martens
consulting engineers since 1989

Posted		
Faxed		
Emailed	X	John Toon - evjotoon@bigpond.com
Courier		
By Hand		
Contact:		Megan Kovelis / Andrew Norris
Our Ref:		P1203365JC52V01
Pages:		4
cc.		

22 November 2017

NSW Department of Planning and Environment
Att: Deana Burn
By Email

Dear Deana Burn,

RE: STORMWATER QUALITY ASSESSMENT – STAGE 1; CULBURRA WEST MIXED USE DEVELOPMENT, CULBURRA, NSW.

1.0 Introduction

Martens & Associates has been requested to undertake a stormwater quality assessment for Stage 1 of the proposed Culburra West development. This assessment identifies the stormwater treatment devices required to satisfy the Shoalhaven City Council (2015) – Development Control Plan (DCP) and water quality objectives established in the West Culburra water quality assessment developed for the application currently under assessment by the NSW Department of Planning and Environment. Though the Concept Approval is yet to be finalised, the proponent sought to have this modelling exercise completed to assist in the consultation process with Shoalhaven City Council and address concerns raised in their submission dated 1 September 2017.

2.0 Water Quality Objectives

To address Shoalhaven Council requirements and NSW DoPE peer reviewer's comments and specifications, the adopted water quality objectives include:

- NorBE (neutral or beneficial effect) – pollutant loads in the post development scenario are equal to or less than those currently generated from the existing site.
- Treatment train effectiveness – the following pollutant load reduction criteria were to be achieved at minimum:
    - 90% of gross pollutants;
    - 85% of total suspended solids (TSS);
    - 65% total phosphorus (TP); and
    - 45% of total nitrogen (TN).

3.0 Methodology

Model for Urban Stormwater Improvement Conceptualisation (*MUSIC*, Version 6.2) was used to evaluate pre and post development pollutant loads from the site. Modelling has been undertaken in accordance with the NSW MUSIC Modelling Guideline (2010) as was the case for modelling completed as part of the peer reviewed concept plan water quality assessment.

The MUSIC model considers two scenarios as follows:

1. Pre-development "source nodes": were modelled adopting an agricultural land use (as per the concept plan assessment), and an area based on site hydrology.

2. Post-development "source nodes": were modelled as a combination of roofs, roads, residential and rural land uses, based on the drainage design provided by Allen Price & Scarratts (refer to Attachment A).

The post-development scenario aims to minimise the developed catchment area discharging to Lake Wollumboola (Attachment A). Areas for source nodes were therefore adjusted to reflect flow redistribution proposed. Land use for undeveloped portions of Stage 1 (i.e. APZs and other residual land) was changed from agriculture to rural assuming that, as part of the development, any ongoing agricultural practices would cease.

All other model input parameters were made consistent with the peer reviewed concept plan assessment.

The model was run iteratively in order to ascertain the treatment train required in order to achieve modelling objectives.

4.0 Proposed treatment train

Crookhaven Estuary Catchments

The treatment train developed for the Crookhaven Estuary catchment includes:

- 5kL rainwater tank on each dwelling;
- 622m^2 (filter area) roadside bioswales;
- 25 x Enviropods (to be located as pit inserts); and
- 12 x StormFilters with Psorb media.

We note that the use of Psorb media was not a part of the original concept plan, Psorb media has the benefit of specifically targeting TN and TP removal.

Lake Wollumboola Catchments

Only a relatively small portion of the Stage 1 area is not captured by the proposed drainage system discharging to the north. The area draining to the lake is for Asset Protection Zones (APZ) so will be 100% pervious in nature. The change in land use (agricultural to 100% pervious residential) combined with the greatly reduced area means a significant reduction in pollutant generation, therefore, no treatment is required.

5.0 Results

Water quality assessment results for the areas of Stage 1 discharging to the Crookhaven Estuary are provided in Table 1 and Table 2.

Table 1: MUSIC NorBE results: Pre and Post development for the Crookhaven Estuary catchment.

