NORTHROP

Central Coast Quarter

Concept Stormwater Management Report

26 Mann Street, Gosford NSW 2250

PREPARED FOR
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Ref: SY182302_E01
Rev: C
Date: 29.08.19

Concept Stormwater Management Report

Revision Schedule

Date	Revision	Issue	Prepared By	Approved By
14/08/19	A	Final	R. Suckling	D. Holland
28/08/19	B	Final	R. Suckling	D. Holland
29/08/19	C	Final	R. Suckling	D. Holland

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1. Introduction

1.1 Intent & Information

Northrop Consulting Engineers have been engaged to undertake conceptual stormwater management design proposed mixed-use development at 26 Mann Street, Gosford.

The purpose of this report is to summarise the proposed design solutions for the stormwater management in response to the SEARs letter prepared by the NSW Planning & Environment department dated 22/07/19. This advice has specifically been prepared in response to items 9, 10 and 11 of the SEARs letter.

The information and comments provided herein are based on information provided by St Hilliers, which included a selection of concept architectural plans prepared by DKO, and detailed site survey information prepared by Veris.

We have used the above combined with information obtained from:

- Dial Before You Dig (DBYD);
- Google Maps and Street Viewer; and
- Central Coast Council representatives and development guidelines.

We note the information contained within this report is not intended to present detailed solutions but rather provide solutions commensurate with a conceptual design suitable for submission to NSW Planning & Environment. Further investigation and development of detailed design would need to be undertaken to confirm the recommendations and findings of this report.

1.2 Site Description

The subject site consisting of Lots 2-7 in DP14761, Lot 11 in DP1250131 and Lot 469 in DP821073, is bounded by Mann Street to the east, Baker Street road reserve to the west, Vaughan Avenue to the south and commercial development to the north. The site topography is sloping nature with levels ranging on the site from RL9.00 in the east to RL2.55 in the west.

The site is currently undeveloped and has previously been used as a site compound for construction activities. Figure 1 presents an aerial overview of the site in its current state.

