter media area of approximately 550 m². MUSIC modelling indicates that the proposed treatment train achieves the adopted water quality objectives, with modelled pollutant load reductions of 80.9% for Total Suspended Solids, 71.4% for Total Phosphorus, 48.9% for Total Nitrogen and 100% for Gross Pollutants. The bioretention system is to be further refined during detailed design, including confirmation of the final filter media area, basin levels, batters, hydraulic connections, underdrainage and maintenance access requirements.

Construction phase stormwater quality will be managed through erosion and sediment control measures prepared in accordance with Best Practice Erosion and Sediment Control. The preliminary erosion hazard assessment identifies the development area as requiring high-risk erosion and sediment control treatment, with Type 1 sediment controls identified as the applicable sediment control standard. Final erosion and sediment control measures, including construction staging, stabilisation, sediment controls and construction phase runoff management, will be confirmed during detailed design once the final earthworks extents, soil conditions and anticipated disturbance durations are known.

Subject to detailed design being generally consistent with the assumptions and stormwater management strategies presented in this report, and the detention basin being further refined to demonstrate compliance with the applicable hydraulic, depth, freeboard, blockage and outlet requirements, the proposed stormwater management strategy is considered suitable to support the proposed development from both a stormwater quantity and stormwater quality perspective.

Appendix A – Proposed Plans of Development

PROPOSAL PLAN



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SUBJECT BOUNDARIES: Vide DWG 7553-0002-A Potholing Survey by SURVEY MARK dated 22/07/2026
CONTOURS: ELVIS - LIDAR (2023)

DEVELOPMENT STATISTICS - Overall			
RESIDENTIAL ALLOTMENTS	**No. Lots**	**%**	**Net Area**
25m Deep Lots			
8.5m - 10.49m frontage	13	8.0%	0.283 ha
10.5m - 12.49m frontage	7	4.3%	0.187 ha
12.5m + frontage	3	1.9%	0.114 ha
26m Deep Lots			
8.5m - 10.49m frontage	24	14.8%	0.543 ha
10.5m - 12.49m frontage	12	7.4%	0.337 ha
12.5m + frontage	7	4.3%	0.285 ha
28m deep Lots			
Terrace (7.5m frontage)	26	16.0%	0.555 ha
8.5m - 10.49m frontage	22	13.6%	0.565 ha
10.5m - 12.49m frontage	16	9.9%	0.539 ha
12.5m + frontage	6	3.7%	0.237 ha
30m deep Lots			
8.5m - 10.49m frontage	15	9.3%	0.409 ha
10.5m - 12.49m frontage	8	4.9%	0.278 ha
12.5m + frontage	3	1.9%	0.201 ha
Total Residential Allotments	**162**	**100.0%**	**4.533 ha**

Land Budget	**Area (Ha)**	**%**	
Area of Subject Site / Stage	**7.698 ha**		
Net Residential Area (no roads)	4.533 ha	58.9%	
Detention / Drainage	0.516 ha	6.7%	
Road Widening	0.484 ha	6.3%	
Road Areas	2.166 ha	28.1%	
Total	**7.698 ha**	**100.0%**	

LEGEND

- Site Boundary
- Development Application Boundary
- Major Contour (5.0m interval)
- Minor Contour (1.0m interval)
- Railway Corridor (DAMS Mapping)
- Proposed Access Easement
- Stage Boundary
- 14 Stage No.

SCALE @A1 1:1500 @A3 1:3000 - LENGTHS ARE IN METRES

20 0 20 40 60 80 100 120 140 160 180

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KDL PROPERTY GROUP PTY LTD

SITE ADDRESS
1-63 BRYANTS ROAD & 101 JACKSON COURT, RIPLEY

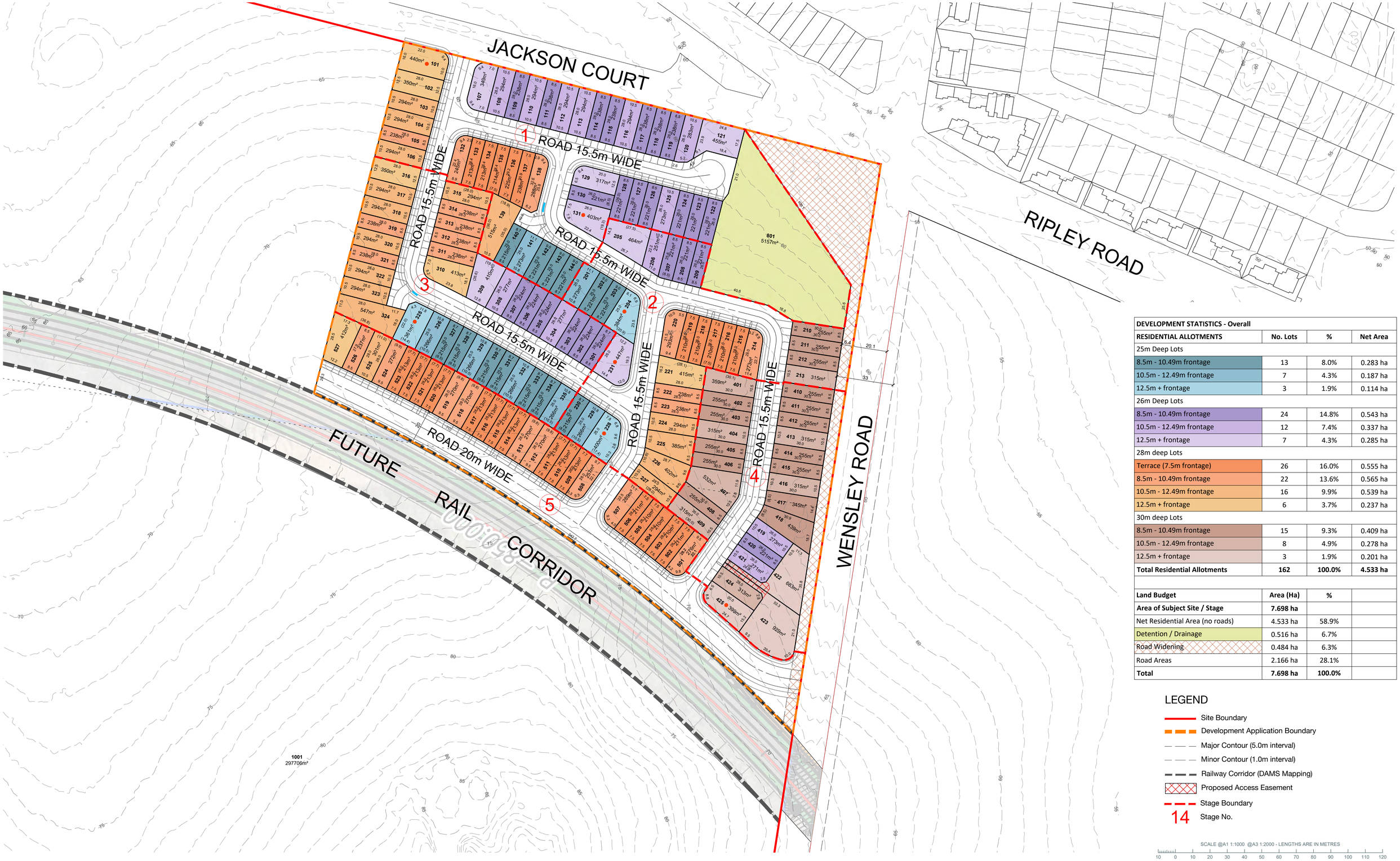
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13059 P 09 Rev J - CON 01

PROPOSAL PLAN



DEVELOPMENT STATISTICS - Overall			
RESIDENTIAL ALLOTMENTS	**No. Lots**	**%**	**Net Area**
25m Deep Lots			
8.5m - 10.49m frontage	13	8.0%	0.283 ha
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SCALE @A1 1:1000 @A3 1:2000 - LENGTHS ARE IN METRES

10 0 10 20 30 40 50 60 70 80 90 100 110 120

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Appendix B – Time of Concentration and Rational Method Calculations

Pre-Development Hydrology

The natural hydrology of the site has been assessed in accordance with QUDM (IPWEAQ, 2017) Section 4. The time of concentration for all catchments has been determined using Friend's Equation as per QUDM Section 4.6.6, combined with a channel time flow calculation.

$$Friend's\ Equation\ tc = (107nL^{0.333})/S^{0.2}$$

Table B.6.1 presents a summary of the catchment parameters used within Friend's Equation and the calculated time of concentration for the pre-development scenario.

