

# **Proposed Residential Subdivision 8-12 Princes Highway Mollymook NSW 2539**

## **Stormwater Management Strategy**

**JUNE 2022**

Project No. 496

Prepared by

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# 1.0 INTRODUCTION

## 1.1. Background

This stormwater management strategy report and associated stormwater concept plan has been prepared to accompany the development application for the proposed medium density development at 8-12 Princes Highway as described in the architectural plans by Edmiston Jones.

## 1.2. Scope and objective

This report addresses the requirements for stormwater management as described by:

- Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control of the Shoalhaven Council Development Control Plan 2014, and associated supporting documents; and
- Shoalhaven City Council's Engineering Design Specification D5 – Stormwater Drainage Design.

The objective is to outline, and where possible, quantify the potential water quantity and quality impacts and issues associated with the proposed development. Information is presented in the form of modelled as well as designs of management strategies to meet current best practice relevant for the site.

## 1.3. Proposal

Demolition of existing motel and constructing of medium density development as described in the architectural plans by Edmiston Jones.

## 2.0 SITE DESCRIPTION

The Site, 8-12 Princes Highway, comprises Lots 1 & 2 DP518702 and Lot 3 DP523625. The existing Site contains a number of buildings, carpark/driveways and landscaped areas that make up the Ocean View Motel, refer Figure 2.1.

The Site generally grades to the north east with slopes across the site vary between 2-20%.

There is minimal formal stormwater infrastructure across the Site with only one existing building and the front driveway/carpark draining to the Princes Highway. The remaining majority of Site runoff currently sheets off onto landscaped areas and disperses along the northern boundary.

Refer to drawings in Appendix A outlining pre-development sub-catchments and illustration of current runoff behaviour.



Figure 2.1 Site locality

## 3.0 COUNCIL PLANNING REQUIREMENTS

### 3.1. Minor and major system design

Design for the major and minor stormwater systems shall address the requirements set out in section 5.1.1 of Chapter G2 of the Shoalhaven DCP and Council's Engineering Design Specification to a level acceptable for development application.

### 3.2. Climate change controls

Climate change impacts, such as changes to rainfall intensity, will be incorporated into system design as per relevant policies and/or Australian Rainfall and Runoff (AR&R) guidelines.

### 3.3. Onsite Stormwater Detention (OSD)

Detention of stormwater is necessary to maintain the capacity of existing stormwater infrastructure, provide protection of downstream infrastructure and limit flooding impacts.

In this case OSD will be applied to reduce peak flow rates to existing levels.

### 3.4. Stormwater reuse

The Building Sustainability Index (BASIX) may not apply to the proposed development however rainwater harvesting and reuse will be implemented with capturing majority of roof runoff in nominal 10kL tank with reuse for external demands.

### 3.5. Stormwater quality and waterway protection

Chapter G2 of the Shoalhaven DCP contains a range of specific stormwater quality and quantity requirements which are summarised below.

#### **Erosion and Sediment control**

A conceptual soil and water management plan will be prepared for the development in accordance with the Managing Urban Stormwater: Soils and Construction series.

#### **Retention**

For medium density 9mm depth of retention is to be provided for the difference in impervious area over the development. This will be achieved through capturing majority of roof runoff in nominal 10kL rainwater tank for reuse including external irrigation and wash-down demands.

### **Stormwater quality**

Pollutant load reduction must be a minimum percentage reduction of the post development average annual load of pollutants in accordance with the following:

<b>Pollutant</b>	<b>Post development average annual load reduction</b>
Gross pollutants	90%
Total suspended solids (TSS)	80%
Total phosphorus (TP)	45%
Total nitrogen (TN)	45%

## 4.0 STORMWATER MANAGEMENT

### 4.1. Stormwater Management Strategy Overview

Table 1 and Table 2 provide a breakdown of pre and post-development imperviousness and ultimate discharge points.

Table 1: Pre-development catchment breakdown

Pre development catchment breakdown			
	Draining to Princes Hwy	Draining to rear of property	Total
Pervious area (m <sup>2</sup> )	75	1649	<b>1724</b>
Impervious areas (m <sup>2</sup> )	688	603	<b>1291</b>
<b>Total area (m<sup>2</sup>)</b>	<b>763</b>	<b>2252</b>	<b>3015</b>
<b>% of Site area</b>	<b>25%</b>	<b>75%</b>	
% pervious	9.8%	73.2%	<b>57.2%</b>
% impervious	90.2%	26.8%	<b>42.8%</b>

Table 2: Post-development catchment breakdown

Post development catchment breakdown					
	Draining direct to Princes Hwy	Draining to Princes Hwy via OSD	Collected and pumped to Princes Hwy	Draining to rear of property	Total
Pervious area (m <sup>2</sup> )	138.3	177	0	605.6	920.9
Impervious areas (m <sup>2</sup> )	170.7	1535.5	200	151.4	2057.6
<b>Total area (m<sup>2</sup>)</b>	<b>309</b>	<b>1712.5</b>	<b>200</b>	<b>757</b>	<b>2978.5*</b>
<b>% of Site area</b>	<b>10%</b>	<b>57%</b>	<b>7%</b>	<b>25%</b>	
% pervious	44.8%	10.3%	0.0%	80.0%	30.9%
% impervious	55.2%	89.7%	100.0%	20.0%	69.1%

\*does not include pool area which will drain to sewer

Key observation from these table as follows:

- Increase in impervious area of 766m<sup>2</sup> under post-development scenario – pre-development site imperviousness of 43% vs post-development imperviousness of 69%
- Decrease in total area draining to the rear of the property under post-development scenario - 75% of the Site vs 25% of the Site
- Decrease in impervious area draining to the rear of the property under post-development scenario – 603m<sup>2</sup> vs 150m<sup>2</sup>

The proposed stormwater management strategy aims to reduce runoff to neighbouring properties directly to the north and limit peak flow discharge to the Princes Highway to existing levels as well as meet Council's stormwater quantity and quality requirements.

