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Tulips Properties Pty Ltd.

Drainage Report

526 Louth Park Road, Louth Park

December 2022

ENGINEERING
PLANNING
SURVEYING
CERTIFICATION

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1 Introduction

Barker Ryan Stewart has been engaged to prepare design documentation to support the approval of the Development Application DA18-1967 for the 24 residential lot subdivision at No 526 Louth Park Road, Louth Park.

1.1 Site Location

The site of the proposed development is described as Lot 412 DP 854995. Access to the site is from Louth Park Road to the east. The location of the site is shown in Figure 1 below.

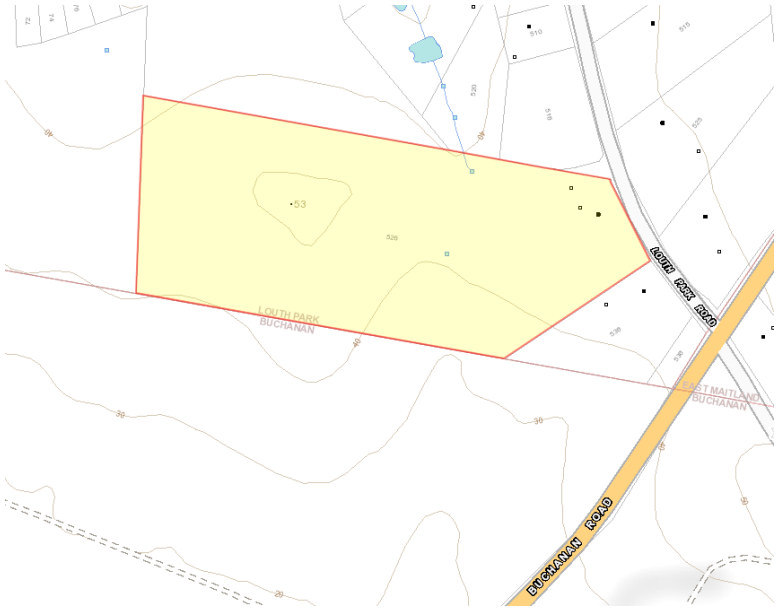

Figure 1 - Subject site location (Source SIX Maps)

2 Design

2.1 Stormwater Management

A stormwater pit and pipe network was prepared for the subject land, generally in accordance with the minor/major storm principles of AR&R[1]. The pit and pipe system hydraulics adopted Council's preferred standards for inlet capacity calculations, pipe roughness and pit loss configurations and implemented in DRAINS software. 63.2%, 20%, 10%, 5%, and 1% Average Exceedance Probability (AEP) rainfall events were used as inputs to the model.

Catchment Hydrology was based on the ILSAX model utilising a soil type of C and Antecedent Moisture Condition (AMC) of 3 in accordance with Council's Civil Works Design Guidelines. These soil parameters are representative of relatively wet clayey soils at the commencement of each modelled storm event. Saturated hydraulic conductivity of the native soils on site is estimated at less than 1.0mm/hr.

Rainfall intensity duration model inputs were obtained from the new ARR design IFD's from the Bureau of Meteorology Website[2].

[2] Bureau of Meteorology new IFD's: http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016

The pipe network was designed to minimum pipe grades where possible. The flows from the site are to be adequately detained and treated in the bio-retention/detention basin.

The drainage system has been designed for both the interim and ultimate conditions (pre and post dwelling construction) to ensure compliance with Council's design guidelines.

2.2 Catchments

The stormwater network was prepared for the entire development site. The pre-developed catchments for this development were delineated by the natural surface contours for the development locality and are shown on Sheet 511 of the engineering set. The post-developed catchments were delineated based on the finished surface contours for the entire development together with the upstream natural catchments and are shown on sheet 512. The pre-developed catchment condition was modelled as having 0% impervious area in accordance with the Flooding and Stormwater Strategy Report. The post-developed catchments were modelled as 40% impervious for the rural residential lots and 70% impervious for roads.