Table B.6.1 Time of Concentration for Pre-Development Scenario

Catchment ID	EXT_1	EXT_2	PRE_A1a	PRE_A1b	PRE_A2	PRE_A3	PRE_A4	PRE_A5
Overland Flow								
Estimated Length of Sheet (m)	100	50	100	100	100	20	20	20
Hortons Roughness Value	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
Slope (%)	7	9	7	4	8	12	22	15
tc (mins)	**15.12**	**11.42**	**15.12**	**16.91**	**14.72**	**7.94**	**7.04**	**7.60**
Channel/Creek Flow								
Length of Channel Flow (m)	120	0	380	280	450	200	120	200
Velocity (m/s)	1.5	1.5	0.9	0.9	1.5	1.5	1.5	1.5
tc (minutes)	**1.33**	**0.00**	**7.04**	**5.19**	**5.00**	**2.22**	**1.33**	**2.22**
TOTAL tc (minutes)	**16.45**	**11.42**	**22.16**	**22.10**	**19.72**	**10.17**	**8.37**	**9.82**

Post-Development Hydrology – Unmitigated

Table B.6.2 presents a summary of the catchment parameters used for the calculated time of concentration for the post-development scenario. The time of concentration for the external catchment is presented in Table B.6.1 above.

Table B.6.2 Time of Concentration for Post-Development Scenario

Catchment ID	Post_A3	Post_A2a	Post A2b
Overland Flow			
Estimated Length of Sheet (m)	20	100	-
Hortons Roughness Value	0.045	0.045	-
Slope (%)	12	9	-
tc (mins)	**7.94**	**14.38**	-
Channel/Creek Flow			
Length of Channel Flow (m)	170	135	-
Velocity (m/s)	1.5	0.9	-
tc (minutes)	**1.89**	**2.50**	-
Standard Inlet Time			
Standard Inlet Time	**-**	**-**	**5**
Pipe Flow			
Length of Pipe Flow (m)	**-**	**-**	430
Velocity (m/s)	**-**	**-**	1
tc (minutes)	**-**	**-**	**7.17**
TOTAL tc (minutes)	**9.83**	**16.88**	**12.17**

Design storm event flows across the site were derived using the Rational Method as per the above-mentioned manuals. This involved:

- Determination of a C10 value (derived in accordance with QUDM Table 4.05.3(b) and Council guidelines). A value of 0.7 was applied to the pre-development catchment and 0.83 was applied to the post-development catchment;
- Adoption of design rainfall using BoM IFD data; and
- Calculation of design flows through the site 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 Table B.6.3 for pre and post-development (un-mitigated) scenarios.

Table B.6.3 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)	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)	I_1 (mm/hr)	C	Q_1 (m^3/s)	Q_{3month} (m^3/s)
EXT_1	5.792	16.45	179.37	0.72	**2.08**	166.15	0.69	**1.84**	146.82	0.63	**1.49**	132.02	0.60	**1.27**	117.69	0.57	**1.08**	94.47	0.51	**0.78**	75.88	0.48	**0.59**	**0.29**
EXT_2	0.741	11.42	210.52	0.72	**0.31**	195.05	0.69	**0.28**	172.62	0.63	**0.22**	155.41	0.60	**0.19**	138.74	0.57	**0.16**	112.16	0.51	**0.12**	90.81	0.48	**0.09**	**0.04**
PRE_A1a	13.278	22.16	155.95	0.72	**4.14**	144.09	0.69	**3.67**	127.09	0.63	**2.95**	113.75	0.60	**2.52**	100.97	0.57	**2.12**	80.58	0.51	**1.52**	64.12	0.48	**1.14**	**0.57**
PRE_A1b	7.957	22.10	156.15	0.72	**2.49**	144.28	0.69	**2.20**	127.26	0.63	**1.77**	113.91	0.60	**1.51**	101.12	0.57	**1.27**	80.70	0.51	**0.91**	64.23	0.48	**0.68**	**0.34**
PRE_A2	8.060	19.72	164.47	0.72	**2.65**	152.09	0.69	**2.35**	134.27	0.63	**1.89**	120.39	0.60	**1.62**	107.10	0.57	**1.37**	85.65	0.51	**0.98**	68.43	0.48	**0.74**	**0.37**
PRE_A3	3.525	10.17	219.07	0.72	**1.54**	202.95	0.69	**1.37**	179.67	0.63	**1.11**	161.76	0.60	**0.95**	144.45	0.57	**0.81**	116.96	0.51	**0.58**	94.86	0.48	**0.45**	**0.22**
PRE_A4	1.509	8.37	239.96	0.72	**0.72**	222.00	0.69	**0.64**	196.45	0.63	**0.52**	176.10	0.60	**0.44**	156.55	0.57	**0.37**	126.99	0.51	**0.27**	103.42	0.48	**0.21**	**0.10**
PRE_A5	3.335	9.82	222.40	0.72	**1.48**	206.00	0.69	**1.32**	182.36	0.63	**1.06**	164.10	0.60	**0.91**	146.46	0.57	**0.77**	118.64	0.51	**0.56**	96.29	0.48	**0.43**	**0.21**
Post_A2a	1.889	16.88	177.43	0.72	**0.67**	164.32	0.69	**0.59**	145.18	0.63	**0.48**	130.51	0.60	**0.41**	116.31	0.57	**0.35**	93.32	0.51	**0.25**	74.91	0.48	**0.09**	**0.00**
Post_A2b	7.747	12.17	205.38	0.97	**4.30**	190.31	0.93	**3.81**	168.38	0.85	**3.08**	151.59	0.81	**2.64**	135.32	0.77	**2.24**	109.28	0.69	**1.62**	88.38	0.65	**0.62**	**0.01**
Post_A3	1.753	9.83	222.23	0.72	**0.78**	205.85	0.69	**0.69**	182.23	0.63	**0.56**	163.99	0.60	**0.48**	146.37	0.57	**0.41**	118.57	0.51	**0.29**	96.23	0.48	**0.11**	**0.00**

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: 0.045; 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 C.6.4.

Table C.6.4 Adopted Initial & Continuing Losses

Impervious Area		Pervious Area	
IL (mm)	CL (mm/hr)	IL (mm)	CL (mm/hr)
0	0	10	2

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

Table C.6.5 Pre-Development Catchment Parameters

Catchment	Impervious Area			Pervious Area		
	Area (ha)	Fraction Impervious (%)	Slope (%)	Area (ha)	Fraction Impervious (%)	Slope (%)
Pre A2	0.007	100	5.5	8.053	0	5.5
Pre A3	0	100	12	3.525	0	12

Table C.6.6 Post-Development (Unmitigated) Catchment Parameters

Catchment	Impervious Area			Pervious Area		
	Area (ha)	Fraction Impervious (%)	Slope (%)	Area (ha)	Fraction Impervious (%)	Slope (%)
Post A2a	0	100	5.5	1.889	0	5.5
Post A2b	5.423	100	5.5	2.324	0	5.5

Table C.6.7 Post-Development (Mitigated) Catchment Parameters

Catchment	Impervious Area			Pervious Area		
	Area (ha)	Fraction Impervious (%)	Slope (%)	Area (ha)	Fraction Impervious (%)	Slope (%)
Post A2a detained	0	100	5.5	1.889	0	5.5
Post A2b detain	5.337	100	5.5	1.991	0	5.5
Post A2b bypass	0.086	100	5.5	0.333	0	5.5

Rainfall and Evapotranspiration

MUSIC modelling was based on 6-minute interval data obtained from the Bureau of Meteorology (BOM) for rainfall station 040004 Amberley, QLD, as summarised in Table D.6.8.

Table D.6.8 Meteorological and Rainfall Runoff Data Reporting Table

Input	Data Used in Modelling
Rainfall station	040004
Time step	6 minute
Modelling period	1/01/1990 to 31/12/1999 (10 years)
Mean annual rainfall (mm)	762
Evapo-Transpiration	1393
Rainfall runoff parameters	Urban
Pollutant export parameters	Urban

Catchment Parameters

Based on the proposed land uses within the development, the site has been modelled as urban land use as detailed in Table D.6.9. The site has been divided into roof, ground and road, as well as MDR lump and ChildCare lump source nodes as per the architectural drawings included in Appendix A.

Table D.6.9 Land Use Parameters

Catchment ID	Land Use	Catchment Area (ha)	Total Impervious (%)
Roof	Urban	3.410	100
Ground	Urban	2.154	20
Road	Urban	1.595	70

The MUSIC catchment plan with full breakdown of rood, ground and road areas is presented in Appendix D. The pollutant loads and runoff parameters for each source node have been based on the data from the Water by Design MUSIC Modelling Guidelines (2010), as summarised in Table D.6.10 and Table D.6.11.

