Stormwater Management Plan

Forresters Beach Planning

80514013

Prepared for
Terrigal Grosvenor Lodge Pty Ltd

20 January 2021

Cardno
Shaping the Future

Contact Information

Cardno NSW/ACT Pty Ltd
ABN 95 001 145 035

Suite 34/207 Albany St Nth

Telephone: (02) 4320 01000
Facsimile: (02) 4324 3251
International: 612 4320 1000

gosford@cardno.com.au
www.cardno.com.au

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Author(s):
Jason Stewart
Civil/Environmental Engineer

Approved By:
Sara Belgrove
Principal Civil Engineer

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1 Introduction

Cardno was engaged by Terrigal Grosvenor Lodge Pty Ltd to undertake the preparation of a Water Cycle Management study in relation to the proposed rezoning of No. 957 and Nos. 987-991 The Central Coast Highway (CCH) and Nos. 137,139, 143 and 145 Bakali Road, Forresters Beach (Lots 1-4 DP1000694, Lot 51 DP 1028301 and Lot 522 DP 1077907).

This report has been prepared in support of a planning proposal to Gosford City Council seeking rezoning of the subject land. The rezoning application seeks to rezone the flood free and non-environmentally sensitive parts of the site to R2 to support low density residential development. Towards this end, an indicative staging layout has been prepared by Bannister and Hunter.

This report outlines the methodology for the analysis of on-site stormwater detention (OSD) and water quality requirements and presents the investigation outcomes. The information presented is to indicate the potential sizes/locations of proposed elements and is not intended to present DA level detail.

2 Existing Site Conditions

The land to be rezoned covers an area of 9.855ha and is located between the CCH and Bakali Rd. The site is bound to the north by Lot 5 DP 1082979, to the east and south-east by existing residential properties which front on to the CCH, to the west by Bakali Road (formed and unformed sections). The existing site falls from the CCH to the western boundary at an approximate grade of 3%. Refer to the survey plan in Appendix A for the existing site survey. Figure 2-1 below shows the site location and existing development form.

Figure 2-1 Satellite Image of Rezoning Area

The existing development on the site consists of open rural grassed paddocks with four residences and a large cluster of trees present towards the top north-western corner of the site. An existing open channel runs through the site which starts directly behind the existing residential allotments fronting the CCH and is situated opposite Maas Parade on the western side of the CCH. A stormwater drainage easement is located on No. 971 CCH, which drains the upstream catchment to the east of the CCH. A dam is present on No. 137 Bakali Road which receives runoff from portions of Nos. 137, 139 and 143 Bakali Road.

3 Proposed Development

For the purposes of this report, an indicative subdivision layout has been prepared by Bannister and Hunter (refer to Appendix A). The proposed layout allows for the development to be undertaken in 6 stages corresponding with different land owners. For the current planning proposal, Stage 3 will initially remain as vacant land with no proposed development except for a section of road to connect the Stage 1 and Stage 2 developments. As such, no stormwater management infrastructure is proposed to detain and treat runoff from the vegetated Stage 3 area. Residential development is proposed over the Stage 3 area following completion of the Central Coast Highway road and drainage upgrades, at which point additional stormwater management measures may be required for this area. Stages 5 and 6 will share OSD and water quality infrastructure and as such have been treated as a single stage for the purpose of this analysis.

Internal road infrastructure is proposed for each stage of development.

It should be noted that the subdivision layout proposed is indicative only and allows for the assessment of required stormwater management infrastructure. Future development past rezoning may differ from the indicative layout provided.

Figure 3-1 below shows the proposed development boundaries.

Figure 3-1 Proposed Development Boundaries

4 On-Site Detention

Section 6.7.7.4.4 of Gosford City Council's DCP 2013 requires on-site detention to ensure that post developed flows from a development site do not exceed pre-development flows for all storm events up to and including the 1% AEP storm events.

Four OSD basins are proposed for the site, one for each stage of development. The Stage 1 OSD basin is proposed to be located adjacent to the western Stage 1 boundary and immediately north of Stage 3. The Stage 2 basin will be located adjacent to the western Stage 2 boundary, immediately north of the existing open channel and immediately south of Stage 3. The Stage 4 basin will be located at site of the existing dam. Finally, the Stages 5+6 basin will be located in the southern corner of the site.

A DRAINS computer model (Version 2020.03) was developed to demonstrate compliance with DCP 2013.