Stormwater management measures will include:

- New internal stormwater network to manage runoff from new roof areas to new rainwater tank (RWT) / On-site detention (OSD) tank;
- Prior to RWT will be a “Stormfilter” Chamber with Stormfilter cartridges for stormwater treatment;
- RWT to provide opportunity harvesting and reuse for external demands (irrigation and wash down);
- OSD tank to temporarily detain runoff and reduce peak flow discharge to the Princes Highway via Site discharge pit and kerb outlet on Princes Highway;
- Collection tank and pump out arrangement for new carpark ramp runoff with submersible pumps directing flows to the Highway via new Site discharge pit and kerb outlets;
- Within the carpark runoff collection tank will be a “Stormfilter” Chamber with Stormfilter cartridges for stormwater treatment; and
- Areas that cannot drain to new RWT / OSD tank to be directed to landscaped depressions to promote detention and infiltration.

Appendix A contains development design drawings which outline all the stormwater management features to be implemented at the site.

## **4.1. Stormwater Quantity**

### **4.1.1. Treatment Approach**

Post-development peak flow is to be reduced to pre-development levels through the incorporation of stormwater detention.

Both pre and post-development hydrologic and hydraulic models were developed to establish peak flow targets (pre-development) and determine performance of proposed stormwater system (post-development) for a range of storm events (2, 20 and 100 year ARI).

#### **4.1.1. Hydrologic and Hydraulic Modelling**

The pre and post-development stormwater systems were assessed using DRAINS Hydrologic and Hydraulic Urban Catchment modelling. Relevant Australian Rainfall and Runoff (ARR) procedures were used to set up the hydrological model. Site IFD data was downloaded from the Bureau of Meteorology (BOM) website and storm patterns, pre-burst and losses downloaded from ARR Data Hub website.

Impervious percentages were based on sub-catchment land use (roofs, hardstand, open space etc.). Refer to pre and post-development catchment plans in Appendix A.

Model assumptions included: soil type = Normal (3.0), paved (impervious) area depression storage = 1mm, grassed (pervious) area depression storage = 2.5mm and antecedent moisture condition = 3.0.

The carpark ramp sump and pump arrangement was modelled with the basin and pump tool within DRAINS to size an appropriate collection volume and determine pumping capacity.

### 4.1.2. Design Process

The design process undertaken for this project within DRAINS is outlined below:

- Using Site survey data Pre-development Site split up into sub-catchments based on land use and ultimate drainage points (i.e. Princes Highway or northern boundary) to establish pre-development peak flows;
- Post-development Site split up into sub-catchments based on land use and ultimate drainage points (i.e. Princes Highway or northern boundary);
- OSD sized to match pre and post development peak flows for range of events up to the 100 year ARI through refinement of orifice sizes and tank volumes.

The proposed OSD was modelled in DRAINS as detailed below:

- Determining the maximum height of the OSD system within the constraints of draining the tank under gravity to the low point in the kerb fronting the Site;
- Preliminary orifice equations were undertaken for the depth in the storage to determine the 100 year orifice sizing;
- The OSD surface area was then modified to accommodate the required storage volume.

### 4.1.3. Results

The proposed OSD tank has a volume of approximately 80m<sup>3</sup> with the following configuration:

- OSD area = 100m<sup>2</sup>
- OSD base level = 38.2
- OSD top level = 39
- OSD depth = 800mm
- Low level outlet = 150mm, IL 38.2
- High level outlet = 150mm, IL 38.75

The proposed carpark runoff collection tank and pump arrangement includes an 18m<sup>3</sup> collection sump and nominal 2L/s pump capacity (dual pumps). The collection tank has been sized to capture the runoff volume for a 1% AEP, 1.5hr storm. Although Council's policy doesn't provide basement drainage design criteria the adopted storm event is above what many other Councils would specify. Examples of other Council policies can be provided upon request.

Refer to design of the proposed stormwater system in Appendix A.

The results from the proposed OSD design are summarised in Table 3 highlighting compliance with the matching of pre and post-development peak flows up to the 100 year ARI.

The maximum discharge also complies with the maximum allowable kerb discharge rate of 55L/s as outlined in Councils Stormwater Design Specification.

