30 May 2025

Optimal Ref: 21P54

Northern Beaches Council
573 Military Road, Spit Junction
NSW 2088

STORMWATER MANAGEMENT PLAN

14 Mirrrool Street, North Narrabeen (DA2023/1770)

Dear Sir or Madam

Optimal Stormwater has been engaged by the applicant, Mick Wykrota to provide stormwater engineering services in support of the proposed three(3) lot subdivision in 14 Mirrool Street, North Narrabeen (DA2023/1770). See **Figure 1** below.

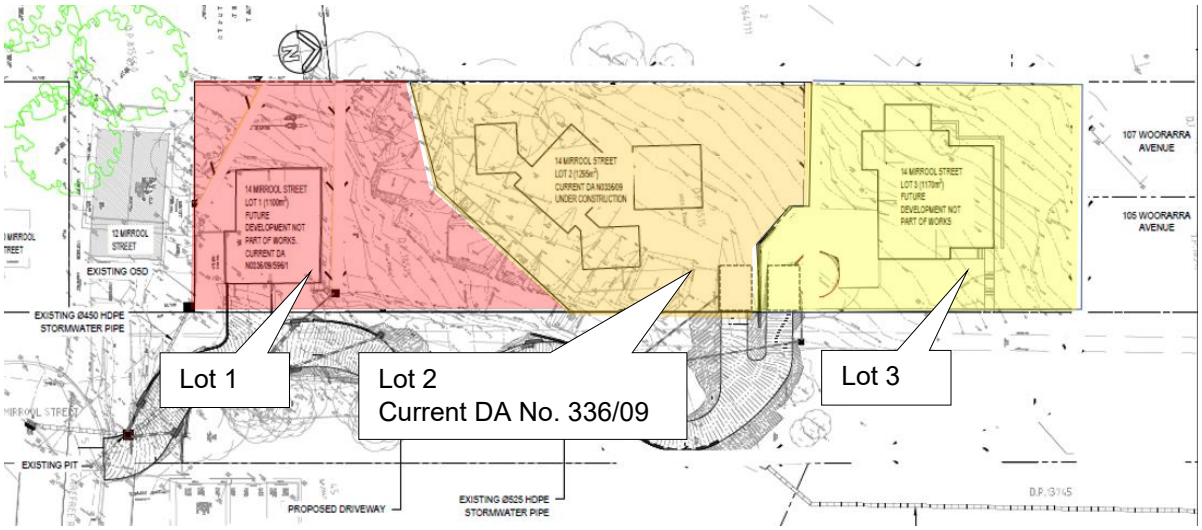

Figure 1 *– Proposed subdivision of 14 Mirrool Street*

This Stormwater Management Plan has been amended in response to the "*Water Management Referral Response*" from Northern Beaches Council dated 15 January 2025. This report makes the following comment:

Referral updated 14/01/2025
Not Supported.
The stormwater management plan prepared by Optimal Stormwater, dated 23 May 2023, made an offer to contribute financially toward a stormwater treatment solution on public land, seemingly in lieu of stormwater treatment on private land. Although innovative the proposal is not supported. The stormwater treatment devices for the subdivision must be located on the private land and maintained by the owner to meet the water quality targets at all times.
The proposal must:
• Meet the WMD Policy Table 5 – General Stormwater Quality Requirements, and demonstrate compliance by providing a model, preferably a Model for Urban Stormwater Improvement Conceptualisation (MUSIC), or an equivalent;
• Show the rainwater tanks required by BASIX in the stormwater plan; and
• Ensure all stormwater treatment measures for the subdivided lots are located on private land.

Previous referral dated 20/02/2024
Not Supported
This application was assessed in consideration of:
• Supplied plans and reports;
• Northern Beaches Water Management for Development Policy (WMD Policy), and;
• Relevant LEP and DCP clauses;
The proposal includes Torrens Title subdivision of one (1) lot into three (3), alterations and additions to existing garage/gym to convert into a separate dwelling house with a first floor addition, construction of a new driveway and associated drainage, and a new parking bay on one of the proposed lots.
The proposed stormwater management strategy is not demonstrating compliance with WMD Policy for:
- inappropriate location of the proposed water management devices
- incomplete information on the proposed water management system
Northern Beaches Water Management for Development Policy states that Stormwater treatment measures must be sited on private land.
Council will not accept the ownership or maintenance responsibilities of any stormwater treatment devices required for private development site.
A model, preferably a Model for Urban Stormwater Improvement Conceptualization (MUSIC), or an equivalent, widely accepted model or methodology, must be provided to demonstrate compliance with the water quality requirements of the WMD Policy (section 4.1.3 Demonstrating Compliance of the WMD Policy and Table 5 – General)
Included in any revised stormwater plan should be the rainwater tanks required by BASIX (minimum).