4.1 Base Information

The DRAINS computer model was prepared in accordance with the requirements of Central Coast Council's Civil Works Specification, Volume 1 – Design (2020). Australian Rainfall and Runoff (AR&R) 1987 rainfall data was adopted from Bureau of Meteorology IFD tables for Forresters Beach.

Catchment depression storage was set at 1mm for paved/impervious areas and 5mm for grassed/pervious areas. A Hydrological Soil Type 3 was adopted.

4.2 Catchments

For the existing and proposed development cases, four catchments were modelled corresponding to the Stages 1, 2, 4 and 5+6 development boundaries shown in Figure 2-1. For the developed cases, it was assumed that runoff from external catchments will be diverted and thus will not contribute to peak runoff from the subject sites. Consequently, runoff from external catchments was not considered for the existing cases as doing so would not allow for an accurate comparison of pre and post development flows.

The existing catchments were assumed to be in a natural state (0% imperviousness) in accordance with Section 6.7.7.4.4 of DCP 2013.

4.2.1 Stage 1 Catchment

The existing Stage 1 site was modelled as a single catchment of 1.948ha with 0% imperviousness. Time of concentration was estimated at 10.2 minutes using Equation 5.4 in AR&R 1987.

The developed Stage 1 site was modelled as a single catchment of 1.948ha with 70% imperviousness. It is proposed that the entire developed area will drain to an OSD basin. Time of concentration for the developed site was assumed as 5 and 6 minutes for impervious and pervious areas respectively.

4.2.2 Stage 2 Catchment

The existing Stage 2 site was modelled as a single catchment of 1.869ha with 0% imperviousness. Time of concentration was estimated at 10.1 minutes using Equation 5.4 in AR&R 1987.

The developed Stages 2 site was modelled as a single catchment of 1.869 ha with 70% imperviousness. It is proposed that the entire developed site will drain to an OSD basin. Time of concentration for the developed site was assumed as 5 and 6 minutes for impervious and pervious areas respectively.

4.2.3 Stage 4 Catchment

The existing Stage 2 site was modelled as a single catchment of 1.617ha with 0% imperviousness. Time of concentration was estimated at 9.5 minutes using Equation 5.4 in AR&R 1987.

The developed Stage 2 site was modelled as a single catchment of 1.617ha with 70% imperviousness to account for the developed area. It is proposed that the entire developed area will drain to an OSD basin.

Time of concentration for the developed site was assumed as 5 and 6 minutes for impervious and pervious areas respectively.

4.2.4 Stages 5+6 Catchment

The existing Stages 5+6 site was modelled as a single catchment of 2.017ha with 0% imperviousness. Time of concentration was estimated at 10.4 minutes using Equation 5.4 in AR&R 1987.

The developed Stages 5+6 site was modelled as a single catchment of 2.017 ha with 70% imperviousness. It is proposed that the entire developed site will drain to an OSD basin. Time of concentration for the developed site was assumed as 5 and 6 minutes for impervious and pervious areas respectively.

4.3 Results

Indicative detention basin volume requirements are identified below. During the DA stage of the project, each detention basin will need to be designed to the meet depth, freeboard and embankment slope requirements specified in Section 10.13 of Council's Civil Works Specification, Volume 1 – Design (2020).

4.3.1 Stage 1 OSD

The DRAINS model shows that an OSD basin with a 100 year ARI storage volume of approximately 260m^3 is required to restrict post development flows to no greater than predeveloped flows.

Discharge from the OSD basin will be controlled via 4 x 375 mm diameter Reinforced Concrete Pipes (RCPs) as a primary outlet and a 4m wide broad crested weir as a secondary outlet.

Results of peak outflows from the DRAINS model are summarised in Table 4-1.

Table 4-1 Summary of DRAINS Peak Outflows (Stage 1)

Storm Event	Predeveloped Flows	Developed Flows (With OSD)	Comments
5 year ARI (20% AEP)	0.742 m^3/s	0.741 m^3/s	Developed flows less than predeveloped
10 year ARI (10% AEP)	0.832 m^3/s	0.803 m^3/s	Developed flows less than predeveloped
20 year ARI (5% AEP)	0.948 m^3/s	0.886 m^3/s	Developed flows less than predeveloped
50 year ARI (2% AEP)	1.02 m^3/s	0.933 m^3/s	Developed flows less than predeveloped
100 year ARI (1% AEP)	1.13 m^3/s	1.13 m^3/s	Developed flows equal to predeveloped

4.3.2 Stage 2 OSD

The DRAINS model shows that an OSD basin with a 100 year ARI storage volume of approximately 250m^3 is required to restrict post development flows to no greater than predeveloped flows.