Table 3: Pre and Post-Development Peak Flows to Princes Highway + OSD Levels

ARI event	Pre-dev peak flow to Princes Highway (m3/s)	Post-dev peak flow to Princes Highway (m3/s) with OSD	Levels in OSD Basin
2 year	0.018	0.018	38.39
5 year	0.026	0.024	38.49
20 year	0.041	0.030	38.66
100 year	0.060	0.040	38.96

Table 4: Pre and Post-Development Peak Flows to rear of property

ARI event	Pre-dev peak flow to rear of property (m3/s)	Post-dev peak flow to rear of property (m3/s) with OSD
2 year	0.048	0.011
5 year	0.073	0.019
20 year	0.111	0.031
100 year	0.169	0.050

## 4.2. Stormwater Quality

### 4.2.1. Introduction

The effectiveness of proposed stormwater quality measures is estimated using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC). MUSIC uses a continuous period of rainfall, combined with a rainfall-runoff model and pollutant generation rates to estimate pollutant loads generated by landscapes. MUSIC has a range of treatment modalities that estimate pollutant collection as a factor of area, shape, retention time and treatment type.

This assessment follows the stormwater objectives outlined in Council's Urban Stormwater Quality Management Plan, and the Water Sensitive Urban Design (WSUD) Objectives as outlined by the WSUD Program through the NSW Sydney Catchment Management Authority (SMCMA). These objectives are based on a comparison of pollutant loads from an equivalent untreated development with a development employing treatment.

### 4.2.2. Modelling Parameters

The model procedure follows Council's guidelines along with the Sydney Catchment Authority Guideline on Using MUSIC in Sydney's Drinking Water Catchment.

Climate information is sourced from the Nowra RAN continuous rainfall gauge with data from 1966 to 1975.

### 4.2.3. Treatment Approach

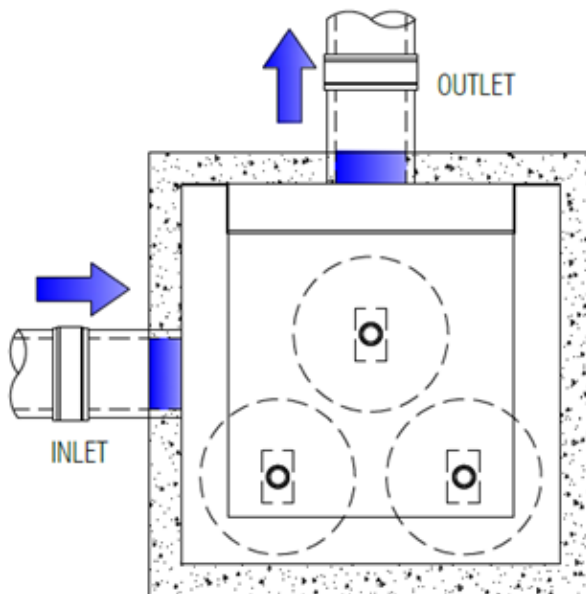
Stormwater treatment measures include:

*Rainwater harvesting and reuse* - 10kL rainwater tank to harvest and reuse Site roof water for external demands (i.e. irrigation and wash down). Assumptions include 500mm irrigation of landscape area per year and 5kL/week for wash down, water features and laundry demands.

*StormFilters* – Stormfilters will be installed prior to the rainwater tank and also within the carpark runoff collection tank. The StormFilter™ cleans stormwater through a passive filtration system, with rechargeable, self-cleaning, media-filled cartridges to absorb and retain pollutants from stormwater runoff including total suspended solids, hydrocarbons, nutrients, soluble heavy metals, and other common pollutants.

The siphon actuated, high surface area cartridges draw stormwater evenly through the filter media. For modelling purposed certified MUSIC nodes have been obtained from the manufacturer with high flow bypass adjustments made based on the number of cartridges nominated.

The proposed arrangement will include 5 stormfilters.



*Stormfilter typical plan view*

*Passive irrigation* – Private open space area will be largely vegetated with either grass or planter beds. Sub-surface drainage will be provided for planter beds which will essential act as raingardens. For modelling purposes generic buffer treatment nodes were adopted to represent passive irrigation treatment.

#### 4.2.4. Model Configuration

Council's water quality target is the retention of a percentage of the annual pollutant load from a development based on comparison of pollutant loads from an equivalent untreated development with a development employing treatment.

#### 4.2.5. Stormwater Modelling Results

The stormwater treatment targets appropriate for the site will be met by the treatment measures provided. The pollutant removal performance as predicted by MUSIC modelling exceeded Council's targets of 85%/45%/45% for TSS/TP/TN respectively. The results are summarised in Table 5.

Table 5: Pre and Post-Development Mean Annual Pollutant Loads

POST-DEVELOPMENT	Pollutant load (kg/yr)	Residual Load (kg/yr)	% Reduction	Benchmark (minimum reduction)
Suspended Solids	439	85.3	80.6%	80%
Total Phosphorus	0.723	0.298	58.7%	45%
Total Nitrogen	5	2.84	43.1%	45%

Council's water quality targets are met for TSS and TP but just fall short for TN. For previous similar projects Council has been willing to accept slightly lower than the specified targets due to the difficulties in removing such small quantities of pollutants.

#### 4.2.6. Stormwater retention

9mm of runoff from the difference in imperviousness over the development is to be retained. The development includes an additional impervious area of 766m<sup>2</sup>

This equates to approximately 7.7m<sup>3</sup> of retention required. This volume will be provided with a 10kL rainwater tank to harvest and reuse Site roof water for external demands (i.e. irrigation and wash down).

