APPENDIX K1:

CONCEPTUAL STORMWATER MANAGEMENT PLAN

PROVIDED BY: ADG

Country Club Estate

100 Country Club Avenue, Prospect Vale

Conceptual Stormwater Management Plan

Engine Room VM (NSW) Pty Ltd

13 November 2020

Document Verification

Job Title **Country Club Estate**

Job Number 23337

Document Title Conceptual Stormwater Management Plan

Document Control

Date	Document	Revision No.	Author	Reviewer
02.11.20	Conceptual Stormwater Management Plan	00	M Brown	S Thienpont
13.11.20	Conceptual Stormwater Management Plan	01	M Brown	S Thienpont

Approval for Issue

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1 EXECUTIVE SUMMARY

ADG Engineers (Aust.) Pty Ltd has been engaged by Engine Room VM (NSW) Pty Ltd to prepare a Stormwater Management Plan suitable for submission to Meander Valley Council in support of a Development Application for a residential subdivision located across a portion of 100 Country Club Avenue, Prospect Vale, TAS 7250.

The proposed development is to be primarily comprised of detached residential dwellings, retirement living units and a retail area around the existing golf course.

This report aims to assess the proposed development with relation to both stormwater quantity and quality. The quantity assessment is undertaken to confirm a 'non-worsening' of peak flow discharges from the site and the quality assessment is undertaken to determine the required stormwater treatment measures to be implemented on site.

A stormwater management plan is required to comply with the Council Planning Scheme, the Tasmanian Regional Subdivisional Guidelines, and the State Stormwater Strategy, which stipulates requirements regarding the removal of gross pollutants, suspended solids, nitrogen and phosphorus.

The stormwater quantity objective was to demonstrate that there is no increase in peak discharges from the subject site. This considered storm events up to and including the 1% AEP (Q_{100}) storm event. The purpose is to ensure that the existing infrastructure and/or downstream properties are not adversely affected. The above-mentioned objectives are achieved through the use of detention storage measures.

All relevant standards and guidelines are addressed in this Stormwater Management Plan including the State Stormwater Strategy, the Meander Valley Planning Scheme and the MUSIC Modelling Guidelines, Version 1.0 (2010). The proposed stormwater quantity and quality solutions are summarised in the following table:

Table 1 - Proposed Stormwater Quantity and Quality Solutions

Catchment	Quantity Mitigation Requirement	Quality Mitigation Requirement
C1	873.5m^3 of On-Site Detention within combined treatment / detention basin	180m^2 of Bioretention within combined treatment / detention basin
C2	Additional 11,768.5m^3 of On-Site Detention within existing East Lake	120m^2 of Bioretention within combined treatment / detention basin
C7		25m^2 of Bioretention within combined treatment / detention basin
C3	Additional 12,153.6m^3 of On-Site Detention within existing West Lake	160m^2 of Bioretention within combined treatment / detention basin
C5		95m^2 of Bioretention within combined treatment / detention basin
C4	15.5m^3 of On-Site Detention within combined treatment / detention basin	26m^2 of Bioretention within combined treatment / detention basin
C6	143.3m^3 of On-Site Detention within combined treatment / detention basin	28m^2 of Bioretention within combined treatment / detention basin

2 INTRODUCTION

2.1 General

ADG Engineers (Aust.) Pty Ltd has been engaged by Engine Room VM (NSW) Pty Ltd to prepare a Stormwater Management Plan suitable for submission to Meander Valley Council (MVC) in support of a Development Application for a residential subdivision located across a portion of 100 Country Club Avenue, Prospect Vale, TAS 7250, henceforth referred to as *the site*.

The proposed development is to be primarily comprised of detached residential dwellings, retirement living units and a retail area around the existing golf course.

This report aims to assess the proposed development with relation to both stormwater quantity and quality. The quantity assessment is undertaken to confirm a 'non-worsening' of peak flow discharges from the site and the quality assessment is undertaken to determine the required stormwater treatment measures to be implemented on site.

The purpose of this SMP is to provide advice as to the development proposal detailed in the Place Design Group drawings in **Appendix A**. The works described herein are subject to further approvals and cover works required to service the proposed development with regard to stormwater treatment.

2.2 Background Information

This report was compiled using information from the following sources:

- 'Dial Before You Dig' (DBYD) As-Constructed information;
- Tasmanian Government ListData;
- Architectural drawings by Place Design Group (refer to **Appendix A**);
- Detailed survey plan prepared by Woolcott Surveys (refer to **Appendix B**); and
- Google Maps Aerial Imagery.

2.3 Property Details

The site is located in Prospect Vale, TAS. The land titles that make up the site are given in **Table 1**. Refer to the architectural drawings in **Appendix A** for further details. **Figure 1** displays the site locality.