Discharge from the OSD basin will be controlled via 4 x 375 mm diameter RCPs as a primary outlet and a 3m wide broad crested weir as a secondary outlet.

Results of peak outflows from the DRAINS model are summarised in Table 4-2.

Table 4-2 Summary of DRAINS Peak Outflows (Stage 2)

Storm Event	Predeveloped Flows	Developed Flows (With OSD)	Comments
5 year ARI (20% AEP)	0.719 m^3/s	0.716 m^3/s	Developed flows less than predeveloped
10 year ARI (10% AEP)	0.806 m^3/s	0.772 m^3/s	Developed flows less than predeveloped
20 year ARI (5% AEP)	0.919 m^3/s	0.848 m^3/s	Developed flows less than predeveloped
50 year ARI (2% AEP)	0.987 m^3/s	0.923 m^3/s	Developed flows less than predeveloped

100 year ARI (1% AEP)	1.1 m^3/s	1.1 m^3/s	Developed flows equal to predeveloped

4.3.3 Stage 4 OSD

The DRAINS model shows that an OSD basin with a 100 year ARI storage volume of approximately 170m^3 is required to restrict post development flows to no greater than predeveloped flows.

Discharge from the OSD basin will be controlled via 3 x 375 mm diameter RCPs as a primary outlet and a 3m wide broad crested weir as a secondary outlet.

Results of peak outflows from the DRAINS model are summarised in Table 4-3.

Table 4-3 Summary of DRAINS Peak Outflows (Stage 4)

Storm Event	Predeveloped Flows	Developed Flows (With OSD)	Comments
5 year ARI (20% AEP)	0.630 m^3/s	0.627 m^3/s	Developed flows less than predeveloped
10 year ARI (10% AEP)	0.706 m^3/s	0.688 m^3/s	Developed flows less than predeveloped
20 year ARI (5% AEP)	0.804 m^3/s	0.77 m^3/s	Developed flows less than predeveloped
50 year ARI (2% AEP)	0.863 m^3/s	0.811 m^3/s	Developed flows less than predeveloped
100 year ARI (1% AEP)	0.958 m^3/s	0.952 m^3/s	Developed flows less than predeveloped

4.3.4 Stages 5+6 OSD

The DRAINS model shows that an OSD basin with a 100 year ARI storage volume of approximately 260m^3 is required to restrict post development flows to no greater than predeveloped flows.

Discharge from the OSD basin will be controlled via 4 x 375 mm diameter RCPs as a primary outlet and a 3m wide broad crested weir as a secondary outlet.

Results of peak outflows from the DRAINS model are summarised in Table 4-4.

Table 4-4 Summary of DRAINS Peak Outflows (Stage 5+6)

Storm Event	Predeveloped Flows	Developed Flows (With OSD)	Comments
5 year ARI (20% AEP)	0.765 m^3/s	0.765 m^3/s	Developed flows equal to predeveloped
10 year ARI (10% AEP)	0.857 m^3/s	0.831 m^3/s	Developed flows less than predeveloped
20 year ARI (5% AEP)	0.977 m^3/s	0.919 m^3/s	Developed flows less than predeveloped
50 year ARI (2% AEP)	1.05 m^3/s	0.969 m^3/s	Developed flows less than predeveloped
100 year ARI (1% AEP)	1.17 m^3/s	1.16 m^3/s	Developed flows less than predeveloped

5 Water Quality

Section 6.7.7.3.3 of DCP 2013 requires, as a minimum, the following reductions in total pollutant load compared to untreated runoff from the developed site.

Table 5-1 Minimum Pollutant Reduction Targets

Pollutant	Minimum Reduction
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	45%
Total Nitrogen (TN)	45%
Gross Pollutants	80%

Section 6.7.7.3.3 of DCP 2013 discusses various options to achieve compliance with the minimum pollutant reduction targets as an area of specified treatment per 100m² of impervious area.

In order to optimise the treatment train while still demonstrating compliance with Section 6.7.7.3.3 of DCP 2013, a MUSIC model was prepared for the development site.

5.2 Base Information

The MUSIC model was prepared in computer model Version 6.3 (Build 0.1908) in accordance with the NSW MUSIC Modelling Guidelines, August 2015.

Meteorological stations near the development site were reviewed in reference to distance from the development site, completeness of data record, dates of data record and type of data record.

Historical pluviograph data was taken from Meteorology Station Number 061351 at Waratah Road, Peats Ridge. The station is approximately 15km from the development site with the rainfall record approximately 99% complete.