### 4.3. Operation and Maintenance

Maintenance requirements are shown in Table 6.

Table 6: Maintenance requirements.

Item	Maintenance	
	Description	Inspection Frequency
RWT	Inspect and clean inlet pipes	1/ 12 months
	Test pump	1/ 12 months
	Clean tank	As required
OSD	Inspect and clean inlet and outlets	1/ 12 months
	Clean tank	As required
StormFilters	<p>Inspect StormFilter interior to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity.</p> <p>It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, the cartridges need to be replaced (Typically 1 – 5 year intervals)</p> <p>Removal of accumulated sediments should be performed during periods of dry weather.</p>	<p>1/ 12 months</p> <p>Also check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation.</p> <p>It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system.</p>

In addition, inspection of system elements will also be required after large rain events to check for blockages.

### 4.4. Construction Period Controls

A Soil and Water Management Plan (SWMP) shall be developed for CC in accordance with the *Managing Urban Stormwater, Soils and Construction* (Blue Book).

Excavation and earthworks will need to include diversions and erosion and sediment controls that can accommodate steeper slopes.

## 5.0 SUMMARY AND CONCLUSION

### 5.1. Stormwater Management Strategy Overview

Stormwater management measures will include:

- New internal stormwater network to manage runoff from new roof areas to new rainwater tank (RWT) / On-site detention (OSD) tank;
- Prior to RWT will be a “Stormfilter” Chamber with Stormfilter cartridges for stormwater treatment;
- RWT to provide opportunity harvesting and reuse for external demands (irrigation and wash down);
- OSD tank to temporarily detain runoff and reduce peak flow discharge to the Princes Highway via Site discharge pit and kerb outlet on Princes Highway;
- Collection tank and pump out arrangement for new carpark ramp runoff with submersible pumps directing flows to the Highway via new Site discharge pit and kerb outlets;
- Within the carpark runoff collection tank will be a “Stormfilter” Chamber with Stormfilter cartridges for stormwater treatment; and
- Areas that cannot drain to new RWT / OSD tank to be directed to landscaped depressions to promote detention and infiltration.

The proposed strategy has been developed in accordance with Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control of the Shoalhaven Council Development Control Plan 2014. Councils planning requirements and the proposed development measures are outlined in Table 7.

Table 7: Assessment of proposed Stormwater Management Strategy

Council Planning Requirement	Proposed measures/Comments	Assessment
Provision of major and minor stormwater system	Site stormwater system to be designed for the 100 year ARI	Complies
Stormwater Quantity measures	Post-development peak flow is to be reduced to pre-development levels through the incorporation of stormwater detention.	Complies
Stormwater Quality Measures	<p>The proposed stormwater quality measures include stormfilters, rainwater tanks (and reuse), detention and landscaping to promote detention/infiltration.</p> <p>The inclusion of these stormwater quality controls ensures that the development meets the Councils target benchmark of 80% removal of TSS, 45% removal of TP and very close to the 45% removal of TN (43.1%) for the development.</p>	Complies

## 6.0 REFERENCES

Landcom, (2009), *Water Sensitive Urban Design Policy Draft*, Landcom, 2009.

Landcom, (2004), *Managing Urban Stormwater Soils and Construction*, 2004.

SMCMA, (2010), *Draft NSW MUSIC Modelling Guidelines*, NSW Department of Primary Industries, 2010.

Ball, J (2013), *Australian Rainfall & Runoff Revision Projects PROJECT 11 Blockage of Hydraulic Structures STAGE 2 REPORT*, Engineers Australia.

Ball, J (2015), *Australian Rainfall and Runoff*, Engineers Australia

# **APPENDIX A – STORMWATER MANAGEMENT CONCEPT PLAN**



LEGEND

PRE DEVELOPMENT HARDSTAND/ROOF AREAS

PRE DEVELOPMENT PERVIOUS AREAS

DIRECTION OF RUNOFF

- NOTES:
1. BOUNDARIES AND IMPROVEMENTS HAVE BEEN LOCATED WITH APPROXIMATE ACCURACY FOR THE PURPOSE OF THIS SURVEY.

2. RELATIONSHIPS OF IMPROVEMENTS TO BOUNDARIES FOR FINANCIAL OR ANY OTHER PURPOSES SHOULD BE CONFIRMED BY FURTHER SURVEY BY A REGISTERED SURVEYOR.

3. THE LOCATION OF UNDERGROUND SERVICES BETWEEN LOCATING MARKS SHOWN ON THIS PLAN IS INDICATIVE ONLY.

4. IT IS CONTRACTORS RESPONSIBILITY TO LOCATE UNDERGROUND SERVICES BY CAREFUL HAND POT-HOLING PRIOR TO ANY EXCAVATION AND EXERCISE DUE CARE DURING THAT EXCAVATION

Pre development catchment breakdown (m²)			
	Draining direct to Princes Highway	Draining to Princes Highway via OSD	Total
Pervious area (m2)	75	1649	1724
Impervious area (m2)	688	603	1291
Total area (m2)	763	2252	3015
% of Site area	25%	75%	
% Pervious	9.8%	73.2%	57.2%
% Impervious	90.2%	26.8%	42.8%

PRE DEVELOPMENT  
CATCHMENT BREAKDOWN

REDUCTION RATIO: 1:125 AT A1	AMENDMENTS		BY	DATE
DATUM: AUSTRALIAN HEIGHT DATUM	SURVEYED	I.M.	J.A.	28/06/2022
CONTOUR INTERVAL: 0.25m (EX.)	DESIGNED	J.A.		
ORIGIN OF LEVELS: SSM42015 RL 37.88	DRAWN	J.A.		
DATE OF PLAN : 28/06/2022	CHECKED	P.S.		

