



SEEC

Water Cycle Management Study

For Proposed 4 Lot Subdivision
Lot 11 DP 1271846, 3 Southdown Road, Marulan

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Document Issue Table

Version	Date	Author	Reviewed	Notes
DRAFT 01	18/01/2024	JA (AMIEAust)	Client	Draft Issue
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SUMMARY

The following report is a Water Cycle Management Study, designed to comply with the requirements of various consent authorities that require that new developments demonstrate a level of environmental responsibility by maintaining or improving water quality.

This report contains:

- a description of the proposed development (Section 2),
- a detailed site description (Section 3),
- a series of measures to offset the potential impacts of the development and any major existing issues (Section 4),
- modelling to justify the proposed measures contained in Section 4 (Section 5).

The most important component of this report for the developer is Section 4. It contains a series of measures to be implemented as part of the development that are proposed to offset observed potential problems caused by the development. This is referred to as a Water Cycle Management Plan. It considers the existing conditions (Section 3) and the likely impacts of the development (Section 4). In most cases, the planned measures in Section 4 of this report will become “conditions of consent” if the development application (DA) is approved.

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1 INTRODUCTION

SEEC have been commissioned by Big Merino Investments Pty Ltd C/- Laterals Planning (the Applicant) to provide this Water Cycle Management Study (WCMS). It is required to accompany a Development Application (DA) for a proposed seven lot residential subdivision at 11 Southdown Road, Marulan (Lot 11 on DP 1271846).

This study includes:

- an investigation into the existing water cycle;
- an assessment of how the proposed development will affect the management of the water cycle; and
- a plan for managing the water cycle to achieve a neutral or beneficial effect on the quality of water leaving the site.

The site is within the Sydney Drinking Catchment area administered by the WaterNSW who requires all new developments to demonstrate a neutral or beneficial effect (NorBE) on water quality.

The study follows the latest WaterNSW guidelines (WaterNSW, 2023a and 2023b) for a Module 3 development type. This assessment has been undertaken for the subdivision development only (i.e. internal access road and vacant lots). Future development of individual lots would be subject to separate individual development applications and are to be designed in accordance with Council's and Water NSW development controls and engineering guidelines.

Note that SEEC does not make any comment on the suitability to develop the site and have simply assessed the proposed works against the relevant guidelines.

2 PROPOSED DEVELOPMENT

It is proposed to subdivide the existing site into seven large lot residential (R5 Zoned) lots (Figures 1 and 2). The lots range in size from approximately 2,000 to 3,000 m² in area. The new lots are to be accessed by a new internal road and cul-de-sac from Southdown Road.

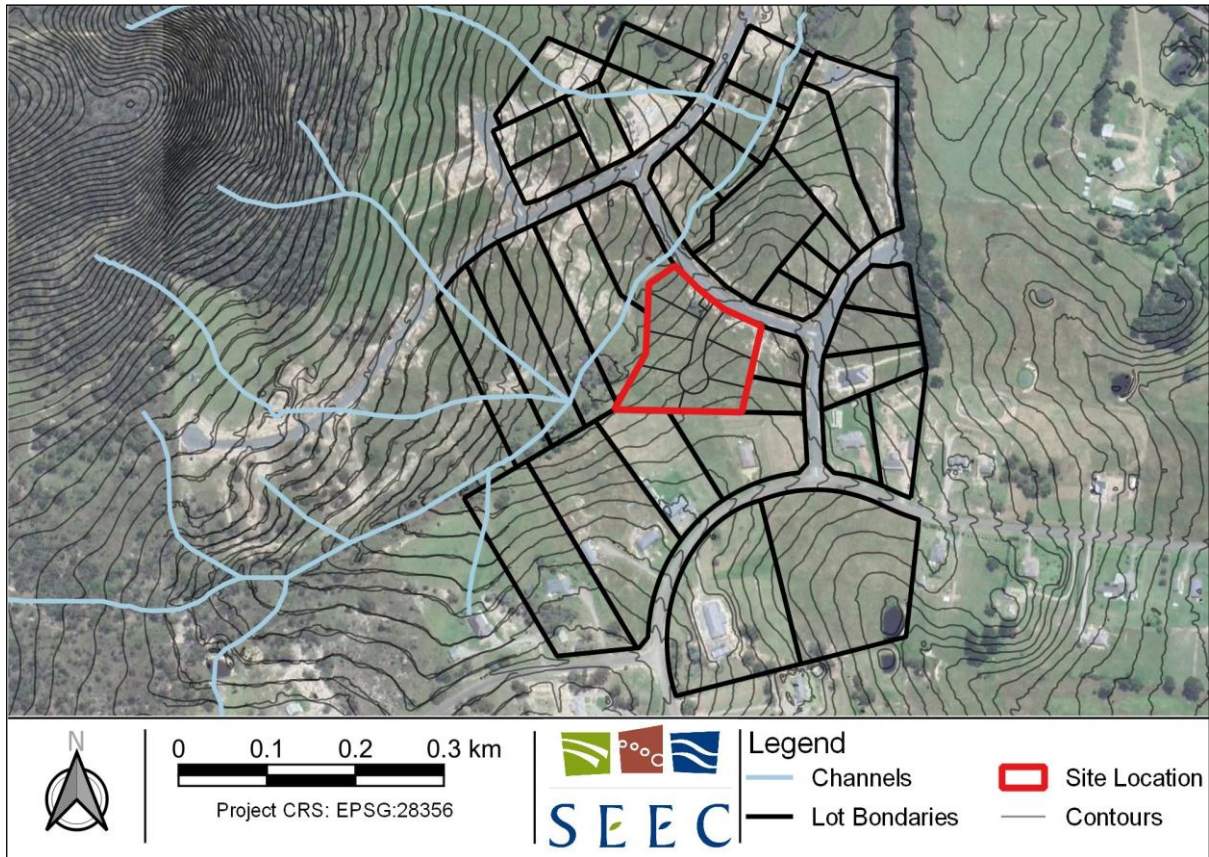


Figure 1: Site Plan - Lot 11 on DP 1271846. Image obtained from SIXMAPS (NSW Spatial Services, 2023)

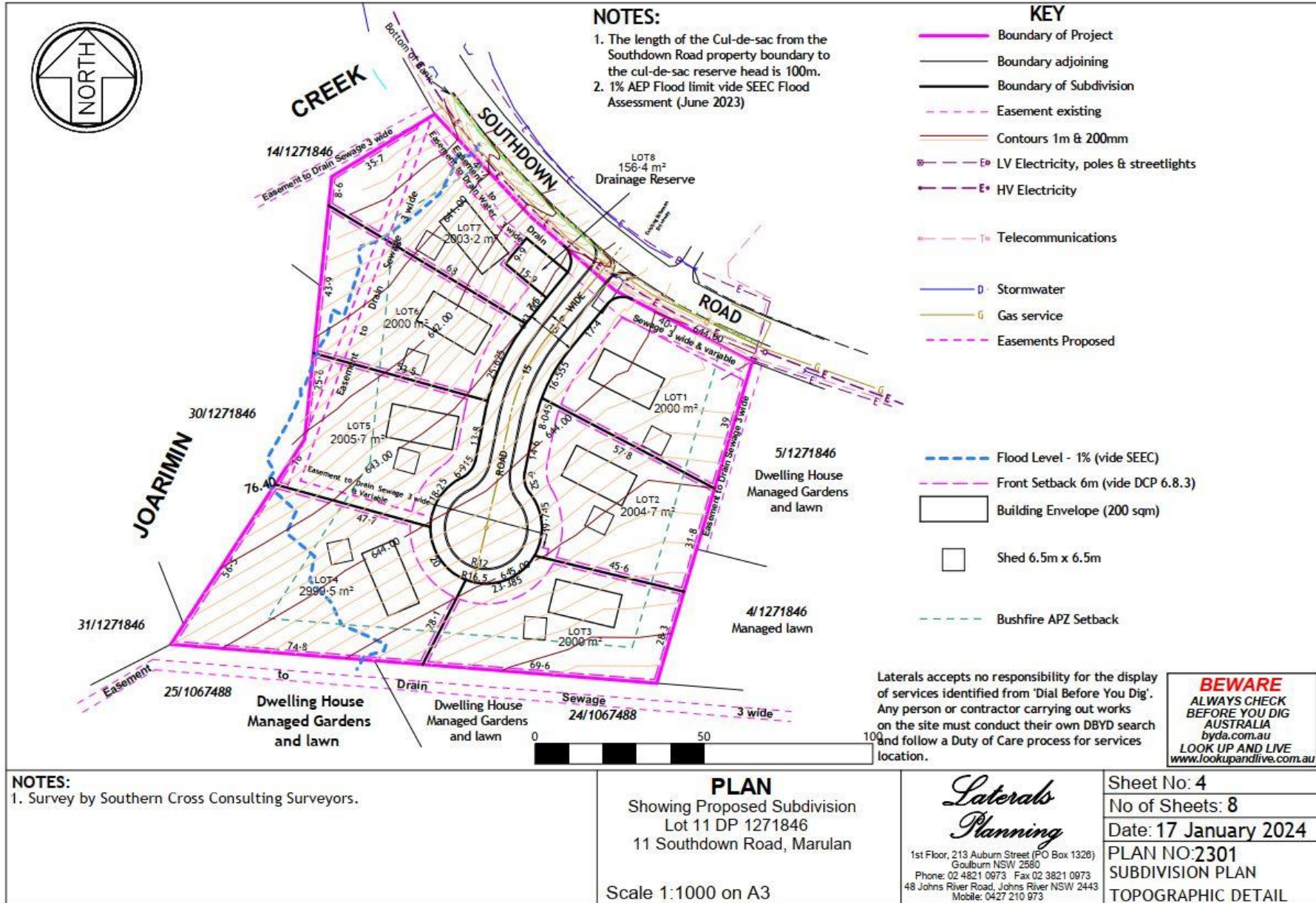


Figure 2: Proposed Development Layout. Sourced from Laterals Planning, 2024

3 SITE DETAILS

3.1 Location and General Conditions

The subject property (11 Southdown Road, Marulan) is a semi-rural property of approximately 1.7 Ha in area. It is located amongst existing semi-rural properties (see **Figure 1**). It is located approximately 2.2 km southeast of the main centre of Marulan.

3.2 Topography and Surface Drainage

The terrain within the proposed subdivision is described as moderately undulating. The subject watercourse is wide with a defined shallow erosion gully located wholly within the adjoining northern lots (Lots 14 & 30 DP 1271846). The watercourse flows in a north easterly direction and discharges into Jaorimin Creek, 1.2 km to the northeast and eventually into the Wollondilly River located approximately 8.8 km downstream of the property to the north. The closest pipe crossing within the watercourse is located under Southdown Road, which will likely have a backwater effect on flood levels adjacent to the site. **Figures 1 and 2** shows the site location and proposed development layout. Concept civil and stormwater drainage plans for the development have also been prepared by SEEC. Refer to drawings 23000043_P01_C000 to C702 (**Appendix 1**) for details.

3.3 Soils and Geology

The development site is located on the Bindook Road Soil landscape and has been described by Hird C., 1991, as part of the Goulburn 1:250,000 Sheet map and report. The Bindook Road Soil Landscape was formed in situ from alluvial-colluvial material derived from parent rock. It is also associated with pockets of Goodmans Ford Soil Landscapes (Hird C., 1991) in the northern areas. The site is located mainly within type 2b soil horizon consisting of yellow clay loams below fine sandy loam topsoils.

Topsoils are expected to experience moderate erodibility and subsoils moderate erodibility and moderate sheet erosion. They are expected to have neutral soil pH and moderate fertility. Note that site specific soil profile investigations has not been undertaken at the site to confirm this desktop assessment.

3.4 Climate and Erosion Potential

According to the Australian Bureau of Meteorology, the closest rainfall station to the site is Marulan (George St), Rainfall Station 70063), which receives a mean annual 716 mm of rainfall. Rainfall is evenly distributed throughout the year, but with a peak in February and trough in September. Evaporation is greater in late spring and summer. The mean annual temperate climate for Marulan ranges between a maximum temperature of 28.1°C and minimum temperature of 12.9°C.

The estimated R-Factor is 1,210 which is low and the site is relatively flat so the risk of rills forming is low. The estimated soil erodibility (K-factor) is 0.05 which is high and so the subsoils are potentially erodible. The Revised Universal Soil Loss Equation (RUSLE)

estimates that soil loss at this site would be 72 t/ha/yr¹ (Soil Loss Class 1 - Table 4.2 in Landcom, 2004), which is a low erosion hazard.

3.5 Biodiversity

The site is predominately grassed. There are no significant trees or vegetation located within the proposed development area at the time of inspection.

3.6 Salinity

No soil samples or testing for salinity were taken, however there were no visual signs of salinity at the time of inspection.

3.7 Governing Bodies Constraints and Opportunities

The site is within the Goulburn Mulwaree Council and Sydney Drinking Water Catchment area and must therefore accord with their guidelines, Local Environment Plans (LEPs) Development Control Plans (DCPs) and Current Recommended Practices (CRPs).

3.8 Existing Issues

At the time of the site inspection the property was in good condition, with no evident issues relating to water quality or soil erosion.

¹ Based on R-factor of 1,210, slope of 5%, slope length 80m, K-factor of 0.05, P-factor of 1.3 and C-factor of 1.

4 WATER CYCLE MANAGEMENT STUDY

4.1 Soil and Water Management During Construction

A construction phase Soil and Water Management Plan (SWMP) is to be prepared and issued to Council and WaterNSW with the construction drawings for the development. A concept Soil and Water Management Plan has been provided with the concept civil and stormwater drainage design plans. Refer to drawings 23000043_P01_C700 to C702 (**Appendix 1**) for details. Note that the erosion hazard at the subject site is low as previously discussed in Section 3.4. In accordance with Landcom, 2004, a sediment basin wouldn't be required as the potential soil loss is less than 200 tonnes/year. Note that also in the future, each development application on each new lot must be accompanied by a lot specific Erosion and Sediment Control Plan (ESCP) as described by Landcom, 2004. Chapter 9 of Landcom (2004) gives some generic examples.

The implementation of the SWMP or individual ESCP's must adhere to the guidelines and recommendations in Landcom, 2004 (The "Blue Book") and should include the following *generic* principles.

- Sediment fencing is to be used downslope of any construction area until works are complete (Standard Drawing SD 6-8, Landcom, 2004).
- Topsoil will be stripped from any construction areas and stockpiled following Standard Drawing SD 4-1 (Landcom, 2004) for later re-use.
- The upslope catchment length of exposed soil areas will be kept below 80m. Any slope length exceeding 80m will have a berm installed to direct overland flows onto well protected, vegetated lands.
- Construction traffic access is to be limited to the minimum required for efficient construction. Areas not essential for construction purposes are to be protected from traffic entry using a barrier and/or sediment fencing. **Table 1** contains details of access limitations during construction in accordance with Landcom (2004).
- While C-factors² are likely to rise to 1.0 during the work's program, they will not exceed those given in **Table 2**.
- Diversion berms will be used to divert "clean" runoff from upslope of any construction areas away. Discharges are to be put onto a stabilised, well-vegetated area, preferably using a level spreader or sill.
- Rapidly rehabilitate disturbed lands to bring C-factors down to acceptable levels (see **Table 2**) and minimise the risk of erosion.
- Areas of concentrated flow (e.g., drainage pathways, swales etc.) are to be protected using appropriate erosion control measures. We suggest a biodegradable Rolled Erosion Control Product (RECP) such as coconut fibre matting or jute matting to provide stable ground cover until vegetation regenerates.

² C-factor is a measure of ground cover. It is a value between 0.005 and 1, with lower values indicating better ground cover and higher values for exposed soil with no vegetation or erosion control measure in place. At a construction site, a C-factor of 0.1 can be achieved with 60% grass cover.

Table 1 - Limitations to access during construction works.

Land use	Limitation	Comments
Construction areas	Limited to 5 (preferably 2) metres from the edge of any essential construction activity as shown on the engineering plans	All site workers should clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope) or similar materials.
Access areas	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones on site. They can vary in position to best conserve existing vegetation and protect downstream areas while being considerate of the needs of efficient works activities. All site workers will clearly recognise these boundaries
Remaining lands, including re-veg areas	Entry prohibited except for essential management works	Thinning of growth might be necessary, for example, for fire reduction or weed removal

Table 2 - Maximum acceptable C-factors at nominated times during works.

Lands	Maximum C-factor	Remarks
Waterways and other areas subjected to concentrated flows (e.g., table drains), post construction	0.05	Applies after ten working days from completion of formation and before they are allowed to carry any concentrated flows. Flows will be limited to those shown in Table 5.2 of Landcom (2004). Foot and vehicular traffic will be prohibited in these areas
Stockpiles, post construction	0.10	Applies after ten working days from completion of formation. Maximum C-factor of 0.10 equals 60% ground cover
All lands, including waterways and stockpiles during construction	0.15	Applies after 20 working days of inactivity, even though works might continue later. Maximum C-factor of 0.15 equals 50% ground cover
All lands post construction	0.1/0.05	0.1 applies after 10 days of works finish and can be achieved by 60 percent ground cover. 0.05 applies after 60 days and can be achieved with 70 percent ground cover.

4.2 Production, Management and Disposal of Wastes

4.2.1 Domestic Waste

Waste and recycling bins would be provided for the proposed dwellings with regular collection by a waste services contractor.

4.2.2 Domestic Effluent Disposal

The site would be serviced by a reticulated sewerage scheme. There is currently insufficient capacity within the existing Marulan system and it is understood that Council is currently working on upgrading the exiting sewerage scheme to accept the new development zonings and approvals would be granted for subdivisions, but development of individual lots would be on hold until the upgraded sewerage scheme is up and running.

4.3 Land Surface Changes

Moderate cut and fill would be required to construct the internal access road and bioretention basin, and to establish building pads for the proposed dwellings. A balanced approach must be undertaken to ensure the amount of imported soil required is kept to a minimum. Exposed soils must be seeded or turfed as soon as practical to minimise the erosion risk on this site.

4.4 Pre vs Post Assessment of Stormwater Quality

The proposed future land use at this site will lead to an increase in stormwater discharge and pollutant production due to increased runoff from impervious surfaces. This report addresses the subdivision works only. All future development on individual lots would be subject to separate development approvals and meet Councils current Development Controls and engineering guidelines.