Over 25 years of historical rainfall data was analysed in 6 minute time steps from 3 October 1981 to 30 June 2007. The average annual rainfall over this period was 1,122mm.

Daily evapotranspiration data from Sydney was analysed over the same 25 year time period noted above.

5.3 Source Nodes

Pollutant loads for source nodes were adopted from Table 5-6 and 5-7 of the NSW MUSIC Modelling Guidelines (BMT WBM, 2015).

Stochastic pollutant generation was selected.

5.4 Treatment Nodes

Three treatment nodes are proposed as part of the water cycle treatment train for each stage of development:

1. Rainwater Tanks
2. HumeGuard GPT
3. Constructed Wetland

5.5 Stage 1 Treatment

The Stage 1 treatment train is presented in Figure 5-2 below.

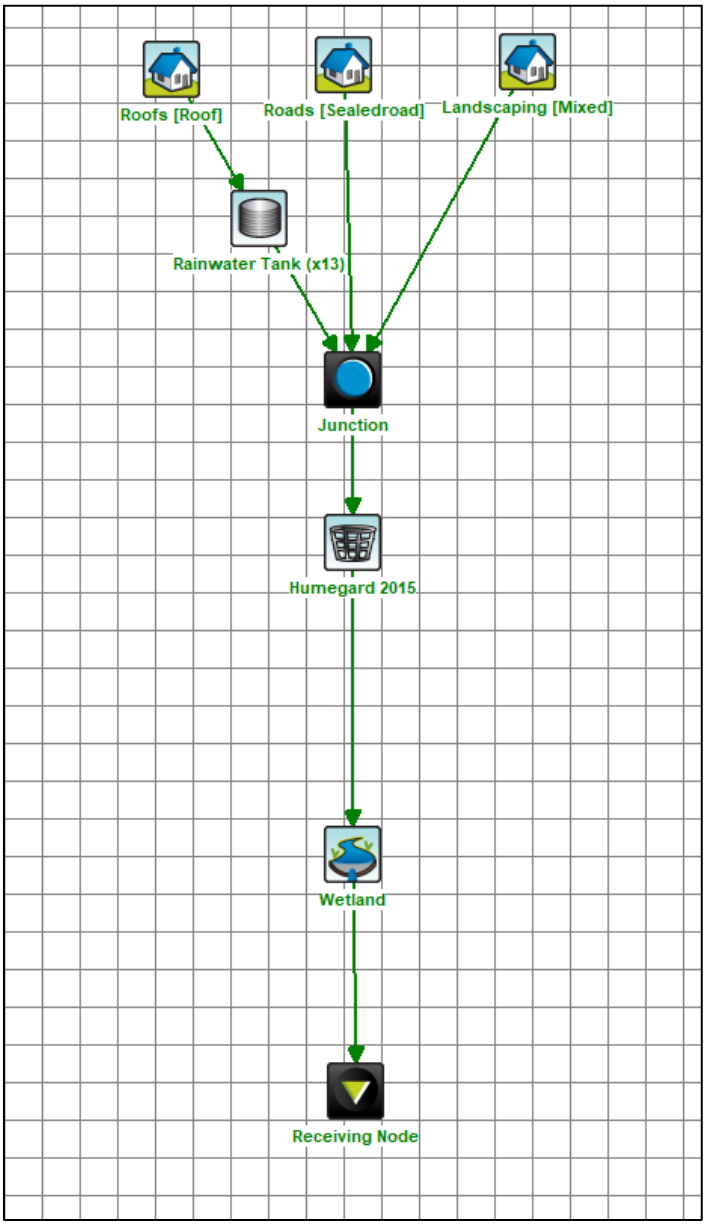

Figure 5-1 Stage 1 Treatment Train

5.5.1 Rainwater Tanks

It is assumed that rainwater tanks will be fitted to each property in the Stage 1 development. The rainwater tanks have been modelled with a nominal storage volume of 3kL per lot/dwelling, totalling 39kL for an assumed 13 lots.

Stormwater reuse was assumed to be used for the following:

1. Toilet
2. Laundry
3. External use

Reuse has been estimated with reference to BMT WBM's MUSIC Modelling Guidelines for urban dwellings with an average of 3.05 occupants. An internal reuse figure of 0.176kL/dwelling/day and an external reuse figure of 0.151kL/dwelling/day were adopted, totalling 4.25kL/day for the assumed 13 dwellings in Stage 1.

