infrastructure & development consulting

Vacy Village South – Stage 4

DA Stormwater Management Report

May 2025

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1 Introduction

Infrastructure & Development Consulting (IDC) have been commissioned by Cornish Group to prepare a stormwater management & Infrastructure strategy for the proposed residential subdivision at Vacy, known as Vacy Village South – Stage 4. This report will be lodged with Dungog Shire Council (Council) to support the Development Application (DA) and outlines the modelling procedures and outcomes for stormwater and infrastructure management strategies for the site.

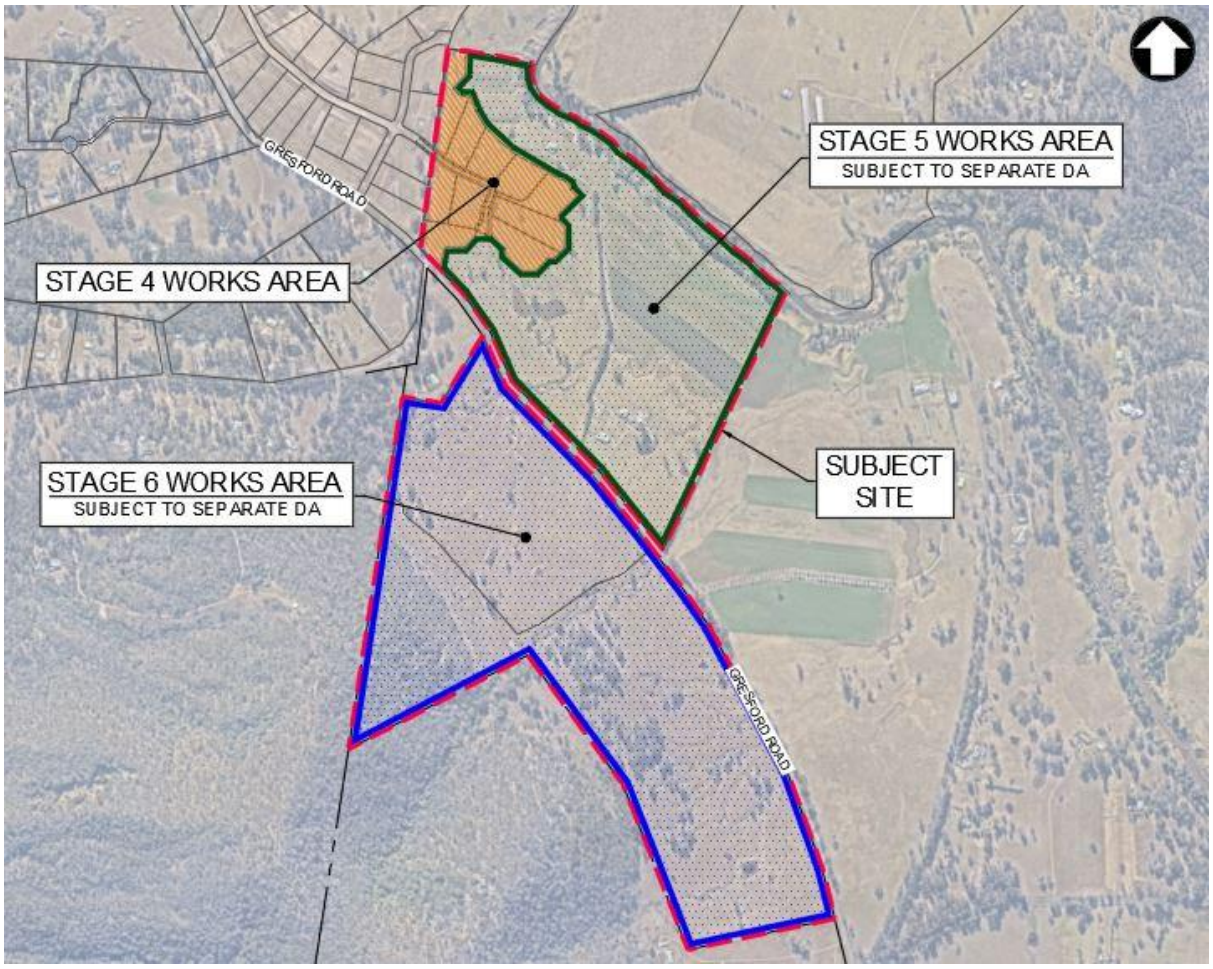
The results as outlined in this report and documented on the IDC drawings address the following items:

- Review of existing stormwater conditions;
- Design of a stormwater strategy to convey flows to appropriate discharge points;
- Assessment of overland flow safety;
- Measures to achieve Council's water quantity and quality objectives.