Note that Optimal Stormwater did not review the previous referral dated 20 February 2024.

Northern Beaches Council Policy

The development proposal is subject to the following Northern Beaches Council policies:

- Pittwater 21 Development Control Plan
- Part: C4 Design Criteria for Subdivision
- Water Management for Development Policy, Version 2

The general requirements of sub-division resulting in the creation of three(3), or more lots is stipulated in Table 1 – Development Types in *Water Management for Development Policy*, Version 2.

Development Type	**Section 3.0** General Requirements	**Section 4.1** Stormwater Quality and hydrology	**4.3 Erosion** Sediment and Pollution Controls	**Section 5.0** Disposal of Stormwater	**Section 7.0** Water Conservation	**Section 9.0** Onsite Stormwater Management
Subdivision resulting in the creation of three(3) lots or more.	X	X	X	X	X	X

Flood Risk

The subject property is identified by Council as falling within a '*Low Flood Risk*' precinct. See **Figure 2** below. The proposed lots are all on higher land where flooding is not identified by Council, so no specific controls apply.

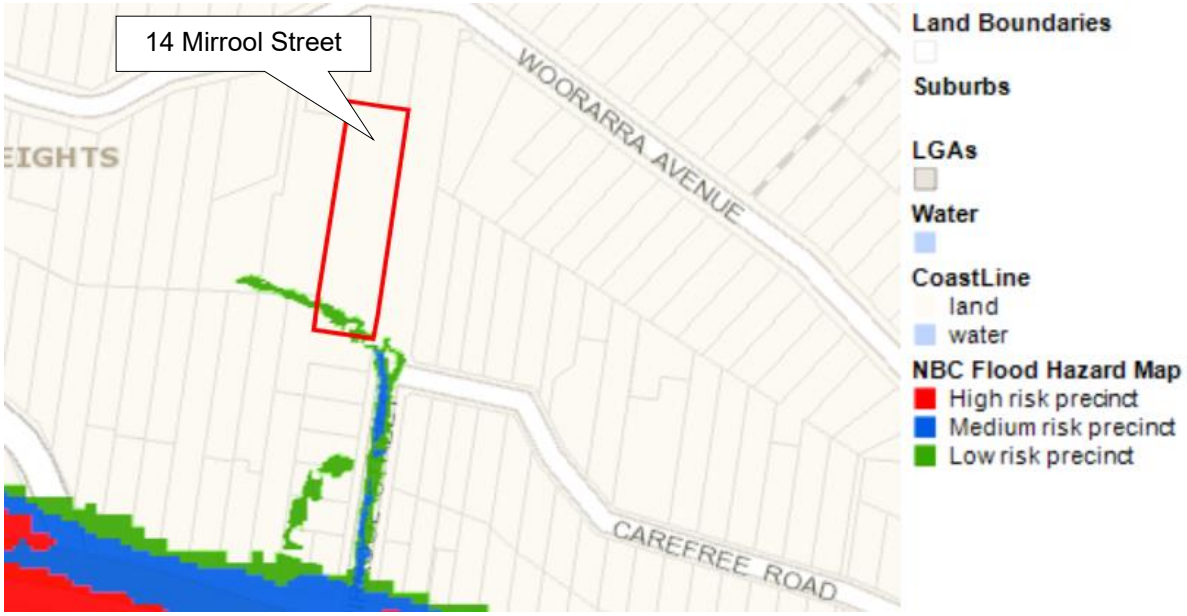

Figure 2 *– Flood Risk Precincts*

A DRAINS model was developed to assess the capacity of the existing pipeline along the driveway. It will convey the 1% AEP (1 in 100yr ARI) storm before surcharge occurs. The overland flow path has been designed on the conservative assumption that the headwall at the top of the pipeline is substantially blocked. Surcharge flows will be directed to the road reserve, away from private property as shown on the Stormwater Management Plan. A large letterbox pit at the bottom of the overland flow path will intercept overland flow. See **Attachment 1** for the Hydraulic Analysis report.