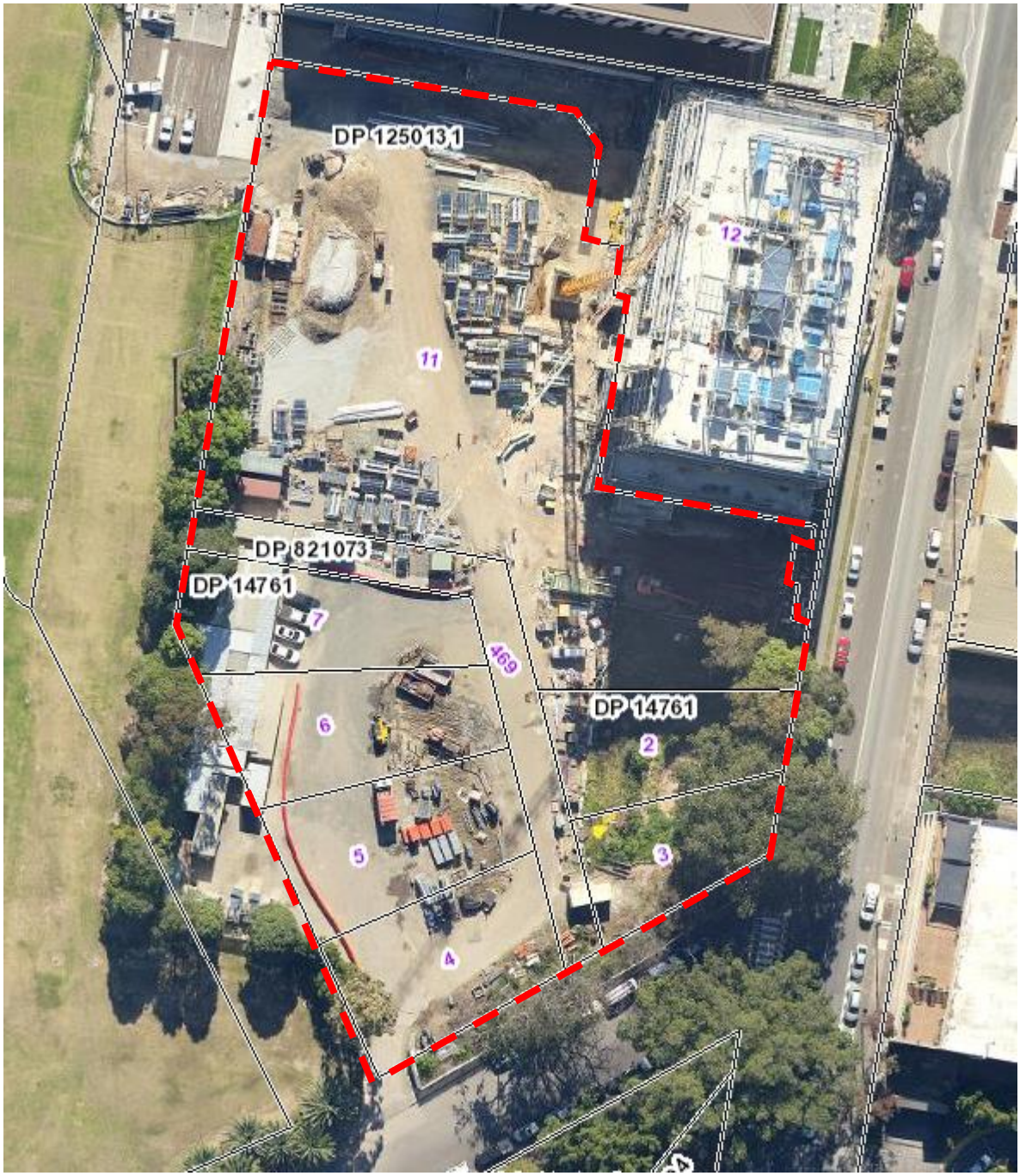


Figure 1 - Site Aerial Image - Obtained from maps.six.nsw.gov.au

1.3 Proposed Development

The proposed development consists of three high-rise towers including residential, hotel and retail spaces. A shared basement carpark is provided to service the proposed development with access from the existing right of way off Baker Street. A large podium & common area will be provided linking between each of the towers for public use.

2. Existing Stormwater Infrastructure

Information obtained from Dial Before You Dig (DBYD) drawings provided by Central Coast Council and experience from previous projects adjacent to the subject site identify an existing stormwater drainage culvert is located within the adjacent park.

An extract from the DBYD drawings is presented in Figure 2.

Figure 2 – DBYD Drawing Extract - Obtained from Central Coast Council

It is proposed that the stormwater drainage for the full subject site will converge to a single outlet and make a new connection to the existing drainage culvert. It is anticipated that any additional drainage infrastructure constructed as part of the Baker Street road extension will connect via the same culvert connection. Figure 3 shows a schematic of the proposed drainage connection.