5.5.2 HumeGuard GPT

A Humegard GPT is proposed as a primary treatment device to remove gross pollutants and coarse sediments from stormwater runoff. The HumeGuard MUSIC treatment node was downloaded from the Humes website.

5.5.3 Constructed Wetland

A constructed wetland with a permanent pool volume of 343m^3 and minimum surface area of 400m^2 is proposed at the base of the Stage 1 OSD basin to facilitate the removal of finer nutrients and sediment from stormwater runoff. The combined volume of the Stage 1 rainwater tanks and wetland permanent pool volume meets the required Stage 1 Stormwater Retention Volume of 382m^3.

The wetland parameters were selected in accordance with Section 6.5.13 of the NSW MUSIC Modelling Guidelines (BMT WBM, 2015). The high-flow bypass was set at the 3-month ARI flow.

5.5.4 Results

Results of the MUSIC model show the nominated treatment train for Stage 1 exceeds the pollutant removal targets outlined in DCP 2013. Table 5-2 presents a summary of the MUSIC model results.

Table 5-2 Summary of MUSIC Model Results (Stage 1)

Pollutant	Minimum Reduction	Achieved Reduction	Comments
Total Suspended Solids (TSS)	80%	85.4%	Treatment exceeds minimum
Total Phosphorus (TP)	45%	72.7%	Treatment exceeds minimum
Total Nitrogen(TN)	45%	47.9%	Treatment exceeds minimum
Gross Pollutants	80%	100%	Treatment exceeds minimum

The above results demonstrate compliance with the minimum pollutant reduction detailed in Section 6.7.7.3.2 of DCP 2013.

5.6 Stage 2 Treatment

The Stage 2 treatment train is presented in Figure 5-3 below.

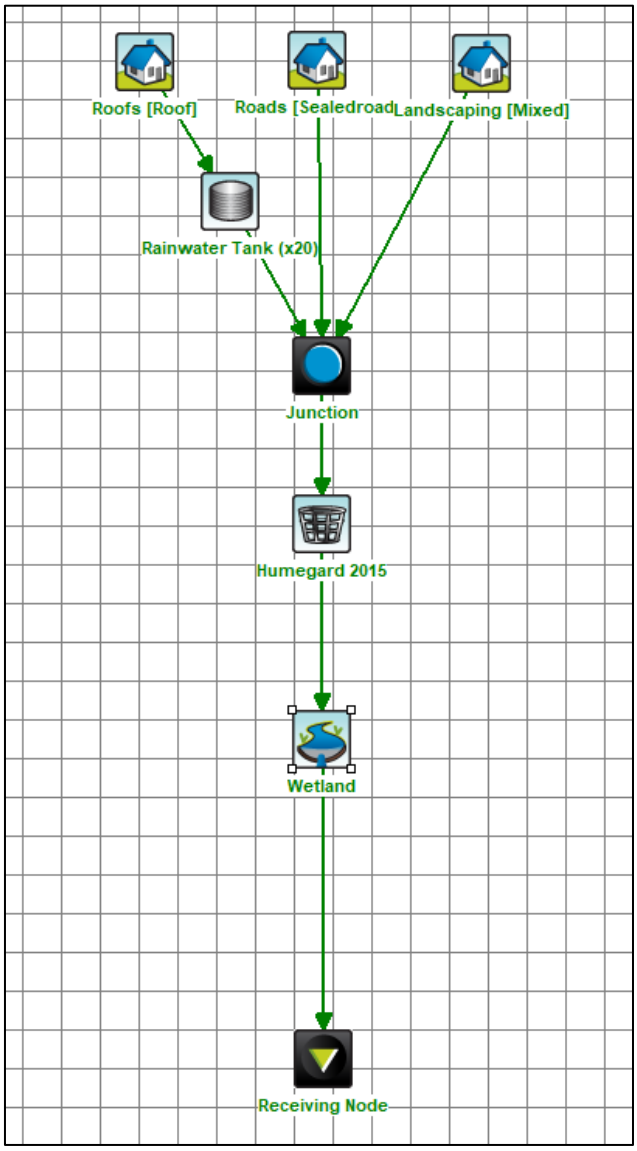

Figure 5-2 Stage 2 Treatment Train

5.6.2 Rainwater Tanks

It is assumed that rainwater tanks will be fitted to each property in the Stage 2 development. The rainwater tanks have been modelled with a nominal storage volume of 3kL per lot/dwelling, totalling 60kL for an assumed 20 lots.