Table 2– Property Detail

Title	P119422
Street Address	100 Country Club Avenue, Prospect Vale 7250 TAS
Site Area	1,156,639m^2 (115.664 ha)
Area of Works	37.620ha

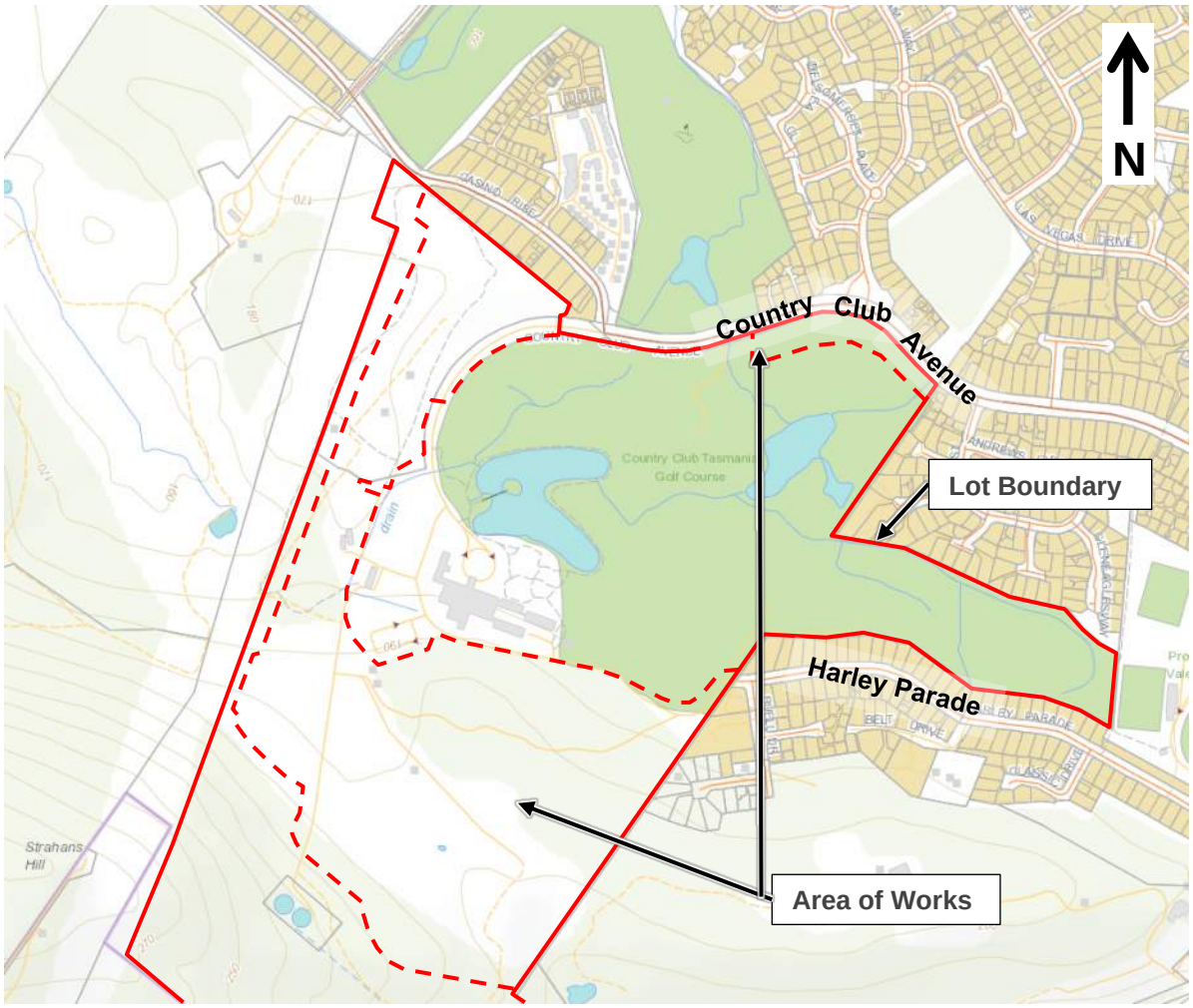

Figure 1 – Locality Map (Accessed on 19.10.2020 from MVC Discover Communities Mapping)

2.4 Existing Site

The proposed development is located over sections of undeveloped land on 100 Country Club Avenue, Prospect Vale, TAS. Prospect Vale is within the MVC local government area and thus will be assessed by MVC officers. The proposed area of works generally falls from a high of 220m AHD in the south to local low points of 168m AHD in the north-east.

The site is subject to a steep grade, which varies from over 20% to 5%.

Much of the existing site is occupied by the existing Country Club Golf Course, the associated clubhouse and car parking. The existing golf course is the confluence point for the surrounding catchment and several existing water bodies are located there. The flows continue north via culverts under Country Club Avenue at two points.

Figure 2 demonstrates the existing site conditions discussed above.

The existing lot on which the site is located is burdened by an existing electrical easement in the west and an existing trunk water main easement passes from a reservoir in the south, through the centre of the site towards the north. A drainage easement is located in the north-west of the existing lot. Refer to the survey in **Appendix B** for further details.