Section 5 of this report contains a MUSIC modelling that shows how a neutral or beneficial effect on water quality can be achieved with the adoption of appropriate mitigation measures.

4.5 Development In Relation to Flooding

The site is located adjacent to an existing intermittent watercourse that is part of the Jaorimin Creek catchment as described in the Goulburn Mulwaree Council "*Marulan Flood Study Final Report – June 2023*". The site is partially affected by the 1% AEP flood extents along the edge of the intermittent watercourse (Lots 6 and 7) and Lot 4 is affected by a minor overland flow path coming from the south. Refer to the accompanying Preliminary Flood Assessment also prepared by SEEC (report reference 23000043-FS01 REV01) that specifies the adjacent 1% AEP flood levels and recommendations for flood planning levels of future dwellings floor levels.

4.6 Stormwater Management (Subdivision Stage)

Site stormwater is to be managed in accordance with the Concept Civil and Stormwater Drainage Plans in **Appendix 1** and as outlined in the following section. All stormwater drainage calculations have been undertaken using DRAINS urban stormwater drainage

modelling software using the current Australian Rainfall & Runoff (ARR 2019) requirements.

4.6.1 New Internal Access Road Drainage System

A new piped trunk stormwater drainage system is to be constructed within the proposed internal access roadway. The piped system is to be designed to convey the minor 0.2 EY storm event (5 year Average Recurrence Interval (ARI)) with allowance for overland flows up to the 1% Annual Exceedance Probability (AEP) (100 year ARI) within the road reserve roll kerb and gutters. All stormwater run-off from the internal road is to drain to the proposed bioretention basin.

4.6.2 On-site Detention

Approximately 50m³ of on-site detention storage is required and is to be provided within the proposed bioretention basin above the extended detention depth requirement for the bioretention basin.

4.6.3 Bioretention Basin

A Bioretention basin with a filter bed area of 130m² is required to capture run-off from the new internal access road and cul-de-sac.

The bioretention basin will be design and built to the requirements of the latest version of FAWB (2015) and WaterNSW Using MUSIC in Sydney Drinking Water Catchment (2023), in summary, it will have the following properties (**Figure 3**):

- have a gravel mulch surface;
- be planted with spiky, native, moisture-tolerant, plants such as Carex sp. and Juncus sp.;
- the basin will have a 500mm thick filtration zone;
- the basin to have a 100mm thick transition layer;
- the basin to have a 200mm thick , gravel anaerobic zone at the base;
- the basin to have a grated high-flow outlet set 200 mm above the surface (extended detention depth); and
- drain via subsoil drainage pipes to the proposed stormwater drainage system within the internal road (See Concept Civil and Stormwater Drainage Plans – **Appendix 1**).

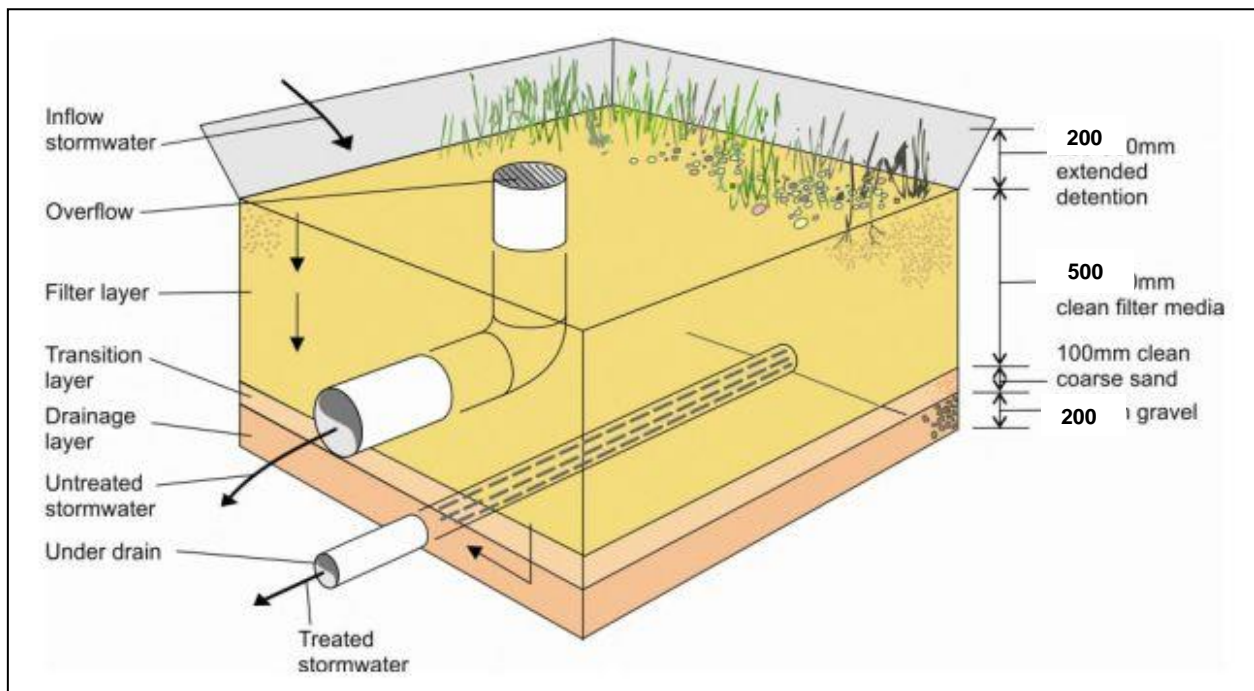


Figure 3: Typical Section Bioretention Basin (FAWB 2015)

Bioretention Basin Media Specification

The filtration media will be well-graded loamy sand with:

- Hydraulic conductivity (ASTM F1815-06) between 250 and 300 mm/hour
- pH between 5.5 and 7.5
- Organic content less than 5 percent
- Electrical conductivity less than 1.2 dS/m
- Orthophosphate content less than 20 mg/kg
- Total nitrogen content <400 mg/kg

Subject to adequate hydraulic conductivity the following particle size distribution is a guide:

Clay and silt	< 3%	(<0.05 mm)
Very fine sand	5-30%	(0.05 - 0.15 mm)
Fine sand	10-30%	(0.15 - 0.25 mm)
Med-Coarse sand	40-60%	(0.25 - 1.0 mm)
Coarse sand	7-10%	(1.0 - 2.0 mm)
Fine gravel	<3%	(>2.0 mm)

The filtration media will be compacted with one pass of a vibratory plate compacter or drum roller.

The transition layer shall be clean, well-graded sand containing little or no clay and silt (<2%). D15 of the transition layer must be <5 x D85 of the filter media.

The drainage layer shall be 2 - 7 mm washed screenings with <2% silt and clay.

4.7 Stormwater Management (Lot Specific Development Stage)

The development of each individual lot for the construction of dwellings, sheds, driveways and other hardstand areas would be subject to a separate NorBE and stormwater drainage assessment in accordance with Council and Water NSW requirements and submitted to Council with each separate development or complying development application.

All stormwater drainage from individual lots to incorporate a rainwater harvesting tank and overflows connected into the proposed internal road drainage system or lots downstream of internal road are to discharge onto a level spreader or on-site disposal/absorption trench.

4.8 Monitoring and Maintenance

4.8.1 Stormwater Pits and Pipes

Drainage problems are usually caused by obstructions of pit grates, pit baskets and blockages within the underground stormwater pipes. These obstructions are often caused by tree roots that have grown into the pipe or debris that has been washed down the pipe. To rectify these problems a plumber or other approved contractor should be engaged to investigate the problem and, if necessary, clean blocked pits, baskets and clear/replace pipes.

The stormwater pit and pipe shall be inspected after significant rain (rainfall that causes run-off), quarterly or if ponding/surcharging of pits has been observed.

4.8.2 Bioretention Basin

Bioretention basins will require the following maintenance actions.

- The bioretention basin will be regularly checked for erosion and will involve checking the condition of vegetation.
- Any choked areas will be cleaned to ensure they maintain an effective runoff/infiltration balance.
- Any bare areas or vegetative die-off will be rapidly rehabilitated.
- If water ponds on the surface of the bioretention basin for more than 24 hours after rainfall:
 - the subsoil drainage pipe will be inspected/cleared; and (if clear); and
 - the permeability of the system will be checked by a geotechnical engineer or soil scientist. If the filter media is clogged it will require replacement.

4.8.3 Operational Environmental Management Plan

An Operational Environmental Management Plan (OEMP) will be provided prior to the occupation certificate stage for approval by WaterNSW that details the proposed stormwater management maintenance schedule and actions.

5 MUSIC MODELLING

Pre and post development sediment and pollutant loads were estimated using MUSIC (Model for Urban Stormwater Improvement Conceptualisation), developed by eWater. MUSIC contains algorithms based on the known performance characteristics of common stormwater quality improvement structures used in Australia. This data is derived from research undertaken by eWater and others.

The modelling quantifies the loads of the principal pollutants before and after the development. Statistics are produced in MUSIC for the following parameters:

- Flow (ML/yr)
- Peak Flow (m³/s) (although this is not used in a NorBE assessment)
- TSS - Total Suspended Solids (kg/yr)
- TP - Total Phosphorus (kg/yr)
- TN - Total Nitrogen (kg/yr)
- Gross Pollutants (kg/yr)

5.2 MUSIC Modelling Inputs

5.2.1 Climate Data

Creation of a MUSIC catchment file requires an associated meteorological data file representative of the catchment area. The data used here is "Zone 1" data (WaterNSW, 2023b). Basic rainfall and evapotranspiration statistics are in Table 3 and the time-series graph is in Figure 4.

Table 3 - Rainfall and PET Statistics for WaterNSW Zone 1 (WaterNSW, 2023b).

Measure	Statistics						
	mean	median	maximum	minimum	10%ile	90%ile	mean annual (mm)
Rainfall (mm/6-minute steps)	0.008	0	12.5	0	0	0	721
Potential evapotranspiration (mm/day)	2.966	2.60	4.81	1.23	1.29	4.52	1083

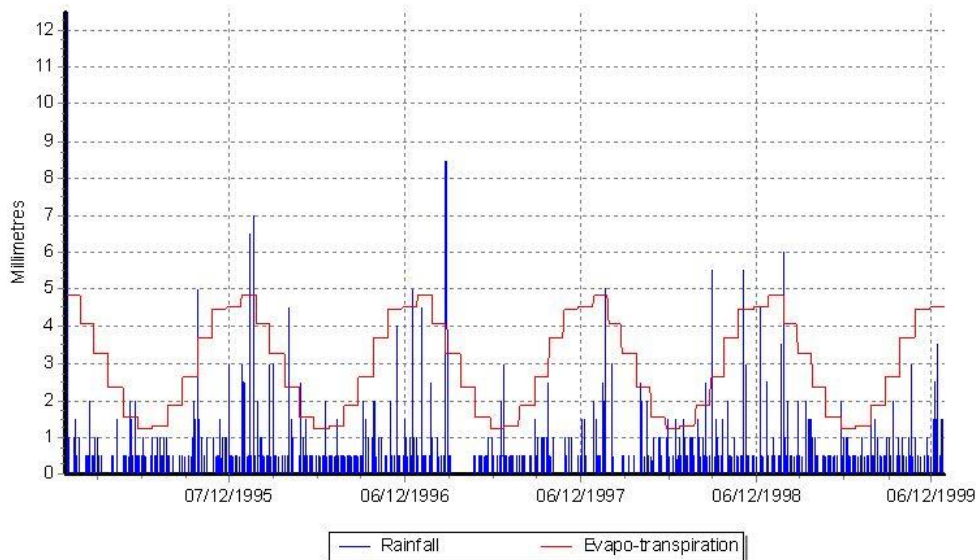


Figure 4 - Time Series Graph for WaterNSW Zone 1 data set (WaterNSW, 2023b)

5.2.2 Model Parameters

Table 4 presents the event mean concentrations (EMCs) of various surfaces and land uses. These are the defaults in MUSIC for the various land uses represented as source nodes.

Table 4 - Event Mean Concentrations (Storm Flow)

Source Node	TSS mean (log mean)	TSS std dev (log std dev)	TP mean (log mean)	TP std dev (log std dev)	TN mean (log mean)	TN std dev (log std dev)
Rural Residential	89.12 (1.95)	2.1 (0.32)	0.21 (-0.66)	1.8 (0.25)	2 (0.30)	1.55 (0.19)
Urban Residential	141.25 (2.15)	2.1 (0.32)	0.25 (-0.60)	1.8 (0.25)	2 (0.30)	1.55 (0.19)
Sealed Roads	269.15 (2.43)	2.1 (0.32)	0.50 (-0.30)	1.8 (0.25)	2.18 (0.34)	1.55 (0.19)

The pervious area characteristics for each source node have been calibrated based on a clay loam soil with a 0.5 m rooting depth (WaterNSW, 2023b). Adopted runoff parameters are shown in Table 5. The MUSIC schematic for development is shown in Figure 6.

Table 5 - Pervious area parameters used in MUSIC

Parameter	Value
Soil storage capacity	119 mm
Initial storage	30 mm
Field capacity	99 mm
Infiltration capacity coefficient	180 mm/day
Infiltration capacity exponent	3
Groundwater initial depth	30 mm
Daily recharge rate	25%
Daily baseflow rate	25%
Daily deep seepage rate	0%

5.2.3 Pre-development Modelling Assumptions

Pre-development modelling is based on a total catchment area of 0.74 ha modelled with a rural residential land node as in Tables 4 and 5 with a 1 % impervious catchment area.

5.2.4 Post-development Modelling Assumptions

Post-development modelling is based on the following assumptions:

- The plan described in Section 4 and attached in **Appendix 1** is implemented.
- The proposed road reserve area of 0.19 ha (60% impervious) is to drain to the proposed bioretention basin with a filter area of 130m².
- The undeveloped remaining urban curtilage area of 0.55 ha (0% impervious) would also drain to the bioretention basin

Figure 5 shows the schematic of the MUSIC model.

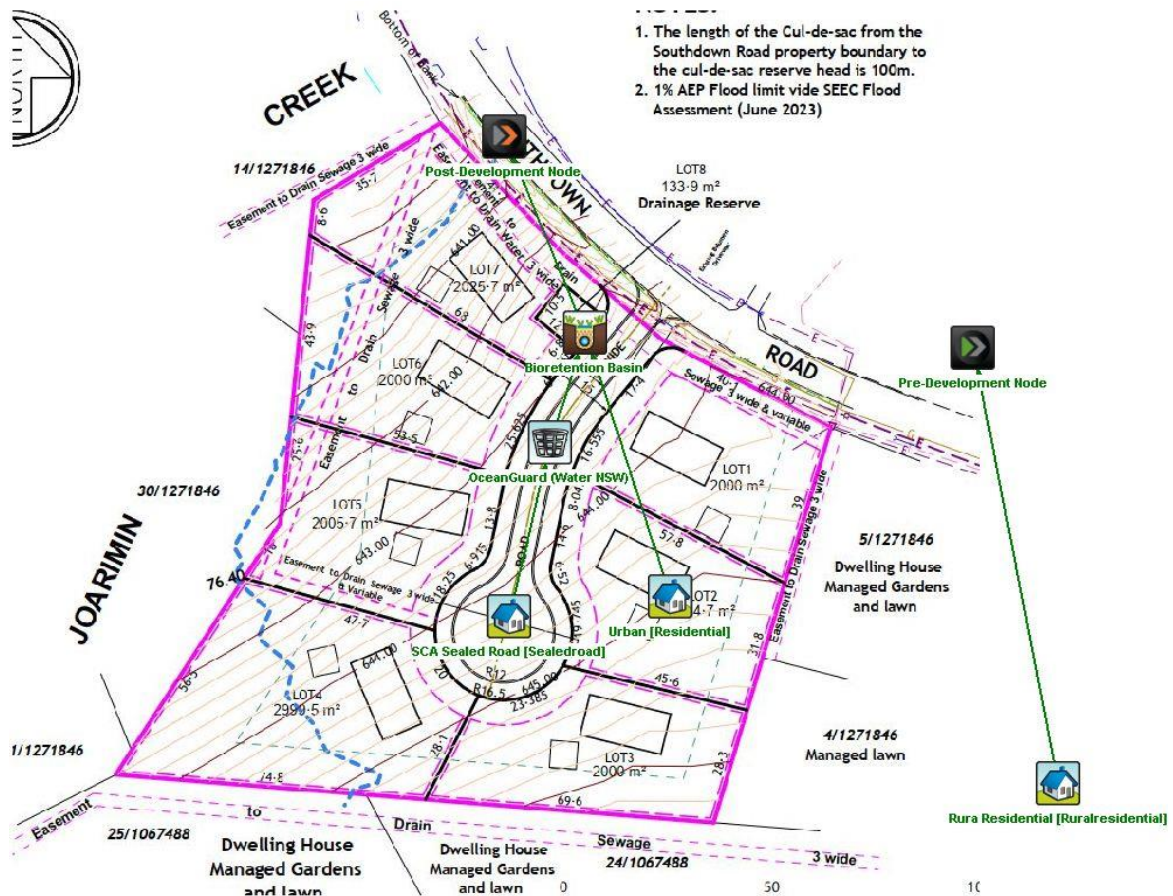


Figure 5 – MUSIC Model Schematic

5.3 Modelling Results

5.3.1 Mean Annual Loads

Table 6 presents the results of the modelling for the development. It shows the proposed treatment system would improve the existing mean annual loads of sediment and nutrients in water leaving the site.

Table 6 – MUSIC results - Mean Annual Loads (Generated by eWater)

	Inflow	
	Pre	Post
Flow (ML/yr)	0.498	0.817
Total Suspended Solids (kg/yr)	40.4	4.45
Total Phosphorus (kg/yr)	98.1E-3	27.5E-3
Total Nitrogen (kg/yr)	0.905	0.573
Gross Pollutants (kg/yr)	0.180	0.00

5.3.2 Pollutant Concentrations

To demonstrate neutral or beneficial effect, the post-development pollutant concentrations need to be less than or equal to the pre-development concentrations between (at least) 50 and 98 percent of the time. **Figure 6** to **Figure 7** show the TP and TN graphs for pollutant concentrations in both pre and post (treated) development scenarios. NorBE is met in both cases.