RYGATE & WEST

INCORPORATING BULLOCK & WALTERS

SINCE 1893

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P.O. BOX 346, SUITE 6, 30 ORIENT STREET BATEMANS BAY NSW 2536  
mail@rygateandwest.com.au  
02 44542137

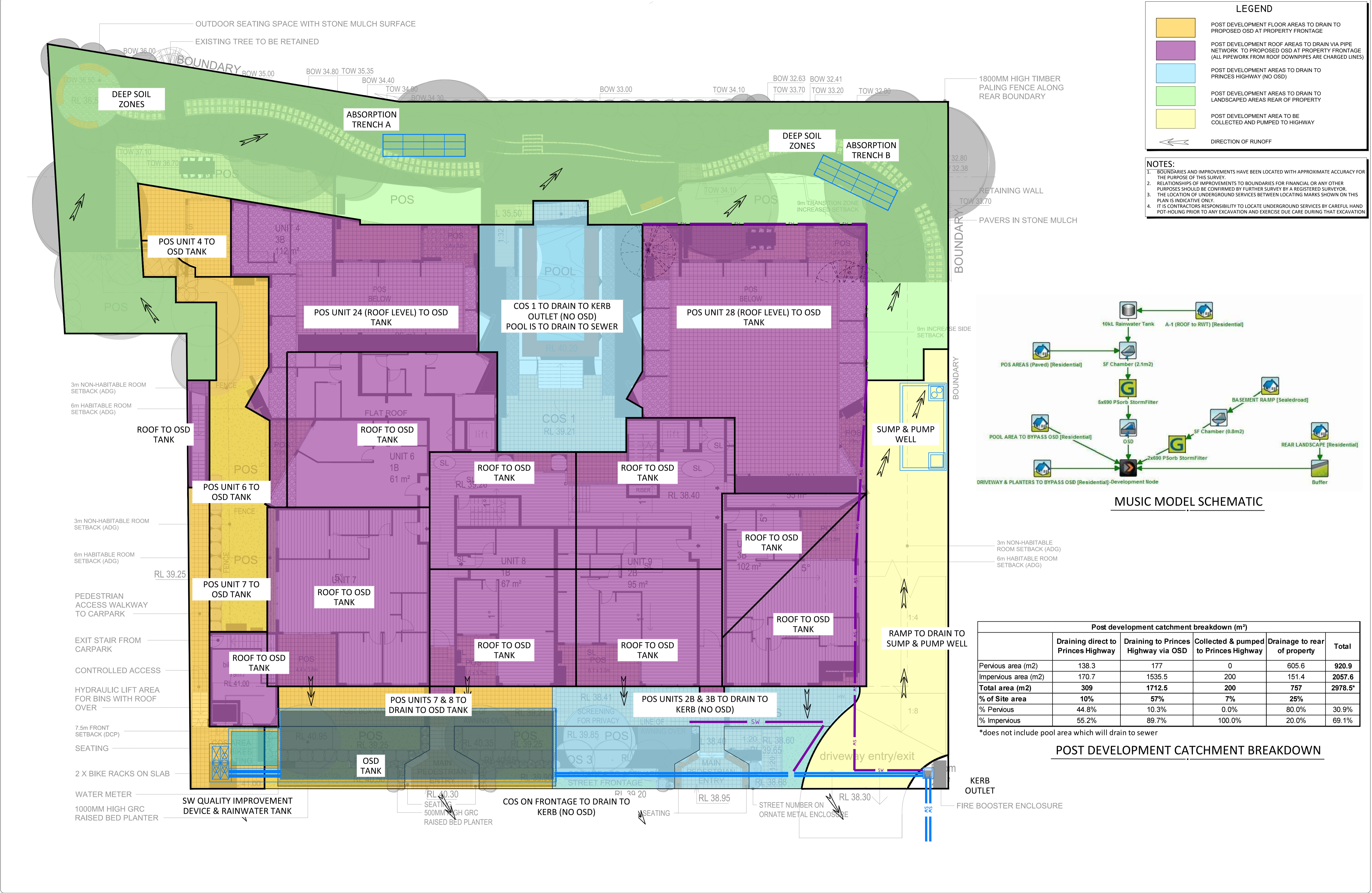
R & G CREATIONS

STORMWATER MANAGEMENT

PRE-DEVELOPMENT STORMWATER CATCHMENT - LAYOUT PLAN  
FOR PROPOSED RESIDENTIAL DEVELOPMENT  
OVER LOTS 1 & 2 ON DP518702 AND LOT 3 ON DP523625