Overland Flow

The topography of the land is very steep and rocky. It is subject to overland flow from higher elevations, both from natural and developed land. Capturing and directing these flows around the future dwellings in 14 Mirrool Street is critical to reduce the risk of '*water nuisance*'. See **Figure 3** below.

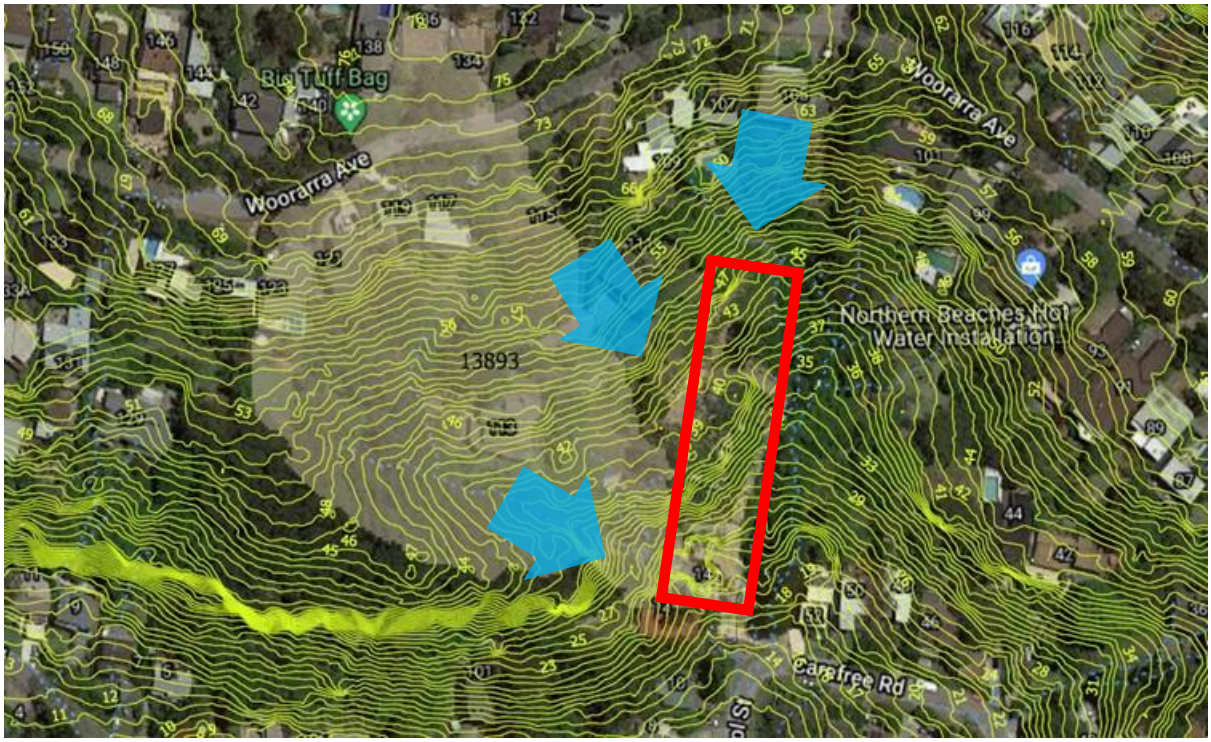

Figure 3 *– Topography in 14 Mirrool Street*

It should be noted that the existing dwellings in 105, 107, 109 and 111 Woorarra Avenue fall away from the carriageway. They do not benefit from appropriate drainage easements over 14 Mirrool Street. Instead stormwater from these developments is discharged overland in a largely uncontrolled manner. This may not have generated a '*water nuisance*' in 14 Mirrool Street before, but it now needs to be catered for.

Capturing overland flow, reducing velocity and dissipating energy is critical. To this end, a conventional network of overland flow paths, dish drains, inlet pits and pipes is

proposed to convey stormwater through 14 Mirrool Street. The applicant has approached the owners of 105, 107, 109 and 111 Woorarra Avenue concerning the discharge of stormwater over his land. Should the owners of those properties wish to develop in future, Council's *Water Management for Development Policy, Version 2* requires them to approach the owner of 14 Mirrool Street to acquire appropriate inter-allotment drainage easements.