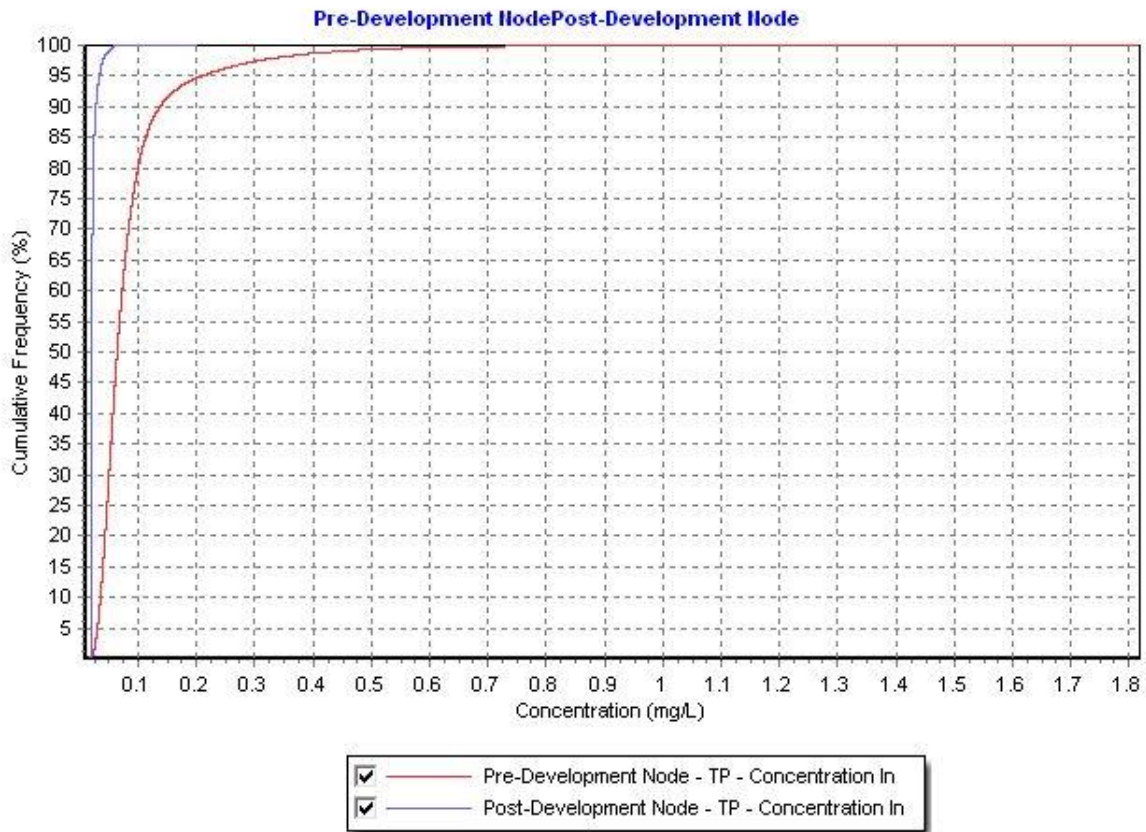


Figure 6 - Total Phosphorous Concentration Graph

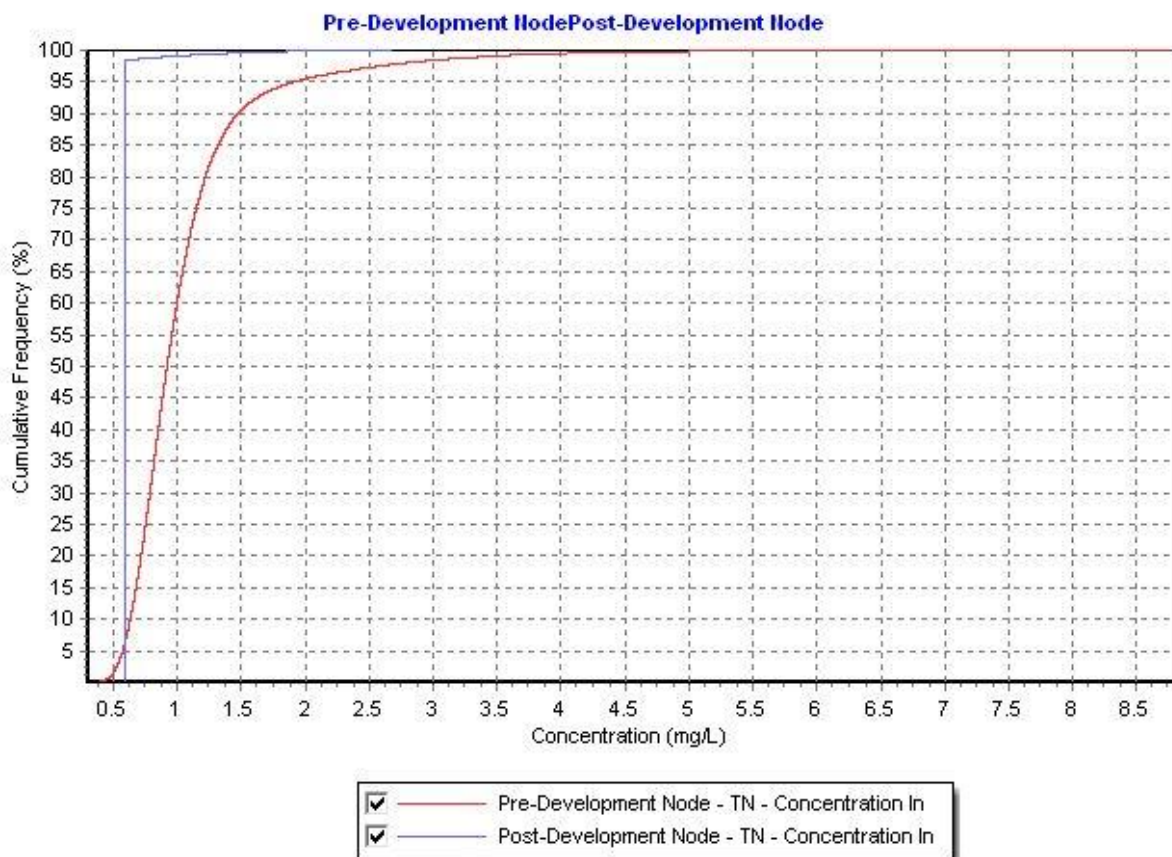


Figure 7 - Total Nitrogen Concentration Graph

6 CONCLUSIONS

The results of the MUSIC modelling demonstrate that a beneficial effect can be achieved, providing the proposed Water Cycle Management Plan (**Section 4**) is implemented. Without these specific measures, the development could potentially have a negative impact on water quality. The plan includes a set of long-term maintenance strategies to ensure that the effectiveness of the proposed measures provides ongoing benefits for water quality.

Section 4 of this report details the measures required to achieve a neutral or beneficial effect. We recommend that this plan be implemented in full, as it provides an integrated management strategy for water quality control.

7 REFERENCES

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8 APPENDICES

8.1 Appendix 1 – Concept Civil and Stormwater Drainage Plans (over-page)

(Drawings 23000043_P01_C000 to C702)

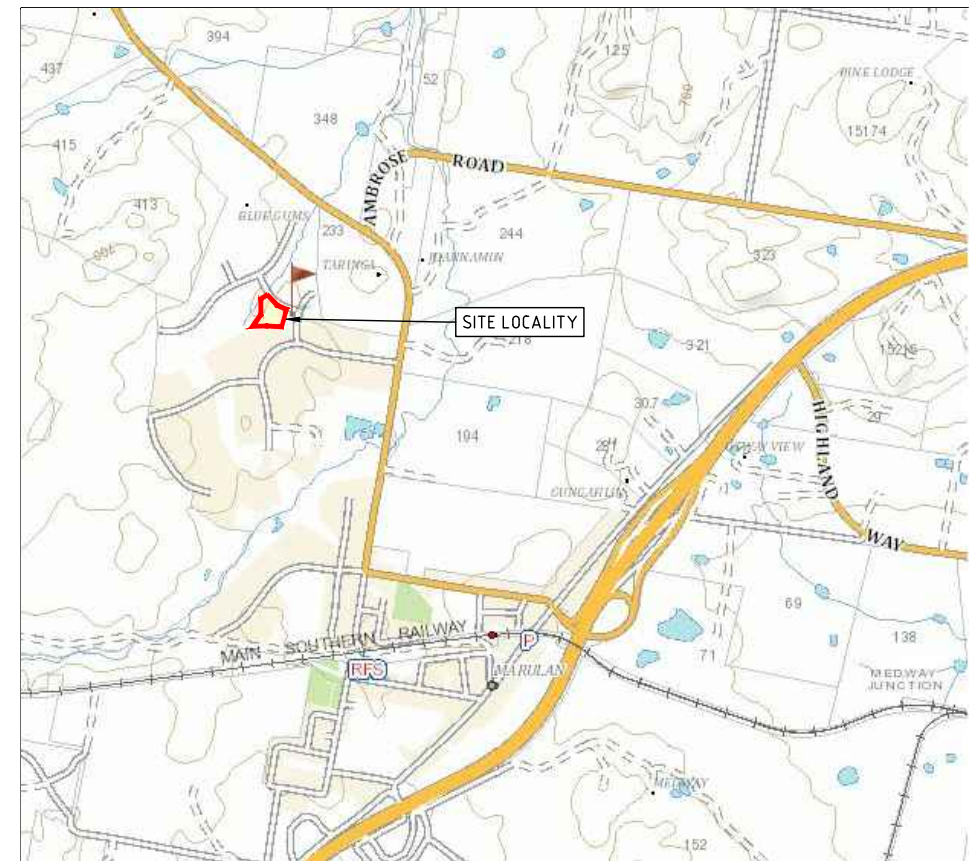
PROPOSED RESIDENTIAL SUBDIVISION

3 SOUTHDOWN ROAD, MARULAN NSW

CONCEPT CIVIL & STORMWATER PLANS

DRAWING SCHEDULE

DRAWING NUMBER	DRAWING TITLE
C000	TITLE SHEET, DRAWING SCHEDULE & SITE LOCALITY PLAN
C100	CONCEPT SITE GENERAL ARRANGEMENT PLAN
C200	CONCEPT ROAD LAYOUT & LONGITUDINAL SECTION
C300	CONCEPT ROAD TYPICAL CROSS-SECTION & STANDARD DRAWINGS
C301	CONCEPT ROAD CROSS-SECTION SHEET
C400	CONCEPT STORMWATER DRAINAGE PLAN
C401	CONCEPT STORMWATER DRAINAGE CATCHMENT PLAN & 'DRAINS' MODEL LAYOUT & RESULTS
C500	CONCEPT WATER QUALITY ASSUMPTIONS & BIORETENTION BASIN DETAILS
C501	CONCEPT NorBE ASSESSMENT & MUSIC MODEL LAYOUT
C502	CONCEPT WATER QUALITY MAINTENANCE/MANAGEMENT CHECKLISTS
C600	CONCEPT CUT/FILL PLAN & SUMMARY
C700	CONCEPT SOIL & WATER MANAGEMENT SITE ARRANGEMENT
C701	CONCEPT SOIL & WATER MANAGEMENT STANDARD DRAWINGS & NOTES (PAGE 1 OF 2)
C702	CONCEPT SOIL & WATER MANAGEMENT STANDARD DRAWINGS & NOTES (PAGE 2 OF 2)



LOCALITY PLAN
N.T.S

DOCUMENT CERTIFICATION

This plan has been developed based on agreed requirements as understood by SEEC at the time of engagement. It applies only to a specific task on the nominated lands. Other interpretations should not be made, including changes in scale or application to other projects. Changes to the project scope or extent might impact on the validity of this plan.

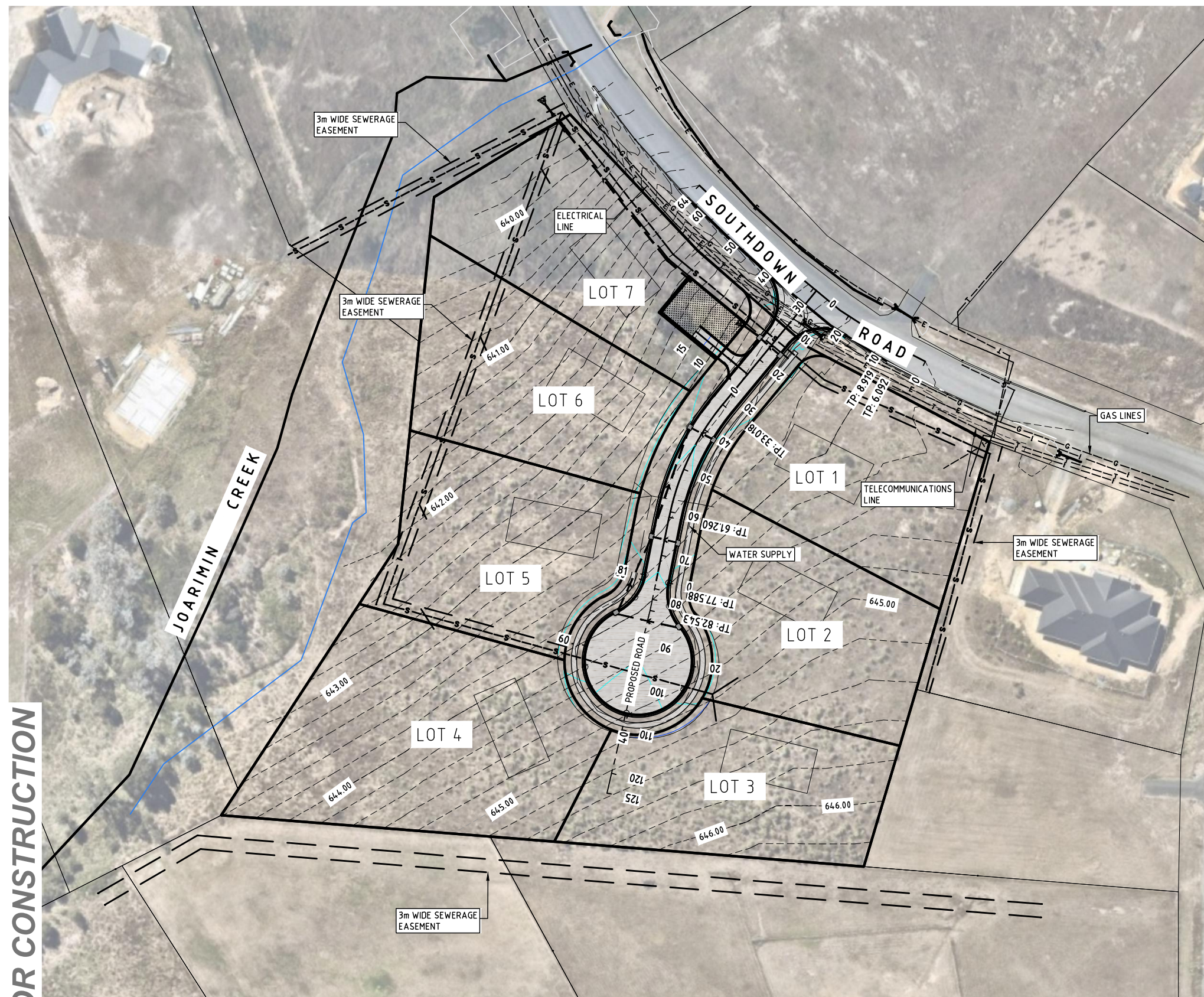
Any recommendations contained in this plan are based on an honest appraisal of the opportunities and constraints that existed at the site at the time of investigation, or as advised to us. Such recommendations are potentially subject to the limited scope and resources available.

NOT FOR CONSTRUCTION

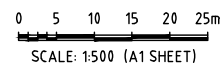


REV	DATE	DES.	DRN.	APP.	REVISION DETAILS	DRAWING STATUS	North	CLIENT	PROJECT TITLE	DRAWING TITLE								
						DESIGN BY: R.B. DRAWN BY: R.B. FINAL APPROVAL: J.A. SCALE: (on A1 Original) NOT TO SCALE		KEITH ALLEN LATERALS PLANNING	 Suites 7 & 8, 68-70 Station Street PO Box 1098, Bowral NSW 2576. (t) 02 4862 1633 (f) 02 4862 3088 email: reception@seec.com.au WWW.SEEC.COM.AU	PROPOSED RESIDENTIAL SUBDIVISION LOT 11 DP1271846 3 SOUTHDOWN RD, MARULAN NSW	TITLE SHEET, DRAWING SCHEDULE & SITE LOCALITY PLAN							
00	24/01/24	R.B.	R.B.	J.A.	FOR APPROVAL	DA												
B	17/01/24	R.B.	R.B.	J.A.	DRAFT ISSUE - REVISED CUL-DE-SAC DESIGN													
A	28/07/23	R.B.	R.B.	J.A.	DRAFT ISSUE - FOR REVIEW													
<table border="1" style="float: right; border-collapse: collapse;"> <thead> <tr> <th>PROJECT NO.</th> <th>SUB-PR NO.</th> <th>DRAWING NO.</th> <th>REV</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">23000043</td> <td style="text-align: center;">P01</td> <td style="text-align: center;">C000</td> <td style="text-align: center;">00</td> </tr> </tbody> </table>											PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV	23000043	P01	C000	00
PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV															
23000043	P01	C000	00															

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CONCEPT SITE GENERAL ARRANGEMENT PLAN



STORMWATER DESIGN SUMMARY

GENERAL

- IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE SUPERINTENDENT OF ANY DISCREPANCIES IN THE DOCUMENTS PRIOR TO CARRYING OUT THE WORKS.
- THESE DRAWINGS ARE FOR DEVELOPMENT APPLICATION PURPOSES ONLY. FULL CONSTRUCTION STORMWATER DRAINAGE PLANS ARE TO BE UNDERTAKEN AFTER THE DA HAS BEEN APPROVED AND PRIOR TO CONSTRUCTION.
- ALL WORKMANSHIP AND MATERIALS SHALL COMPLY WITH THESE DRAWINGS AND THE APPROPRIATE CURRENT AUSTRALIAN STANDARDS.
- THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL SPECIFICATIONS AND SUPPORTING DOCUMENTATION.
- EXACT DIMENSIONS AND CONFIGURATION TO BE ESTABLISHED ON SITE. DESIGNED BATTERS SHALL BE SMOOTHLY TRANSITIONED TO CONNECT TO EXISTING SLOPES.
- ALL NEW WORKS ARE TO JOIN NEATLY TO EXISTING.
- DIMENSIONS SHALL NOT BE OBTAINED BY SCALING THE DRAWINGS. CONSTRUCT AS PER DIMENSIONS, SETOUT POINTS AND REFERENCE LEVELS NOTED ON THE DRAWINGS.
- THE CONTRACTOR'S ENGINEER IS TO UNDERTAKE INSPECTIONS DURING CONSTRUCTION TO ENSURE CONSTRUCTION IS IN ACCORDANCE WITH THE DRAWINGS. THE ENGINEER IS TO PROVIDE AN INSPECTION CERTIFICATE.
- THESE DRAWINGS HAVE BEEN PREPARED BASED ON DRAWINGS FROM LATERALS PLANNING WITH SURVEY DATA BEING PROVIDED ON THESE DRAWINGS. LIDAR HAS ALSO BEEN IMPORTED TO ESTIMATE EXTERNAL CATCHMENTS TO THE SITE.
- ALL LEVELS ARE IN METRES TO AUSTRALIAN HEIGHT DATUM (AHD).
- ALL COORDINATES ARE BASED ON AN ASSUMED DATUM.
- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING ANY WORKS.
- A DIAL BEFORE YOU DIG (DBYD) HAS NOT BEEN UNDERTAKEN AS PART OF THE DESIGN SHOWN. THE CONTRACTOR IS RESPONSIBLE TO CONFIRM THE DEPTH AND LOCATION OF ALL OBSTRUCTIONS AND UNDERGROUND SERVICES IN THE VICINITY OF THE WORKS PRIOR TO THE COMMENCEMENT OF ANY WORKS.
- ALL REASONABLE EFFORT SHALL BE MADE TO PRESERVE AND PROTECT EXISTING VEGETATION.
- ALL CHANGES PROPOSED TO WORKS DURING THE CONSTRUCTION PHASE WHICH DIFFER TO THAT SHOWN ON THE APPROVED DRAWING SET MUST BE APPROVED IN WRITING BY THE DESIGN ENGINEER.