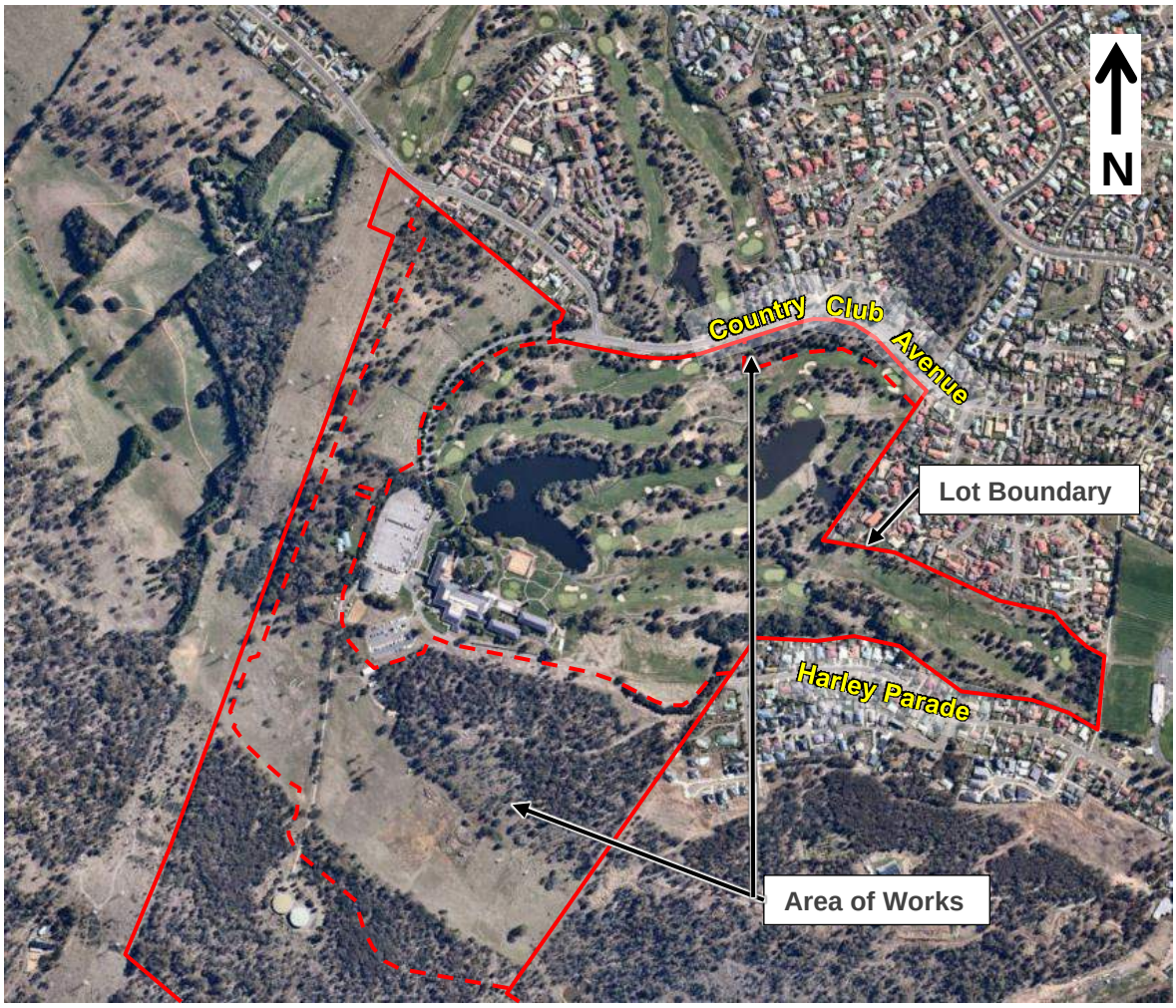

Figure 2 – Site Condition (Source: Nearmap, dated 02.03.2020)

3 PROPOSED DEVELOPMENT

The proposed development as described in the architectural drawings in **Appendix A** is to be primarily comprised of detached residential dwellings, retirement living and a retail area around the existing golf course.

The surface areas exposed to rainfall for the proposed development is presented in **Table 3**. Refer to the architectural drawings in **Appendix A** and DA08 in **Appendix C** for further information regarding the proposed development.

Table 3 – Proposed Development Areas

Catchment ID	Land Type	Impervious	Area (ha)
C1	Roof Area	100.00%	4.065
	Ground	37.00%	5.600
	Road / Driveway	100.00%	1.295
C2	Roof Area	100.00%	2.579
	Ground	37.00%	3.318
	Road / Driveway	100.00%	1.023
C3	Roof Area	100.00%	3.347
	Ground	37.00%	4.543
	Road / Driveway	100.00%	1.480
C4	Roof Area	100.00%	0.724
	Ground	37.00%	0.736
C5	Roof Area	100.00%	2.202
	Ground	37.00%	2.537
	Road / Driveway	100.00%	0.691
C6	Roof Area	100.00%	0.680
	Ground	37.00%	0.780
	Road / Driveway	100.00%	0.210
C7	Roof Area	100.00%	0.789
	Ground	37.00%	0.661
TOTAL		**68.24%**	**37.260**

Note: Assumed lot breakdown – 29% pervious ground, 68% impervious roof, 17% impervious ground. Assumed road reserve breakdown: 50% pervious ground, 50% impervious road. Overall Fraction impervious 68% based on advice provided by Meander Valley Council, as per **Appendix F**.

3.1 Existing Stormwater Infrastructure

Meander Valley Council infrastructure mapping in addition to the attached detailed site survey has identified the following stormwater infrastructure within the vicinity of the site:

- Overland flow paths and are the primary means of flow conveyance through the site, leading to artificial open drains lower in the catchment. In the vicinity of the existing golf course culverts have been provided under pedestrian bridges over the open drains.
- Culverts convey flows from the southern side of Country Club Avenue to the northern side at two points as described below.
- A DN800 Stormwater culvert conveys flows from south to north under Country Club Avenue approximately 60m east from the centre of the Country Club Avenue – Casino Rise intersection.
- 2x DN1125 Stormwater culverts conveys flows from south to north under Country Club Avenue approximately 210m east from the centre of the Country Club Avenue – Casino Rise intersection.
- The west end of Country Club Avenue is serviced by an open-channel swale in the eastern verge. Pits and pipes convey flows from the western kerb and channel to the swale at intervals along the road.
- Existing drainage structures are present around the existing golf course and the associated club house.