Stormwater reuse was assumed to be used for the following:

4. Toilet
5. Laundry
6. External use

Reuse has been estimated with reference to BMT WBM's MUSIC Modelling Guidelines for urban dwellings with an average of 3.05 occupants. An internal reuse figure of 0.176kL/dwelling/day and an external reuse figure of 0.151kL/dwelling/day were adopted, totalling 6.54kL/day for the assumed 20 dwellings in Stage 2.

5.6.3 HumeGuard GPT

A Humegard GPT is proposed as a primary treatment device to remove gross pollutants and coarse sediments from stormwater runoff. The HumeGuard MUSIC treatment node was downloaded from the Humes website.

5.6.4 Constructed Wetland

A constructed wetland with a permanent pool volume of 310m^3 and minimum surface area of 400m^2 is proposed at the base of the Stage 2 OSD basin to facilitate the removal of finer nutrients and sediment from stormwater runoff. The combined volume of the Stage 2 rainwater tanks and wetland permanent pool volume meets the required Stage 2 Stormwater Retention Volume of 367m^3.

The wetland parameters were selected in accordance with Section 6.5.13 of the NSW MUSIC Modelling Guidelines (BMT WBM, 2015). The high-flow bypass was set at the 3-month ARI flow.

5.6.5 Results

Results of the MUSIC model show the nominated treatment train for Stage 2 exceeds the pollutant removal targets outlined in DCP 2013. Table 5-3 presents a summary of the MUSIC model results.

Table 5-3 Summary of MUSIC Model Results (Stage 2)

Pollutant	Minimum Reduction	Achieved Reduction	Comments
Total Suspended Solids (TSS)	80%	85.4%	Treatment exceeds minimum
Total Phosphorus (TP)	45%	72.7%	Treatment exceeds minimum
Total Nitrogen(TN)	45%	49.1%	Treatment exceeds minimum
Gross Pollutants	80%	100%	Treatment exceeds minimum

The above results demonstrate compliance with the minimum pollutant reduction detailed in Section 6.7.7.3.2 of DCP 2013.

5.7 Stage 4 Treatment

The Stage 4 treatment train is presented in Figure 5-4 below.

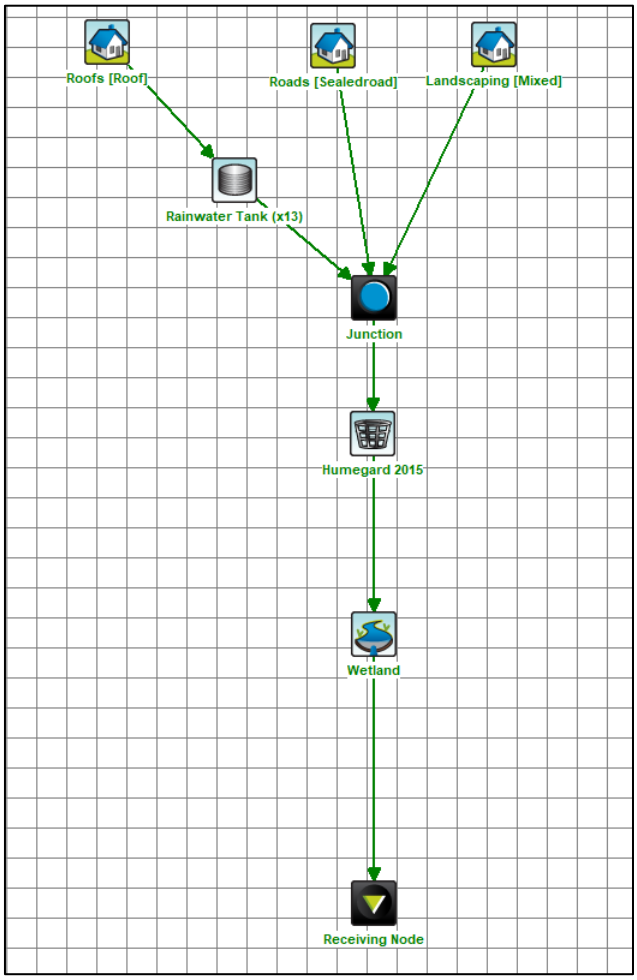

Figure 5-3 Stage 2 Treatment Train

5.7.2 Rainwater Tanks

It is assumed that rainwater tanks will be fitted to each property in the Stage 4 development. The rainwater tanks have been modelled with a nominal storage volume of 3kL per lot/dwelling, totalling 39kL for an assumed 13 lots.