Catchment Hydrology was based on the ILSAX model regime using a soil type of C and Antecedent Moisture Condition (AMC) of 3 in accordance with Council's standards.

The road layout redirects part of the site to the north, into the basin before then discharging into a legal point of discharge. The basin is located in this low point and reduces the peak post development flows back to at least the pre-development peak flows and is sized to cater for the developed lots and constructed road system.

2.3 Water Quality Analysis

A stormwater quality analysis has been completed using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software. The MUSIC model was prepared using the parameters recommended in the draft MUSIC modelling guidelines for source and pollutant nodes. Soil parameters were based on a clay soil in accordance with the modelling guidelines. Rainfall and evapotranspiration data spanned a 12-year simulation period of 6-minute rainfall increments from 1997 to 2009.

The site has been broken down into four source nodes comprising of roof (25% Lot area), driveway or impervious areas (15% of lot area), landscaping areas (60% of lot area) and road (road reserve areas).

The MUSIC model treatment train is represented by Figure 2 and shows the treatment comprising an Ecosol 4750 GPT and a bioretention basin in addition to swales. The swale treatment node has been assumed downstream of lot 1 and lots 4-15 (120m in length, 10m per lot) due to the requirement of a level spreader prior to discharge to the downstream catchment. The bio retention basin is to be of minimum area of 435m2 with a filter media depth of 400mm and an extended detention depth of 150mm.

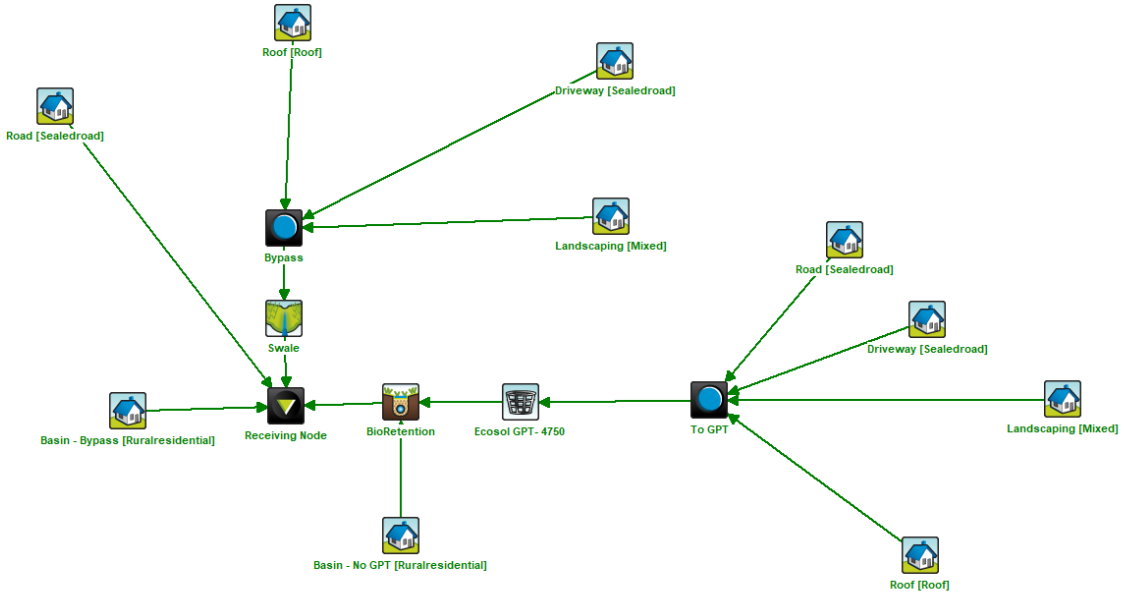

Figure 2: MUSIC Model Treatment Train

2.4 Performance Criteria

The stormwater modelling of the proposed street stormwater network has been undertaken for all storm events up to and including the 1% AEP storm event. The network was designed to satisfy all performance criteria detailed in Council's Manual of Engineering Standards. The results of the 10% and 1% AEP stormwater analysis for the entire network are presented on sheets 541 and 542 on the engineering set. Discrepancies in the drainage model will be refined and finalised as part of the subdivision works certificate submission.