3.2 Lawful Point of Discharge (LPD)

The existing area of works is characterised by multiple catchments that fall to the north, east and south. As such the site has multiple points of discharge. It is proposed that for most catchments the existing discharge points will be retained by the post-developed site. Refer to the attached DA07 and DA08 to see the existing and proposed points of discharge. **Table 4** presents the different LPDs for each catchment.

Table 4 – Catchment LPDs

Catchment	Lawful Point of Discharge
C1	LPD1
C2	LPD7
C3	
C4	LPD4
C5	LPD7
C6	LPD6
C7	LPD7

3.3 External Catchments

The land to the east, west and south of the site falls towards the site boundary. As such there are several external catchments that burden the site. Refer to the attached DA07 and DA08 to see the external catchments. These external catchments will be conveyed through the site via a combination of culverts and overland flow paths capable of conveying the 1% AEP flow event.

3.4 Flooding

Refer to the ADG Engineering Services Report (23337 C R001) for flooding impacts.

4 STORMWATER QUANTITY ASSESSMENT

The aim of the stormwater quantity assessment is to ensure that the development shall impose no adverse effects on downstream properties or receiving water bodies and that the conveyance of flows will be in a safe manner with minimal risk of human endangerment as well as the following objectives:

- Address the need for stormwater quantity control measures;
- Ensure there is no increase in peak discharges from the subject site for events up to and including the 1% Annual Exceedance Probability (formerly known as the 1 in 100 year Annual Recurrence Interval) event; and
- Ensure proposed quantity control measures detain and convey flows in accordance with MVC minimum freeboard recommendations.

4.1 Proposed Development and Associated Issues

The impervious area increases from the pre-development case across the proposed area of works. One of the major implications of an increase in impervious area is that the total volume and flow rate of stormwater run-off from the catchment will generally increase. It can subsequently be concluded that the development across the area of works alters the existing flow characteristics of the site. It is essential that any increase to post-developed peak site discharge over pre-developed peak site discharge are mitigated.

4.2 Stormwater Quantity Modelling – XP-STORM

An XP-STORM Hydraulic and Runoff model was created to analyse the pre- and post-developed scenarios. The model includes a typical node-link connectivity identifying the catchments and hydraulic parameters. The proposed model was designed to reduce the increase of developed runoff to match pre-developed levels.

The AR&R Storm Generator was used based on the site coordinates to run all design storm events for events from the 10-minute storm to the 72-hour storm events. The Bureau of Meteorology Intensity-Frequency-Duration data applied to AR&R storm patterns is shown in **Table 6**.

Table 5 - BOM Intensity Frequency Data for Site (mm/hr)

Storm Duration	Annual Exceedance Probability (%)					
	50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
10 mins	36.7	49.0	58.4	68.3	83.2	95.8
15 mins	29.8	39.9	47.6	55.8	68.1	78.6
20 mins	25.6	34.2	40.8	47.7	58.1	66.9
25 mins	22.6	30.2	36.0	42.0	51.0	58.5
30 mins	20.5	27.3	32.4	37.7	45.5	52.0
45 mins	16.3	21.6	25.4	29.5	35.1	39.7
1 hour	13.8	18.2	21.3	24.6	29.0	32.5
1.5 hours	10.9	14.3	16.6	18.9	22.0	24.4
2 hours	9.26	12.0	13.9	15.7	18.1	20.0
3 hours	7.30	9.36	10.7	12.1	13.8	15.2
4.5 hours	5.73	7.30	8.34	9.33	10.6	11.6
6 hours	4.82	6.11	6.96	7.78	8.88	9.72
9 hours	3.75	4.75	5.40	6.04	6.93	7.62
12 hours	3.12	3.96	4.51	5.05	5.83	6.44
18 hours	2.40	3.05	3.49	3.92	4.57	5.09
24 hours	1.98	2.53	2.90	3.27	3.84	4.30
30 hours	1.70	2.18	2.51	2.83	3.34	3.75
36 hours	1.50	1.93	2.22	2.52	2.97	3.35
48 hours	1.22	1.58	1.83	2.07	2.45	2.77
72 hours	0.91	1.18	1.37	1.56	1.84	2.07

4.2.1 XP- Modelling Assumptions and Methodology

The following modelling assumptions were used to create the XP-STORM Models:

- Laurenson's method was used for catchment routing with an 'n' value of -0.285 and 'B' value calculated by XP-STORM.
- Infiltration was modelled as 'uniform loss' with the following parameters:
  - Impervious Areas
    - Initial loss of 1.0mm;
    - Continuing loss of 0.1mm/hr; and
    - Appropriate Manning's 'n' to suit the surface.
  - Pervious Areas
    - Initial loss of 19.0mm;
    - Continuing loss of 4.8mm/hr; and
    - Appropriate Manning's 'n' to suit the surface.
  - Note: initial and continuing losses were determined based on the AR&R 2016 storm generator values, which were calculated based on the site coordinates.
- Separate catchments were generated, which were:
  - External Catchments; 'EXT1', 'EXT3', 'EXT4', 'EXT5', 'EXT6' and 'EXT7'. External catchments were assumed to be 50% impervious in developed areas, based on sample areas.
  - Pre-Development Catchments; 'EX1', 'EX2', 'EX3', 'EX4', 'EX6', 'EX7' and 'EX8'; and
  - Post-Development Mitigated Catchments; 'C1', 'C2', 'C3', 'C4', 'C5', 'C6', 'C7' and 'C8';

- The detention basins and existing lakes were modelled using a step-wise-linear area-depth relationship with preliminary basin dimensions estimated using the concept lot layout plan and post-development contours. The lake dimensions were based on the detailed site survey in **Appendix B**;
- Each node included runoff sub-catchments simulating the contributing areas;
- The sub-catchment areas were split into 0% impervious & 100% impervious areas; and
- The models were run through all storms from 10min to 72-hour durations for all AR&R generated storms to determine the critical storm events for each duration and AEP.

4.2.2 Pre-Development Case Model

The pre-development scenario model consisted of nodes representing the pre-developed contributing catchments as described in section 4.2.1. A link with negligible energy loss was added to the downstream end of the pre-development scenario at each LPD and connected to an outfall node as to provide a single point of comparison for all catchments between the pre- and post-development cases.

4.2.3 Post-Development Case Model

The post-development model includes the nodes for the catchments shown in **Table 2**. As noted in Section 3, the post-development catchments exhibit an increased fraction impervious in the post-development case over the pre-development case. A treatment basin is proposed downstream of each catchment in order to manage stormwater flows, with basins downstream of catchments that drain away from the lakes to also incorporate detention volumes. Catchments that drain to the existing lakes will be mitigated by additional detention to be provided in said lakes. Flows will enter these basins, then be released at a controlled rate in order to retard peak discharge to pre-development rates. For the performance of the basin with regard to treating flows for quality, see Section 5.

As stated previously, a link with negligible energy loss was added at each LPD and connected to an outfall node as to provide a single point of comparison for all catchments between the pre and post-development cases.

A step-wise linear table was used to represent the proposed basin volumes, as shown in **Table 6**.

Table 6 – OSD Depth – Area Relationship

Catchment	Depth	Surface Area (m^2)	Description
C1	0.00	500	Bioretention retained level
	1.00	8000	
	2.00	1500	Top of basin wall
C2 & C7 (East Lake)	0.00	12,347	Existing max retained water level
	0.20	14,620	
	0.40	19,622	
	0.60	28,149	
	0.80	37,423	
C3 & C5 (West Lake)	0.00	24,328	Existing max retained water level
	0.08	24,645	
	0.28	25,407	
	0.48	26,897	
	0.68	28,427	
C4	0.00	69	Bioretention retained level
	0.40	142	Top of basin wall
C6	0.00	250	Bioretention retained level
	0.40	875	Top of basin wall

The proposed detention basin outlet arrangements are as shown in **Table 7** on the following page.

In order to achieve a no-worsening outcome it was also determined that modifications are required to the existing outlets from the lakes.

Proposed West Lake outlet modifications: The west lake has two outlets, one on the east side of the lake and one on the west side of the lake. It is proposed to remove one of the existing DN600 outlet pipes from the West Lake east outlet and to elevate the existing low point around the West Lake to prevent premature overflow from the lake.

Proposed East Lake outlet modifications: The east lake has a single outlet; a weir on the north side of the lake. The weir is not level, and is instead shown on the site survey to have a rounded bottom that will encourage channelisation of outflows. It is proposed to reduce the size of the channel in order to restrict outflows and slow the release of stormwater.

The proposed pre and post-development outlet arrangements for the lakes are as shown in **Table 8** and **Table 9,** with the location of the outlets shown on **Figure 3**.

Table 7 – Proposed Basin Outlet Arrangement

Upstream Catchment	Low Flow Outlet	High Flow Outlet	Emergency Overflow Weir	Peak Water Level	Peak Volume
C1	200(H) x 800(W) orifice Outlet invert to be equal to top of Bioretention retained level	2x 200(H) x 800(W) orifice Outlet invert to be 620mm above Bioretention retained level	20m wide weir 1,250mm above Bioretention retained level	1,287mm above Bioretention retained level	899.4m^3
C2 & C7 (East Lake)	Refer to **Table 8**				
C4	20m wide weir Weir level to be at Bioretention retained level			185mm above Bioretention retained level	15.5m^3
C6	100(H) x 800(W) orifice Outlet invert level to be at Bioretention retained level		10m wide weir 260mm above Bioretention retained level	312mm above Bioretention retained level	143.3m^3
C3 & C5 (West Lake)	Refer to **Table 9**				

Figure 3 – Site Condition (Source: Nearmap, dated 02.03.2020)

Table 8 – Modification to West Lake Outlets

		Existing West Lake Outlets					
		East Outlet 1	East Outlet 2	West Outlet	Bund Top 1	Bund Top 2	Bund Top 3
Existing Outlets	Description	DN600	DN600	DN525	8m weir *	26m weir *	6m weir *
	IL (m AHD)	175.32	175.33	175.35	175.5	175.7	175.85
Proposed Outlets	Description	DN600	Removed	DN525	N/A **	34m weir **	6m weir
	IL (m AHD)	175.32	N/A	175.35	N/A	175.7	175.85