Table D.6.10 Rainfall Runoff Parameters

Parameter	All Nodes
Landuse	Urban
Rainfall threshold (mm)	1
Soil storage capacity (mm)	500
Initial storage (% capacity)	10
Field capacity (mm)	200
Infiltration capacity coefficient a	211
Infiltration capacity coefficient b	5
Initial depth (mm)	50
Daily recharge rate (%)	28
Daily baseflow rate (%)	27
Daily seepage rate (%)	0

Table D.6.11 Pollutant Load Parameters

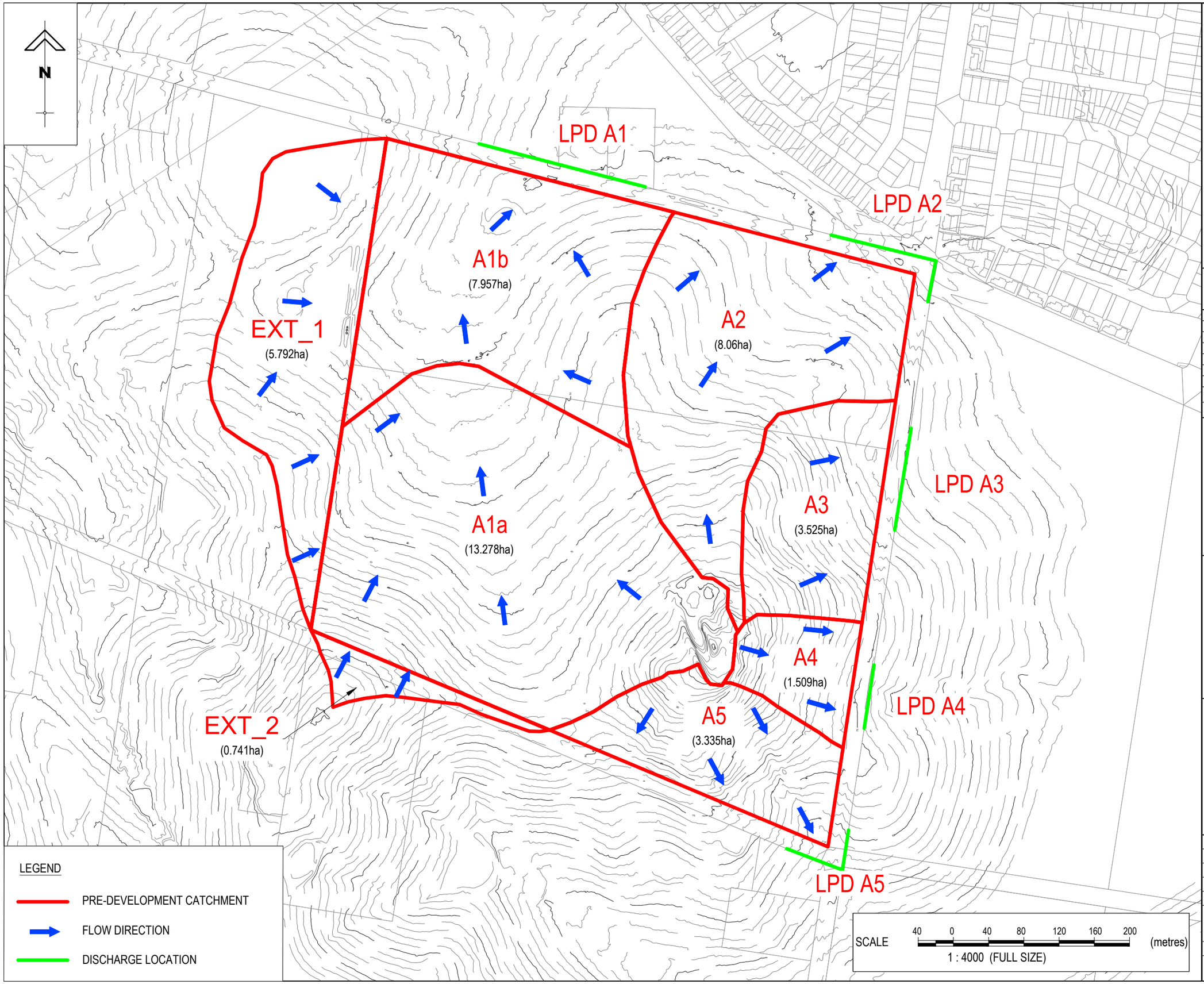
Urban Residential	Total Suspended Solids (log mg/L)		Total Phosphorous (log mg/L)		Total Nitrogen (log mg/L)	
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Storm Flow Concentration	1.30(1) 2.43(2) 2.18(3)	0.39	-0.89(1) -0.30(2) -0.47(3)	0.31	0.26	0.23
Base Flow Concentration	0(1) 1(2,3)	0(1) 0.34(2,3)	0(1) -0.97(2,3)	0(1) 0.31(2,3)	0(1) 0.20(2,3)	0(1) 0.20(2,3)

NOTE: (1) values applied to 'Roof' areas

(2) Values applied to 'Carpark' areas

(3) Values applied to 'Ground' areas

Appendix E – Burchills Engineering Solutions Conceptual Stormwater Management Drawings



PROPOSED DEVELOPMENT

1-63 JACKSON CT, RIPLEY

FOR

KDL PROPERTY GROUP PTY LTD

ORIGINAL SCALE BEFORE REDUCTION

A3 0 10 20 30 40mm.

VER.	DESCRIPTION	APPR.	DATE
A	ORIGINAL ISSUE		09.09.26

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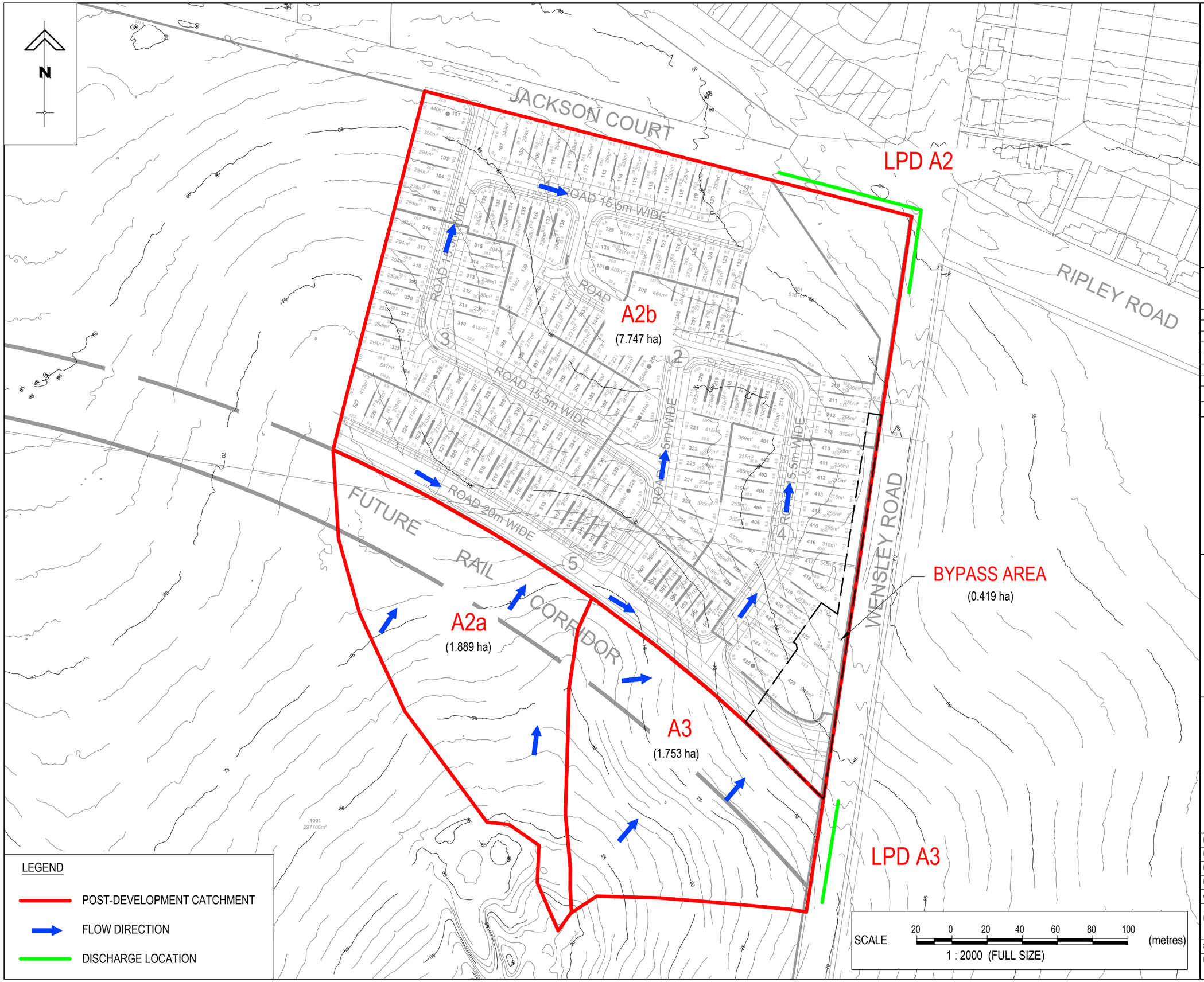
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PRE-DEVELOPMENT CATCHMENT PLAN

DEVEL. APPLIC. No. :	DATE : 09.09.26
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DESIGNER :	
DRAFTSPERSON :	
CHECKED :	
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PROPOSED DEVELOPMENT

1-63 JACKSON CT, RIPLEY

FOR

KDL PROPERTY GROUP PTY LTD

ORIGINAL SCALE BEFORE REDUCTION

A3 0 10 20 30 40mm.