Stormwater reuse was assumed to be used for the following:

7. Toilet
8. Laundry
9. External use

Reuse has been estimated with reference to BMT WBM's MUSIC Modelling Guidelines for urban dwellings with an average of 3.05 occupants. An internal reuse figure of 0.176kL/dwelling/day and an external reuse figure of 0.151kL/dwelling/day were adopted, totalling 4.25kL/day for the assumed 13 dwellings in Stage 4.

5.7.3 HumeGuard GPT

A Humegard GPT is proposed as a primary treatment device to remove gross pollutants and coarse sediments from stormwater runoff. The HumeGuard MUSIC treatment node was downloaded from the Humes website.

5.7.4 Constructed Wetland

A constructed wetland with a permanent pool volume of 280m^3 and minimum surface area of 400m^2 is proposed at the base of the Stage 4 OSD basin to facilitate the removal of finer nutrients and sediment from stormwater runoff. The combined volume of the Stage 4 rainwater tanks and wetland permanent pool volume meets the required Stage 4 Stormwater Retention Volume of 317m^3.

The wetland parameters were selected in accordance with Section 6.5.13 of the NSW MUSIC Modelling Guidelines (BMT WBM, 2015). The high-flow bypass was set at the 3-month ARI flow.

5.7.5 Results

Results of the MUSIC model show the nominated treatment train for Stage 4 exceeds the pollutant removal targets outlined in DCP 2013. Table 5-4 presents a summary of the MUSIC model results.

Table 5-4 Summary of MUSIC Model Results (Stage 4)

Pollutant	Minimum Reduction	Achieved Reduction	Comments
Total Suspended Solids (TSS)	80%	86.8%	Treatment exceeds minimum
Total Phosphorus (TP)	45%	71.5%	Treatment exceeds minimum
Total Nitrogen(TN)	45%	45.4%	Treatment exceeds minimum
Gross Pollutants	80%	100%	Treatment exceeds minimum

The above results demonstrate compliance with the minimum pollutant reduction detailed in Section 6.7.7.3.2 of DCP 2013.

5.9 Stages 5+6 Treatment

The Stages 5+6 treatment train is presented in Figure 5-5 below.

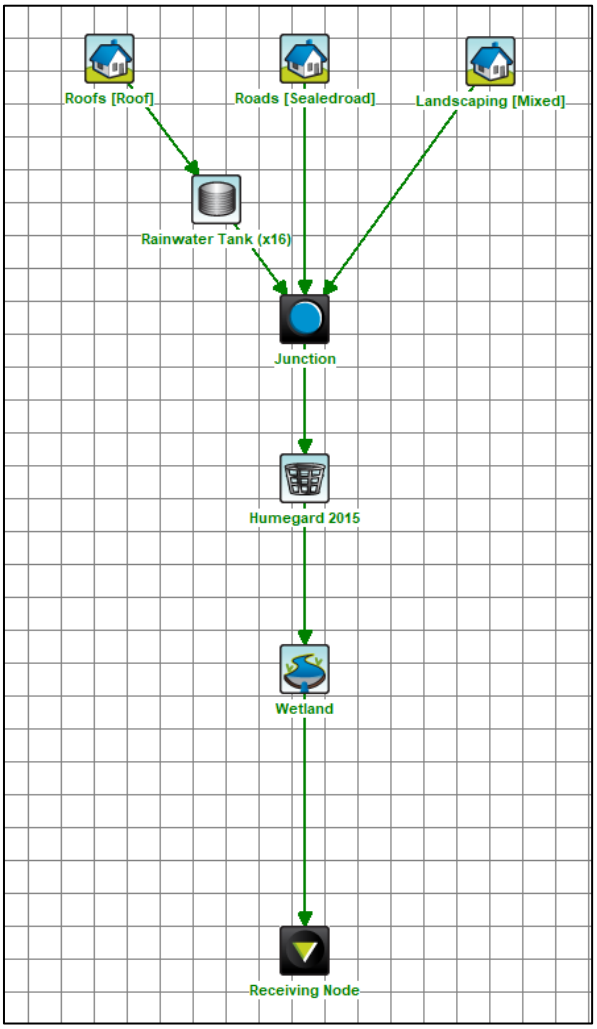

Figure 5-4 Stages 5+6 Treatment Train

5.9.2 Rainwater Tanks

It is assumed that rainwater tanks will be fitted to each property in the Stage 5+6 development. The rainwater tanks have been modelled with a nominal storage volume of 3kL per lot/dwelling, totalling 48kL for an assumed 16 lots.