2 Site Description

Vacy Village South – Stage 4 is located at 598 Gresford Road, Vacy, north of Gresford Road and falls within in the Dungog Shire local government area in the Hunter Region of NSW. The site sits on Lot 123 DP 1063557 and encompasses approximately 9.5ha of undeveloped R5 Large Lot Residential zoned land. Land dedicated to environmental management (Zone C3) surrounds the proposed development along its northern, eastern and southern site boundary. We note the subject development Vacy Village South – Stage 4 (refer to Figure 1 – Site Location below) forms part of the proposed development known as Vacy Village South.

Figure 1 - Site Location



Source: Nearmap Imaging 2024

The site is naturally split into two sub-catchments by a central ridge, with flows draining either north-east or south-west. This catchment division is generally maintained in the design.

The western boundary of the site joins into the existing subdivision at 734 Gresford Road, with the development strategy to demolish the temporary cul-de-sac head on this site and extend the local access road through to the proposed development at Vacy Village South – Stage 4.

The proposed development will consist of the creation of 10 large rural residential lots (inclusive of a battle axe lot) and an associated cul-de-sac road with an open table drain on its northern verge leading to a stormwater level spreader. Refer Figure 2 below for the proposed site layout and road configuration.

Figure 2 - Proposed Development

3 Methodology

The following stormwater models were undertaken to analyse the stormwater management strategy for the site in support of the Development Application proposal.

To fully appreciate the water cycle characteristics of the local catchment, a number of analyses have been undertaken in support of the Development Application proposal.

The following is a breakdown of the key technical assessments which have been used to inform the concept civil design for the proposed subdivision:

3.1 Water Quantity (DRAINS)

- Sizing the proposed table drain and pipe crossing to adequately convey stormwater flows during the design storm event;
- Assessment of the safety of surface flows in the road reserve during major storm events to suit the ultimate development scenario; and

3.2 Water Quality (MUSIC)

- Identify a stormwater treatment train that results in a neutral or beneficial impact downstream on water quality.

We note that modelling parameters and design development for the different analyses described above is discussed in more detail throughout the following sections of this Report.

4 Data

4.1 Topography

Topographic information for the site was obtained from aerial LiDAR data obtained from NSW Government Spatial Services.

4.2 Rainfall Data

The design intensity-frequency-duration rainfall data was obtained from the BoM portal (Design Rainfall Data System 2016). Refer to Table 1 below for rainfall data.

Table 1 – Rainfall Intensity Data

Duration	10 year (mm/h)	100 year (mm/h)
5 min	151	246
10 min	120	198
15 min	101	166
20 min	86.8	143
25 min	76.7	126
30 min	68.9	113
45 min	53.5	87.5
1 hour	44.3	72.3
1.5 hours	33.8	55.0
2 hours	27.8	45.3
3 hours	21.3	34.6

Source: BoM portal (Design Rainfall Data System 2016)

5 Design Controls & Guidelines

The stormwater network for the site has been designed to comply with the following guidelines:

- Dungog Local Environment Plan (2014);
- Dungog Development Control Plan (2004);
- Environmental Planning and Assessment Act (1979);
- Australian Rainfall and Runoff (2019); and
- Managing Urban Stormwater: Soils and Construction (2004)

6 Stormwater Management Strategy

6.1 Sediment & Erosion Control

Prior to any works commencing on site, erosion and sediment control measures will be put in place generally in accordance with Managing Urban Stormwater: Soils and Construction 4th Edition March 2004. These measures include:

- Installation of a 1.8m high chain wire fence covered with geotextile fabric to the perimeter of the work site area;
- A sediment basin situated towards the low point of the site for the collection of stormwater runoff during construction;
- The use of appropriate sediment diverting methods to minimise sediment in Council's stormwater drainage network;
- Locations for temporary stockpiling;
- Provision of a temporary truck wash down facility for vehicles exiting the site during construction.

Refer to the Sediment and Erosion Control Plan prepared by IDC for details.

6.2 Water Quantity Management

6.2.1 Design ARI

For the purposes of this study, DRAINS hydrological modelling software has been used to size the proposed table drain and pipe crossing to adequately convey the 10-year ARI storm (minor), with provision for safe overland flows during the 100-year ARI storm event (major).