STORMWATER GENERAL

- ALL PIPES TO HAVE MIN 300mm COVER IF LOCATED WITHIN PROPERTY.
- ALL WORK DO BE DONE IN ACCORDANCE WITH AS/NZ 3500.3, THE BUILDING CODE OF AUSTRALIA (BCA), AND COUNCIL SPECIFICATIONS.

LOCATION OF STRUCTURES

- THE LOCATION OF STRUCTURES SHOWN INDICATE THE POSSIBLE ARRANGEMENT OF STORMWATER AND WATER QUALITY CONTROL DEVICES THAT WOULD SATISFY COUNCIL REQUIREMENTS.
- FLOOR LEVELS OF ALL BUILDINGS TO BE SET A MINIMUM OF 300mm ABOVE ANY ADJACENT OVERLAND FLOW PATHS.

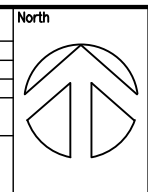
STORMWATER DESIGN

- THE PROPOSED STORMWATER SYSTEM DESIGN, STRUCTURES AND MANAGEMENT IS TO BE IN ACCORDANCE WITH GOULBURN MULWAREE COUNCIL DESIGN SPECIFICATIONS & ENGINEERING STANDARDS.
- ON-SITE DETENTION** - 50m³ OF ON-SITE DETENTION HAS BEEN PROVIDED IN BIORETENTION BASIN 1.
- MANAGEMENT & MAINTENANCE** - ALL STORMWATER MANAGEMENT STRUCTURES INCLUDING ROOF GUTTERS, TANKS, PIT & PIPE SYSTEMS ARE TO BE FREQUENTLY INSPECTED AND CLEARED OF SEDIMENT & DEBRIS TO REDUCE THE RISK OF BLOCKAGE & OVERFLOW DURING RAINFALL EVENTS.



REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
00	24/01/24	R.B.	R.B.	J.A.	FOR APPROVAL
B	17/01/24	R.B.	R.B.	J.A.	DRAFT ISSUE - REVISED CUL-DE-SAC DESIGN
A	28/07/23	R.B.	R.B.	J.A.	DRAFT ISSUE - FOR REVIEW

DRAWING STATUS	
DESIGN BY	R.B.
DRAWN BY	R.B.
FINAL APPROVAL	J.A.
SCALE:	1:500
(on A1 Original)	
DA	



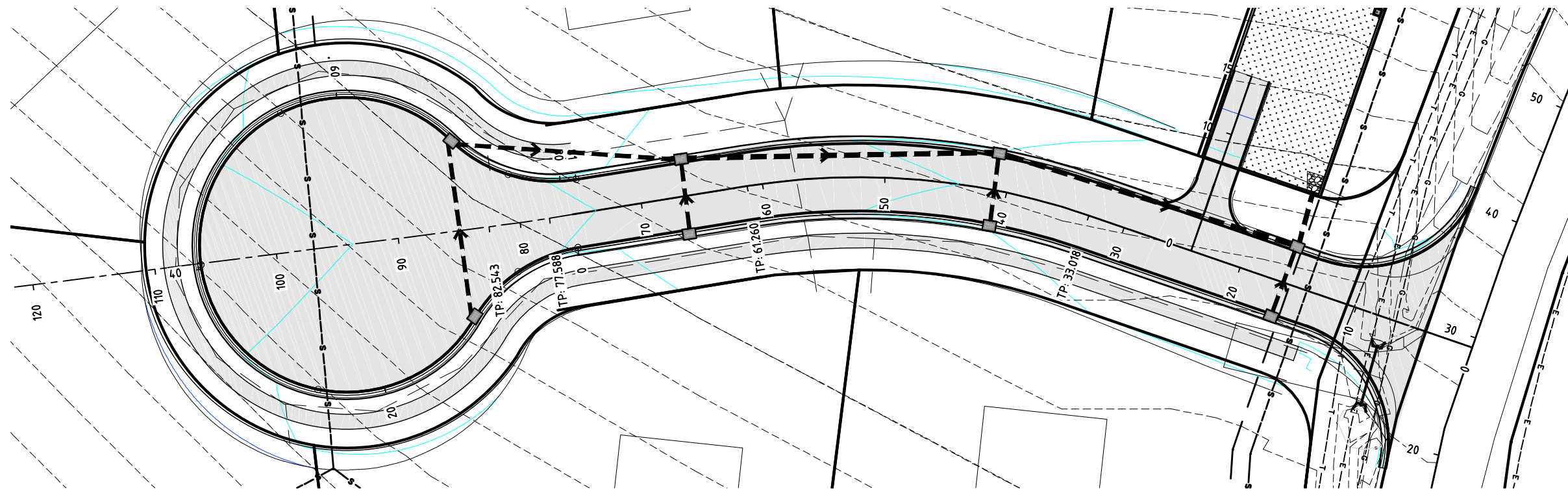
CLIENT
**KEITH ALLEN
LATERALS PLANNING**

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PO Box 1098, Bowral NSW 2576.
(t) 02 4862 1633
(f) 02 4862 3088
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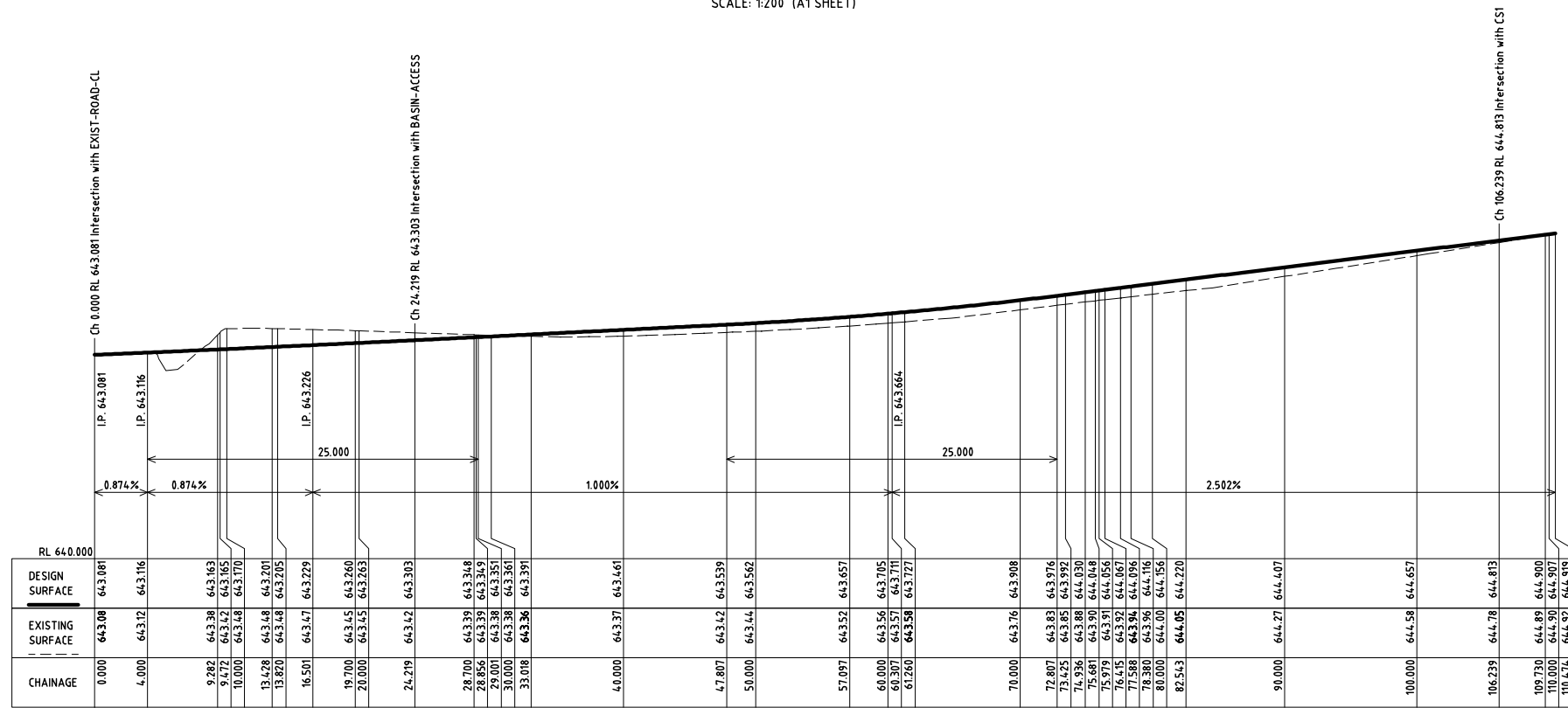
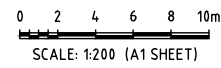
PROJECT TITLE
**PROPOSED RESIDENTIAL SUBDIVISION
LOT 11 DP1271846
3 SOUTHDOWN RD,
MARULAN NSW**

DRAWING TITLE CONCEPT SITE GENERAL ARRANGEMENT PLAN			
PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
23000043	P01	C100	00

NOT FOR CONSTRUCTION

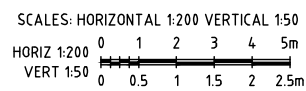


CONCEPT ROAD LAYOUT



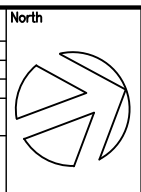
CONCEPT ROAD LONGITUDINAL SECTION

CH 0.000 TO CH 110.474



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DRAWING STATUS	
DESIGN BY	R.B.
DRAWN BY	R.B.
FINAL APPROVAL	J.A.
SCALE:	AS SHOWN
(on A1 Original)	
DA	



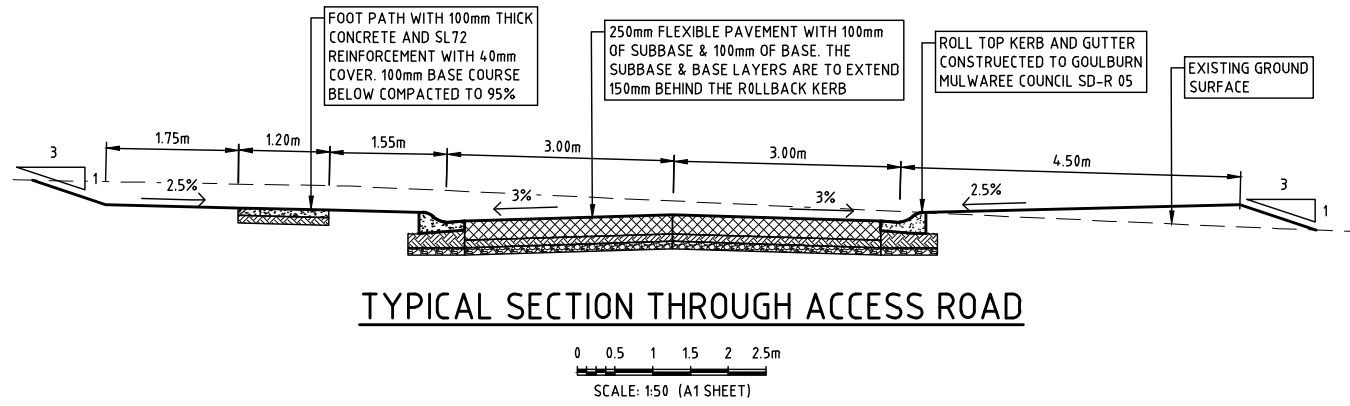
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PROJECT TITLE
**PROPOSED RESIDENTIAL SUBDIVISION
LOT 11 DP1271846
3 SOUTHDOWN RD,
MARULAN NSW**

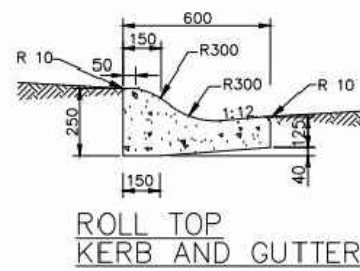
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CONCEPT ROAD LAYOUT & LONGITUDINAL SECTION			
PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
23000043	P01	C200	00

NOT FOR CONSTRUCTION



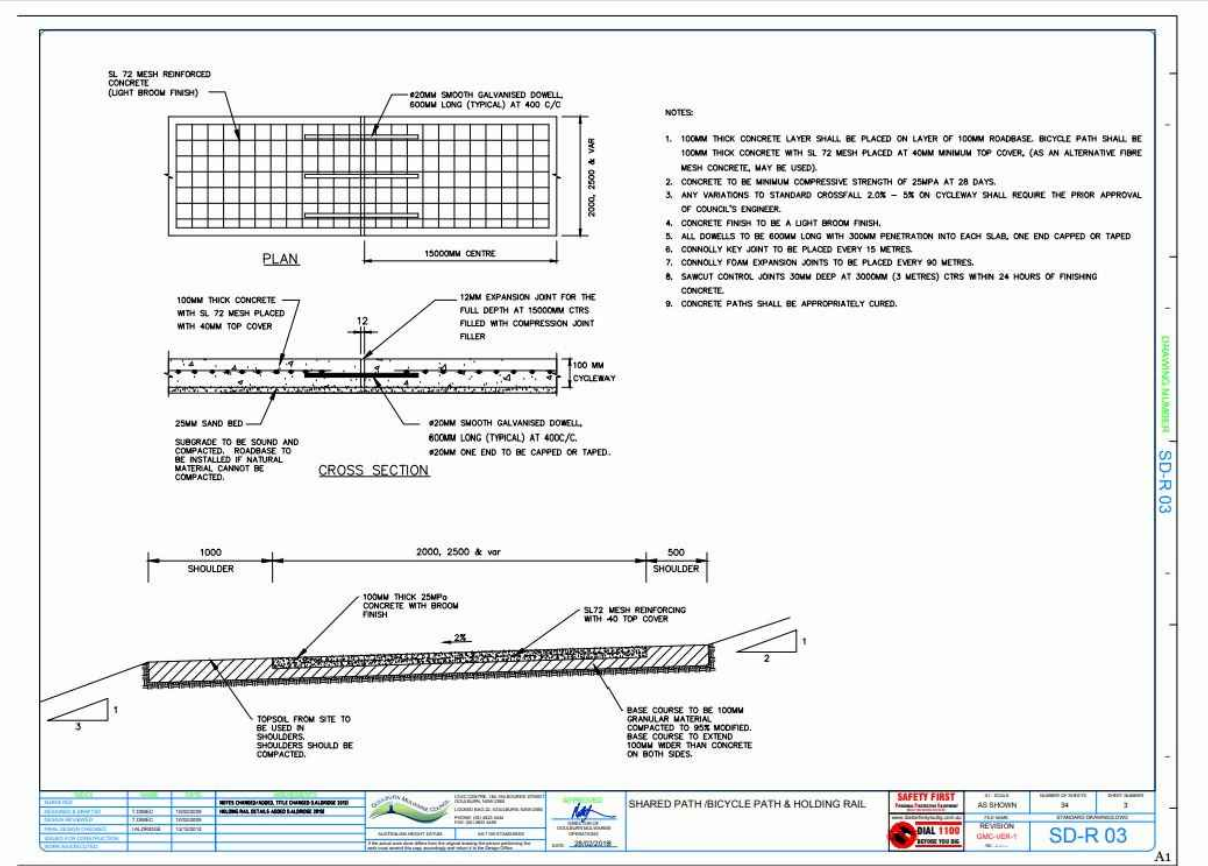
TYPICAL SECTION THROUGH ACCESS ROAD

0 0.5 1 1.5 2 2.5m
SCALE: 1:50 (A1 SHEET)