Parameter	Pre-development	Post Development	% Change
TSS (kg/year)	236	94.7	-59.9%
TP (kg/year)	1.0	0.5	-52.6%
TN (kg/year)	7.1	7.0	-0.7%
Gross Pollutants (kg/year)	0	0	0.0%

Table 2: MUSIC Treatment Train Effectiveness results: Crookhaven Estuary

Parameter	Sources	Residual Load	Achieved Reduction	Required Reduction	Complies (Y/N)
TSS (kg/year)	1510	94.7	93.7%	85%	Y
TP (kg/year)	3.8	0.5	87.4%	65%	Y
TN (kg/year)	33.0	7.0	78.8%	45%	Y
Gross Pollutants (kg/year)	352.0	0.0	100.0%	90%	Y

Results for the areas of Stage 1 discharging to Lake Wollumboola is provided in Table 3.

Table 3: MUSIC NorBE results: Pre-development and Post-development for the Lake Wollumboola catchment

Parameter	Pre-development	Post Development	% Change
TSS (kg/year)	245	44.7	-81.8%
TP (kg/year)	1.1	0.2	-81.8%
TN (kg/year)	7.3	1.3	-82.2%
Gross Pollutants (kg/year)	0	0	0.0%

Note no treatment train effectiveness results are provided for areas draining to Lake Wollumboola as no treatment train is proposed.

6.0 Conclusion

The results indicate that post development water quality objectives will be met by the proposed treatment train, which includes the following:

- 5kL rainwater tank on each dwelling;
- 622m^2 (filter area) roadside bioswales;
- 25 x Enviropods; and
- 12 x StormFilters with Psorb media.

If you have any queries please contact the undersigned.

For and on behalf of

MARTENS & ASSOCIATES PTY LTD

Erica Zhu

ERICA ZHU
Civil Engineer

Attachment A – Planset

PROJECT: PROPOSED RESIDENTIAL SUBDIVISION: STAGE 1

PLANSET: STORMWATER QUALITY ASSESSMENT

CLIENT: THE HALLORAN TRUST

DRAWING LIST		
DWG NO.	REV	DWG TITLE
GENERAL		
PS04-A000	A	COVER SHEET
DRAINAGE		
PS04-E700	A	WATER QUALITY CATCHMENT PLANS, MODELS & RESULTS

LOCALITY PLAN
NOT TO SCALE

LGA: SHOALHAVEN CITY COUNCIL

WEST CULBURRA, NSW
LOT 5 AND PART OF LOT 6
DA: DP 1065111

INTERNAL

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	INITIAL RELEASE	9/11/2017	KH	EZ	MK	

SCALE

GRID	DATUM	PROJECT MANAGER
---	---	MK

CLIENT: REALTY REALIZATIONS PTY LTD

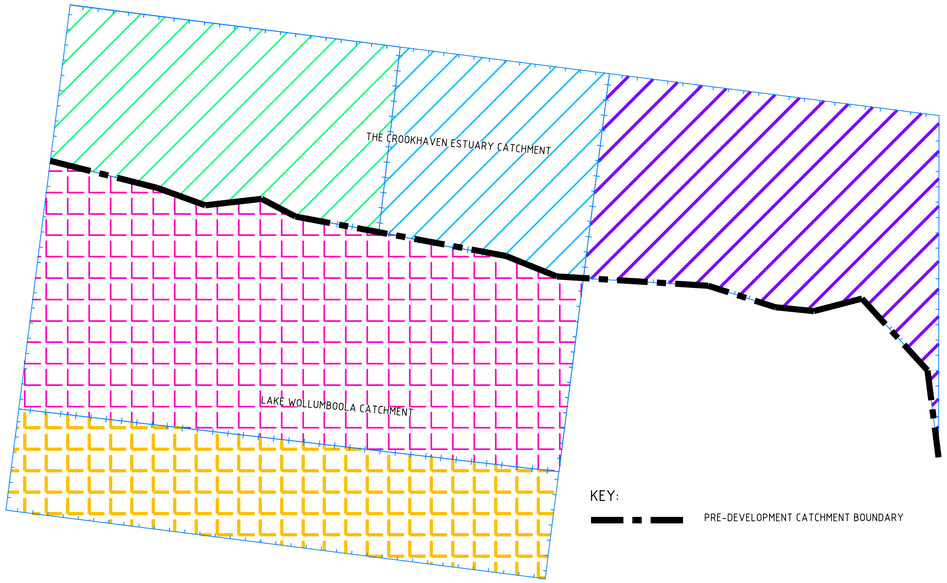
DISCLAIMER & COPYRIGHT
This plan must not be used for construction unless signed as approved by principal certifying authority.
All measurements in millimetres unless otherwise specified.
This drawing must not be reproduced in whole or part without prior written consent of Martens & Associates Pty Ltd.
(C) Copyright Martens & Associates Pty Ltd