Stormwater reuse was assumed to be used for the following:

10. Toilet
11. Laundry
12. External use

Reuse has been estimated with reference to BMT WBM's MUSIC Modelling Guidelines for urban dwellings with an average of 3.05 occupants. An internal reuse figure of 0.176kL/dwelling/day and an external reuse figure of 0.151kL/dwelling/day were adopted, totalling 5.23kL/day for the assumed 16 dwellings in Stage 5+6.

5.9.3 HumeGuard GPT

A Humegard GPT is proposed as a primary treatment device to remove gross pollutants and coarse sediments from stormwater runoff. The HumeGuard MUSIC treatment node was downloaded from the Humes website.

5.9.4 Constructed Wetland

A constructed wetland with a permanent pool volume of 350m^3 and minimum surface area of 500m^2 is proposed at the base of the Stage 5+6 OSD basin to facilitate the removal of finer nutrients and sediment from stormwater runoff. The combined volume of the Stage 5+6 rainwater tanks and wetland permanent pool volume meets the required Stage 5+6 Stormwater Retention Volume of 395m^3.

The wetland parameters were selected in accordance with Section 6.5.13 of the NSW MUSIC Modelling Guidelines (BMT WBM, 2015). The high-flow bypass was set at the 3-month ARI flow.

5.9.5 Results

Results of the MUSIC model show the nominated treatment train for Stages 5+6 exceeds the pollutant removal targets outlined in DCP 2013. Table 5-5 presents a summary of the MUSIC model results.

Table 5-5 Summary of MUSIC Model Results (Stages 5+6)

Pollutant	Minimum Reduction	Achieved Reduction	Comments
Total Suspended Solids (TSS)	80%	86.8%	Treatment exceeds minimum
Total Phosphorus (TP)	45%	71.6%	Treatment exceeds minimum
Total Nitrogen(TN)	45%	45.6%	Treatment exceeds minimum
Gross Pollutants	80%	100%	Treatment exceeds minimum

The above results demonstrate compliance with the minimum pollutant reduction detailed in Section 6.7.7.3.2 of DCP 2013.

6 Conclusion

This report has outlined the methodology behind the analysis of on-site detention and water quality requirements for the proposed rezoning development.

It was found that a single OSD basin for each stage of development (shared basin for Stages 5 and 6) will be sufficient to ensure developed flows do not exceed pre-developed flows for all storm events up to and including the 100 year ARI storm events. Spatial requirements and details of the OSD basins will be confirmed during DA design.

It was found that a treatment train consisting of rainwater tanks, a HumeGuard GPT and a constructed wetland will be sufficient to meet Council's water quality requirements for each stage of development (shared treatment train for Stages 5 and 6).

Forresters Beach Planning

APPENDIX A

DEVELOPMENT LAYOUT

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STAGE 1 COMBINED OSD BASIN/ WETLAND
100YR ARI STORAGE VOLUME = 260 m3
WETLAND PERMANENT WATER VOLUME = 345 m3

STAGE 4 COMBINED OSD BASIN/ WETLAND
100YR ARI STORAGE VOLUME = 170 m3
WETLAND PERMANENT WATER VOLUME = 280 m3

STAGE 2 COMBINED OSD BASIN/ WETLAND
100YR ARI STORAGE VOLUME = 250 m3
WETLAND PERMANENT WATER VOLUME = 310 m3

STAGE 5+6 COMBINED OSD BASIN/ WETLAND
100YR ARI STORAGE VOLUME = 250 m3
WETLAND PERMANENT WATER VOLUME = 350 m3

E2 ZONED LAND
(1.849 ha)

STAGE 1
STAGE 2
STAGE 3
STAGE 4
STAGE 5
STAGE 6

1 DP 405510
DP 1016491
DP 28283
62 DP 838562
51 DP 1028301

FORRESTERS BEACH ROAD
ROAD
MAAS PARADE
ENTRANCE
THE

M.G.A.

NOTES:

- BASED ON MIN. LOT SIZE 550m²
- PLAN SUBJECT TO REVIEW OF ENGINEERING, BUSHFIRE & ENVIRONMENTAL CONTROLS
- ALL FINAL DIMENSIONS AND AREAS SUBJECT TO SURVEY

STAGE 1
STAGE 2
STAGE 3
OSD BASIN/ WETLAND EXTENTS

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

12 6 0 12 24 36 48 60
SCALE IN METRES ON ORIGINAL DRAWING AT REDUCTION RATIO 1:600