To meet the requirements for subdivision, the existing flow paths through 14 Mirrool Street will be formalised along the boundaries of the proposed lots. See **Figure 4** below.

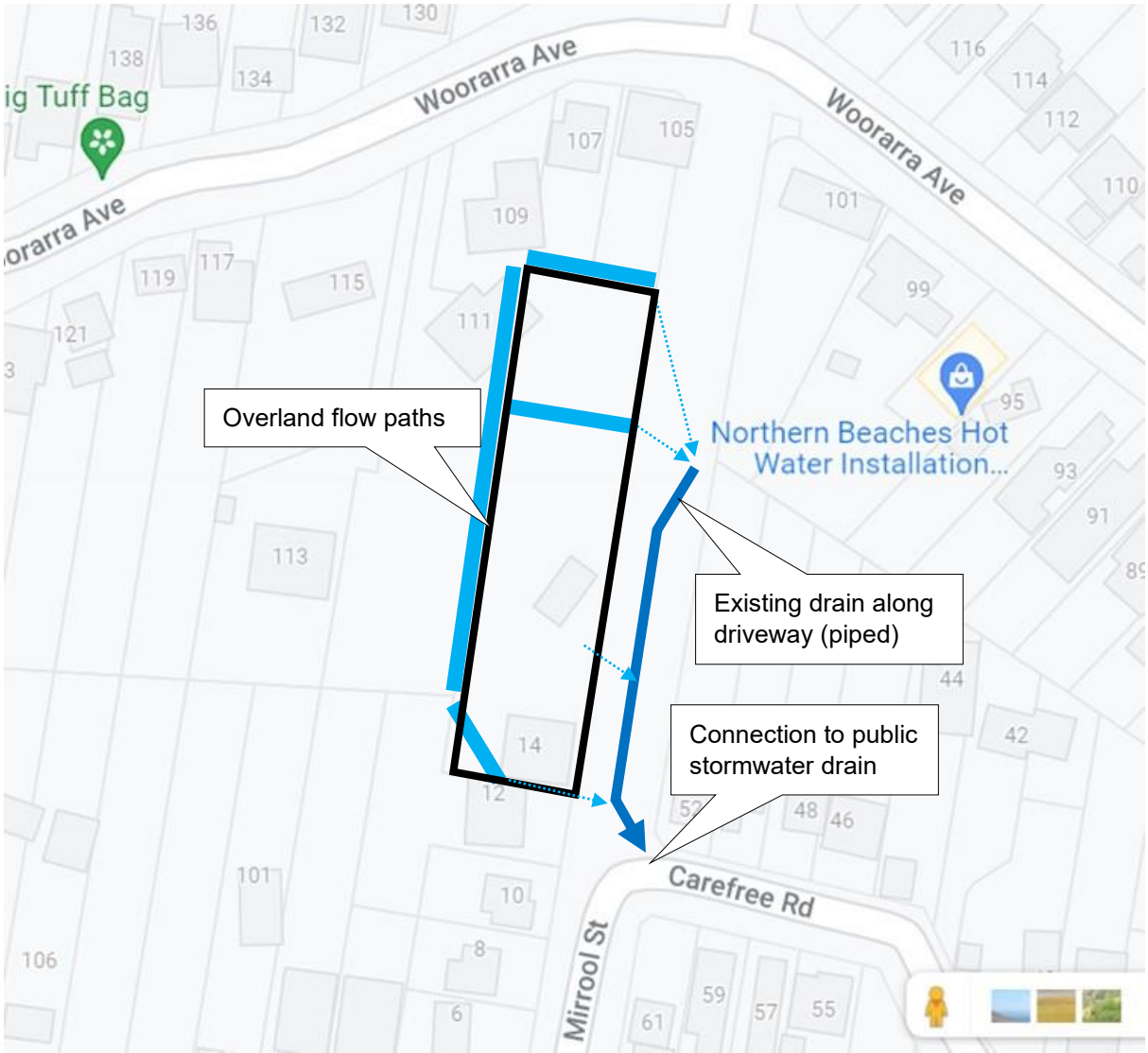

Figure 4 *– General location of overland flow paths through 14 Mirrool Street*

The overland flow paths are detailed on the Stormwater Management Plan prepared for the proposed subdivision.

On-Site Detention

The subject property falls within a catchment of 3.3ha (approx.) in area draining through the public drainage network across Wakehurst Parkway to the northern side of Narrabeen Lake. See **Figure 5** below.