PROJECT NAME/PLANSET TITLE
PROPOSED RESIDENTIAL SUBDIVISION
STORMWATER QUALITY ASSESSMENT
WEST CULBURRA, NSW

martens & Associates Pty Ltd
Consulting Engineers
Environment
Water
Geotechnical
Civil
Suite 201, 20 George St, Hornsby, NSW 2077 Australia Phone: (02) 9476 9999 Fax: (02) 9476 8767
Email: mail@martens.com.au Internet: www.martens.com.au

DRAWING TITLE: COVER SHEET

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1203365	PS04	R01	PS04-A000	A



PRE DEVELOPMENT MUSIC MODEL

CATCHMENT AREAS AND MODELLING RESULTS

MUSIC CATCHMENTS (LAKE WOLLUMBOOLA)

PRE-DEVELOPMENT CATCHMENT AREAS

KEY	DESCRIPTION	MUSIC NODE ID	AREA (ha)	IMPERVIOUS %	MUSIC NODE REFERENCE
	AGRICULTURAL	C20B	1.287	0	NSW MUSIC MODELLING GUIDELINES 2015
	AGRICULTURAL	Additional area	0.607	0	NSW MUSIC MODELLING GUIDELINES 2015
		TOTAL - OVERALL		1.895	= 100 % OF OVERALL AREA
		TOTAL - IMPERVIOUS		0	= 0 % OF OVERALL AREA
		TOTAL - PERVIOUS		1.895	= 100 % OF OVERALL AREA

POST-DEVELOPMENT CATCHMENT AREAS

KEY	DESCRIPTION	MUSIC NODE ID	AREA (ha)	IMPERVIOUS %	MUSIC NODE REFERENCE
	APZ	1B01B	0.361	0	NSW MUSIC MODELLING GUIDELINES 2015
		TOTAL - OVERALL		0.361	= 100 % OF OVERALL AREA
		TOTAL - IMPERVIOUS		0	= 0 % OF OVERALL AREA
		TOTAL - PERVIOUS		0.361	= 100 % OF OVERALL AREA

MUSIC CATCHMENTS (CROOKHAVEN ESTUARY)

PRE-DEVELOPMENT CATCHMENT AREAS

KEY	DESCRIPTION	MUSIC NODE ID	AREA (ha)	IMPERVIOUS %	MUSIC NODE REFERENCE
	AGRICULTURAL	C19	0.617	0	NSW MUSIC MODELLING GUIDELINES 2015
	AGRICULTURAL	C20A	0.437	0	NSW MUSIC MODELLING GUIDELINES 2015
	AGRICULTURAL	C18	0.773	0	NSW MUSIC MODELLING GUIDELINES 2015
		TOTAL - OVERALL		1.827	= 100 % OF OVERALL AREA
		TOTAL - IMPERVIOUS		0	= 0 % OF OVERALL AREA
		TOTAL - PERVIOUS		1.827	= 100 % OF OVERALL AREA