MOLLYMOOKCITY OF SHOALHAVEN

REFERENCE No. U18173
DRAWING No. U18173_ENG.dwg
ISSUE
SHEET 1 OF 6 SHEETS



LEGEND

POST DEVELOPMENT FLOOR AREAS TO DRAIN TO PROPOSED OSD AT PROPERTY FRONTAGE

POST DEVELOPMENT ROOF AREAS TO DRAIN VIA PIPE NETWORK TO PROPOSED OSD AT PROPERTY FRONTAGE (ALL PIPEWORK FROM ROOF DOWNPIPES ARE CHARGED LINES)

POST DEVELOPMENT AREAS TO DRAIN TO PRINCES HIGHWAY (NO OSD)

POST DEVELOPMENT AREAS TO DRAIN TO LANDSCAPED AREAS REAR OF PROPERTY

POST DEVELOPMENT AREA TO BE COLLECTED AND PUMPED TO HIGHWAY

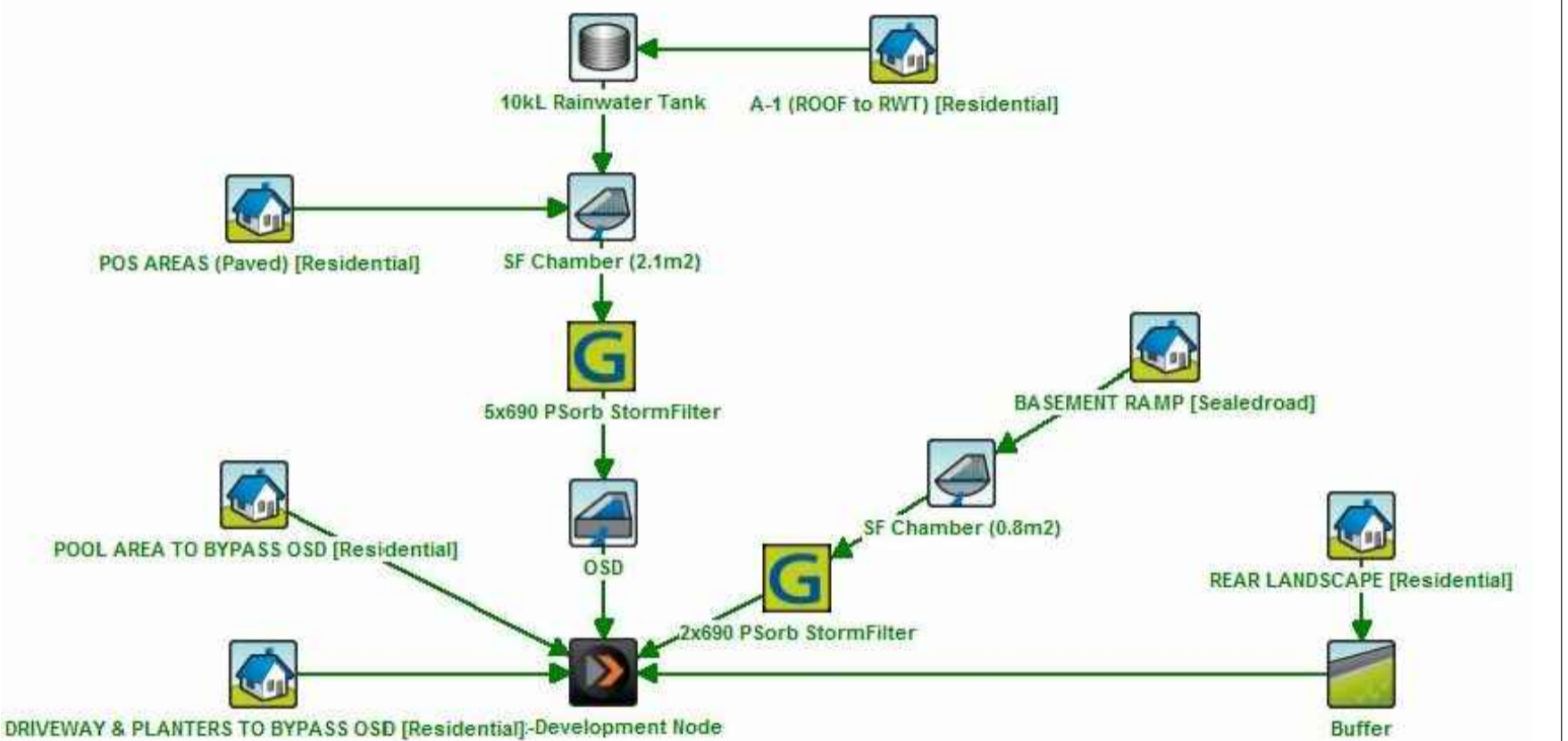
DIRECTION OF RUNOFF

- NOTES:
1. BOUNDARIES AND IMPROVEMENTS HAVE BEEN LOCATED WITH APPROXIMATE ACCURACY FOR THE PURPOSE OF THIS SURVEY.