Lot 1 already has a very large On-Site Detention (OSD) tank sized to serve the whole of 14 Mirrool Street (32,000L). Nevertheless, Council requires OSD for the eventual dwellings in Lots 2 and 3. For Lot 2, the current approval, now under construction (DA 336/09) specifies an OSD volume of 5,000 litres.

For Lot 3 the OSD volume will be determined by the size and scale of the eventual dwelling. The objective being to ensure that the post developed stormwater flow is no greater than existing. The subject property falls within Region 1 – Northern Stormwater Region. Table 7 in *Water Management for Development Policy, Version 2* specifies the required OSD volume. Detention storage of 12,000m^3 is assumed consistent with 150 to 200m^2 of impervious area, which would be a large house. The volume can be confirmed when the DA for the dwelling is prepared. The OSD tank for Lot 3 would be conveniently located under the driveway it ensure that all developed land can be drained to it.

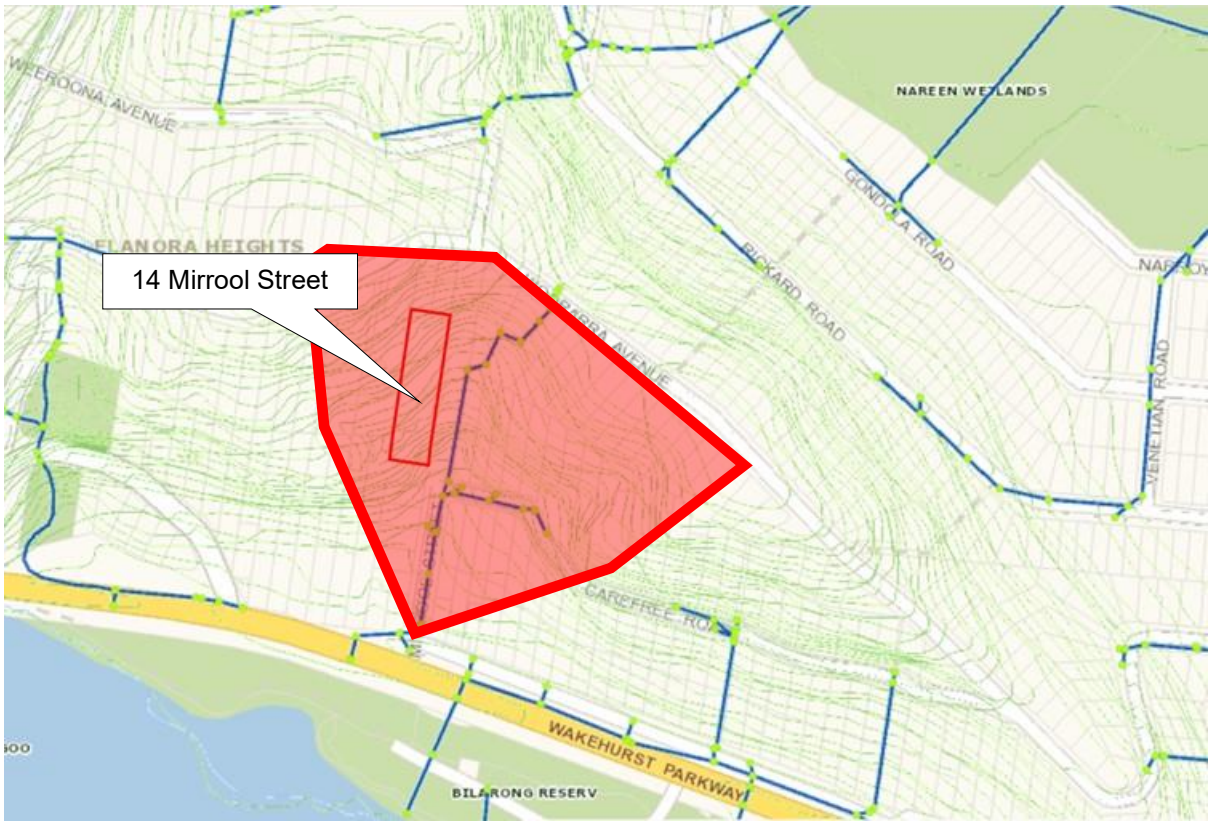

Figure 5 *– Catchment draining to Narrabeen Lake.*

Water Quality and Hydrology

The proposed development falls within Region 1 – Northern Stormwater Region. The stormwater quality objectives are stipulated in Table 5 – General Stormwater Quality Requirements in *Water Management for Development Policy, Version 2*.