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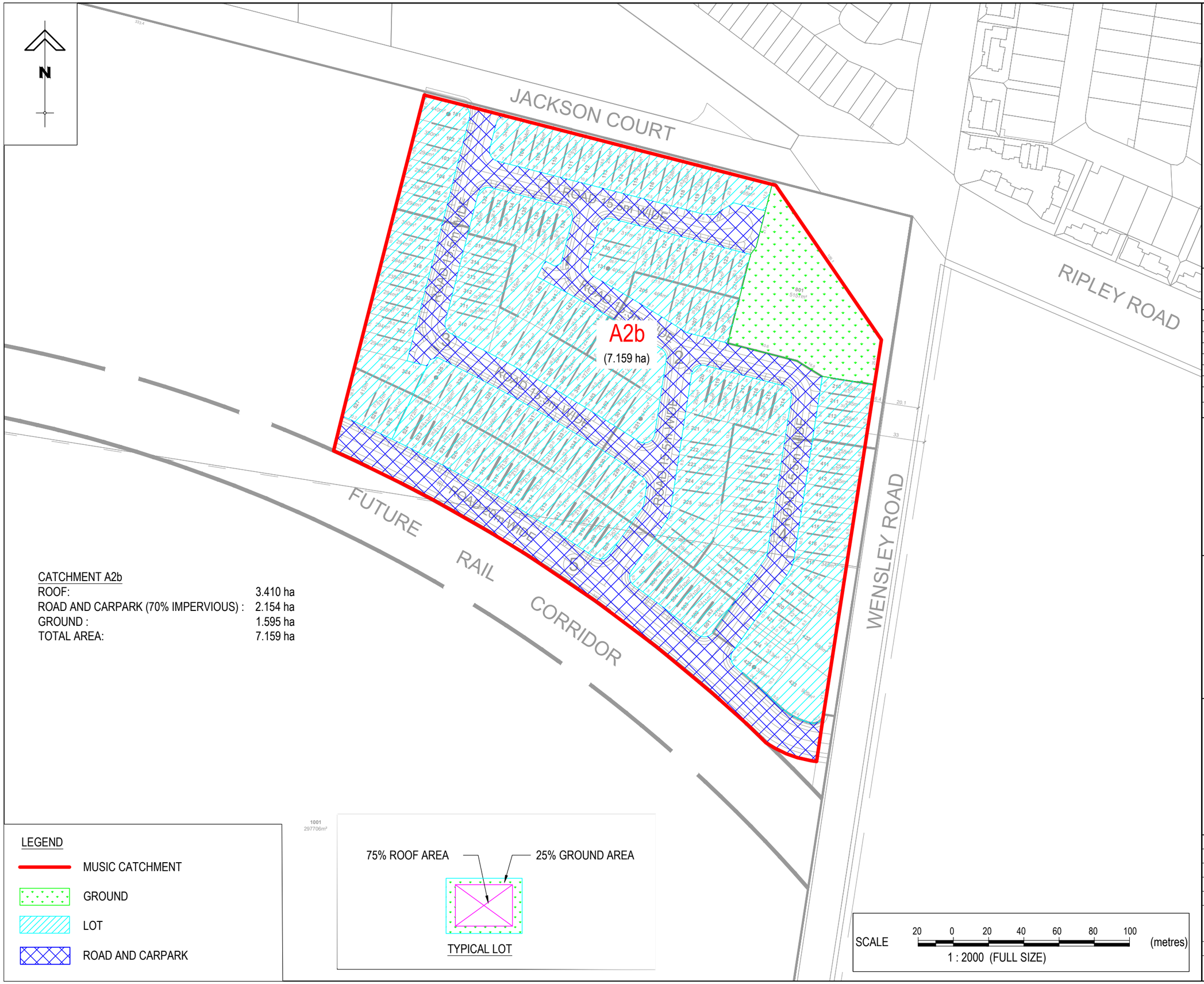
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POST-DEVELOPMENT CATCHMENT PLAN

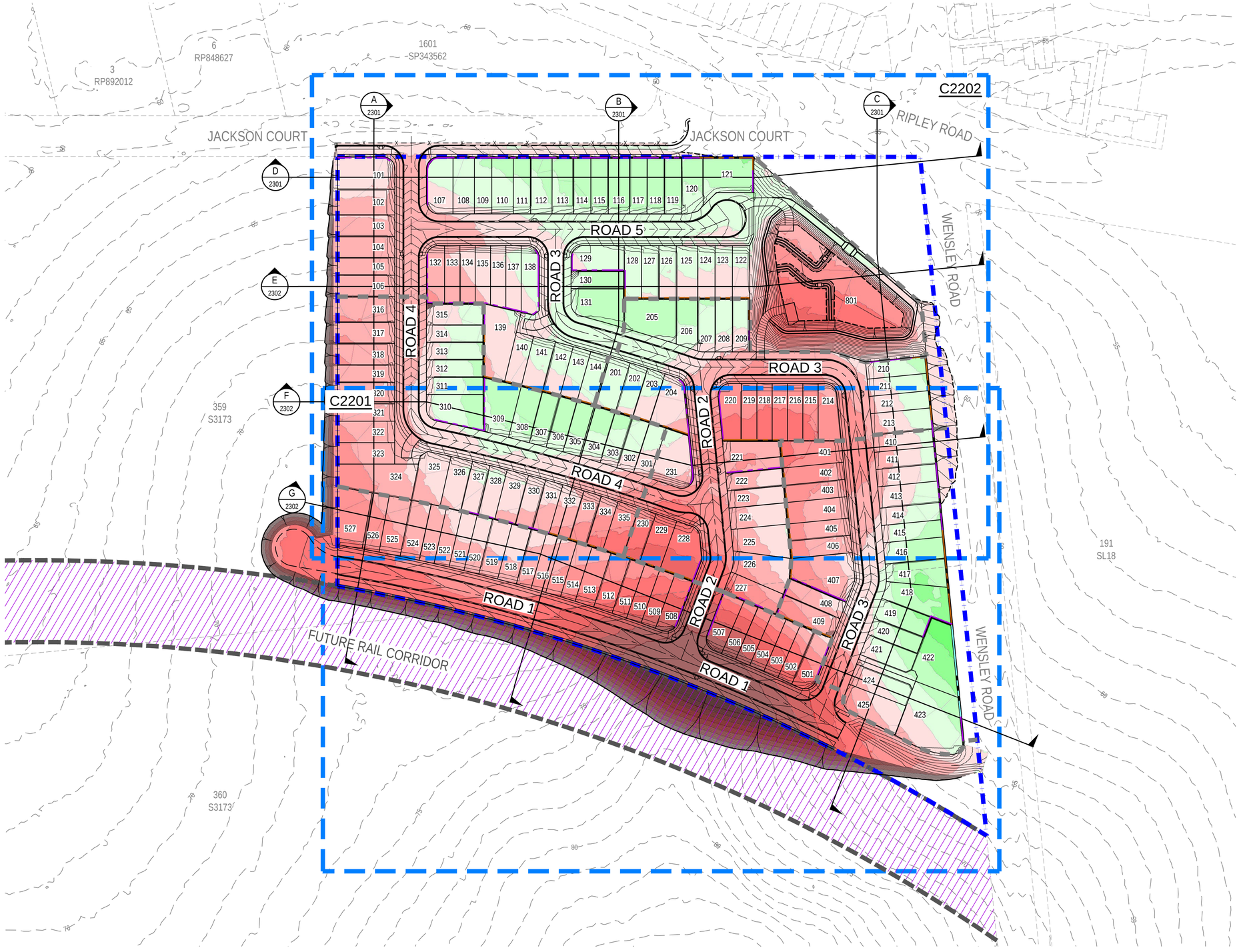
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PROJECT No.: BE260182	DRAWING No. : N201 / VERSION: A