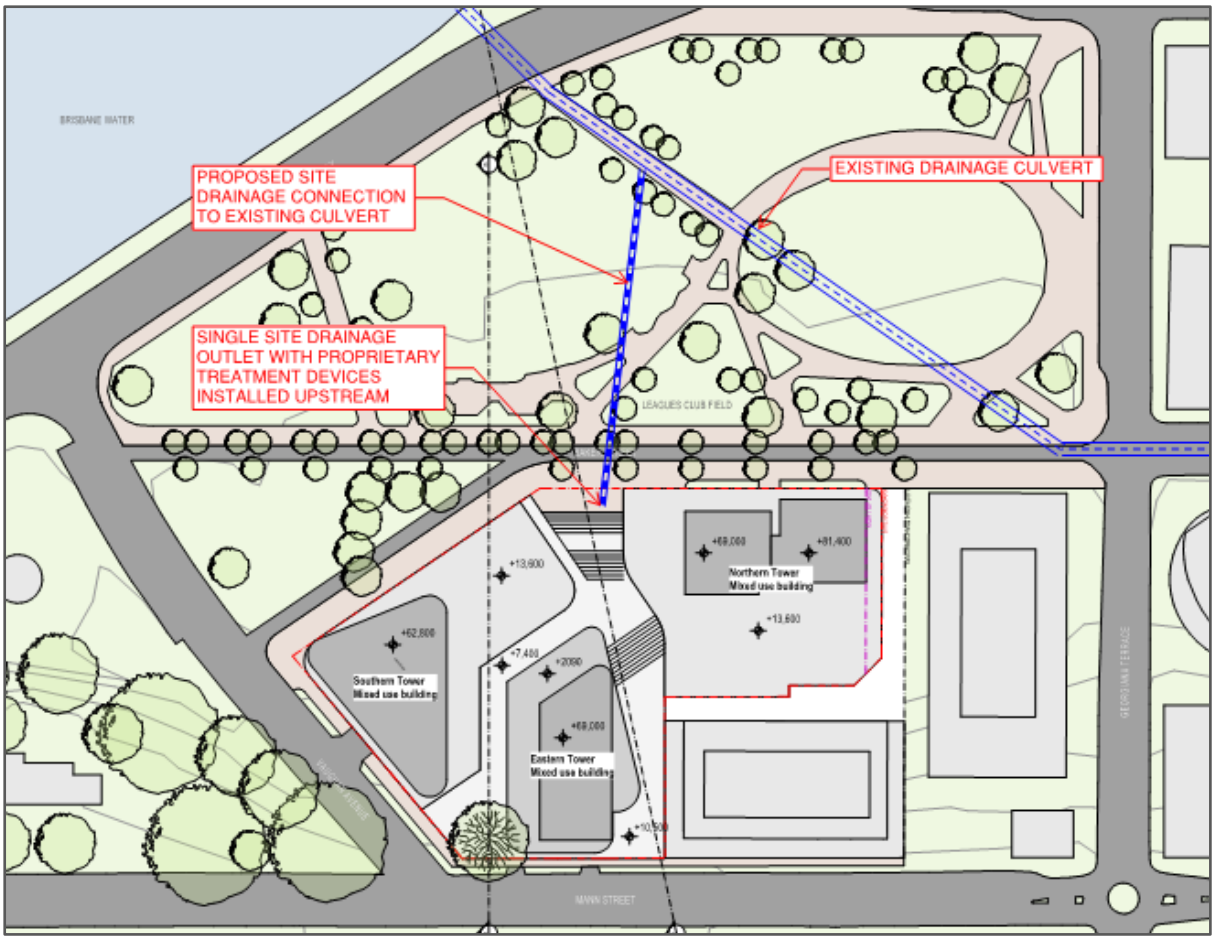


Figure 3 – Proposed Stormwater Drainage Connection

The existing drainage infrastructure in Baker Street will be retained & no new connections are proposed for this system.

3. Water Cycle Management

3.1 General Strategy

The proposed development will need to meet the design intent for water cycle management as outlined in Section 6.7 of Central Coast Councils Development Control Plan (Gosford). A water cycle management strategy will be required to address the following items:

- Water Conservation
- Stormwater Retention
- Stormwater Quality
- On-site Detention
- Local Overland Drainage
- Flooding

3.2 Water Conservation

The water conservation objective for the development is to reduce potable water demand by 40%. The redevelopment will incorporate the following water saving measures:

- Using AAA+ efficient taps, hoses and fittings and undertaking regular maintenance of these fixtures;
- The use of 4.5/3 duel flush toilet cisterns;
- Providing water efficient washing machines and dishwashers;
- Landscaping with plant species that require minimal watering and irrigation with appropriate systems to minimise water loss and evaporation. This includes native plant species, using mulch around garden beds, avoiding watering when it's windy, watering during the coolest parts of the day and using drip irrigation;
- Harvested rainwater from the roof of the new buildings is proposed to be collected and reused for cooling tower make-up, irrigation of landscaping areas, carwash water supply and hardstand wash down.