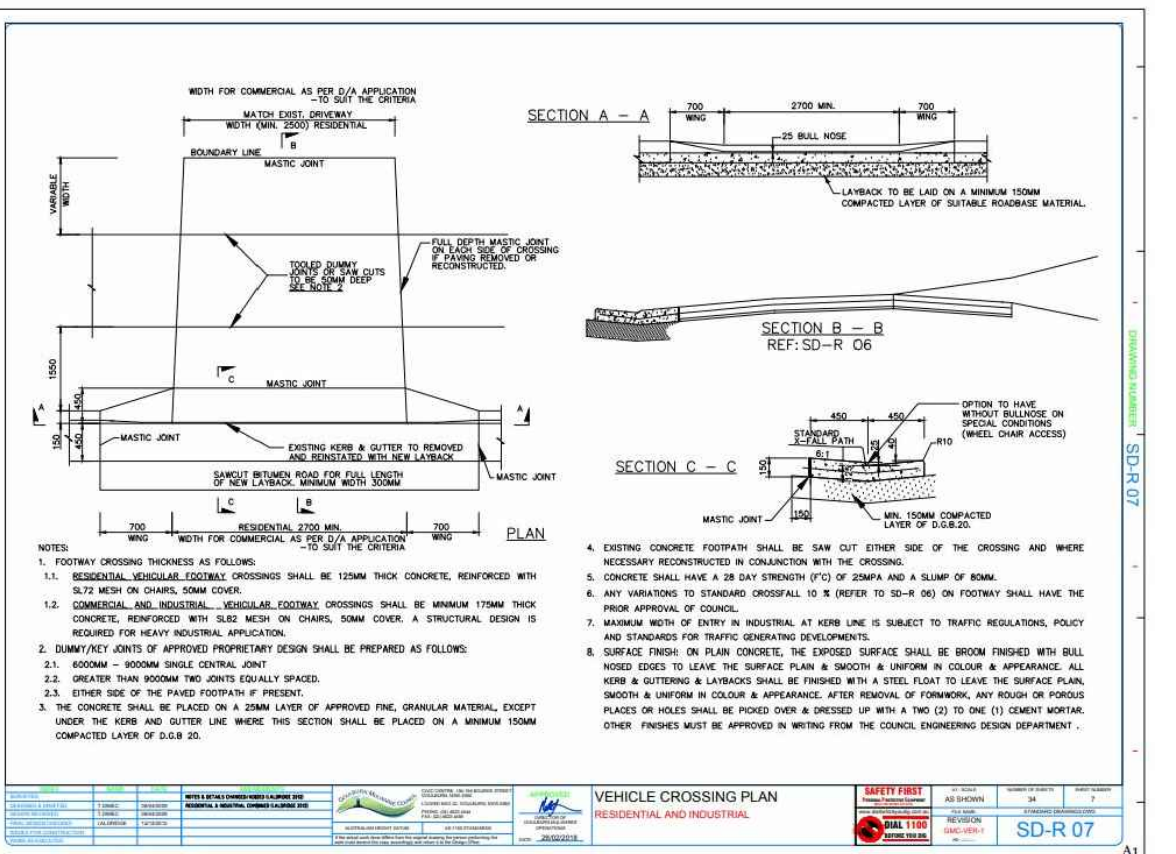
ROLL TOP KERB AND GUTTER

SD-R 05
NOT TO SCALE



SHARED PATH (BICYCLE PATH & HOLDING RAIL)

SD-R 03



VEHICLE CROSSING PLAN
RESIDENTIAL AND INDUSTRIAL

SD-R 07

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
00	24/01/24	R.B.	R.B.	J.A.	FOR APPROVAL
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A	28/07/23	R.B.	R.B.	J.A.	DRAFT ISSUE - FOR REVIEW

DRAWING STATUS	
DESIGN BY	R.B.
DRAWN BY	R.B.
FINAL APPROVAL	J.A.
SCALE:	AS SHOWN
(on A1 Original)	
DA	

North

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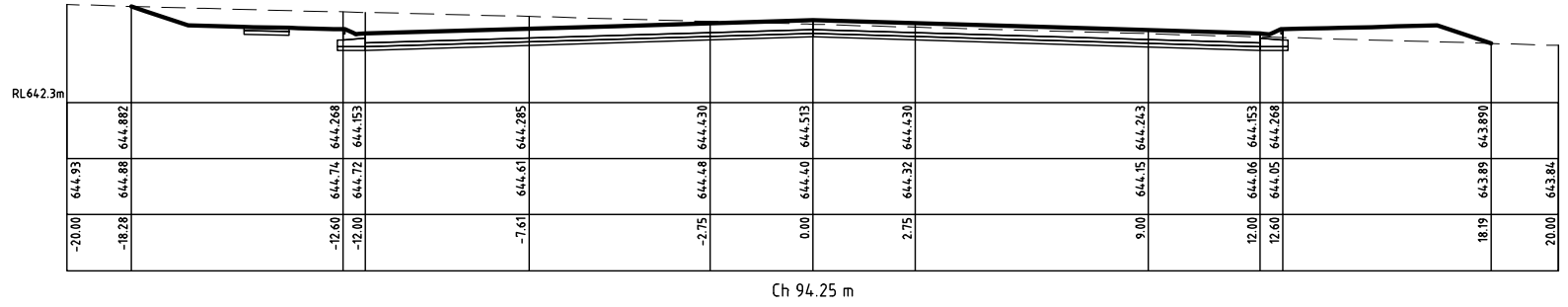
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**PROPOSED RESIDENTIAL SUBDIVISION
LOT 11 DP1271846
3 SOUTHDOWN RD,
MARULAN NSW**

DRAWING TITLE			
CONCEPT ROAD TYPICAL CROSS-SECTION & STANDARD DRAWINGS			
PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
23000043	P01	C300	00

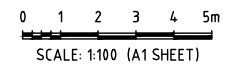
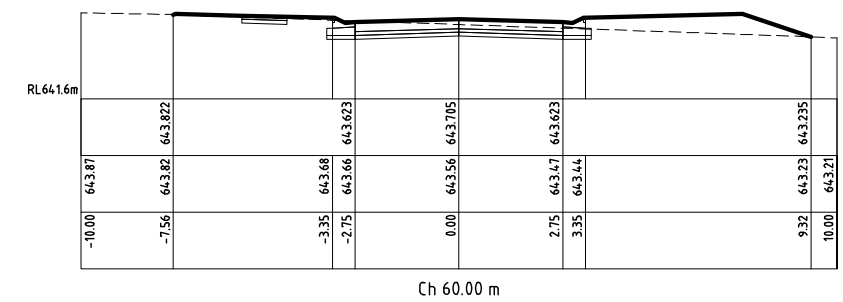
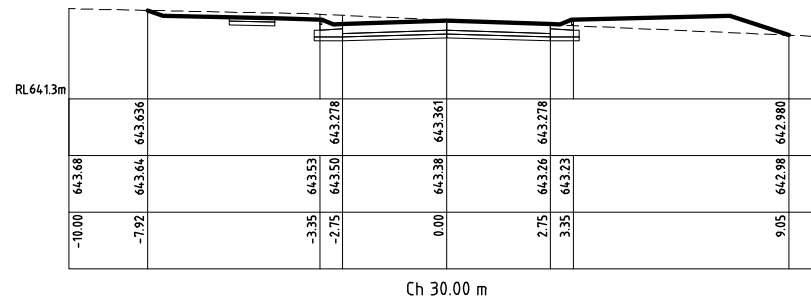
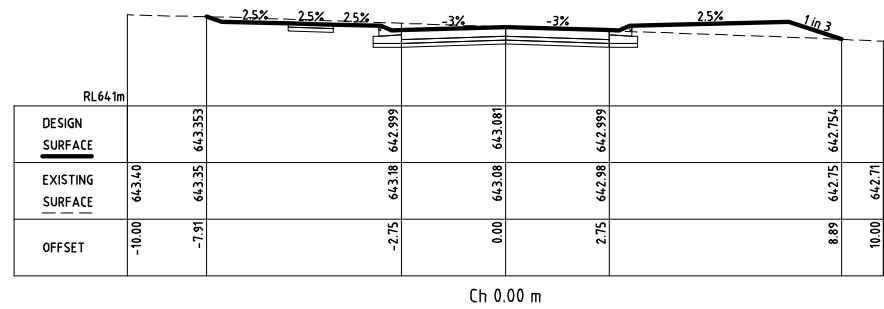
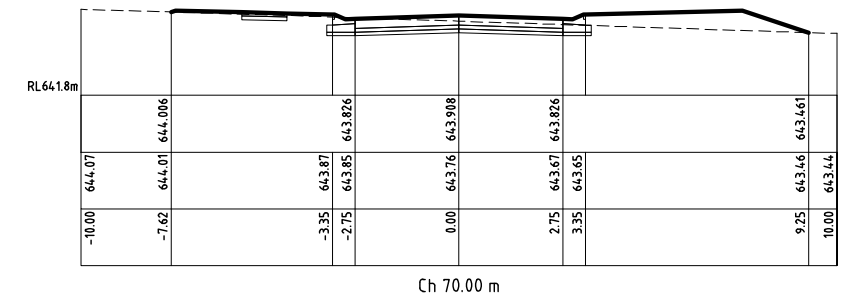
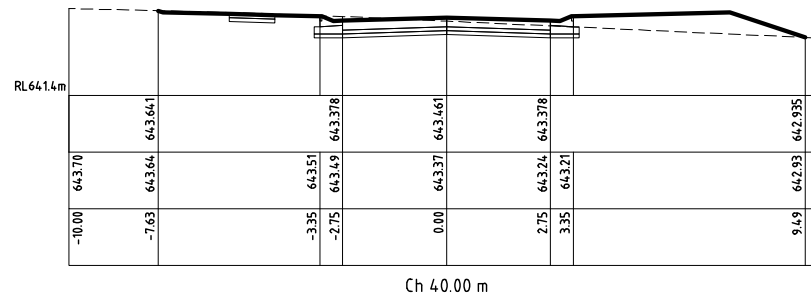
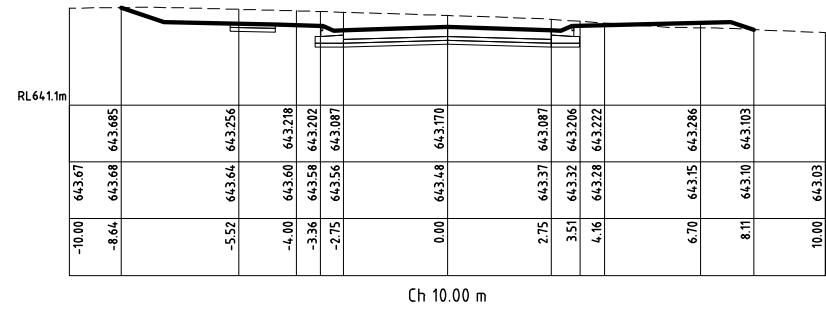
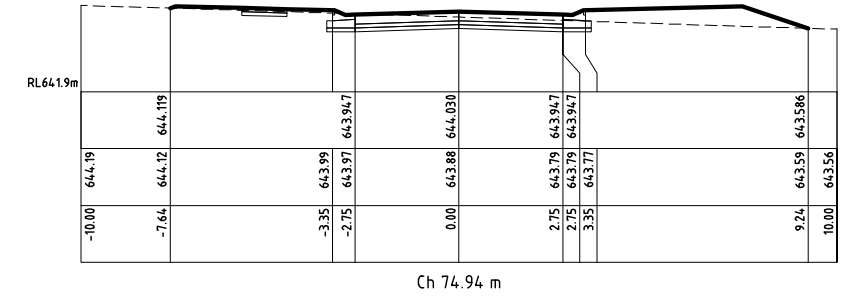
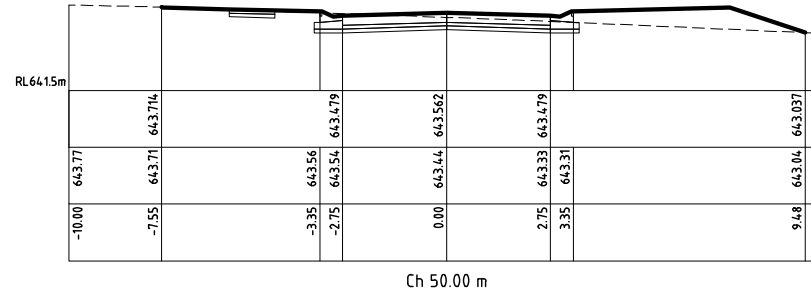
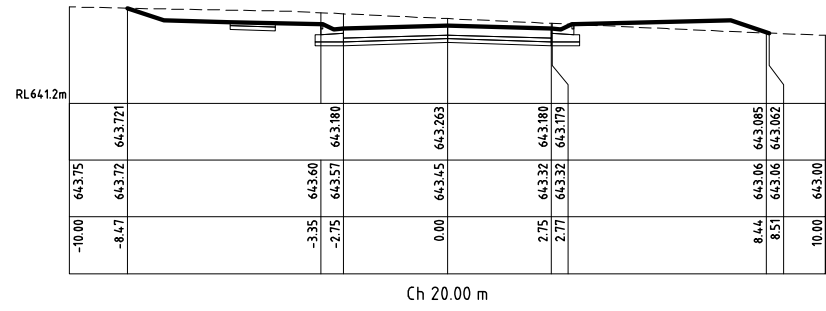


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SECTION THROUGH CENTRE OF CUL-DE-SAC



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00	24/01/24	R.B.	R.B.	J.A.	FOR APPROVAL
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A	28/07/23	R.B.	R.B.	J.A.	DRAFT ISSUE - FOR REVIEW

DRAWING STATUS	
DESIGN BY	R.B.
DRAWN BY	R.B.
FINAL APPROVAL	J.A.
SCALE:	AS SHOWN
(on A1 Original)	
DA	

North

CLIENT
**KEITH ALLEN
LATERALS PLANNING**

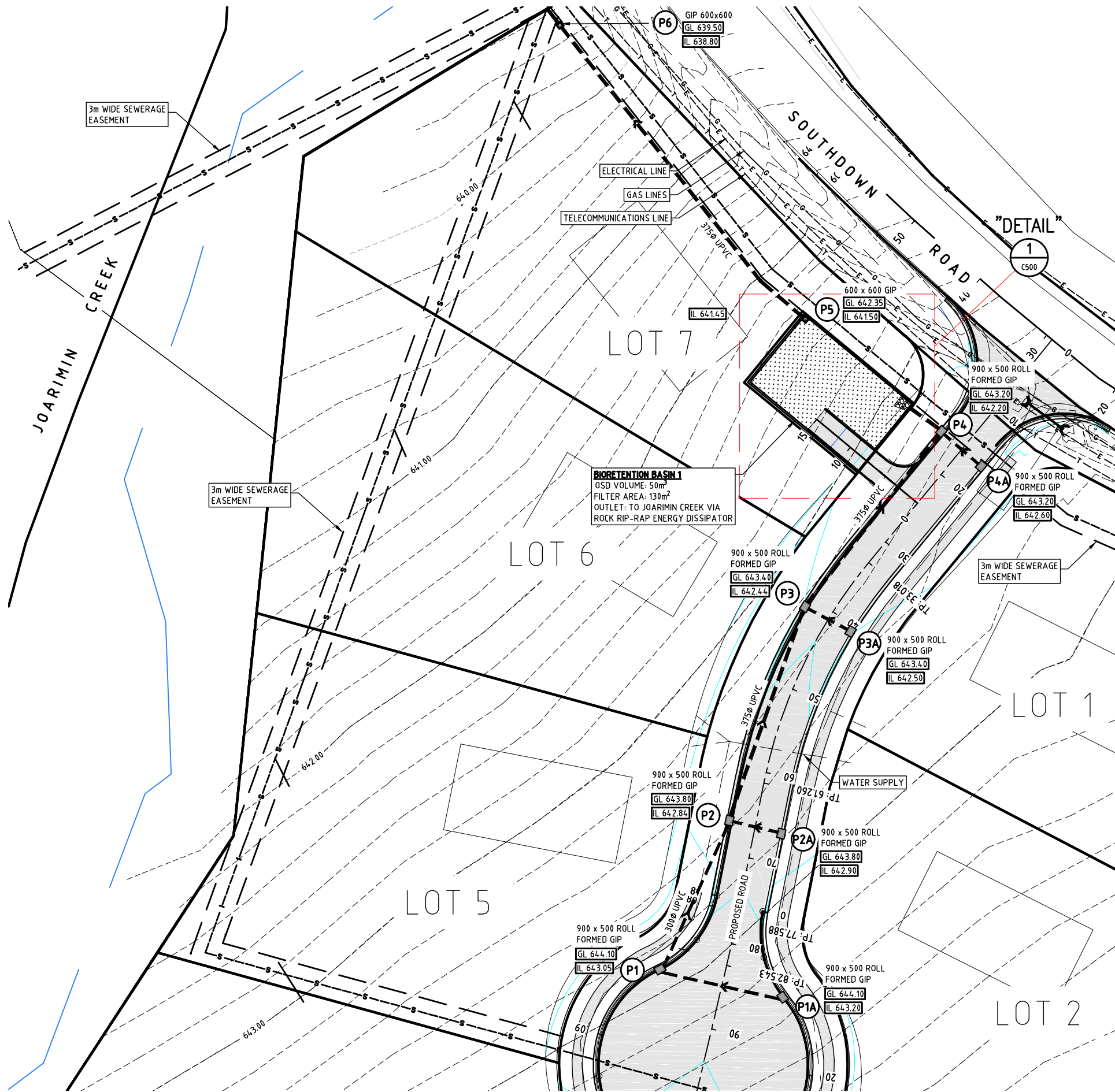


PROJECT TITLE
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LOT 11 DP1271846
3 SOUTHDOWN RD,
MARULAN NSW**

DRAWING TITLE			
CONCEPT ROAD CROSS-SECTION SHEET			
PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
23000043	P01	C301	00

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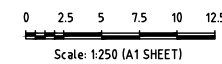
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LEGEND:

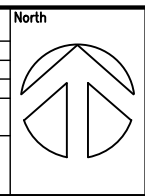
- GL 622.56 PIT GRATE LEVEL
- IL 622.56 PIT INVERT LEVEL
- EXISTING SURFACE CONTOUR (0.20m INTERVAL)
- DIRECTION OF WATER FLOW
- >--- STORMWATER DRAINAGE PIPE
- JP X COVERED JUNCTION PIT WITH FILTER SCREEN
- GIP ■ GRATED INLET PIT
- P1 PIT NUMBER
- ▲ ROCK RIP-RAP ENERGY DISSIPATOR
- BIORETENTION BASIN / RAINGARDEN FILTER BED