N
JACKSON COURT
RIPLEY ROAD
WENSLEY ROAD
FUTURE
RAIL
CORRIDOR
A2b
(7.159 ha)
X ROAD 15.5m WIDE
ROAD 15.2m WIDE
ROAD 15.2m WIDE
ROAD 15.2

Appendix F – Burchills Engineering Solutions Preliminary Civil Engineering Drawings

LEGEND

- EXISTING SURFACE CONTOURS
- DESIGN SURFACE CONTOURS
- EXISTING LOT BOUNDARY
- EXISTING EASEMENT
- PROPOSED LOT BOUNDARY
- PROPOSED EASEMENT
- PROPOSED ROAD CONTROL LINE
- PROPOSED KERB
- PROPOSED SINGLE TIER RETAINING WALL 0.6 - 1.5m
- PROPOSED SINGLE TIER RETAINING WALL 1.5 - 3.0m
- PROPOSED DOUBLE TIER RETAINING WALL 1.5-3.0m
- DEVELOPMENT APPLICATION BOUNDARY
- STAGING BOUNDARY



EARTHWORKS DEPTH ANALYSIS LEGEND

LOWER		UPPER	COLOUR
-4.0m	TO	-3.5m	
-3.5m	TO	-3.0m	
-3.0m	TO	-2.5m	
-2.5m	TO	-2.0m	
-2.0m	TO	-1.5m	
-1.5m	TO	-1.0m	
-1.0m	TO	-0.5m	
-0.5m	TO	0.0m	
0.0m	TO	0.5m	
0.5m	TO	1.0m	
1.0m	TO	1.5m	
1.5m	TO	2.0m	
2.0m	TO	2.5m	
2.5m	TO	3.0m	
3.0m	TO	3.5m	
3.5m	TO	4.0m	

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COOTE BURCHILLS ENGINEERING PTY LTD
ABN 76 166 942 365

CLIENT : KDL PROPERTY GROUP

DRAWING TITLE :
BULK EARTHWORKS OVERALL LAYOUT PLAN

PROJECT :
RESIDENTIAL SUBDIVISION
1-63 BRYANTS ROAD & 101 JACKSON COURT, RIPLEY

PRELIMINARY
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1 : 1000 (FULL SIZE)

DEVEL. APPLIC. No. :	DATE : 11-09-26
PROJECT LEADER : J. GARCIA	DESIGNER : J. BURNS
DRAFTSPERSON : J. HUYNH	CHECKED : J.SHAO

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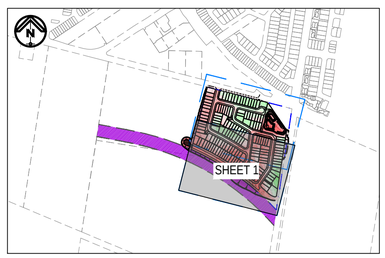
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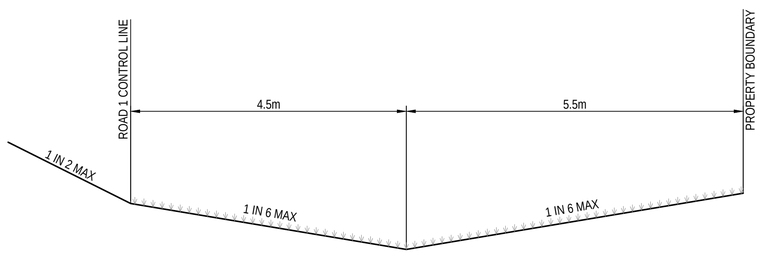
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- DESIGN SURFACE CONTOURS (65)
- EXISTING LOT BOUNDARY
- EXISTING EASEMENT
- PROPOSED LOT BOUNDARY
- PROPOSED EASEMENT
- PROPOSED ROAD CONTROL LINE
- PROPOSED KERB
- PROPOSED EARTHWORKS PAD
- PROPOSED SINGLE TIER RETAINING WALL 0.6 - 1.5m
- PROPOSED SINGLE TIER RETAINING WALL 1.5 - 3.0m
- PROPOSED DOUBLE TIER RETAINING WALL 1.5-3.0m
- DEVELOPMENT APPLICATION BOUNDARY
- STAGING BOUNDARY
- 69.00 PREFERRED BENCH LEVEL

EARTHWORKS DEPTH ANALYSIS LEGEND

LOWER		UPPER	COLOUR
-10.0m	TO	-3.5m	
-3.5m	TO	-3.0m	
-3.0m	TO	-2.5m	
-2.5m	TO	-2.0m	
-2.0m	TO	-1.5m	
-1.5m	TO	-1.0m	
-1.0m	TO	-0.5m	
-0.5m	TO	0.0m	
0.0m	TO	0.5m	
0.5m	TO	1.0m	
1.0m	TO	1.5m	
1.5m	TO	2.0m	
2.0m	TO	2.5m	
2.5m	TO	3.0m	
3.0m	TO	3.5m	
3.5m	TO	4.0m	



KEY PLAN
SCALE NTS



TYPICAL DIVERSION SWALE
SCALE 1:50

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ABN 76 166 942 365

CLIENT : KDL PROPERTY GROUP

DRAWING TITLE :
BULK EARTHWORKS LAYOUT PLAN
SHEET 1 OF 2

PROJECT :
RESIDENTIAL SUBDIVISION
1-63 BRYANTS ROAD & 101 JACKSON COURT, RIPLEY

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

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PROJECT LEADER : J. GARCIA	DESIGNER : J. BURNS
DRAFTSPERSON : J. HUYNH	CHECKED : J.SHAO

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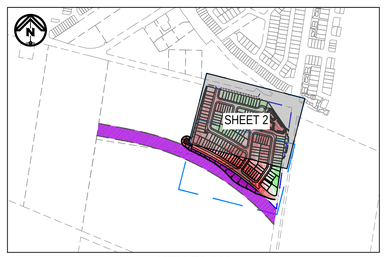
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- EXISTING EASEMENT
- PROPOSED LOT BOUNDARY
- PROPOSED EASEMENT
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- DEVELOPMENT APPLICATION BOUNDARY
- STAGING BOUNDARY
- 69.00 PREFERRED BENCH LEVEL
- PROPOSED PAVEMENT SAWCUT

EARTHWORKS DEPTH ANALYSIS LEGEND

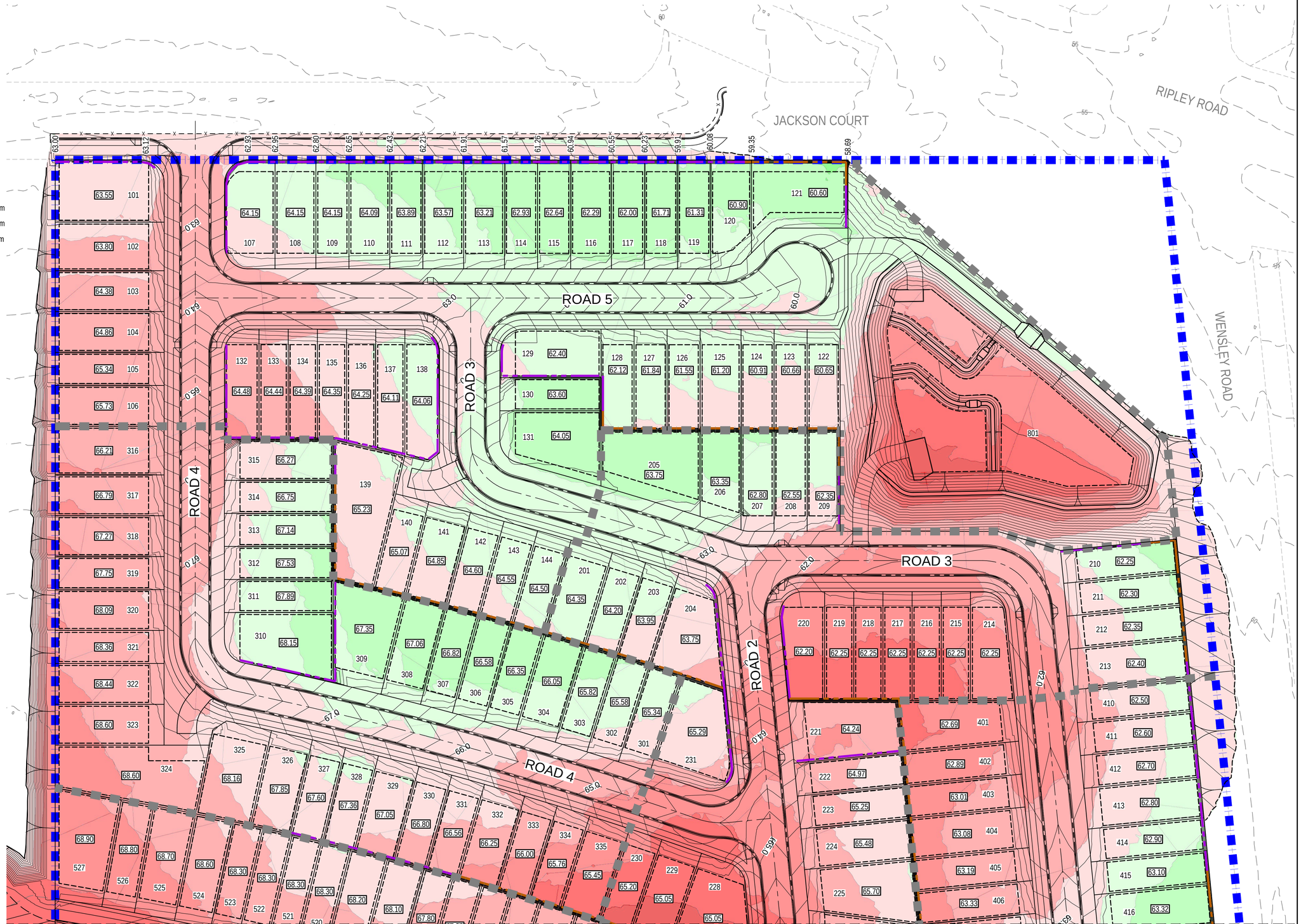
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3.5m	TO	4.0m	