It is our opinion that the measures outlined above will provide adequate reduction in potable demand to meet the intent of the water conservation target. The residential portions of the development will also be subject to satisfy BASIX commitments to meet water conservation targets.

3.3 Stormwater Retention

The intent of water retention targets in Chapter 6.7 of DCP 2013 is to mimic the natural catchment hydrology from all development sites, in terms of:

- Quantity - the annual volume of stormwater reaching natural creeks and waterways;
- Rate - the peak flow rates leaving the site; and
- Response - the time it takes for rain to runoff the site.

To satisfy the intent of the retention targets in the DCP it is proposed to incorporate stormwater source controls to the impervious catchments for the site. In order for stormwater source controls to be effective, they need to have sufficient capacity to meet the above targets. Sizing of controls is described in The Hunter & Central Coast Water Smart Model Planning document (HCCREMS, 2012). Sizing is based on the concept of mitigation of increased stormwater runoff arising from impervious surfaces, for rainfall events with an average recurrence interval of 3 months.

The depth of stormwater runoff that must be captured by the stormwater source controls in order to achieve frequent discharge mitigation is termed the mitigation depth. The mitigation depth for various soil types and are shown below in Table 1.

Table 1: Mitigation Depth

Soil Texture	Mitigation Depth (mm)
Sand	14
Sandy Loam	14
Clay Loam	10
Clay	7

Based on geotechnical investigation report prepared by Coffey (Ref: SYDGE214942 dated 03/04/2018), a clay soil profile is considered to best represent the soils to be encountered on site.

The volume of stormwater runoff that must be captured by a source control to achieve frequent discharge mitigation relative to the impervious surfaces that drain to the control is referred to as the mitigation storage and is calculated as shown below:

MS = (MIC x MD) / 1000

where: *MS* = *mitigation storage (m^3)*

MIC = *managed impervious catchment (m^2)*

MD = *mitigation depth (mm)*

Using this method, the following mitigation storage for the impervious areas of the proposed development is calculated as shown below:

Mitigation depth	= 7mm	(clay soil type)
Mitigation area	= 7,745 m^2	(90% impervious)
Mitigation Storage	= [(7,745) x 7] / 1 000	
	= 55 m^3	

Using this method, the total mitigation storage, or retention volume is approximately 55 m^3. Runoff from the roof areas will be captured and harvested by a system of reuse tanks. This process involves the collection, storage and re-use of rainwater from the roof areas of the development for internal and external uses. This may be provided by individual tanks to capture and supply reuse for each tower or via a centralised tank system to capture and supply reuse water for the entire development. For this type of development, harvested rainwater is typically intended to be used for cooling tower make-up, washdown of hardstand areas, carwash water supply and irrigation of landscaped areas.

The size, location and configuration of the re-use tank(s) will be determined as part of the future detailed design stage. The size will be determined in accordance with the sizing recommendations of the HCCREMS guide in combination with a detailed water balance assessment to determine the water demand and efficiency to ensure adequate drawdown is achieved.

The minimum sizing of the rainwater reuse tanks is subject to BASIX commitments & approval from Central Coast Council.

3.4 Stormwater Quality

In order to minimise any adverse impacts upon the ecology of downstream watercourses, stormwater treatment devices will need to be incorporated into the design of the development to manage surface runoff. The adopted nutrient and pollution targets will need to meet the requirements from the Central Coast Council (Gosford) Engineering Guidelines which are summarised in Table 2.

Table 2 – Required Water Nutrient and Pollution Reductions

Pollutant Criteria	Required Reduction Target (%)
Total Suspended Solids (TSS)	80
Total Phosphorous (TP)	45
Total Nitrogen (TN)	45
Gross Pollutants	90

The performance of the proposed stormwater management strategy was assessed against these targets using the conceptual design software MUSIC (Version 6). The MUSIC model was developed using parameters recommended in the document “NSW MUSIC Modelling Guidelines” (WBM, 2015) and Central Coast Council MUSIC Link.