POST-DEVELOPMENT CATCHMENT AREAS

KEY	DESCRIPTION	MUSIC NODE ID	AREA (ha)	IMPERVIOUS %	MUSIC NODE REFERENCE
	ROOF	1B01A	0.853	100	NSW MUSIC MODELLING GUIDELINES 2015
	ROAD	1B02A	0.424	100	NSW MUSIC MODELLING GUIDELINES 2015
	REMAINING AREA	1B03A	0.719	0	NSW MUSIC MODELLING GUIDELINES 2015
	ROOF BYPASSES BIOSWALE	1C01B	0.248	100	NSW MUSIC MODELLING GUIDELINES 2015
	REMAINING AREA BYPASSES BIOSWALE	1C02B	0.294	0	NSW MUSIC MODELLING GUIDELINES 2015
	RURAL	1C01C	0.745	0	NSW MUSIC MODELLING GUIDELINES 2015
		TOTAL - OVERALL		3.282	= 100 % OF OVERALL AREA
		TOTAL - IMPERVIOUS		1.524	= 46 % OF OVERALL AREA
		TOTAL - PERVIOUS		1.758	= 54 % OF OVERALL AREA

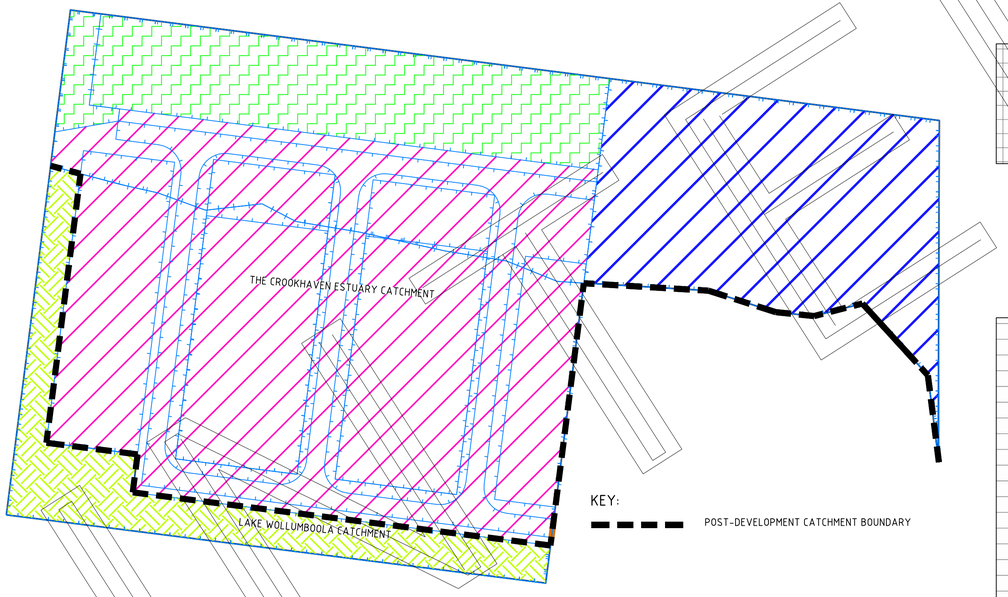
NOTES:
1. ALL LOTS HAVE BEEN SPLIT INTO 'ROOF', 'ROAD' AND 'REMAINING'. ASSUMED EACH LOT HAS A ROOF AREA OF 275M² AND A LAYBACK OF 10.5M².
2. ASSUMED 100% OF ROOF AREA DRAINS TO RAINWATER TANK.

Mean Annual Loads - Lake Wollumboola

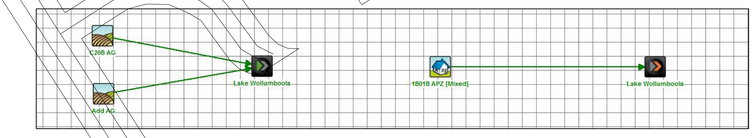
	Inflow	
	Pre	Post
Flow (ML/yr)	4.27	0.814
Total Suspended Solids (kg/yr)	245	44.7
Total Phosphorus (kg/yr)	1.05	0.150
Total Nitrogen (kg/yr)	7.28	1.26
Gross Pollutants (kg/yr)	0.00	0.00