Council's performance objectives are set-out in the table below. No special requirements apply to Region 1.

Pollutant	Performance Requirement
Total Phosphorous	65% reduction in the post-developed mean annual load
Total Nitrogen	45% reduction in the post-developed mean annual load
Total Suspended Solids	85% reduction in the post-developed mean annual load
Gross Pollutants	90% reduction in the post-developed mean annual load (for pollutants greater than 5mm in diameter)
pH	6.5 - 8.5
Hydrology	The post-developed peak discharge must not exceed the pre-development peak discharge in storms up to the 5% AEP (1 in 20yr ARI) event

Commonly seen WSUD measures such as vegetated swales, rain gardens and bioretention systems can be used to achieve the desired results above. These techniques have been incorporated into the Stormwater Management Plan and the Landscape Plan needs to be closely integrated too. For example, the overland flow paths proposed for 14 Mirrool Street are configured as a sequence of cascading pools to reduce water velocity and potential for erosion, while providing opportunities for attractive landscaping and environmental value. The vegetation will help to take-up phosphorous and nitrogen, improving stormwater quality . See **Figure 6** below.

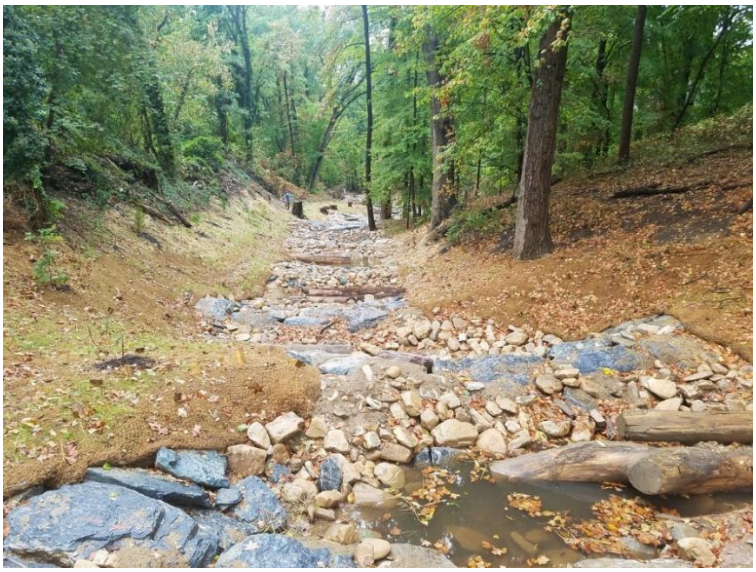

Figure 6 *– Overland flow path integrated with landscaping*

Several options to treat the stormwater were considered, and based on Council's advice that they preferred on-lot treatment, we have designed our solution in line with this preference. The Lot scale bio-filtration controls were able to achieve the results in MUSIC shown below.

Erosion and generation of suspended solids is a risk, but only during the construction period and that can be addressed though site controls. A screenshot of the model appears in **Figure 8** below.

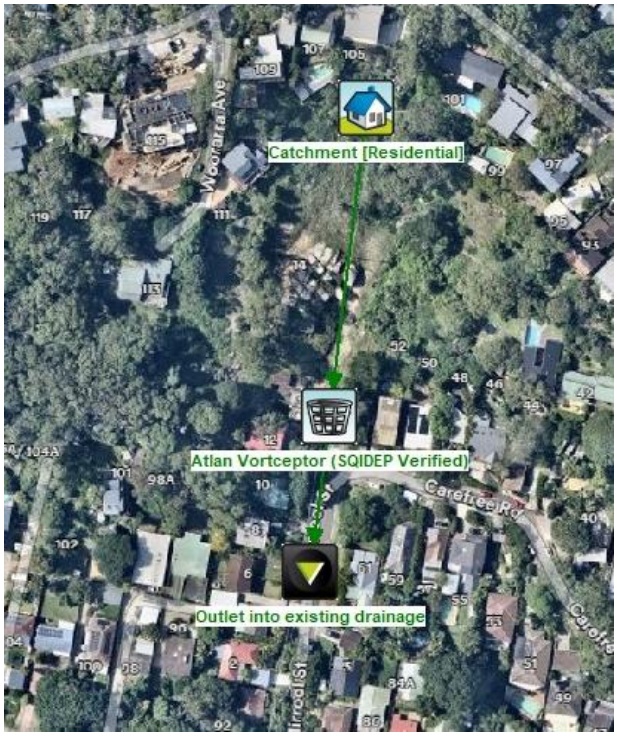

Figure 8 *– MUSIC model (Option 1)*

Bioretention systems, often called raingardens, are landscaped depressions designed to treat stormwater runoff by filtering it through soil, plants and other media, reducing runoff volume and improving water quality. A typical bioretention system is shown in **Figure 9** below.