CONCEPT STORMWATER DRAINAGE PLAN



REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
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A	28/07/23	R.B.	R.B.	J.A.	DRAFT ISSUE - FOR REVIEW

DRAWING STATUS	
DESIGN BY	R.B.
DRAWN BY	R.B.
FINAL APPROVAL	J.A.
SCALE:	1:250
(on A1 Original)	
DA	



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LATERALS PLANNING**

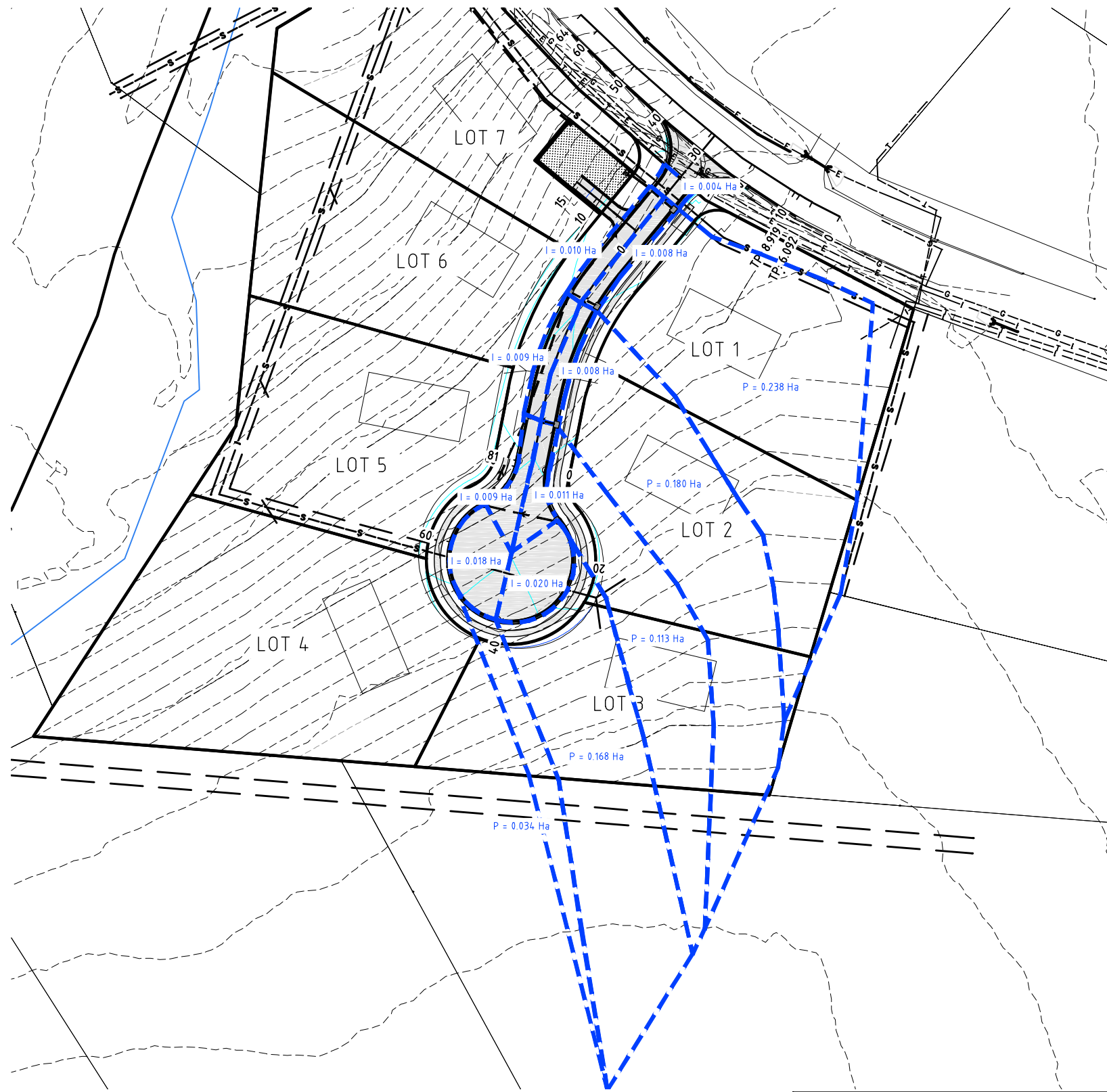
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(F) 02 4862 3088
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PROJECT TITLE
**PROPOSED RESIDENTIAL SUBDIVISION
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3 SOUTHDOWN RD,
MARULAN NSW**

DRAWING TITLE CONCEPT STORMWATER DRAINAGE PLAN			
PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
23000043	P01	C400	00

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CATCHMENT PLAN

0 7.5 15 22.5 30 37.5m
Scale: 1:750 (A1 SHEET)

LEGEND:

- CATCHMENT BOUNDARIES
- P = 50 Ha PERVIOUS CATCHMENT AREA
- I = 50 Ha IMPERVIOUS CATCHMENT AREA

STORMWATER DRAINAGE SUMMARY

SITE DETAILS
 MODELED CATCHMENT AREA = 0.840 Ha
 PRE-DEVELOPMENT IMPERVIOUS AREA = 0%
 POST-DEVELOPMENT IMPERVIOUS AREA = 6%

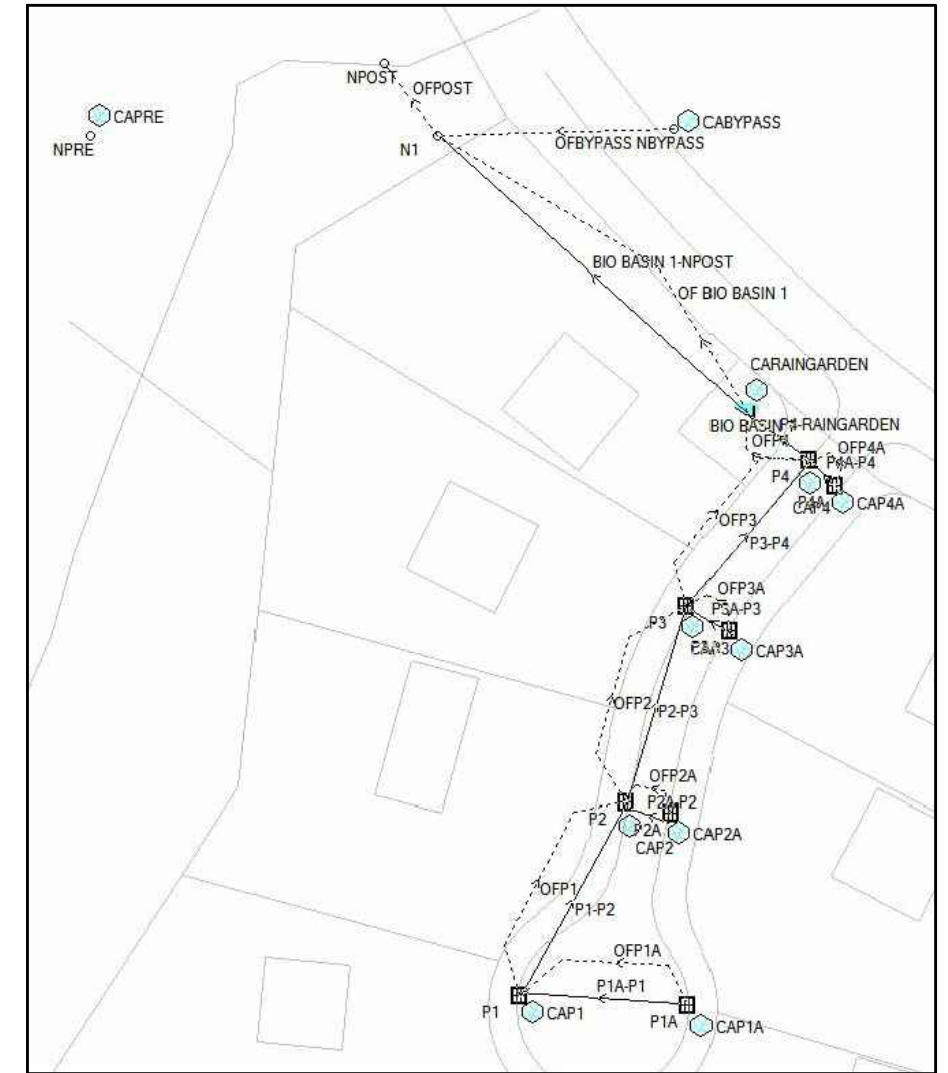
PRE- & POST-DEVELOPMENT DISCHARGE & STORAGE VOLUMES

PRE-DEVELOPMENT Q_{5YR} = 0.054 m³/s
 POST-DEVELOPMENT Q_{5YR} (WITHOUT OSD) = 0.064 m³/s
 POST-DEVELOPMENT Q_{5YR} (WITH OSD) = 0.036 m³/s

PRE-DEVELOPMENT Q_{10YR} = 0.090 m³/s
 POST-DEVELOPMENT Q_{10YR} (WITHOUT OSD) = 0.098 m³/s
 POST-DEVELOPMENT Q_{10YR} (WITH OSD) = 0.063 m³/s

PRE-DEVELOPMENT Q_{100YR} = 0.225 m³/s
 POST-DEVELOPMENT Q_{100YR} (WITHOUT OSD) = 0.230 m³/s
 POST-DEVELOPMENT Q_{100YR} (WITH OSD) = 0.220 m³/s

ON-SITE DETENTION
 50m³ OF ON-SITE DETENTION HAS BEEN PROVIDED IN BIORETENTION BASIN 1.
 REFER TO THE ACCOMPANYING 'DRAINS' MODEL FOR DETAILED CALCULATIONS.



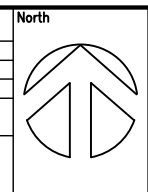
DRAINS MODEL LAYOUT

N.T.S.



REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
00	24/01/24	R.B.	R.B.	J.A.	FOR APPROVAL
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A	28/07/23	R.B.	R.B.	J.A.	DRAFT ISSUE - FOR REVIEW

DRAWING STATUS	
DESIGN BY	R.B.
DRAWN BY	R.B.
FINAL APPROVAL	J.A.
SCALE:	AS SHOWN
(on A1 Original)	
DA	



CLIENT
**KEITH ALLEN
 LATERALS PLANNING**

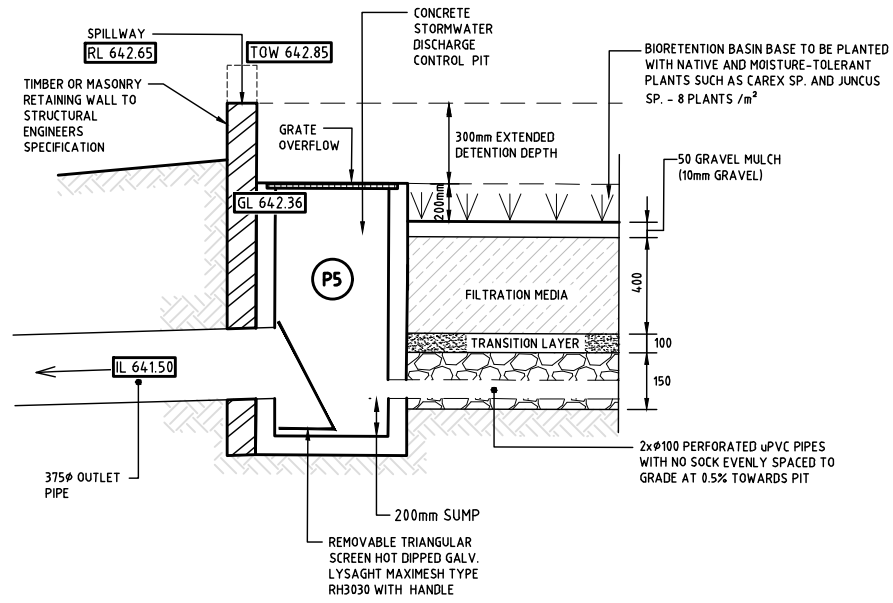
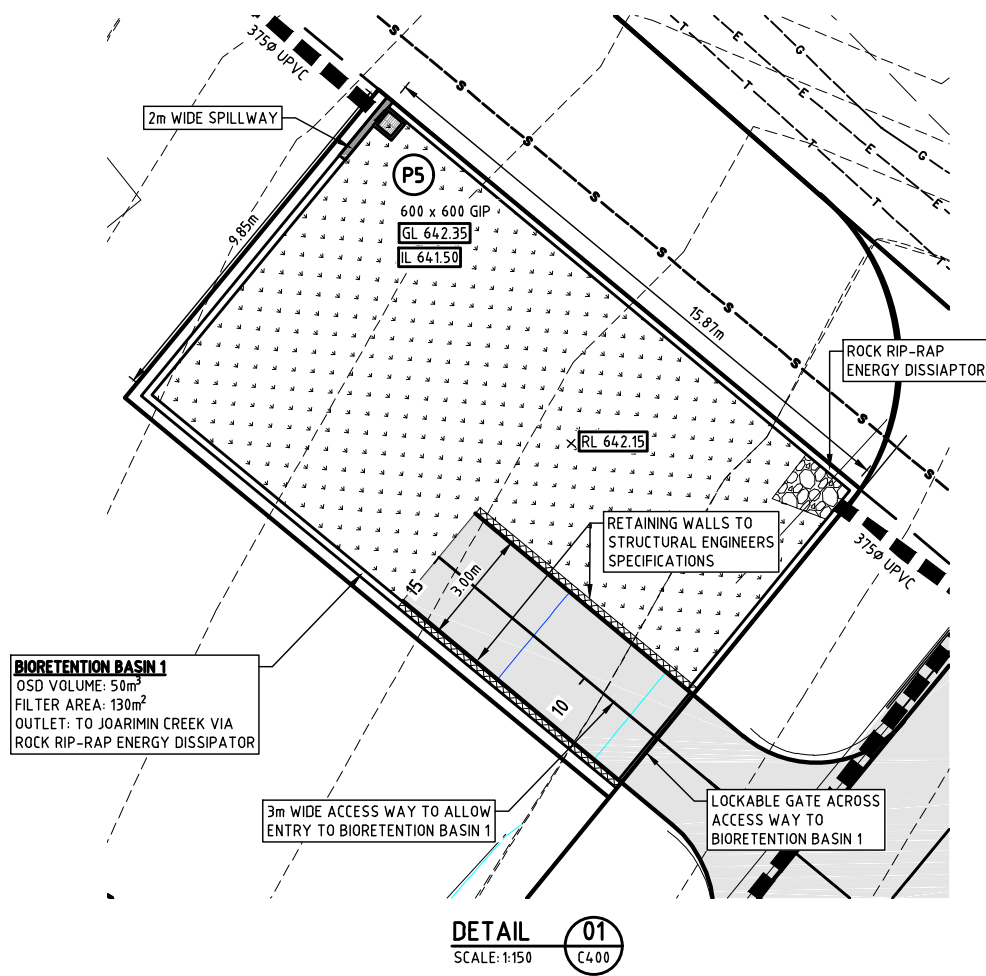
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PROJECT TITLE
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 LOT 11 DP1271846
 3 SOUTHDOWN RD,
 MARULAN NSW**

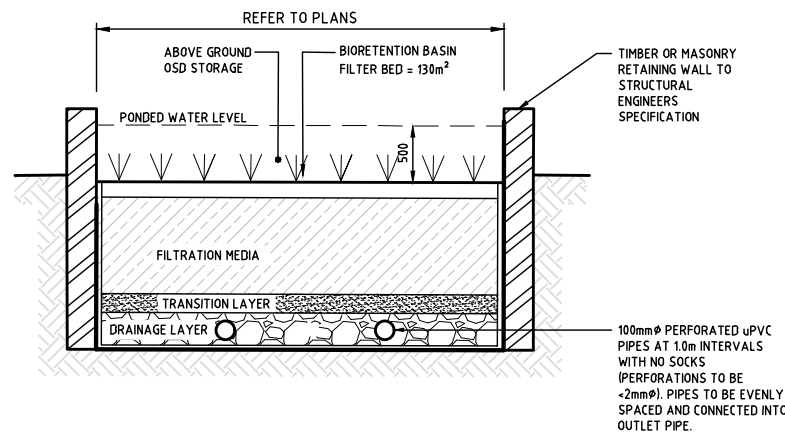
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CONCEPT STORMWATER DRAINAGE CATCHMENT PLAN & 'DRAINS' MODEL LAYOUT & RESULTS			
PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
23000043	P01	C401	00

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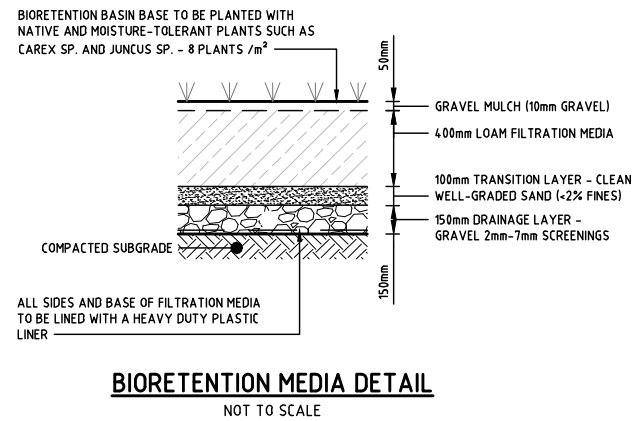
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TYPICAL CROSS SECTION THROUGH BIORETENTION BASIN 1 OUTLET
 NOTE: DETAIL IS NOT TO SCALE (INDICATIVE ONLY)



TYPICAL CROSS SECTION THROUGH BIORETENTION BASINS 1
 NOTE: DETAIL IS NOT TO SCALE (INDICATIVE ONLY)



Media Specifications

The filtration media shall be well graded loamy sand with:

- Saturated hydraulic conductivity (ASTM F1815-06) approximately 100 mm/hour
- pH between 5.5 and 7.5
- Organic content less than 5 percent
- Electrical conductivity less than 1.2 ds/m
- Orthophosphate content less than 40 mg/kg
- Total nitrogen content <400 mg/kg

Subject to adequate hydraulic conductivity the following particle size distribution is a guide:

Clay and silt	< 3%	(<0.05 mm)
vVery fine sand	5-30%	(0.05 - 0.15 mm)
Fine sand	10-30%	(0.15 - 0.25 mm)
Med-coarse sand	40-60%	(0.25 - 1.0 mm)
Coarse sand	7-10%	(1.0 - 2.0 mm)
Fine gravel	<3%	(>2.0 mm)

The filtration media will be compacted with **one** pass of a vibratory plate compactor or drum roller.