The site catchment was split into sub-catchments representing the areas draining to the different treatment devices. A schematic of the MUSIC model is provided in Figure 4.

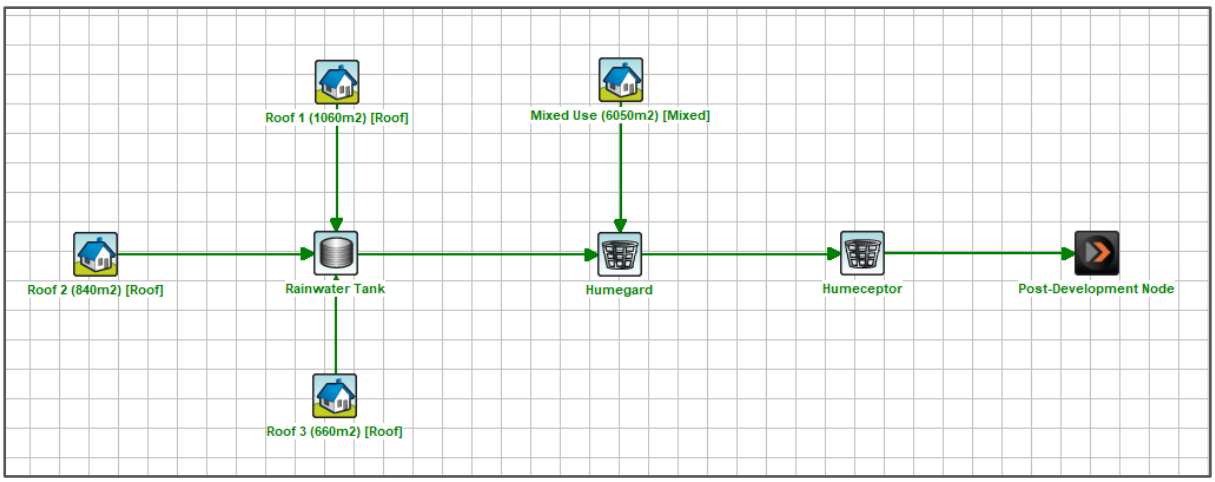


Figure 4 – MUSIC Model Schematic

A number of factors were identified in order to select the most appropriate stormwater quality improvement devices (SQIDs). The proposed development footprint and usage was considered especially significant to this design which eliminated a number of effective treatment options. In addition to the practical constraints, maintenance, operability and aesthetics were considered.

The proposed treatment train incorporates:

- Primary treatment via a proprietary HumeGard GPT and rainwater harvesting tank; and
- Secondary treatment via a proprietary HumeCeptor device.

The following is a summary of the water quality treatment devices that have been utilised in the proposed treatment train. The modelling parameters used can be found in the MUSIC Link report in Appendix A.

- **Rainwater Harvesting Tank** – Runoff from roof areas is to be directed to a below-ground rainwater harvesting tank. The tank is to be fitted with a proprietary first-flush device which will effectively remove dead insects, bird and animal droppings and concentrated tannic acids from the stormwater system. The rainwater tank will also provide secondary treatment by acting as an initial sediment trap, collecting suspended solids and nutrients attached to those sediments. The volume collected in the harvesting tank is to be reused as described previously in this report.
- **HumeGard device** – Overflow from the rainwater tank will pass through a proprietary gross pollutant trap which will remove any gross pollutants that enter the stormwater system.
- **HumeCeptor device –** Overflow from the rainwater tank will pass through a proprietary hydrodynamic separator which is designed to remove hydrocarbons, fine suspended solids and nutrients from entering downstream water ways.

Source node have been adopted from the NSW MUSIC Modelling Guideline (BMT WBM, 2010) along with Appendix D - Water Sensitive Urban Design – Concept Design Tools from the Central Coast Councils Civil Works Design Guidelines. Treatment nodes have been adopted from Humes. The MUSIC modelling results for the above-mentioned treatment strategy are shown below in Table 3.

