

Memo

To:	Jarrod Sim and Rob Howe	Job No:	1019317.1000
From:	Richard Brunton	Date:	27 February 2023
cc:			
Subject:	Indicative stormwater treatment basin footprint area for Block 2-4		

This memo summarises the method, assumptions, and results for the indicative sizing of a stormwater treatment basin for the proposed residential subdivision located within land known as Block 2-4, Kaiapoi.

To support a future Plan Change application for Block 2-3, Woods have requested that T+T provide an indicative estimate of the basin footprint area required to treat stormwater runoff from the subdivision. This work has been undertaken as part of ongoing services for Momentum Land Ltd for the future development of Block 2-4.

The following assumptions were made to estimate the stormwater treatment basin footprint area:

- The stormwater treatment catchment area was assumed to be 208,225 m². This area includes all impervious areas within the subdivision (area provided by Woods).
- Stormwater treatment volume is based on the First Flush volume¹ which is 25 mm as per Waimakariri District Council (WDC) Engineering Code of Practice Part 5: Stormwater & Land Drainage (Section 5.8.4 treatment) states; “*design for discharge quality in accordance with WWDG Part B chapter 6 and ARC TP10*”. Christchurch City Council (CCC’s) Waterways, Wetlands and Drainage Guide (WWDG) recommends “*as best practice the capture of runoff from the first 25 mm of storm rainfall depth, but not less than 12.5 mm. The capture of runoff from at least the first 25 mm of storm rainfall depth is a requirement for green fields developments*”.
- Basin sizing assumes 1V:4H side slopes. This is typically regarded as the steepest slope that can be mowed by a ride on mower.
- It was assumed the shape of the treatment area was even sided for ease of calculation. Different length or width dimensions do not impact the total footprint area.

Detailed calculations are provided in Appendix A.

The estimated stormwater treatment volume is 5,205 m³.

¹ Defined as the runoff from the first 25mm of rainfall on impervious surfaces

Basin footprint results for the three basin depth scenarios (as requested by Woods) are presented below:

- 0.4 m depth: 13,480 m²
- 0.5 m depth: 10,830 m²
- 0.6 m depth: 9,060 m²

The purpose of this assessment is to provide an indicative stormwater treatment footprint size for the subdivision. The sizing presented above does not account for freeboard (likely to be in the order of 0.3 – 0.5 m depth), maintenance buffer, loss of volume from planting, multiple basins or restrictions to basin depth from factors such as geotechnical issues, groundwater levels or hydraulic grade lines. These factors should be considered at later stages of design.

We have not undertaken any assessment of consenting requirements for the treatment of stormwater from the subdivision.

Appendix A: Calculations for methodology

- Total impervious area of the subdivision.
 - $84,261 + 111,696 + 10,536 + 1,732 = 208,225 \text{ m}^2$
- Treatment volume = 25mm x impervious area
 - $208,225 * 0.025 = 5,205.625 \text{ m}^3$
- Calculate a basin/pond footprint area for scenarios at depths 0.4m, 0.5m and 0.6m, accounting for side slopes of 1V:4H.

$$\text{Equation: } V = (1/3) * h * ((a^2) + (b^2) + (a*b))$$

$$V = \text{volume} \quad h = \text{depth scenario} \quad a = b+4 \quad b = x$$

- 0.6 m depth scenario:
 - $(1/3) * 0.6 * ((95.13816^2) + (91.13816^2) + (95.13816 * 91.13816)) = 5,205.63 \text{ m}^3$
 - TOTAL TREATMENT AREA: a x a =
 - $95.13816 * 95.13816 = 9,051 \text{ m}^2$
- 0.5 m depth scenario:
 - $(1/3) * 0.5 * ((104.0291^2) + (100.0291^2) + (104.0291 * 100.0291)) = 5,205.63 \text{ m}^3$
 - TOTAL TREATMENT AREA: a x a =
 - $104.0291 * 104.0291 = 10,822 \text{ m}^2$
- 0.4 m depth scenario:
 - $(1/3) * 0.4 * ((116.0734^2) + (112.0734^2) + (116.0734 * 112.0734)) = 5,205.63 \text{ m}^3$
 - TOTAL TREATMENT AREA: a x a =
 - $116.0734 * 116.0734 = 13,473 \text{ m}^2$

27-Feb-23

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PROJECT	MOORE FARM
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IMPERVIOUS RATIO	
ROAD	74%
LOTS	70%
RESERVE	30%
COMMERCIAL/ HIGH DENSITY	85%

DESCRIPTION:	Moore Farm Block design as of 17/02/23
CATCHMENT AREA:	291602 m2

ROAD			
74%	OVERALL	IMPER	PERV
CATCHMENT AREA (m²)	113,866	84,261	29,605
RUN-OFF COEFFICIENT	0.71	0.85	0.30

LOTS			
70%	OVERALL	IMPER	PERV
CATCHMENT AREA (m²)	159,565	111,696	47,870
RUN-OFF COEFFICIENT	0.69	0.85	0.30

COMMERCIAL/ HIGH DENSITY			
85%	OVERALL	IMPER	PERV
CATCHMENT AREA (m²)	12,397	10,537	1,860
RUN-OFF COEFFICIENT	0.77	0.85	0.30

RESERVE			
30%	OVERALL	IMPER	PERV
CATCHMENT AREA (m²)	5,774	1,732	4,042
RUN-OFF COEFFICIENT	0.45	0.80	0.30

COMPOSITE RUN-OFF COEFFICIENT	0.69
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