* Low points on top of bund around lake where water overflows simulated as weir outlets

** Proposed to elevate the 8m low section of bund from an elevation of 175.5 to an elevation of 175.7m AHD

Table 9 – Modification to East Lake Outlets

		Existing East Lake Outlets			
		Weir (Step 1) *	Weir (Step 2) *	Weir (Step 3) *	Weir (Step 4) *
Existing Outlets	Description	9m weir	5m weir	6m weir	12m weir
	IL (m AHD)	170.00	170.20	170.40	170.60
Proposed Outlets	Description	5m weir **	0.8m weir **	0.8m weir **	0.8m weir **
	IL (m AHD)	170.00	170.20	170.40	170.60

* Weir outlet is rounded rather than flat and has been simulated as 3 separate weirs at different levels to approximate this

** Proposed to narrow the lower portion of the weir to restrict outflows

The proposed modifications to the lake outlets do not increase the water level in the lake under normal conditions, however during rainfall events, the proposed changes will result in increases to the peak water level in the lakes as shown in **Table 10**.

Table 10 – Change in Peak Water Level in Lakes

Storm Event (AEP)	West Lake Peak Water Level (m)			East Lake Peak Water Level (m)		
	Pre-Development	Post-Development	Change	Pre-Development	Post-Development	Change
50	175.419	175.525	+0.106	170.141	170.203	+0.062
20	175.479	175.587	+0.108	170.206	170.283	+0.077
10	175.468	175.579	+0.111	170.205	170.292	+0.087
5	175.544	175.644	+0.100	170.302	170.393	+0.091
2	175.618	175.765	+0.147	170.493	170.553	+0.060
1	175.656	175.799	+0.143	170.569	170.632	+0.063

The increase in water level in the lake equates to an increase in storage above in the lakes as shown in **Table 11**.

Table 11 – Change in Peak Stormwater Storage in Lakes

Storm Event (AEP)	West Lake Peak Water Level (m)			East Lake Peak Water Level (m)		
	Pre-Development	Post-Development	Change	Pre-Development	Post-Development	Change
50	2,422	5,068	+2,646	1,854	3,117	+877
20	3,911	6,640	+2,729	2,776	4,508	+1,206
10	3,636	6,420	+2,784	2,770	4,694	+1,366
5	5,538	8,092	+2,554	4,310	6,649	+1,656
2	7,586	11,258	+3,672	8,191	9,809	+1,397
1	8,727	12,154	+3,427	10,219	11,720	+1,549

4.3 Peak Outflow Results

A comparison between the peak discharge values between each of the XP-STORM modelled scenarios is presented in **Tables 12** to **15**.

Table 12 – XP-STORM Modelling Results, LPD 1

Design Storm	Pre-Development Flows (m^3/s)	Post-Development Flows (m^3/s)	Flow change (m^3/s)
50% AEP	0.361	0.360	-0.28%
20% AEP	0.696	0.603	-13.36%
10% AEP	1.096	0.953	-13.05%
5% AEP	1.393	1.233	-11.49%
2% AEP	1.500	1.331	-11.27%
1% AEP	1.739	1.682	-3.28%

Table 13 – XP-STORM Modelling Results, LPD 4

Design Storm	Pre-Development Flows (m^3/s)	Post-Development Flows (m^3/s)	Flow change (m^3/s)
50% AEP	0.077	0.053	-31.17%
20% AEP	0.164	0.087	-46.95%
10% AEP	0.252	0.127	-49.60%
5% AEP	0.325	0.171	-47.38%
2% AEP	0.326	0.213	-34.66%
1% AEP	0.393	0.247	-37.15%

Table 14 – XP-STORM Modelling Results, LPD 6

Design Storm	Pre-Development Flows (m^3/s)	Post-Development Flows (m^3/s)	Flow change (m^3/s)
50% AEP	0.059	0.059	0.00%
20% AEP	0.104	0.077	-25.96%
10% AEP	0.170	0.098	-42.35%
5% AEP	0.212	0.157	-25.94%
2% AEP	0.247	0.256	3.64%
1% AEP	0.278	0.278	0.00%

Table 15 – XP-STORM Modelling Results, LPD 7

Design Storm	Pre-Development Flows (m^3/s)	Post-Development Flows (m^3/s)	Flow change (m^3/s)
50% AEP	0.811	0.786	-3.08%
20% AEP	1.352	1.324	-2.07%
10% AEP	1.347	1.377	2.23%
5% AEP	2.095	2.103	0.38%
2% AEP	3.470	3.422	-1.38%
1% AEP	4.165	4.099	-1.58%

4.4 Recommendation

As demonstrated in **Table 12** to **Table 15**, the provision of the OSD basins detailed in **Table 7** and the modifications to the lake outlets detailed in **Table 8** and **Table 9** is adequate to mitigate post-development peak discharge with no or negligible increase for each LPD for all peak storm events. The pre and post development catchment plans can be seen in **Appendix C** and further XP-STORM results refer to **Appendix E**.