Table 3 – MUSIC Modelling Results

Pollutant Criteria	Reduction Target (%)	Sources (kg/yr)	Residual Load (kg/yr)	Achieved Reduction (%)
Total Suspended Solids (TSS)	80	1250	121	90.3
Total Phosphorous (TP)	45	2.34	1.21	48.3
Total Nitrogen (TN)	45	20.6	9.92	51.9
Gross Pollutants	90	235	23.6	90

Note: The MUSIC model can be provided to Council upon request.

Table 3 shows that the proposed stormwater quality management strategy will achieve the required load reduction targets. A copy of the MUSIC Link report can be found in Appendix A.

3.5 Onsite Detention

Providing onsite detention for this development could potentially worsen the effects of nuisance flooding by delaying peak discharges to coincide with the peaks from upstream contributors. As such, onsite detention is not proposed for this development.

3.6 Local Overland Drainage

Local overland flow paths will be provided within the site to convey surface flows towards the baker street road frontages. Flow paths will be required to direct surface runoff from the common areas in the event of pipe blockages or surcharge of the drainage system. Maximum ponding depths and velocity-depth products will be calculated to ensure safe flow routes for extreme design storm events. The surrounding levels will also be designed to ensure adequate freeboard is provided to retail tenancies and residential lobby entries.

3.7 Flooding

The subject site falls within the boundary extents of the Local Overland Flow Flood Study prepared by Cardno Lawson Treloar. The study has performed with reference to the NSW Floodplain Development Manual and is used to assess the flooding impacts of the proposed development.

An extract from the flood study is shown below in Figure 5 which displays the 1% AEP flood elevation for the subject site.