Figure 9 *– Typical bioretention system*

The theoretical pollution removal rates for bioretention are slightly greater than for a high-performance vortex type GPT. Importantly, provision of a bioretention system for each of the three(3) lots in the subdivision does achieve Council's requirement for stormwater quality controls that fall entirely within private land. Thus, this option is presented in the amended Stormwater Management Plan. A screen print of the MUSIC model is shown in **Figure 10** and a schematic diagram of the proposed treatment train in **Figure 11** below.

	Sources	Residual Load	% Reduction
Flow (ML/yr)	0.886	0.563	36.4
Total Suspended Solids (kg/yr)	86.9	11.6	86.7
Total Phosphorus (kg/yr)	0.225	0.0782	65.2
Total Nitrogen (kg/yr)	1.79	0.672	62.4
Gross Pollutants (kg/yr)	20.1	0	100

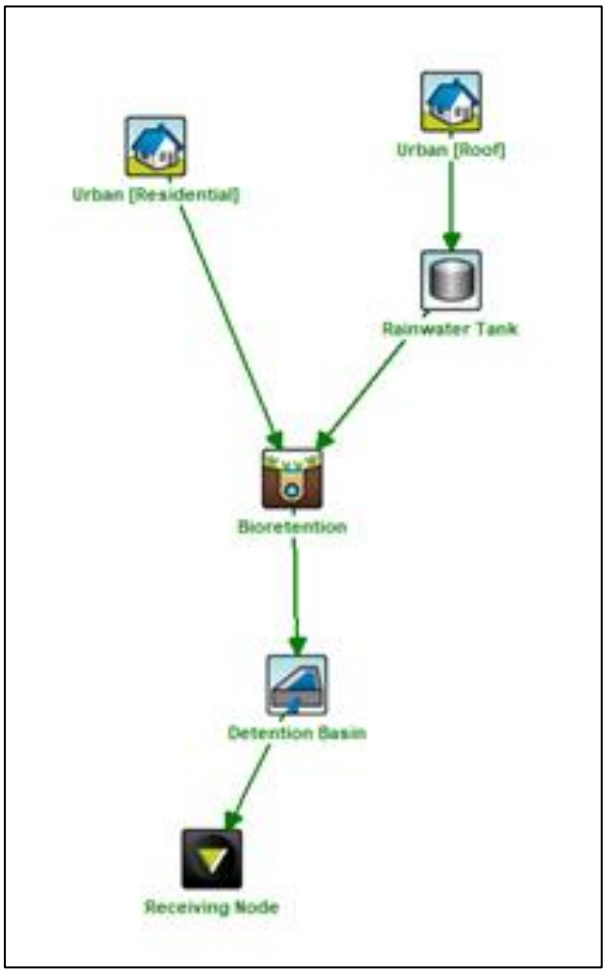

Figure 10 *– MUSIC model (Option 2)*

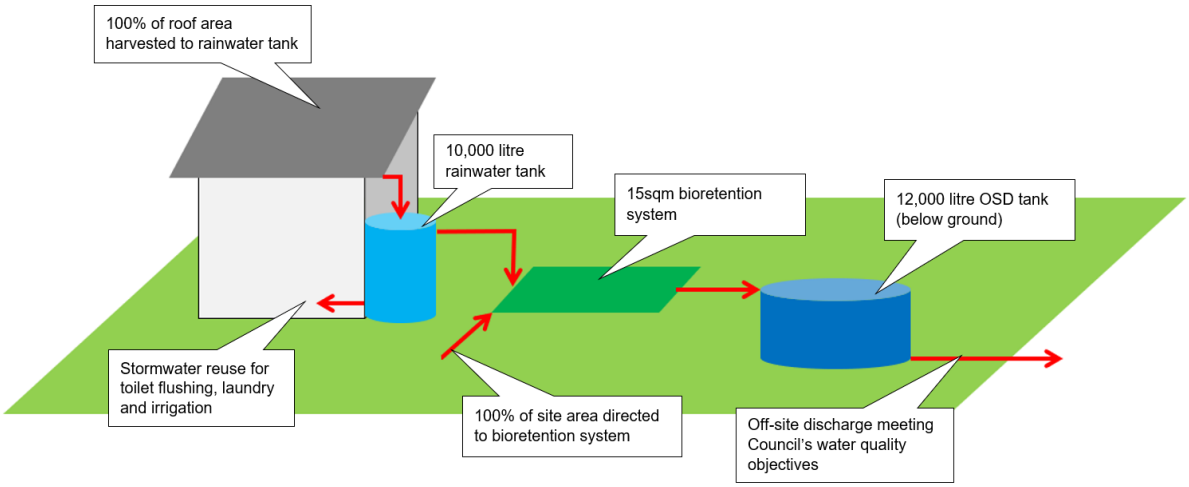

Figure 11 *– Schematic diagram of proposed treatment train*

Water Conservation and Reuse

Potable water is a valuable resource and must be sustainably managed to meet current and future demands. Appropriate water conservation measures are therefore vital in new development. The future dwellings in Lots 1, 2 and 3 will be subject to BASIX. It is anticipated that water efficient plumbing products will be used throughout and include the following:

- ✓ 4 star dual-flush toilets
- ✓ 3 star showerheads
- ✓ 5 star taps (for all taps other than bath outlets and garden taps)
- ✓ 4.5 star washing machines
- ✓ 4.5 star dishwashers.

Stormwater reuse is typically seen in developments subject to BASIX and will likely apply to the future dwellings in 14 Mirrool Street. To this end, 'clean' rainwater harvested from roof areas will be stored and used for beneficial purposes such as toilet flushing, washing machines and irrigation. Rainwater tank capacity will be consistent with the BASIX Certificate requirements. Each of the three(3) lots is of ample size to accommodate one, or more very substantial rainwater tanks. Besides conserving scarce potable water, stormwater harvesting and reuse will result in a corresponding reduction in the site discharge and impact on the receiving environment.

Erosion and Sediment Control