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SHEET 2 OF 2

PROJECT :
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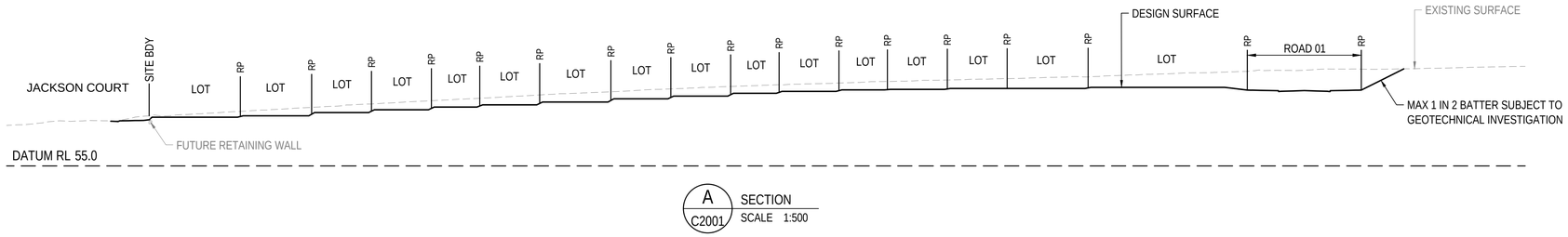
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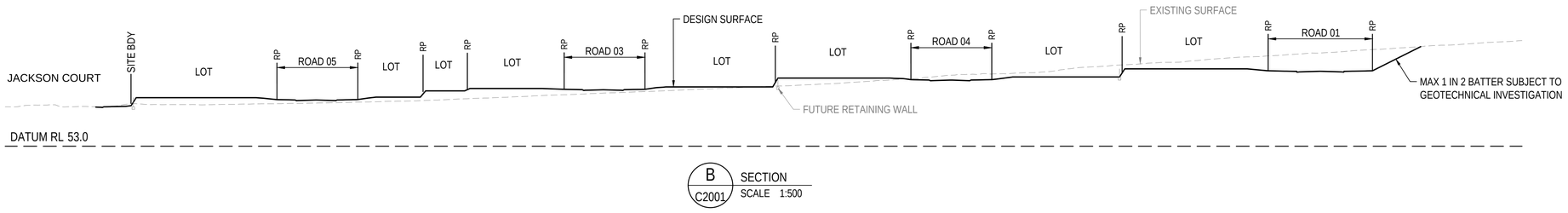
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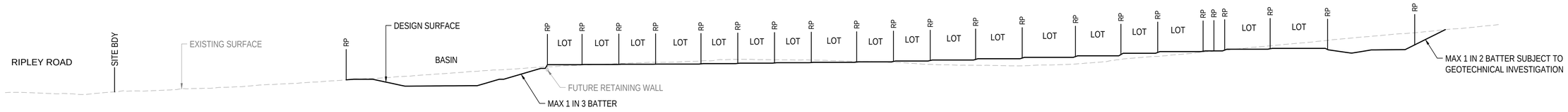
PROJECT No.:	DRAWING No. :	VERSION:
BE260182-DA1	C2202	A



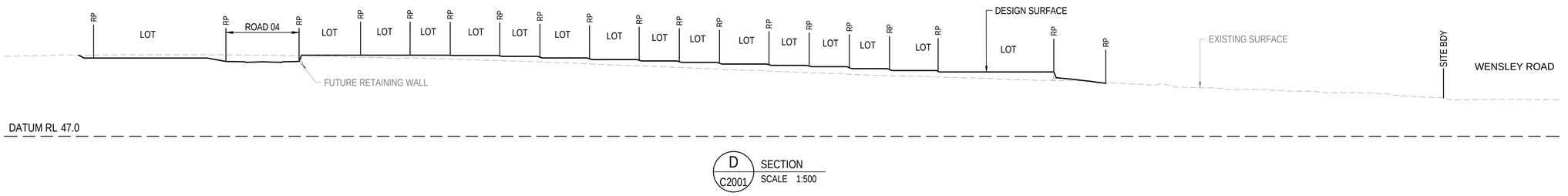
A C2001 SECTION
SCALE 1:500



B C2001 SECTION
SCALE 1:500



C C2001 SECTION
SCALE 1:500



D C2001 SECTION
SCALE 1:500

EARTHWORKS SECTIONS

SCALE 5 0 5 10 15 20 25 (metres)
1 : 500 (FULL SIZE)

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VER.	DESCRIPTION	DATE
A	ORIGINAL ISSUE	11-09-26

BURCHILLS ENGINEERING SOLUTIONS
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PHONE: +61 7 5509 6400
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COOTE BURCHILLS ENGINEERING PTY LTD
ABN 76 166 942 365

CLIENT : KDL PROPERTY GROUP

DRAWING TITLE :
BULK EARTHWORKS SECTIONS
SHEET 1 OF 2

PROJECT :
RESIDENTIAL SUBDIVISION
1-63 BRYANTS ROAD & 101 JACKSON COURT, RIPLEY

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

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

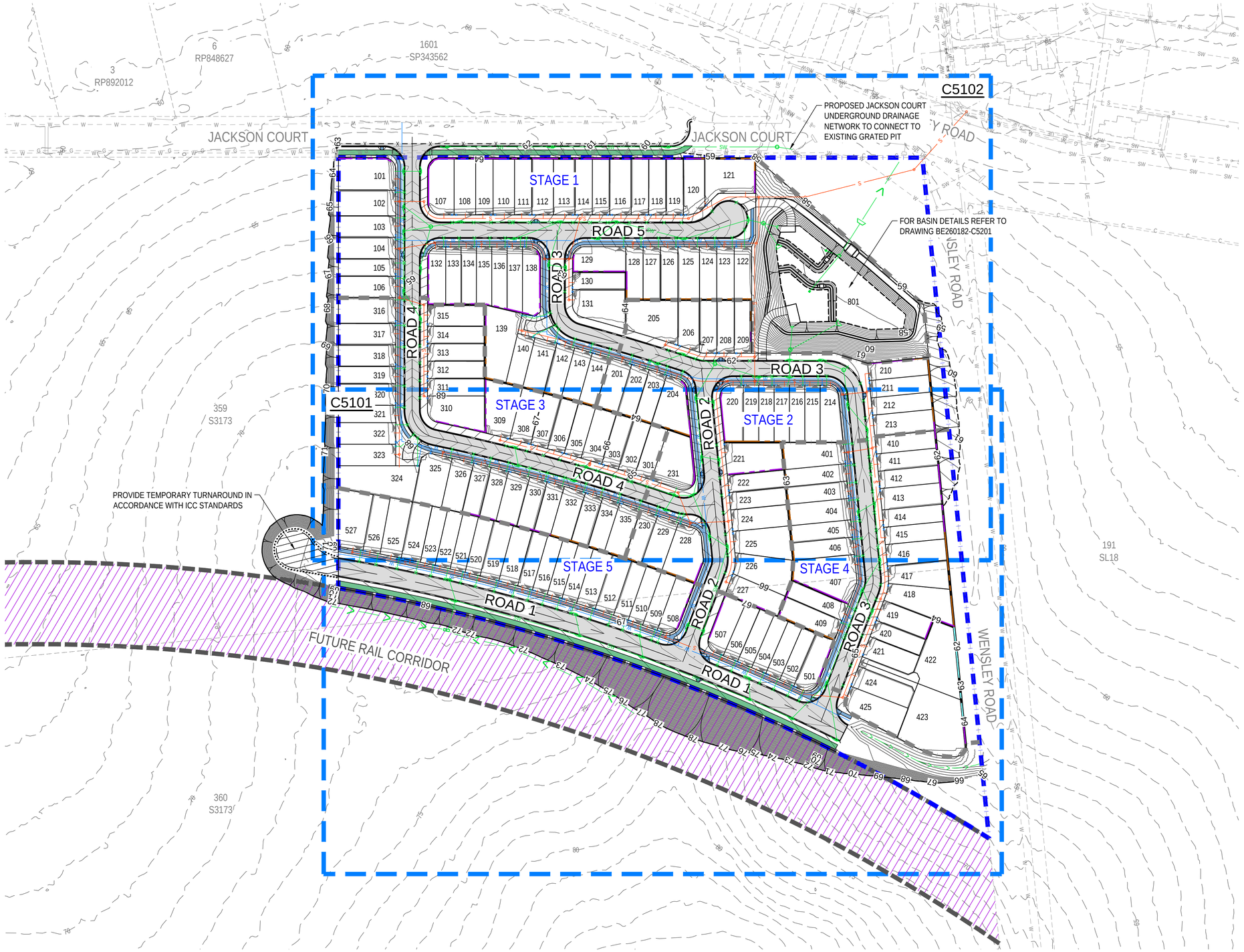
DEVEL. APPLIC. No. :		DATE : 11-09-26
PROJECT LEADER : J. GARCIA	DESIGNER : J. BURNS	
DRAFTSPERSON : J. HUYNH	CHECKED : J.SHAO	

APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

PROJECT No.:	DRAWING No. :	VERSION:
BE260182-DA1	C2301	A

LEGEND

- EXISTING STORMWATER
- EXISTING WATER
- EXISTING SEWER
- EXISTING UNDERGROUND ELECTRIC
- EXISTING COMMS
- EXISTING GAS
- EXISTING LOT BOUNDARY
- EXISTING EASEMENT
- DESIGN SURFACE CONTOURS
- PROPOSED LOT BOUNDARY
- PROPOSED EASEMENT
- PROPOSED STORMWATER
- PROPOSED WATER
- PROPOSED SEWER
- PROPOSED ROAD CONTROL LINE
- PROPOSED KERB
- PROPOSED SINGLE TIER RETAINING WALL 0.6 - 1.5m
- PROPOSED SINGLE TIER RETAINING WALL 1.5 - 3.0m
- PROPOSED DOUBLE TIER RETAINING WALL 1.5-3.0m
- DEVELOPMENT APPLICATION BOUNDARY
- STAGING BOUNDARY
- PROPOSED PAVEMENT ASPHALTIC CONCRETE
- RAILWAY CORRIDOR
- PROPOSED 1.5m FOOTPATH
- PROPOSED 2.5m FOOTPATH
- CONCRETE PAVEMENT
- INDICATIVE FUTURE DRIVEWAY LOCATION
- TEMPORARY TURNAROUND
- BOLLARD



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.

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A	ORIGINAL ISSUE	11-09-26

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COOTE BURCHILLS ENGINEERING PTY LTD
ABN 76 166 942 365

CLIENT : KDL PROPERTY GROUP

DRAWING TITLE : CIVIL SERVICES OVERALL LAYOUT PLAN

PROJECT : RESIDENTIAL SUBDIVISION
1-63 BRYANTS ROAD & 101 JACKSON COURT, RIPLEY

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

SCALE AT FULL SIZE (A1) :
10 0 10 20 30 40 50m
1 : 1000 (FULL SIZE)

DEVEL. APPLIC. No. :	DATE : 11-09-26
PROJECT LEADER : J. GARCIA	DESIGNER : J. BURNS
DRAFTSPERSON : J. HUYNH	CHECKED : J.SHAO

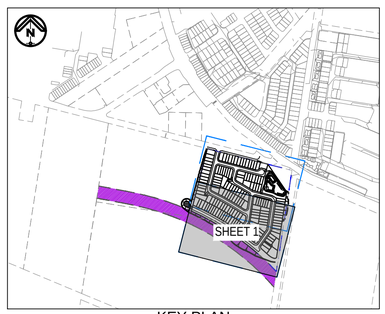
APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

PROJECT No.:	DRAWING No. :	VERSION:
BE260182-DA1	C5001	A

FOR CONTINUATION REFER DRG. C5102

LEGEND

- EXISTING STORMWATER
- EXISTING WATER
- EXISTING SEWER
- EXISTING UNDERGROUND ELECTRIC
- EXISTING COMMS
- EXISTING GAS
- EXISTING LOT BOUNDARY
- EXISTING EASEMENT
- DESIGN SURFACE CONTOURS
- PROPOSED LOT BOUNDARY
- PROPOSED EASEMENT
- PROPOSED STORMWATER
- PROPOSED WATER
- PROPOSED SEWER
- PROPOSED ROAD CONTROL LINE
- PROPOSED KERB
- PROPOSED SINGLE TIER RETAINING WALL 0.6 - 1.5m
- PROPOSED SINGLE TIER RETAINING WALL 1.5 - 3.0m
- PROPOSED DOUBLE TIER RETAINING WALL 1.5-3.0m
- DEVELOPMENT APPLICATION BOUNDARY
- STAGING BOUNDARY
- PROPOSED PAVEMENT ASPHALTIC CONCRETE
- RAILWAY CORRIDOR
- PROPOSED 1.5m FOOTPATH
- PROPOSED 2.5m FOOTPATH
- CONCRETE PAVEMENT
- INDICATIVE FUTURE DRIVEWAY LOCATION



KEY PLAN
SCALE NTS

WARNING: UNDERGROUND SERVICES:
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COOTE BURCHILLS ENGINEERING PTY LTD
ABN 76 166 942 365

CLIENT : KDL PROPERTY GROUP

DRAWING TITLE :
CIVIL SERVICES LAYOUT PLAN
SHEET 1 OF 2

PROJECT :
RESIDENTIAL SUBDIVISION
1-63 BRYANTS ROAD & 101 JACKSON COURT, RIPLEY

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

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

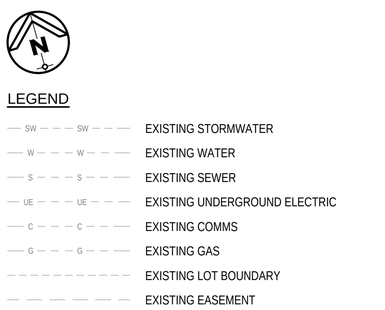
DEVEL. APPLIC. No. :	DATE : 11-09-26
PROJECT LEADER : J. GARCIA	DESIGNER : J. BURNS
DRAFTSPERSON : J. HUYNH	CHECKED : J.SHAO

APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

PROJECT No.:	DRAWING No. :	VERSION:
BE260182-DA1	C5101	A

LEGEND

- EXISTING STORMWATER
- EXISTING WATER
- EXISTING SEWER
- EXISTING UNDERGROUND ELECTRIC
- EXISTING COMMS
- EXISTING GAS
- EXISTING LOT BOUNDARY
- EXISTING EASEMENT
- 65 DESIGN SURFACE CONTOURS
- PROPOSED LOT BOUNDARY
- PROPOSED EASEMENT
- PROPOSED STORMWATER
- PROPOSED WATER
- PROPOSED SEWER
- PROPOSED ROAD CONTROL LINE
- PROPOSED KERB
- PROPOSED SINGLE TIER RETAINING WALL 0.6 - 1.5m
- PROPOSED SINGLE TIER RETAINING WALL 1.5 - 3.0m
- PROPOSED DOUBLE TIER RETAINING WALL 1.5-3.0m
- DEVELOPMENT APPLICATION BOUNDARY
- STAGING BOUNDARY
- PROPOSED PAVEMENT ASPHALTIC CONCRETE
- RAILWAY CORRIDOR
- PROPOSED 1.5m FOOTPATH
- PROPOSED 2.5m FOOTPATH
- CONCRETE PAVEMENT
- INDICATIVE FUTURE DRIVEWAY LOCATION



KEY PLAN
SCALE NTS

JACKSON COURT
RIPLEY ROAD
WENSLEY ROAD
ROAD 2
ROAD 3
ROAD 4
ROAD 5
INDICATIVE BIN PADS TO BE CONFIRMED DURING DETAILED DESIGN
INDICATIVE BIN PADS TO BE CONFIRMED DURING DETAILED DESIGN