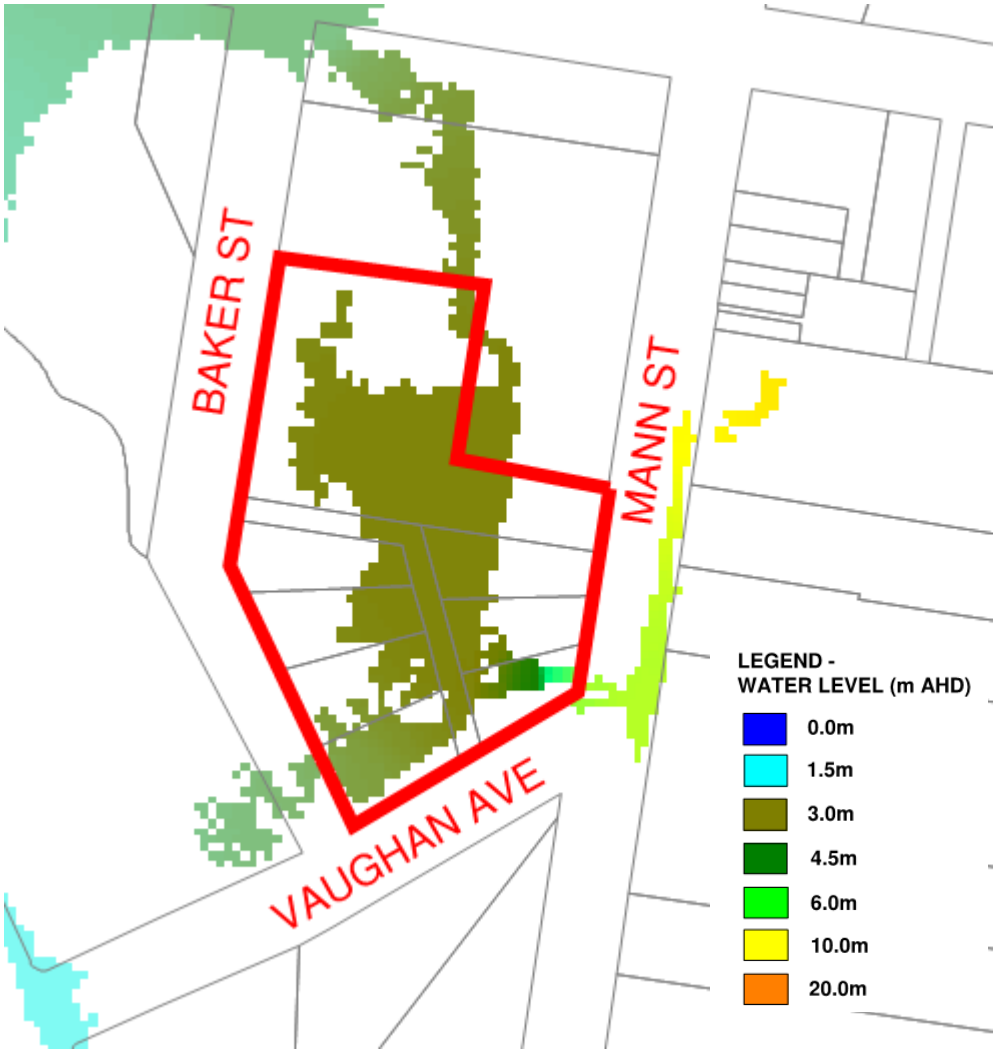


Figure 5 – Peak Water Level – 1% AEP

Based on the figure above, the subject site is identified as being impacted by flood waters. These results show the site being subjected to isolated flooding which is a result of the local grading of the pre-development site. The proposed development will correct this grading and as such will not be impacted by the overland flooding that has been shown in the flood study.

Initial advice provided by Central Coast Council (response to SEARS request dated 19/7/19) indicates the flood planning level is to be RL3.00m AHD. This flood level has been provided based on the 1% AEP flood level + freeboard + sea level rise. Due to the size and significance of the development an 80-year asset life was specified by Council to determine the sea level rise value.

The minimum habitable floor level (including commercial areas) shall be at RL3.00m AHD or above. Flood compatible material will be required for all elements below RL3.00m AHD.

It is required that the access to the basement car park is to have a crest level of RL3.00m AHD. However, as access is provided by an existing right of way which does not achieve this crest level, a suitable flood gate system will need to be installed to provide flood protection to a raised height of RL3.00m AHD.

4. Conclusion

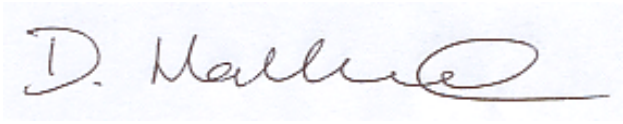
The proposed stormwater management design presented above has been prepared to comply with Central Coast Council DCP Chapter 6.7 as well as industry best practice. The design philosophy is based on the principle of at source treatment, to reduce conveyance infrastructure and manage water quantity and quality aspects.

This advice has been prepared in response to the SEARs letter prepared by the NSW Planning & Environment department dated 22/07/19. This advice has specifically addressed items 9, 10, and 11 of the SEARs letter.

As part of the assessment, preliminary calculations & advice were prepared based on the concept masterplan design and the information contained within this report will enable future discussions with the relevant service authority.

Based on the above, our investigation and concept design indicate the proposed development can adequately manage and address all items surrounding stormwater runoff.

We trust that this meets your requirements, and should you have any queries, please feel free to contact the undersigned on (02) 4365 1668.



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References:

Central Coast Council, Civil Works Design Guideline – Volume 1, August 2013

BMT WBM Pty Ltd, New South Wales MUSIC Modelling Guidelines, August 2015

Central Coast Council, Water Sensitive Urban Design – Technical Guideline No 3. – Device Selection Guide, November 2010

Central Coast Council, SEARS request State Significant Development at 26-32 Mann Street, Gosford Concept DA (SSD-10114), 19th July 2019

Cardno Lawson Treloar, Local Overland Flow Flood Study, September 2013

Limitation Statement

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APPENDIX A: MUSIC LINK REPORT