5 STORMWATER QUALITY ASSESSMENT

This assessment identifies issues relating to stormwater runoff quality and assesses possible methods of treatment and the subsequent impacts on the drainage strategy. The aim of this section of the report is to determine practical approaches in achieving improvements for the quality of the stormwater run-off from the site as set out in the State Stormwater Strategy, the Meander Valley Planning Scheme and the MUSIC Modelling Guidelines, Version 1.0 (2010).

This section will address the following:

- Runoff to treatment devices; and
- Ensuring treatment device selection criteria is in accordance with Industry Best Practice and, WSUD Engineering Guidelines.

5.1 Site Analysis and Design Strategy

The pervious and impervious area for the proposed development is summarised in **Table 3** of this report. Currently no stormwater quality management measures are in place for the subject site. The proposed development offers the opportunity to provide stormwater quality treatment where none exists at present.

As the proposed development involves 500m^2 or more of additional impervious surface, under the State Stormwater Strategy the development is required to achieve the following stormwater management targets:

- 80% reduction in the annual average load of total suspended solids;
- 45% reduction in the annual average load of total phosphorus; and
- 45% reduction in the annual average load of total nitrogen.

A treatment train specific to each catchment was proposed to achieve the pollutant reduction requirements above. Stormwater quality improvement devices (SQIDs) implemented for each catchment were selected based on the location LPD, topography and existing infrastructure.

5.2 Stormwater Quality Improvement Devices (SQIDs)

The following SQIDs are proposed to be utilised on this project:

Bioretention Basin – A bioretention basin involves a basin with filter media and vegetation that is effective in removing nutrients from stormwater. They typically have a limited storage zone (detention) to allow stormwater to seep through the filter media to a series of underdrains prior to discharge. Bioretention basins can also be combined with OSD and thus is useful where precinct-wide detention is proposed at the downstream catchment discharge point.

5.3 MUSIC Modelling Results

The stormwater run-off for the site was modelled using MUSIC version 6.3.0. The site is located in the North Hydrologic Region of Tasmania, and the model uses the 6-minute rainfall data from the Launceston Airport monitoring site.

The utilised data was over a 10-year timeframe from 1/07/1996 to 30/06/2005. Pollutant export parameters for the catchment's different land use types were applied in accordance with Table 3.8 of the MUSIC Modelling Guidelines, Version 1.0 (2010). The objective was to achieve the desired target pollutant reduction levels as specified in the State Stormwater Strategy.

A MUSIC model analysis was undertaken for each LPD to determine the extent of the treatment required. Each catchment upstream of a given LPD was subdivided into roof, road and ground catchments with ground encompassing yards, hardstand areas, footpath and landscaped verges. Refer to **Table 3** for further details of each catchment.

The results for each catchment are presented below and meet the percent reduction water quality objectives identified by the State Stormwater Strategy development guidelines.

The treatment network is proposed as per **Figure 4**, subject to confirmation at the detailed design phase.