2.5 On-site Detention

A stormwater basin is provided within the proposed drainage easement to provide both water quality and quantity treatment for the catchment that will drain to the north. With the road network and grading being as it is, areas from Lots 2, 3 and 15 to 24 will be redirected and graded to the low point in Road 1and discharged to the north. As a result, all of the catchments draining away from the development, and bypassing the OSD to the south, west and north-west have a reduced area and therefore will have a reduced peak flow for events up to and including the 1% AEP event, so no OSD will be required on these catchments.

Table 1: On-Site Detention Configuration

Basin	Top of Media	EDD Depth/ Level	TWL Depth/ Level	Weir RL	Orifice Dia./Centreline Level	Storage Vol in 1% AEP Event	Permitted Site Discharge (PSD)
Bio-Retention Basin	RL 41.45	0.15m / RL 41.60	1.34m / RL42.97	RL 42.90	225mm / RL 41.30 410mm / RL 41.30 500mm / RL 40.925	2,770m³	Refer Table 2

2.6 Water Quantity Results

Results of the maximum discharge rates for the analyses of the 63.2%, 20%, 10%, 5% and 1% AEP pre- and post-developed storm events are shown in Table 1 below.

Table 2: Stormwater Discharge Comparisons

Catchment	63.2% AEP (L/s)		20% AEP (L/s)		10% AEP (L/s)		5% AEP (L/s)		1% AEP (L/s)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
CH1-1	201	182	708	435	1020	572	1,270	721	2,000	1110
CH2-1	106	92	362	220	478	295	637	373	985	675
CH3-1	97	96	318	224	436	296	556	371	861	746
CH4-1	90	89	307	297	406	392	541	477	836	830
CH5-1	16	16	51	31	69	51	88	66	137	108
CH6-1	36	26	110	48	146	66	184	82	283	122

The results in Table 1 confirm the post developed site discharge satisfies council requirements. Note Catchment CH4-1 post-development flow is the attenuated flow from the detention basin.

2.7 Water Quality Results

Results from the MUSIC modelling are provided below. The model has been provided for review by Council with this submission. The results show that the reduction targets have been met in accordance with Council's requirements.

	Sources	Residual Load	% Reduction
Flow (ML/yr)	49.2	48.7	1.2
Total Suspended Solids (kg/yr)	8430	1330	84.2
Total Phosphorus (kg/yr)	17.1	5.78	66.2
Total Nitrogen (kg/yr)	113	61.8	45.5
Gross Pollutants (kg/yr)	1130	16.4	98.6

2.8 Stormwater Operation and Maintenance

Stormwater controls located in the road reserve or drainage reserve are to be ultimately managed and maintained by Council. Stormwater pipes laid to no flatter than 0.5% grade tend to be self-cleansing, so pipes can be assumed to have a negligible maintenance requirement. Sediments and gross pollutants

will be collected in gross pollutant traps, located near the basins. The GPT units should be cleaned out every twelve months or as required, with an inspection carried out once in every three months.

The maintenance burden for the bio-retention basin will be fully borne by Council. Landscaping around the basin and within the primary stormwater channel will need to be carefully selected to reduce the impact of weed infestation and limit the need for slashing or mowing, and excess vegetation within the stormwater channel will limit its hydraulic efficiency. For a well-designed and constructed basin, maintenance should be limited to periodic cleaning of debris, weeds, and garbage, should these pollutants bypass the gross pollutant traps.

The stormwater channel and bioretention basin embankments should be inspected after every major storm event to identify any weaknesses or possible seepage and landslip.

The frequency of maintenance is higher for the primary treatment devices (GPT's) and lesser for the secondary treatment device (bio-retention basin). The configuration of these control structures has been designed to reflect the need to access these for maintenance purposes based on the maintenance frequency.