☑ Include Pre-Development

MODELLING RESULTS (PRE AND POST DEVELOPMENT) FOR THE LAKE WOLLUMBOOLA CATCHMENT



POST DEVELOPMENT MUSIC MODEL



MODEL LAYOUT FOR LAKE WOLLUMBOOLA CATCHMENT

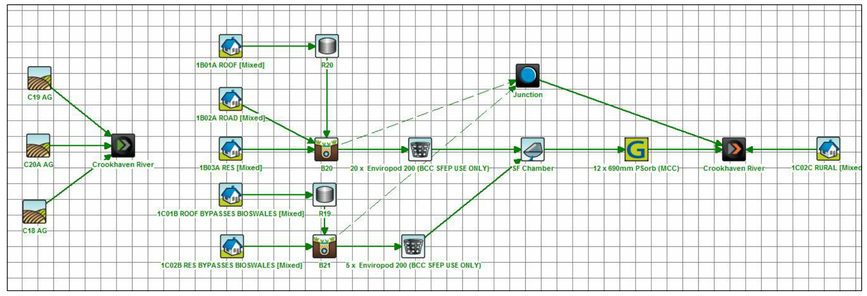
NOT TO SCALE

Mean Annual Loads - Crookhaven River

	Inflow	
	Pre	Post
Flow (ML/yr)	4.12	12.6
Total Suspended Solids (kg/yr)	236	94.7
Total Phosphorus (kg/yr)	1.02	0.483
Total Nitrogen (kg/yr)	7.05	7.00
Gross Pollutants (kg/yr)	0.00	0.00

☑ Include Pre-Development

MODELLING RESULTS (PRE AND POST DEVELOPMENT) FOR THE CROOKHAVEN ESTUARY CATCHMENT



MODEL LAYOUT FOR THE CROOKHAVEN ESTUARY CATCHMENT

NOT TO SCALE

Treatment Train Effectiveness - Crookhaven River

	Sources	Residual Load	% Reduction
Flow (ML/yr)	16.2	12.6	22.1
Total Suspended Solids (kg/yr)	1510	94.7	93.7
Total Phosphorus (kg/yr)	3.83	0.483	87.4
Total Nitrogen (kg/yr)	33	7	78.8
Gross Pollutants (kg/yr)	352	0	100
Warning - upstream treatment train includes losses			

☐ Include Pre-Development

MODELLING RESULTS TREATMENT TRAIN EFFECTIVENESS FOR THE CROOKHAVEN ESTUARY CATCHMENT

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	INITIAL RELEASE	9/11/2017	KH	EZ	MK	

SCALE: A1 (A3) 1:1,000 (1:2,000) — 0 10 20 30 40 50 60 70 80 90 100 METRES

GRID: --- | DATUM: --- | PROJECT MANAGER: MK

CLIENT: REALTY REALIZATIONS PTY LTD

PROJECT NAME/PLANSET TITLE: PROPOSED RESIDENTIAL SUBDIVISION
STORMWATER QUALITY ASSESSMENT
WEST CULBURRA, NSW

DISCLAIMER & COPYRIGHT
This plan must not be used for construction unless signed as approved by principal certifying authority.
All measurements in millimetres unless otherwise specified.
This drawing must not be reproduced in whole or part without prior written consent of Martens & Associates Pty Ltd.
(C) Copyright Martens & Associates Pty Ltd

martens & Associates Pty Ltd
Consulting Engineers
Environment
Water
Geotechnical
Civil
Suite 201, 20 George St, Hornsby, NSW 2077 Australia Phone: (02) 9476 9999 Fax: (02) 9476 8767
Email: mail@martens.com.au Internet: www.martens.com.au

DRAWING TITLE: WATER QUALITY CATCHMENT PLAN, MODEL & RESULTS

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1203365	PS04	R01	PS04-E700	A

DRAWING ID: P1203365-PS04-R01-E700

A1 / A3 LANDSCAPE (A1LC_v02.0.01)

PRINTED ---- USER: KWONG