FOR CONTINUATION REFER DRG. C5101

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ABN 76 166 942 365

CLIENT : KDL PROPERTY GROUP

DRAWING TITLE :
CIVIL SERVICES LAYOUT PLAN
SHEET 2 OF 2

PROJECT :
RESIDENTIAL SUBDIVISION
1-63 BRYANTS ROAD & 101 JACKSON COURT, RIPLEY

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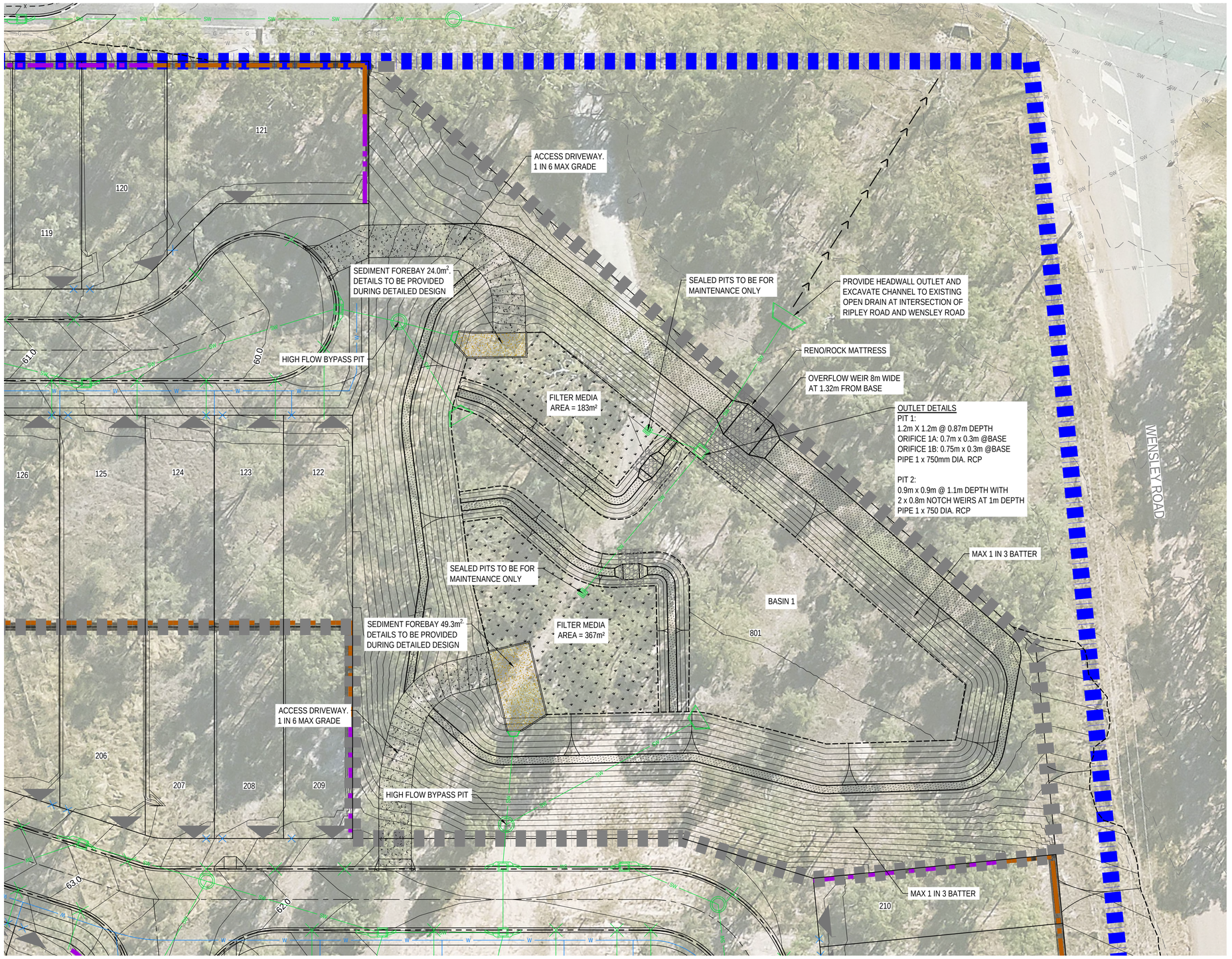
SCALE AT FULL SIZE (A1) :
5 0 5 10 15 20 25m
1 : 500 (FULL SIZE)

DEVEL. APPLIC. No. :
DATE : 11-09-26
PROJECT LEADER : J. GARCIA
DESIGNER : J. BURNS
DRAFTSPERSON : J. HUYNH
CHECKED : J.SHAO
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

PROJECT No.:	DRAWING No. :	VERSION:
BE260182-DA1	C5102	A

LEGEND

- EXISTING SURFACE CONTOURS
- DESIGN SURFACE CONTOURS
- PROPOSED STORMWATER
- BASIN BATTER TOP / BASIN BATTER TICK / BASIN BATTER BOTTOM
- BASIN ROCK PROTECTION
- BASIN FOREBAY
- BASIN CONCRETE
- TOP OF BUND
- BIO BASIN



BASIN 1 LAYOUT PLAN

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COOTE BURCHILLS ENGINEERING PTY LTD
ABN 76 166 942 365

CLIENT : KDL PROPERTY GROUP

DRAWING TITLE : BASIN 1 LAYOUT PLAN

PROJECT : RESIDENTIAL SUBDIVISION
1-63 BRYANTS ROAD & 101 JACKSON COURT, RIPLEY

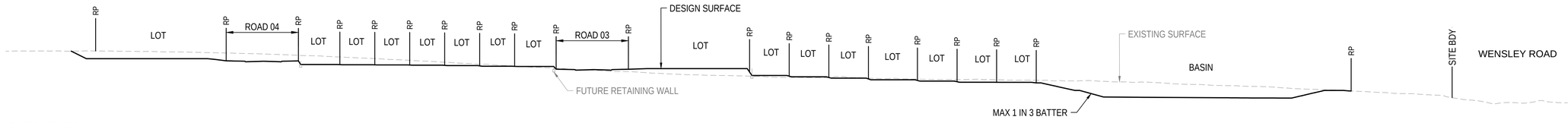
PRELIMINARY
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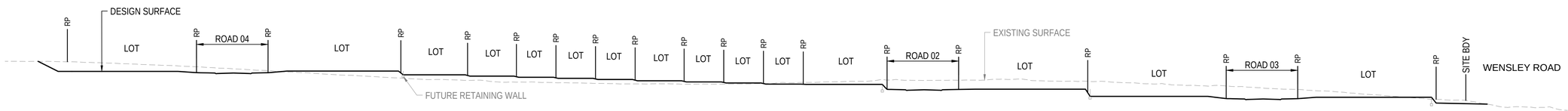
DEVEL. APPLIC. No. :		DATE :	11-09-26
PROJECT LEADER : J. GARCIA	DESIGNER : J. BURNS		
DRAFTSPERSON : J. HUYNH	CHECKED : J.SHAO		

APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

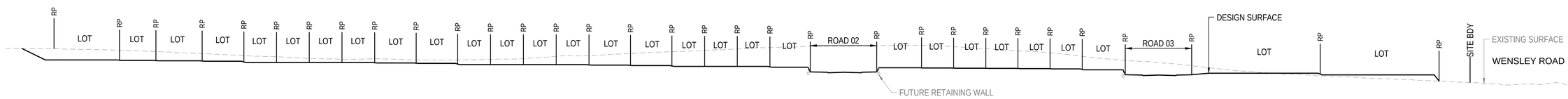
PROJECT No.:	DRAWING No. :	VERSION:
BE260182-DA1	C5201	A



E C2001 SECTION
SCALE 1:500



F C2001 SECTION
SCALE 1:500



G C2001 SECTION
SCALE 1:500

EARTHWORKS SECTIONS

SCALE 5 0 5 10 15 20 25 (metres)
1 : 500 (FULL SIZE)

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ABN 76 166 942 365

CLIENT : KDL PROPERTY GROUP

DRAWING TITLE :
BULK EARTHWORKS SECTIONS
SHEET 2 OF 2

PROJECT :
RESIDENTIAL SUBDIVISION
1-63 BRYANTS ROAD & 101 JACKSON COURT, RIPLEY

PRELIMINARY
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SCALE AT FULL SIZE (A1) :
10 0 10 20 30 40 50m
1 : 1000 (FULL SIZE)

DEVEL. APPLIC. No. :	DATE : 11-09-26
PROJECT LEADER : J. GARCIA	DESIGNER : J. BURNS
DRAFTSPERSON : J. HUYNH	CHECKED : J.SHAO

APPROVED FOR AND ON BEHALF OF
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PROJECT No.:	DRAWING No. :	VERSION:
BE260182-DA1	C2302	A