6.2.2 DRAINS Modelling

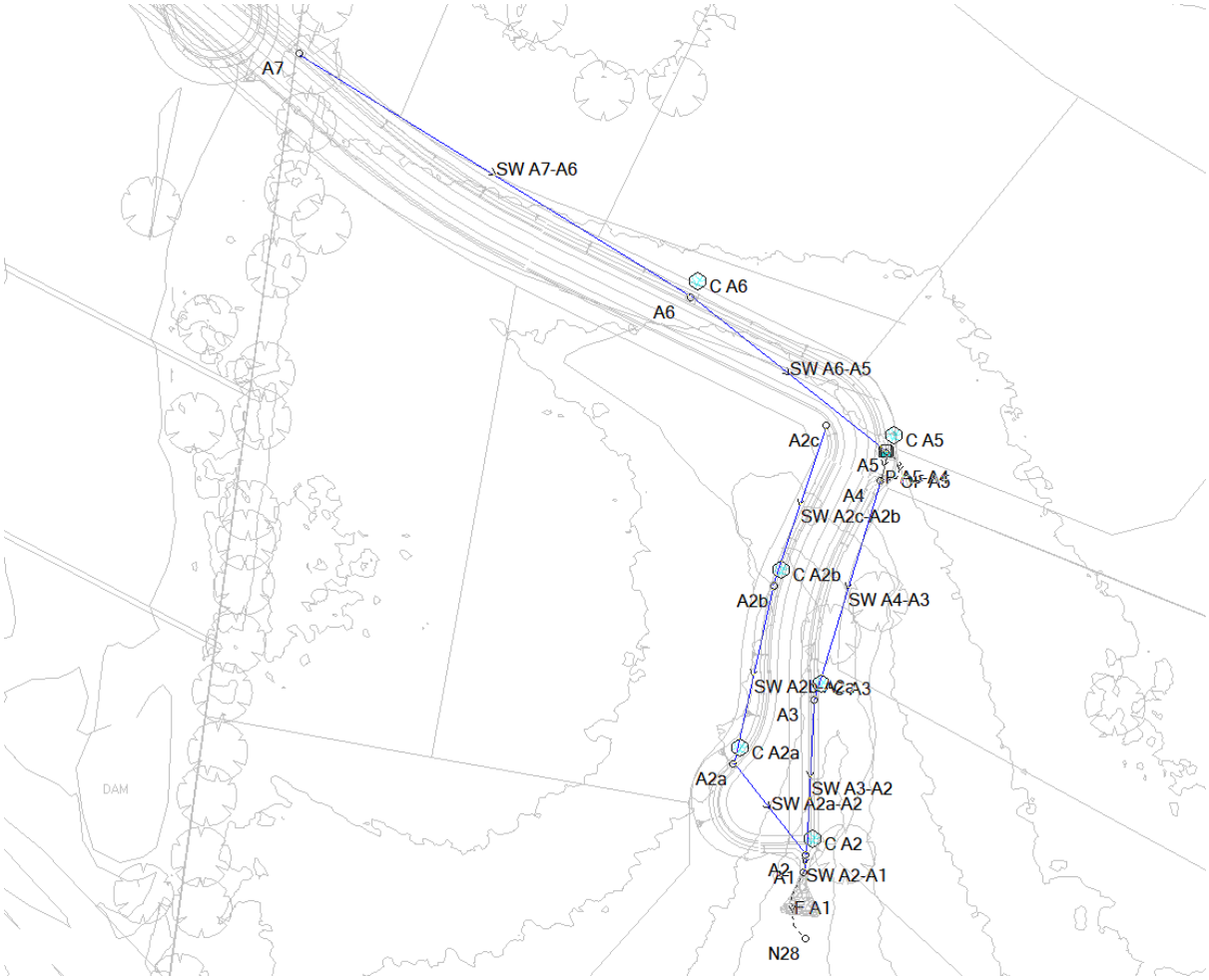
A hydrological model of the catchment was formulated using the DRAINS software package and was analysed to assess the performance of the site stormwater network. The user data inputs required by DRAINS include catchment areas, flow path lengths, time of concentration, pervious and impervious areas, IFD rainfall intensities and flow path roughness.

A DRAINS model has been developed by IDC to model the post developed scenario based on the following methodology:

- A table drain in the northern verge of the new road reserve is proposed to intercept and collect existing flows generated from upstream lots. These flows cross under driveway crossings via a proposed Ø375mm pipe where required. A level spreader is then proposed to discharge the stormwater downstream as overland sheet flow, leading into a natural depression which flows into the Paterson River, as per the current flow regime. (Refer to IDC Engineering Drawing C200 for details);
- Tailwater conditions at the outlet/discharge point has been set to the existing 100yr flood level at this location (TWL_{100} = 19.35m AHD);
- A 10% impervious percentage was adopted for the new large rural residential lots within the development area.