The steep grade of 14 Mirrool Street means that effective erosion and sediment control is important during the construction period before the land is fully stabilised. The Erosion and Sediment Control Plan prepared by Optimal Stormwater shows the measures to be put in place to protect the downstream environment during construction. The measures include strategic placement of silt fences, sandbag check dams, coir logs and settlement areas to remove sediment prior to discharge off-site. These controls will be checked on a daily basis to ensure that they are at all times effective.

Stormwater Management Plan

The main features of the enclosed Stormwater Management Plan for the proposed three(3) lot subdivision in 14 Mirrool Street are described below.

- Overland flow from higher land to the north and west as well as that in excess of the existing pipeline will be effectively managed by formalising the existing flow paths along the boundaries of the proposed lots and alignment of the driveway.

- The Stormwater Management Plan and Landscape Plan will be closely integrated. The overland flow paths will be configured as a sequence of cascading pools to reduce water velocity and potential for erosion, while providing opportunities for attractive landscaping and environmental value.

- OSD will be provided to ensure that the rate of stormwater discharge is no greater than existing conditions.

- We have elected to design the stormwater quality treatment as a rainwater tank followed by onsite bio-filtration, followed by OSD. This design offers the highest pollution removal rates (on-Lot) and meets Council's desire to have the controls on-Lot.

- Several minor connections will be made into the 525mm public stormwater drain running underneath the Mirrool Road reserve.

- The future dwellings in Lots 1, 2 and 3 will be subject to BASIX and include measures to harvest stormwater for beneficial uses.

The Stormwater Management Plan developed for the proposed three(3) lot subdivision in 14 Mirrool Street, North Narrabeen is robust and reliable. It meets, or exceeds the provisions of *Water Management for Development Policy, Version 2*. I trust that this report and accompanying Plan meets Council's expectation. Please do not hesitate to contact Optimal Stormwater if there are any queries at all.

Yours faithfully

Guy C Amos, MIE Aust 1171768
for and on behalf of
Optimal Stormwater Pty Ltd

ATTACHMENT 1 – Hydraulic Analysis