The **transition layer** shall be clean, well-graded sand containing little or no clay and silt (<2%). d15 of the transition layer must be <5 x d85 of the filter zone.

The **submerged zone** is to consist of medium to coarse sand or fine gravel combined with carbon source (usually 5% by volume hardwood chips)

The **drainage layer** shall be 2-5 mm washed screenings with <2% silt and clay.

Plants such as carex and juncus must be planted at a density of 8 plants/m².

A once-off **initial amelioration** is required to provide an initial boost to plant growth. incorporate the constituents in table 1 into the top 100 mm of filter layer.

TABLE 1 - AMELIORANT RECIPE FOR TOP 100mm OF FILTER BED

Constituent	Quantity kg/100m ² filter area
Granulated poultry manure	50
Superphosphate	2
Magnesium sulphate	3
Potassium sulphate	2
Trace element mix	1
Fertilizer (16:4:14)	4
Lime	20

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North

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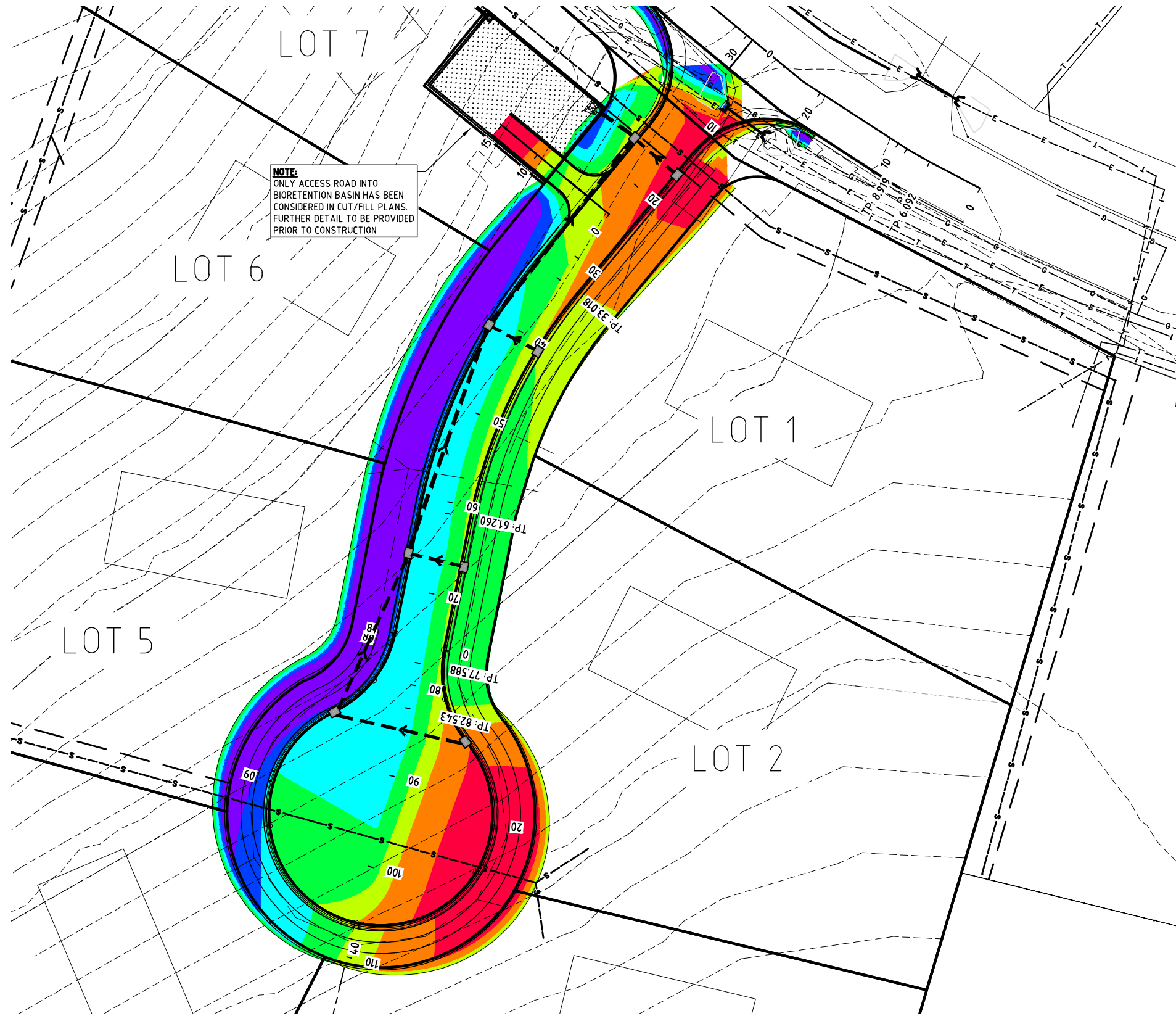
PROJECT TITLE: PROPOSED RESIDENTIAL SUBDIVISION
 LOT 11 DP1271846
 3 SOUTHDOWN RD,
 MARULAN NSW

DRAWING TITLE: CONCEPT WATER QUALITY ASSUMPTIONS & BIORETENTION BASIN DETAILS			
PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
23000043	P01	C500	00

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Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
CUT FILL	1.000	1.000	1348.480sq.m	38.326 Cu. M.	154.152 Cu. M.	115.826 Cu. M.<Fill>
Totals			1348.480sq.m	38.326 Cu. M.	154.152 Cu. M.	115.826 Cu. M.<Fill>

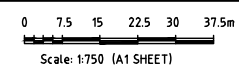


Surface Analysis: Elevation Ranges

Number	Color	Minimum Elevation (m)	Maximum Elevation (m)	2D Area (m ²)	Volume (m ³)
1	Red	-0.639	-0.300	270.6	28.1
2	Orange	-0.300	-0.100	323.0	85.7
3	Yellow	-0.100	0.000	282.7	71.6
4	Green	0.000	0.100	480.0	111.2
5	Cyan	0.100	0.200	401.6	63.2
6	Blue	0.200	0.300	116.8	4.1
7	Purple	0.300	0.600	34.8	4.8

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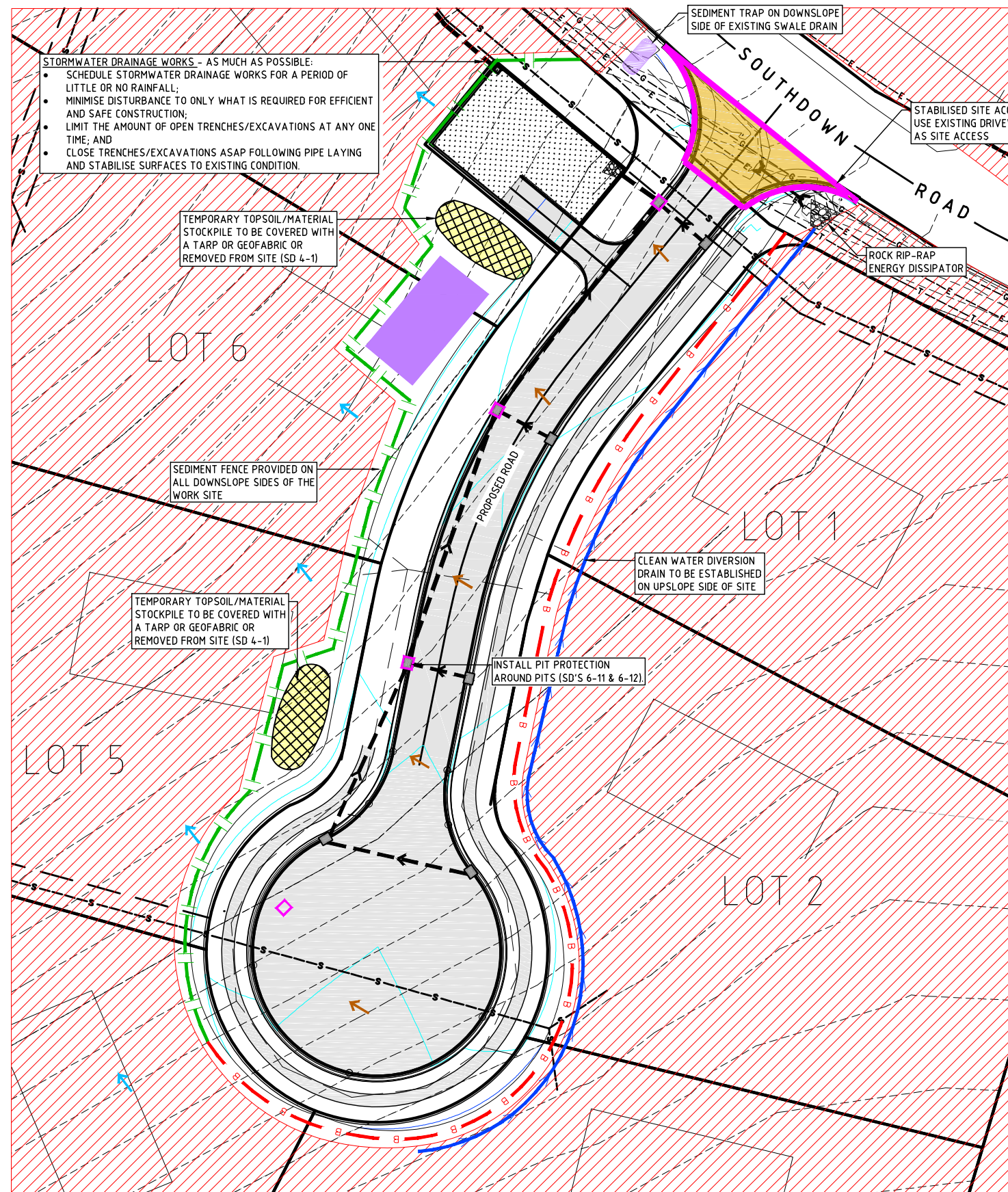
CONCEPT CUT & FILL PLAN



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00	24/01/24	R.B.	R.B.	J.A.	FOR APPROVAL	DA		KEITH ALLEN LATERALS PLANNING	PROPOSED RESIDENTIAL SUBDIVISION LOT 11 DP1271846 3 SOUTHDOWN RD, MARULAN NSW	CONCEPT CUT/FILL PLAN & SUMMARY	23000043	P01	C600	00
B	17/01/24	R.B.	R.B.	J.A.	DRAFT ISSUE - REVISED CUL-DE-SAC DESIGN									
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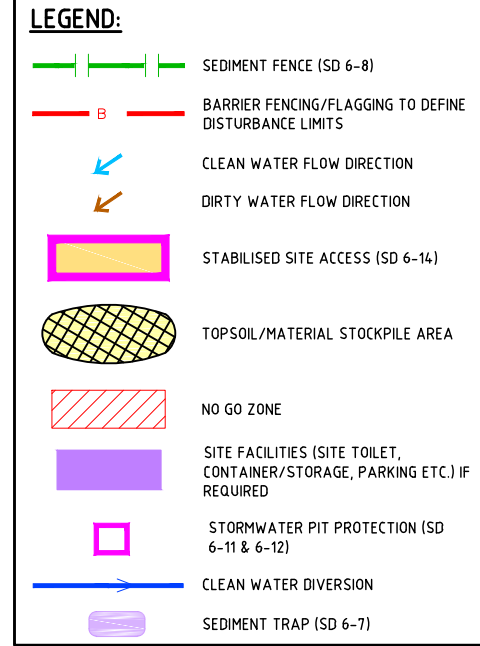
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CONCEPT SOIL & WATER MANAGEMENT PLAN

0 2.5 5 7.5 10 12.5m
SCALE: 1:250 (A1 SHEET)



BACKGROUND

EROSION AND SEDIMENT CONTROL DESIGN

THIS EROSION AND SEDIMENT CONTROL PLAN (ESCP) HAS BEEN PREPARED IN ACCORDANCE WITH BLUE BOOK VOLUME 1 (LANDCOM, 2004) AND PROJECT APPROVAL CONDITIONS.

THE SITE DISTURBANCE AREA IS ~2,500m² AND THEREFORE, DOES NOT TRIGGER THE REQUIREMENT FOR A SWMP AND A SEDIMENT BASIN ASSESSMENT. THEREFORE AN EROSION HAZARD ASSESSMENT HAS NOT BEEN CARRIED OUT FOR THIS SITE.

IMPLEMENTATION OF EROSION AND SEDIMENT CONTROLS

WORKS ARE TO BE STAGED IN THE FOLLOWING ORDER WITH THE RELEVANT EROSION AND SEDIMENT CONTROLS IMPLEMENTED PRIOR TO AND DURING EACH SECTION OF WORKS AS SPECIFIED.

BEFORE COMMENCEMENT OF CLEARING, TOPSOIL STRIPPING AND EARTHWORKS IN EACH AREA/SECTION OF WORKS, THE SITE IS TO BE SECURED AND THE FOLLOWING EROSION AND SEDIMENT CONTROL MEASURES INSTALLED IN ORDER EXCEPT FOR ITEMS 7 TO 10 WHICH ARE TO BE UNDERTAKEN PROGRESSIVELY AS REQUIRED THROUGHOUT ALL STAGES OF WORKS. STRIPPING AND EARTHWORKS NECESSARY TO INSTALL THE EROSION AND SEDIMENT CONTROLS ARE PERMITTED BUT MUST BE KEPT TO AN ABSOLUTE MINIMUM:

- EXISTING SITE FENCING (OR ALTERNATIVE MEASURES) SHOULD BE MAINTAINED IN PLACE AROUND THE EDGE OF THE CONSTRUCTION BOUNDARY TO RESTRICT ACCESS AND BARRIER FENCING INSTALLED IN ANY ADDITIONAL LOCATIONS AS REQUIRED TO MINIMISE UNNECESSARY DISTURBANCE.
- ESTABLISH STABILISED SITE ENTRY/EXIT POINTS (MAINTAIN EXISTING GRAVEL DRIVEWAY IN A STABLE CONDITION OR PROVIDE AS STANDARD DRAWING SD 6-14 ON C702) IN THE LOCATION SHOWN AND ANYWHERE WHERE CONSTRUCTION VEHICLES EXIT A WORK AREA ONTO A PUBLIC ROAD.
- ESTABLISH A TEMPORARY SITE FACILITIES (E.G. TOILET AND PARKING AREA).
- INSTALL SEDIMENT FENCING IN THE LOCATIONS SHOWN AND FOLLOWING STANDARD DRAWING SD 6-8 ON C701. ENSURE RETURNS ARE INSTALLED AT MAX. 20M INTERVALS.
- A STOCKPILE AREA IS TO BE ESTABLISHED IN THE LOCATION AS SHOWN OR AS SPECIFIED BY THE SITE MANAGER AND IN ACCORDANCE WITH STANDARD DRAWING SD 4-1 ON C701.
- ONCE ALL OF THE ABOVE MEASURES ARE COMPLETE AND STABLE, TOPSOIL STRIPPING CAN COMMENCE AND CONSTRUCTION WORKS CAN PROCEED IN ACCORDANCE WITH THE ENGINEERING PLANS.

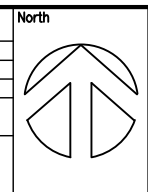
ONCE WORKS HAVE COMMENCED, PROGRESSIVELY UNDERTAKE THE FOLLOWING AT ALL TIMES AS REQUIRED:

- DUST SUPPRESSION TO BE CARRIED OUT AS REQUIRED TO MINIMISE THE RISK OF DUST RISE.
- IF DE-WATERING OF EXCAVATIONS/TRENCHES IS REQUIRED, THE BELOW WATER QUALITY TARGETS MUST BE ACHIEVED:
 - <50 mg/L TSS (TOTAL SUSPENDED SOLIDS)
 - PH 6.6 - 8.5; AND
 - <10 mg/L OIL AND GREASE AND NO VISIBLE TRACE.
- MONITORING, MAINTENANCE AND INSPECTIONS ARE TO BE CARRIED OUT REGULARLY BY THE SITE ENVIRONMENT MANAGER (OR THEIR REPRESENTATIVE):
 - AT LEAST WEEKLY DURING NORMAL CONSTRUCTION HOURS; AND
 - PRIOR TO FORECAST RAINFALL (SEE ABOVE); AND
 - DAILY DURING RAIN EVENTS (IF SAFE TO DO SO); AND
 - WITHIN 24 HOURS OF THE CESSATION OF A RAIN EVENT THAT CAUSES RUNOFF.
- UNDERTAKE PROGRESSIVE STABILISATION OF LANDS AS FINAL EARTHWORKS ARE COMPLETE IN EACH AREA (RATHER THAN WAITING UNTIL THE COMPLETION OF WORKS). FINAL STABILISATION IS TO BE ACHIEVED WITH:
 - TOPSOIL (MIN. 75mm THICK), SEED AND A BIODEGRADABLE SOIL POLYMER; OR
 - TOPSOIL (MIN. 75mm THICK) AND TURF; OR
 - TOPSOIL (MIN. 75mm THICK) AND HYDROMULCH.
 (REFER TO STANDARD DRAWINGS 4-2 AND 7-1 ON C701 & C702 RESPECTIVELY FOR TOPSOIL REPLACEMENT AND SEEDBED PREPARATION RESPECTIVELY)



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DRAWING STATUS	
DESIGN BY	R.B.
DRAWN BY	R.B.
FINAL APPROVAL	J.A.
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CLIENT
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LATERALS PLANNING**