- 10-year and 100-year ARI events were considered for all standard durations.

Figure 3 - Proposed DRAINS Model



6.2.3 DRAINS Results

Iterations were performed in the DRAINS model to determine the size of the proposed drainage network in order to satisfy major / minor system requirements in accordance with Dungog Shire Council requirements. Results of the DRAINS assessment indicate that the proposed stormwater infrastructure sufficiently conveys minor storm flows downstream leading to the Paterson's River with safe provisions for major storm events.

6.3 Water Quality Management

6.3.1 MUSIC Modelling

To ensure that there is no net increase in mean annual pollutant loads leaving the site, the existing (un-developed) site was compared directly against the proposed (developed) site. As such, two separate cases were considered in the MUSIC model, one representing the existing scenario and the other the post-developed site as per the below methodology:

- The post-developed site was consolidated into two main sub-catchment areas based on the proposed drainage layout as follows:

Table 2 - MUSIC Sub-Catchment Summary

MUSIC Sub-Catchment	Area (Ha)
M1	2.799
M2	1.603
Total	**4.402**

- Catchments were separated into "Road", "Roof" and "Lot" areas as per the latest lot layout for the site.

Table 3 - MUSIC Catchment Breakdown

Sub-Catchment	Land Use	Area (Ha)
M1	Roof	0.263
	Road	0.134
	Lot	2.402
	Sub-Total	**2.799**
M2	Roof	0.075
	Road	0.081
	Lot	1.447
	Sub-Total	**1.603**
	Total	**4.402**

The pollutant concentration parameters used within the model were based in the recommended model defaults for different land use categories as specified in New South Wales MUSIC Modelling Guidelines. These are summarised in the following table:

Table 4 - MUSIC Node Classification

MUSIC Node	Classification
Roof	"Roof Areas"
Road	"Road Areas"
Lot	"Residential"

Source: New South Wales MUSIC Modelling Guidelines

- The soil properties for the pervious areas of the catchment were defined based on the recommended default parameters for "Sandy Clay Loam" soils listed in New South Wales MUSIC Modelling Guidelines and are summarised below:

Table 7 - MUSIC Soil Parameters

Soil Properties	Lot	Roof	Road
Impervious Threshold (mm)	1	0.3	1.5
Soil Storage Capacity (mm)	108	108	108
Initial Storage (% of capacity)	30	30	30
Field Capacity (mm)	73	73	73
Infiltration coefficient "a"	250	250	250
Infiltration coefficient "b"	1.3	1.3	1.3
Initial groundwater depth (mm)	10	10	10
Daily recharge rate (%)	60	60	60
Daily base flow rate (%)	45	45	45
Daily deep seepage rate (%)	0	0	0

Source: New South Wales MUSIC Modelling Guidelines

6.3.2 Water Quality Treatment Train

The following treatment train has been proposed for the site:

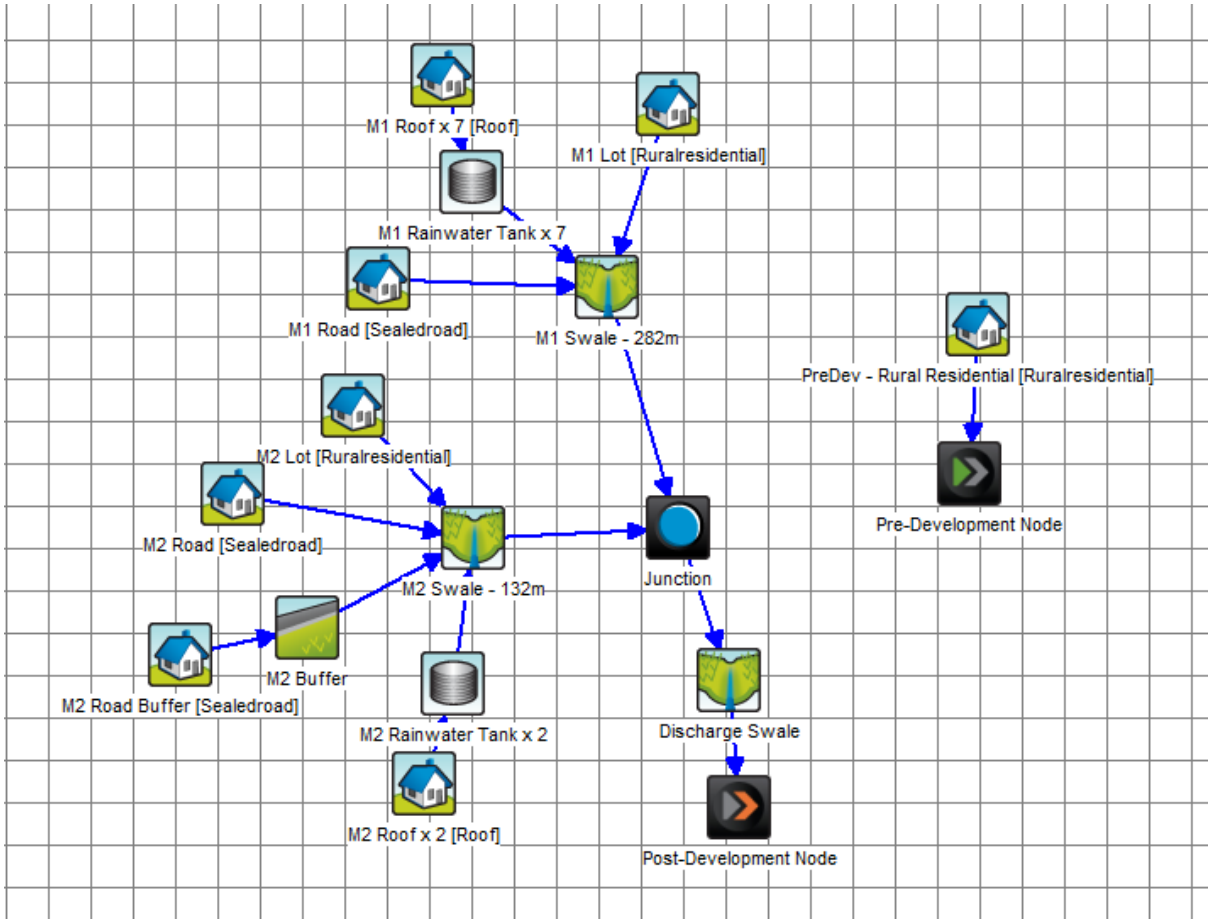
- Rainwater harvesting has been proposed for the development to reduce stormwater runoff through the appropriate re-use of rainwater on lot, with the installation of a minimum 10kL rainwater tank assumed for each allotment;
- A swale has been modelled as a treatment measure which represents the proposed table drain along the northern verge of the proposed cul-de-sac road;
- The stormwater runoff from the proposed cul-de-sac road that flows along the southern verge is treated via its grassed overland flow route. This is represented in MUSIC through the buffer strip node.
- The proposed level spreader discharges the post developed flows to a naturally occurring depression through Lot 208 which conveys stormwater downstream towards the Paterson River. This natural depression is represented in MUSIC as a grassed swale which provides treatment for the post developed flows before leaving the site boundary.

Rainwater Tanks

The following assumptions were made for the rainwater tanks in developing the proposed model:

- 10kL storage per lot;
- 100% of total roof area draining to tanks, which is deemed appropriate for rural residential lots (New South Wales MUSIC Modelling Guidelines), with an assumed average roof area of 375m^2 per lot;
- Re-use rates for rainwater tanks were adopted as 790 litres/day/dwelling from NSW MUSIC Guidelines for 2 occupants with daily external use.

Figure 4 - Proposed MUSIC Model



6.3.3 MUSIC Results

The results of the MUSIC analysis are summarised in the following table:

Table 5 - MUSIC Results

Pollutant	Existing Pollutant Load (kg/yr)	Post-Developed Generation (kg/yr)	Post-Developed Output (kg/yr)	Neutral or Benefit Impact of Post-Developed Pollutant Output
Total Suspended Solids	973	1760	407	Yes
Total Phosphorus	2.33	4.05	1.43	Yes
Total Nitrogen	24.5	34.9	16.5	Yes
Gross Pollutants	37.4	191	11.8	Yes

We note the proposed treatment measures for the proposed subdivision consisting of rainwater re-use and an open table drain results in a neutral or beneficial impact downstream on stormwater water quality. Based on the above, we understand that the objectives for the water quality strategy have been achieved for the site.

7 Summary and Conclusions

The proposed stormwater management strategy addresses both quantity and quality aspects and complies with relevant Council and NSW stormwater design guidelines. Modelling confirms that the system accommodates minor and major flow requirements and results in a neutral or beneficial water quality impact downstream. The proposed rainwater reuse, grassed swales, and appropriate drainage infrastructure support a sustainable and effective solution for the development.

All supporting plans and modelling files are available and referenced accordingly.