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4. IT IS CONTRACTORS RESPONSIBILITY TO LOCATE UNDERGROUND SERVICES BY CAREFUL HAND POT-HOLING PRIOR TO ANY EXCAVATION AND EXERCISE DUE CARE DURING THAT EXCAVATION



MUSIC MODEL SCHEMATIC

Post development catchment breakdown (m²)					
	Draining direct to Princes Highway	Draining to Princes Highway via OSD	Collected & pumped to Princes Highway	Drainage to rear of property	Total
Pervious area (m2)	138.3	177	0	605.6	920.9
Impervious area (m2)	170.7	1535.5	200	151.4	2057.6
Total area (m2)	309	1712.5	200	757	2978.5*
% of Site area	10%	57%	7%	25%	
% Pervious	44.8%	10.3%	0.0%	80.0%	30.9%
% Impervious	55.2%	89.7%	100.0%	20.0%	69.1%

\*does not include pool area which will drain to sewer

POST DEVELOPMENT CATCHMENT BREAKDOWN

REDUCTION RATIO: 1:125 AT A1	AMENDMENTS		BY	DATE
DATUM: AUSTRALIAN HEIGHT DATUM	SURVEYED	I.M.	J.A.	28/06/2022
CONTOUR INTERVAL: 0.25m (EX.)	DESIGNED	J.A.		
ORIGIN OF LEVELS: SSM42015 RL 37.88	DRAWN	J.A.		
DATE OF PLAN : 28/06/2022	CHECKED	P.S.		

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R & G CREATIONS

STORMWATER MANAGEMENT

POST-DEVELOPMENT STORMWATER CATCHMENT - LAYOUT PLAN

FOR PROPOSED RESIDENTIAL DEVELOPMENT

OVER LOTS 1 & 2 ON DP518702 AND LOT 3 ON DP523625

MOLLYMOOK

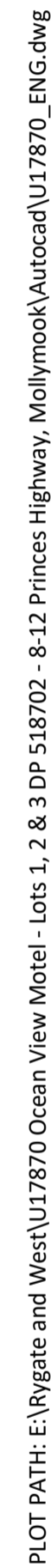
CITY OF SHOALHAVEN

REFERENCE No. U18173
DRAWING No. U18173_ENG.dwg
ISSUE
SHEET 2 OF 6 SHEETS

PLOT PATH: E:\Rygate and West\U17870 Ocean View Motel - Lots 1, 2 & 3 DP 518702 - 8-12 Princes Highway, Mollymook\Autocad\U17870\_ENG.dwg