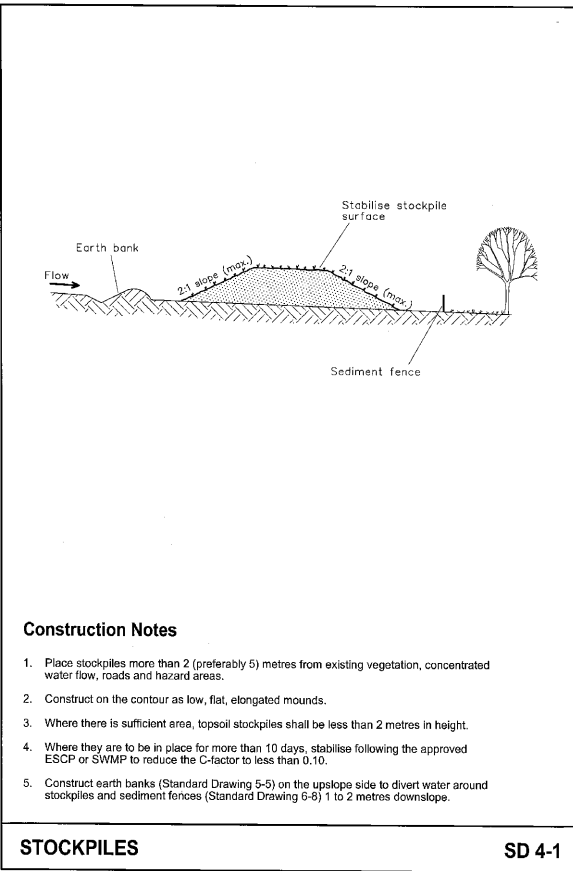
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**PROPOSED RESIDENTIAL SUBDIVISION
LOT 11 DP1271846
3 SOUTHDOWN RD,
MARULAN NSW**

DRAWING TITLE			
CONCEPT SOIL & WATER MANAGEMENT SITE ARRANGEMENT			
PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
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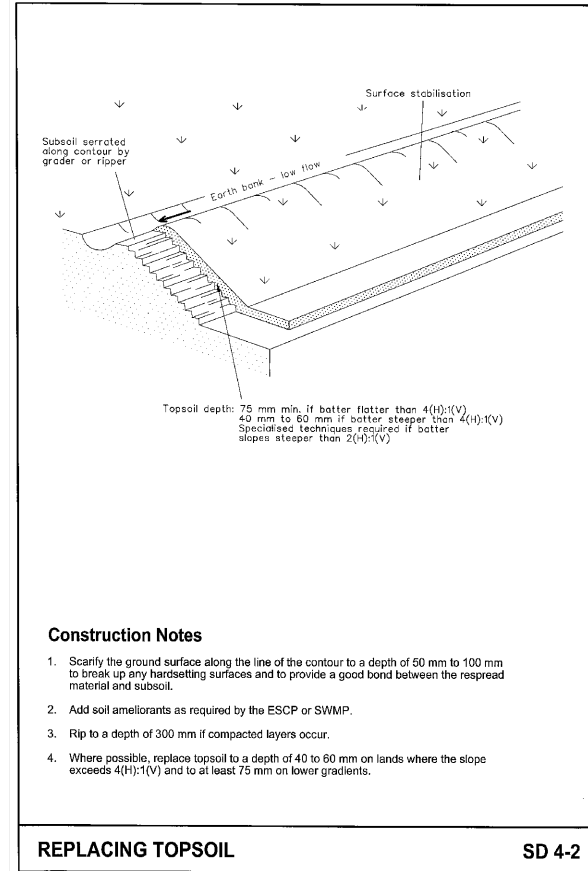
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Construction Notes

- Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
- Construct on the contour as low, flat, elongated mounds.
- Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
- Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
- Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

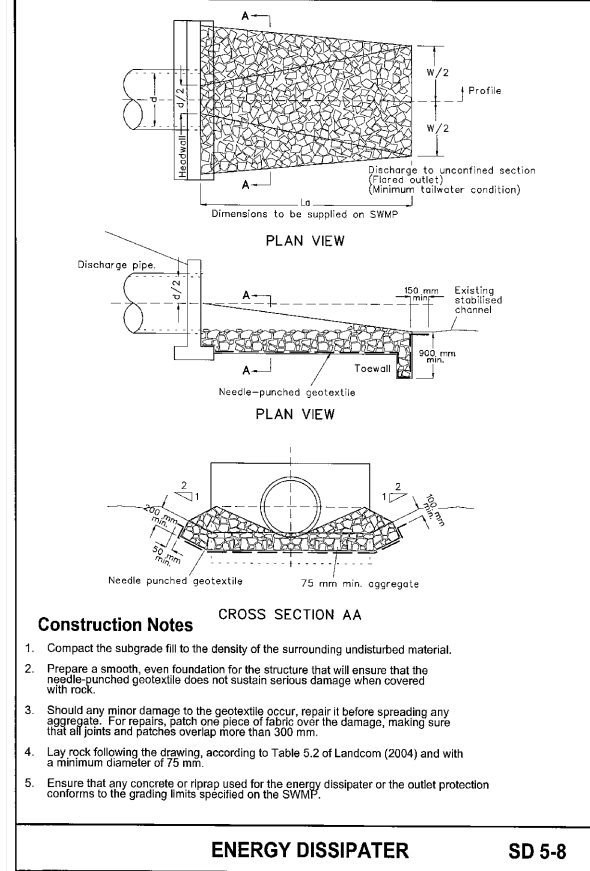
STOCKPILES SD 4-1



Construction Notes

- Scarify the ground surface along the line of the contour to a depth of 50 mm to 100 mm to break up any hardsetting surfaces and to provide a good bond between the respread material and subsoil.
- Add soil ameliorants as required by the ESCP or SWMP.
- Rip to a depth of 300 mm if compacted layers occur.
- Where possible, replace topsoil to a depth of 40 to 60 mm on lands where the slope exceeds 4(H):1(V) and to at least 75 mm on lower gradients.

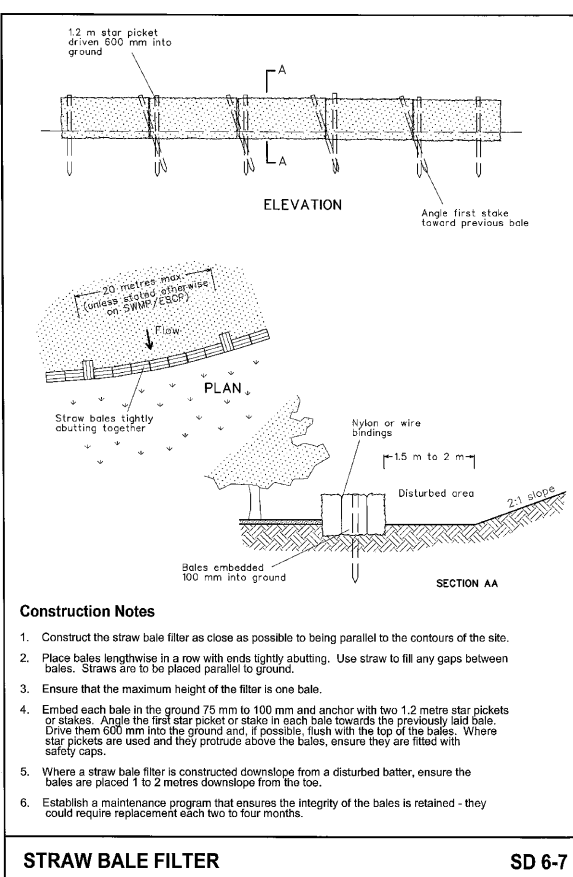
REPLACING TOPSOIL SD 4-2



Construction Notes

- Compact the subgrade fill to the density of the surrounding undisturbed material.
- Prepare a smooth, even foundation for the structure that will ensure that the needle-punched geotextile does not sustain serious damage when covered with rock.
- Should any minor damage to the geotextile occur, repair it before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.
- Lay rock following the drawing, according to Table 5.2 of Landcom (2004) and with a minimum diameter of 75 mm.
- Ensure that any concrete or riprap used for the energy dissipater or the outlet protection conforms to the grading limits specified on the SWMP.

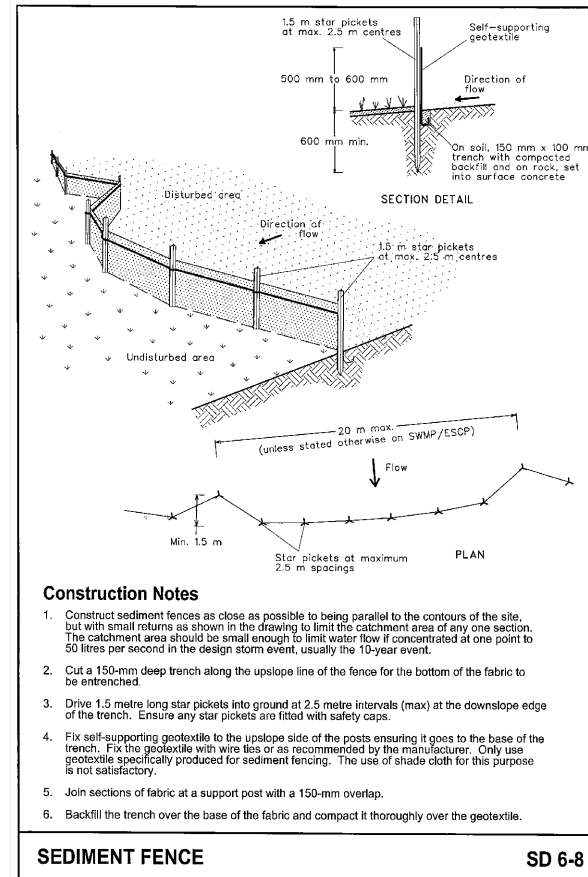
ENERGY DISSIPATER SD 5-8



Construction Notes

- Construct the straw bale filter as close as possible to being parallel to the contours of the site.
- Place bales lengthwise in a row with ends tightly abutting. Use straw to fill any gaps between bales. Straws are to be placed parallel to ground.
- Ensure that the maximum height of the filter is one bale.
- Embed each bale in the ground 75 mm to 100 mm and anchor with two 1.2 metre star pickets or stakes. Angle the first star picket or stake in each bale towards the previously laid bale. Drive them 600 mm into the ground and, if possible, flush with the top of the bales. Where star pickets are used and they protrude above the bales, ensure they are fitted with safety caps.
- Where a straw bale filter is constructed downslope from a disturbed batter, ensure the bales are placed 1 to 2 metres downslope from the toe.
- Establish a maintenance program that ensures the integrity of the bales is retained - they could require replacement each two to four months.

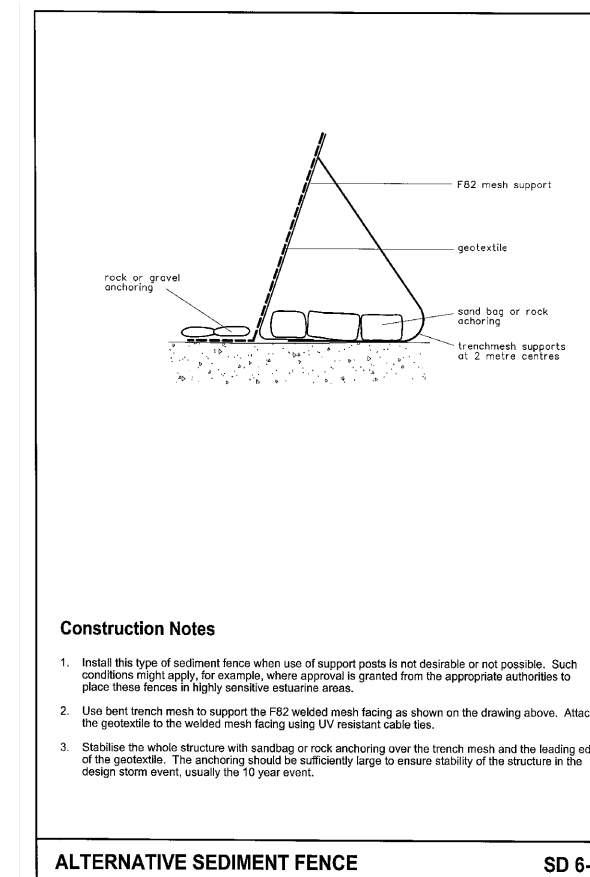
STRAW BALE FILTER SD 6-7



Construction Notes

- Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
- Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
- Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
- Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
- Join sections of fabric at a support post with a 150-mm overlap.
- Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE SD 6-8



Construction Notes

- Install this type of sediment fence when use of support posts is not desirable or not possible. Such conditions might apply, for example, where approval is granted from the appropriate authorities to place these fences in highly sensitive estuarine areas.
- Use bent trench mesh to support the F82 welded mesh facing as shown on the drawing above. Attach the geotextile to the welded mesh facing using UV resistant cable ties.
- Stabilise the whole structure with sandbag or rock anchoring over the trench mesh and the leading edge of the geotextile. The anchoring should be sufficiently large to ensure stability of the structure in the design storm event, usually the 10 year event.

ALTERNATIVE SEDIMENT FENCE SD 6-9

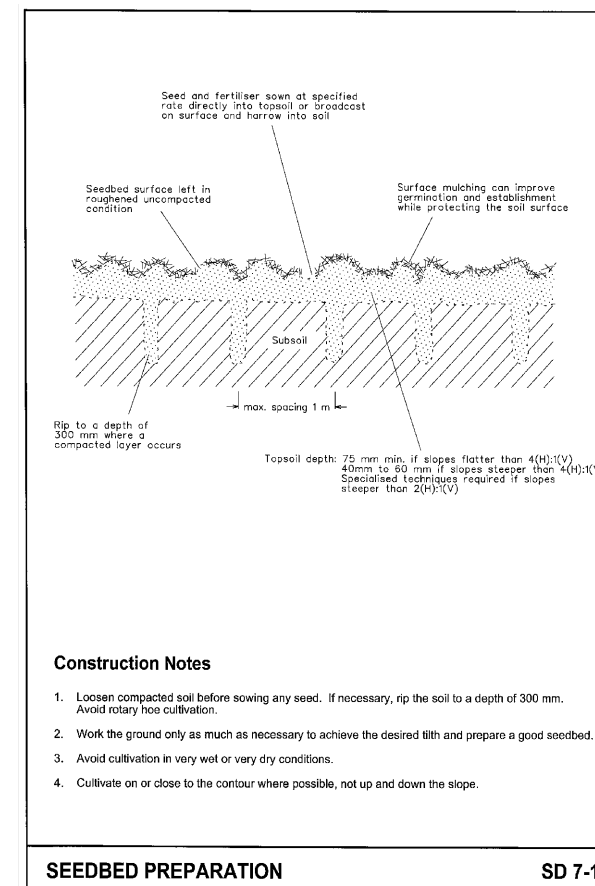
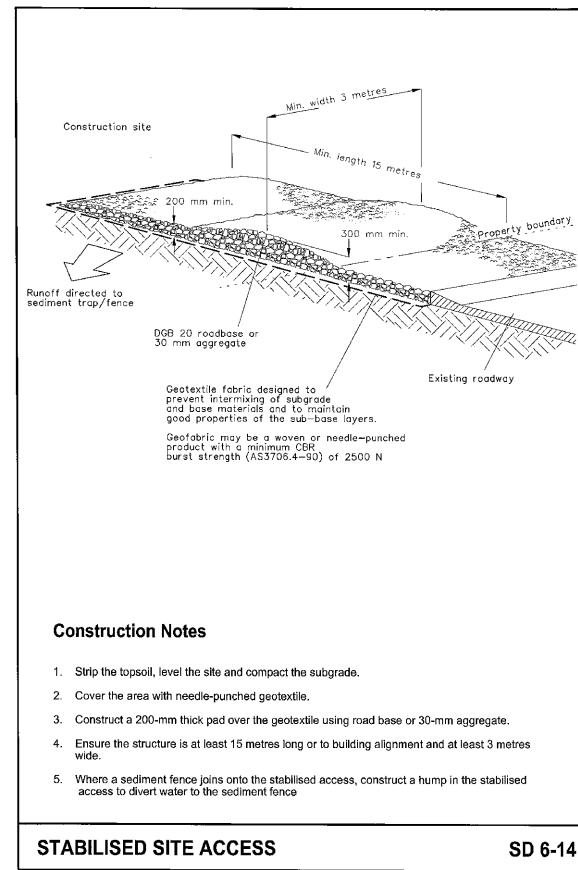
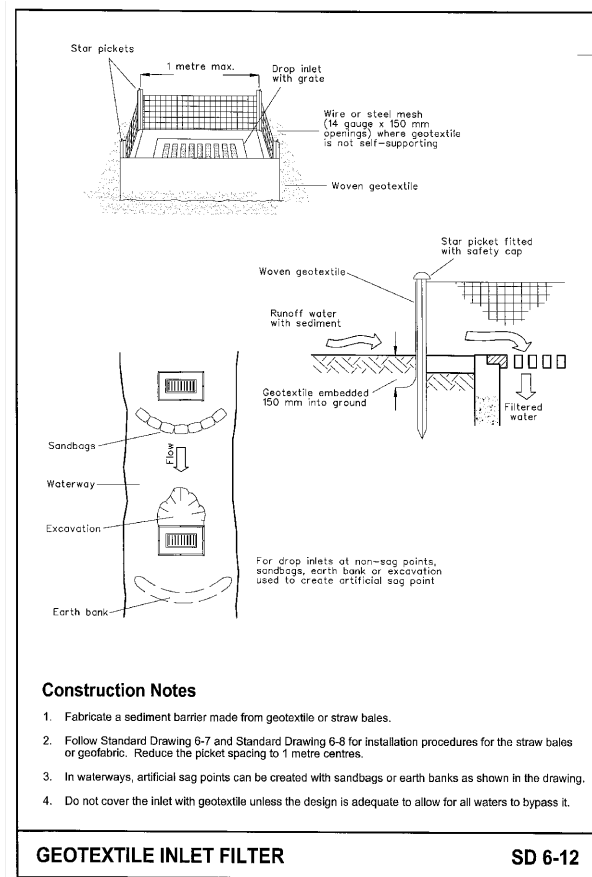
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						DESIGN BY R.B.		KEITH ALLEN LATERALS PLANNING	PROPOSED RESIDENTIAL SUBDIVISION LOT 11 DP1271846 3 SOUTHDOWN RD, MARULAN NSW	CONCEPT SOIL & WATER MANAGEMENT STANDARD DRAWINGS & NOTES (PAGE 1 OF 2)	23000043	P01	C701	00	
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						FINAL APPROVAL J.A.									
						SCALE: (on A1 Original) NOT TO SCALE									
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