MUSIC-*link* Report

Project Details		Company Details	
Project:	SY182302 26 Mann Street	**Company:**	Northrop Consulting Engineers
Report Export Date:	13/08/2019	**Contact:**	Robert Suckling
Catchment Name:	SY182302_Masterplan_DA	**Address:**	Suite 4 257-259 Central Coast Highway, Erina
Catchment Area:	0.861ha	**Phone:**	02 4365 1668
Impervious Area*:	90.28%	**Email:**	rsuckling@northrop.com.au
Rainfall Station:	66062 SYDNEY		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1974 - 31/12/1993 11:54:00 PM		
Mean Annual Rainfall:	1297mm		
Evapotranspiration:	1261mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.32		
Study Area:	Upland		
Scenario:	Central Coast Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Post-Development Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	13.4%	Rain Water Tank Node	1	Urban Source Node	4
TSS	90.3%	GPT Node	2		
TP	48.3%				
TN	51.9%				
GP	90%				

Comments

Unit model of treatment system to be suitably selected to appropriate high-flow bypass value.

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Post	Post-Development Node	% Load Reduction	None	None	13.4
Post	Post-Development Node	GP % Load Reduction	90	None	90
Post	Post-Development Node	TN % Load Reduction	45	None	51.9
Post	Post-Development Node	TP % Load Reduction	45	None	48.3
Post	Post-Development Node	TSS % Load Reduction	80	None	90.3
Urban	Mixed Use (6050m2)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	Mixed Use (6050m2)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	Mixed Use (6050m2)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	Mixed Use (6050m2)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	Mixed Use (6050m2)	Stormflow Total Phosphorus Mean (log mg/L)	-0.6	-0.6	-0.6
Urban	Mixed Use (6050m2)	Stormflow Total Suspended Solids Mean (log mg/L)	2.15	2.15	2.15
Urban	Roof 1 (1060m2)	Baseflow Total Nitrogen Mean (log mg/L)	0.32	0.32	0.32
Urban	Roof 1 (1060m2)	Baseflow Total Phosphorus Mean (log mg/L)	-0.82	-0.82	-0.82
Urban	Roof 1 (1060m2)	Baseflow Total Suspended Solids Mean (log mg/L)	1.1	1.1	1.1
Urban	Roof 1 (1060m2)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	Roof 1 (1060m2)	Stormflow Total Phosphorus Mean (log mg/L)	-0.89	-0.89	-0.89
Urban	Roof 1 (1060m2)	Stormflow Total Suspended Solids Mean (log mg/L)	1.3	1.3	1.3
Urban	Roof 2 (840m2)	Baseflow Total Nitrogen Mean (log mg/L)	0.32	0.32	0.32
Urban	Roof 2 (840m2)	Baseflow Total Phosphorus Mean (log mg/L)	-0.82	-0.82	-0.82
Urban	Roof 2 (840m2)	Baseflow Total Suspended Solids Mean (log mg/L)	1.1	1.1	1.1
Urban	Roof 2 (840m2)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	Roof 2 (840m2)	Stormflow Total Phosphorus Mean (log mg/L)	-0.89	-0.89	-0.89
Urban	Roof 2 (840m2)	Stormflow Total Suspended Solids Mean (log mg/L)	1.3	1.3	1.3
Urban	Roof 3 (660m2)	Baseflow Total Nitrogen Mean (log mg/L)	0.32	0.32	0.32
Urban	Roof 3 (660m2)	Baseflow Total Phosphorus Mean (log mg/L)	-0.82	-0.82	-0.82
Urban	Roof 3 (660m2)	Baseflow Total Suspended Solids Mean (log mg/L)	1.1	1.1	1.1
Urban	Roof 3 (660m2)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	Roof 3 (660m2)	Stormflow Total Phosphorus Mean (log mg/L)	-0.89	-0.89	-0.89
Urban	Roof 3 (660m2)	Stormflow Total Suspended Solids Mean (log mg/L)	1.3	1.3	1.3

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
GPT	Humeceptor	Hi-flow bypass rate (cum/sec)	None	99	100
GPT	Humegard	Hi-flow bypass rate (cum/sec)	None	99	100

Only certain parameters are reported when they pass validation