PLOT DATE: 28/06/2022



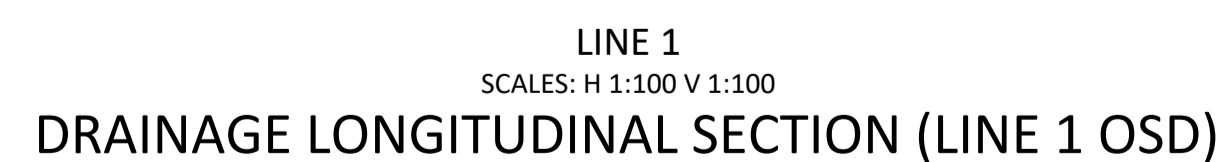


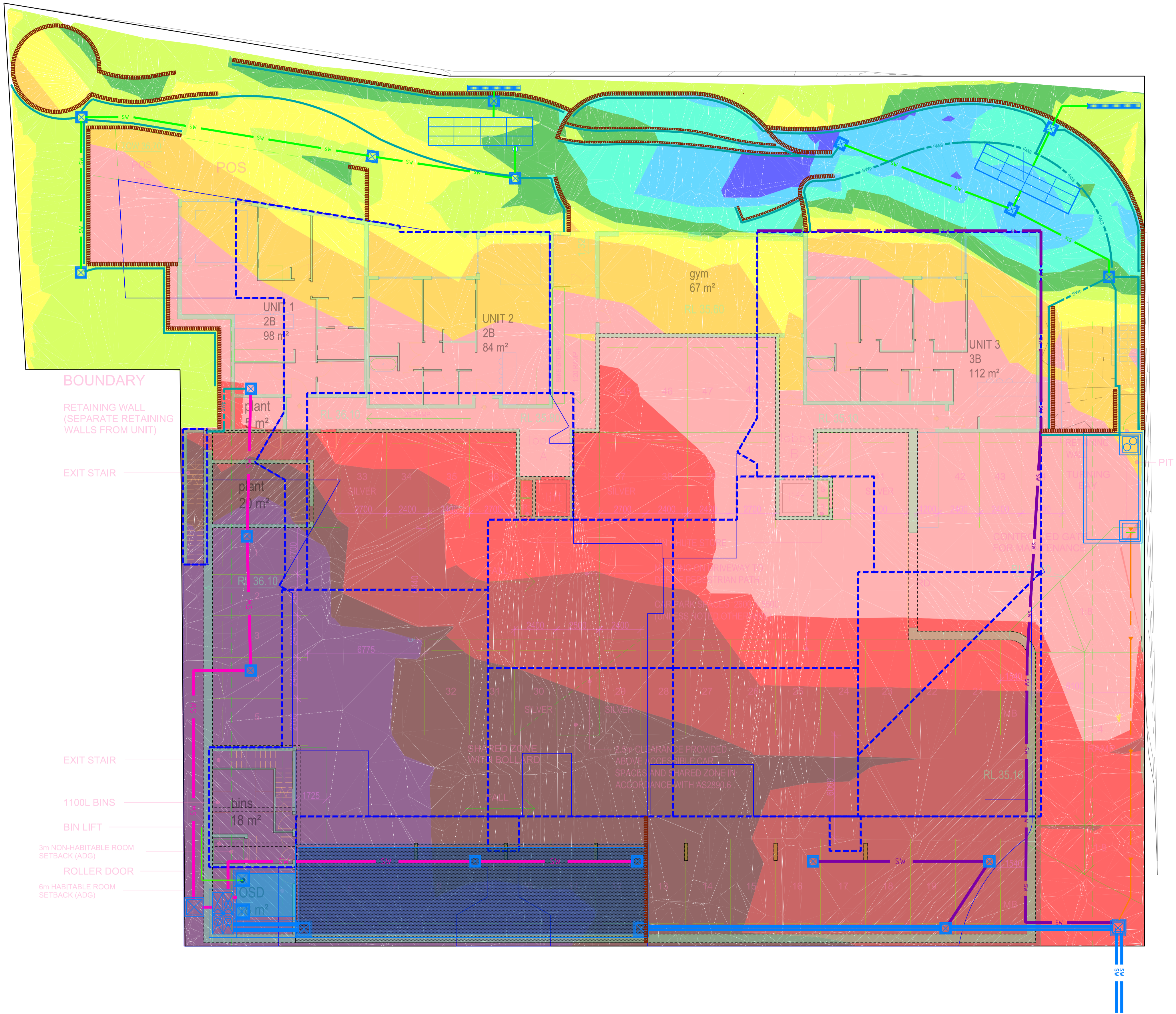
**RYGATE & WEST**  
INCORPORATING BULLOCK & WALTERS  
SINCE 1893

P.O. BOX 107, 266 GREEN STREET ULLADULLA NSW 2539  
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02 44542137

<p align="center"><b>STORMWATER MANAGEMENT</b>  <b>GROUND FLOOR STORMWATER ARRANGEMENT - LAYOUT PLAN</b>  <b>FOR PROPOSED RESIDENTIAL DEVELOPMENT</b>  <b>OVER LOTS 1 &amp; 2 ON DP518702 AND LOT 3 ON DP523625</b></p>	
<b>MOLLYMOOK</b>	<b>CITY OF SHOALHAVEN</b>

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SHEET 4 OF 6 SHEETS





**FILLING NOTES**

Geotechnical Investigations have been undertaken on 7th December 2021 by Fortify Geotech Pty Ltd. Refer to the Geotechnical Investigation Report (Reference AB/S1398) for methodology associated with the filling of the site.

Lots to be filled shall be graded with an absolute minimum grade of 0.5%.

Filling is to be of sound clean material, reasonable standard and free from large rock, stumps, organic matter and other debris.

Placing of filling on the prepared areas shall not commence until the authority to do so has been obtained from Council.

All work shall be in accordance with AS3798. Fill is to be placed in layers not exceeding 150m compacted thickness. All fill is to be compacted to 95% standard maximum dry density. Maximum particle size shall be 2/3 of the layer thickness.

Level 1 Supervision is to be performed for the duration of the filling works and certification confirming satisfactory compaction and placement of the fill.

Fill comprising natural sands or industrial wastes or by-products will be accepted by Council only in approved locations and will be subject to specific requirements determined by prevailing conditions.

It is essential that prior advice be given of intended use of such materials. It should be noted that failure to obtain Council's approval may lead to an order for removal of any material considered by Council or other relevant authorities as unsuitable or in any way unfit for filling.

All areas where filling has been placed are to be dressed with clean arable topsoil, fertilised and sown with suitable grasses.

CUT / FILL DEPTH RANGES			
No.	From Depth	To Depth	Colour
1	-6.000 Cut	-5.000 Cut	
2	-5.000 Cut	-4.000 Cut	
3	-4.000 Cut	-3.000 Cut	
4	-3.000 Cut	-2.000 Cut	
5	-2.000 Cut	-1.000 Cut	
6	-1.000 Cut	-0.500 Cut	
7	-0.500 Cut	-0.100 Cut	
8	0.100 Fill	0.500 Fill	
9	0.500 Fill	1.000 Fill	
10	1.000 Fill	1.500 Fill	
11	1.500 Fill	2.000 Fill	
12	2.000 Fill	2.500 Fill	

REDUCTION RATIO: 1:125 AT A1 DATUM: AUSTRALIAN HEIGHT DATUM CONTOUR INTERVAL: 0.25m (EX.) ORIGIN OF LEVELS: SSM42015 RL 37.88	AMENDMENTS		BY	DATE
	SURVEYED	I.M.	J.A.	28/06/2022
	DESIGNED	J.A.		
	DRAWN	J.A.		
DATE OF PLAN : 28/06/2022	CHECKED	P.S.		

**RYGATE & WEST**  
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R & G CREATIONS

STORMWATER MANAGEMENT  
BULK EARTHWORKS - LAYOUT PLAN  
FOR PROPOSED RESIDENTIAL DEVELOPMENT  
OVER LOTS 1 & 2 ON DP518702 AND LOT 3 ON DP523625

MOLLYMOOKCITY OF SHOALHAVEN

REFERENCE No. U18173
DRAWING No. U18173_ENG.dwg
ISSUE
SHEET 6 OF 6 SHEETS