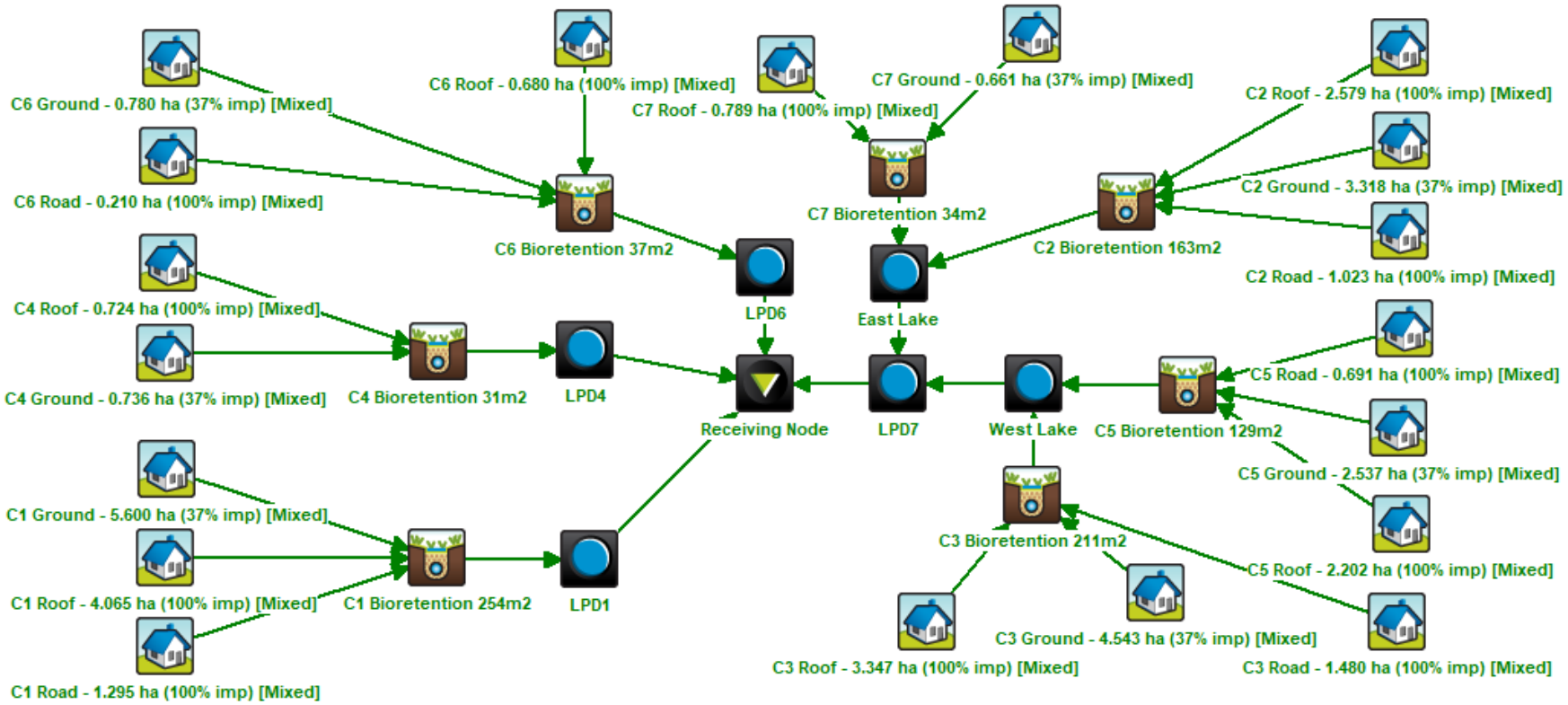

Figure 4 – MUSIC Model arrangement

5.3.1 LPD1 Results

A bioretention basin with filtration area of 254m^2 is adequate to treat the catchment upstream of LPD1 to the required standards prior to discharge. This incorporated a filter media depth of 0.4m and extended detention depth of 0.3m. The model arrangement is shown in **Figure 4** and results in **Table 16**.

Table 16 – LPD1 MUSIC Model Results

Pollutant	Target Pollutant Reduction %	Pollutant Reduction Achieved %	Target Achieved
Total Suspended Solids (TSS)	80	81.1	Yes
Total Phosphorus (TP)	45	62.4	Yes
Total Nitrogen (TN)	45	45.4	Yes

5.3.2 LPD4 Results

A bioretention basin with filtration area of 31m^2 is adequate to treat the catchment upstream of LPD4 to the required standards prior to discharge. This incorporated a filter media depth of 0.4m and extended detention depth of 0.3m. The model arrangement is shown in **Figure 4** and results in **Table 17**.

Table 17 – LPD4 MUSIC Model Results

Pollutant	Target Pollutant Reduction %	Pollutant Reduction Achieved %	Target Achieved
Total Suspended Solids (TSS)	80	80.5	Yes
Total Phosphorus (TP)	45	56.6	Yes
Total Nitrogen (TN)	45	45.5	Yes

5.3.3 LPD6 Results

A bioretention basin with filtration area of 38m^2 is adequate to treat the catchment upstream of LPD6 to the required standards prior to discharge. This incorporated a filter media depth of 0.4m and extended detention depth of 0.3m. The model arrangement is shown in **Figure 4** and results in **Table 18**.

Table 18 – LPD6 MUSIC Model Results

Pollutant	Target Pollutant Reduction %	Pollutant Reduction Achieved %	Target Achieved
Total Suspended Solids (TSS)	80	82.4	Yes
Total Phosphorus (TP)	45	63.2	Yes
Total Nitrogen (TN)	45	45.4	Yes

5.3.4 LPD7 Results

A total bioretention filtration area of 537m^2 spread across five (4) basins as shown in **Figure 6** is adequate to treat the catchment upstream of LPD7 to the required standards prior to discharge. This

incorporated a filter media depth of 0.4m and extended detention depth of 0.3m. The model arrangement is shown in **Figure 4** and results in **Table 19**.

Table 19 – LPD 7 MUSIC Model Results

Pollutant	Target Pollutant Reduction %	Pollutant Reduction Achieved %	Target Achieved
Total Suspended Solids (TSS)	80	81.4	Yes
Total Phosphorus (TP)	45	62.8	Yes
Total Nitrogen (TN)	45	45.0	Yes

As demonstrated, the catchment MUSIC Model results meet the percent reduction water quality targets identified by the State Stormwater Strategy development guidelines.

Refer to **Appendix D** for further information on the MUSIC Models.

5.4 Construction phase

During the construction phase of this development, there is a higher risk of sedimentation transport during construction due to the large areas of disturbed land. Best practice guidance on sediment and erosion control measures are to be conducted in accordance with relevant fact sheets under the Soil and Water Management on Building and Construction Sites by EPA Tasmania (2009).

A Soil and Water Management Plan (SWMP) is required for the lodgement of operational works and shall be implemented during the construction phase in accordance with Appendix 7 of the Tasmanian Subdivision Guidelines.

5.5 Operational phase

The proposed development has been and will continue to be designed to minimise the impact on stormwater quality and peak site discharge by managing stormwater at source using best management design practices to achieve the following stormwater management targets in accordance with the State Stormwater Strategy:

- 80% reduction in the annual average load of total suspended solids;
- 45% reduction in the annual average load of total phosphorus; and
- 45% reduction in the annual average load of total nitrogen.

Once directed to be commissioned by the superintendent and engineers, the Stormwater Quality Improvement Devices (SQIDs) will provide the required level of stormwater quality treatment to runoff from the site prior to discharging into Council's stormwater drainage infrastructure. It is expected that sediment laden runoff and the erosion potential at the subject site during the operational phase will be minimal. This is due to the high amount of permanent impervious area in the form of roofs, paths, courtyards, driveways and other impervious areas. The proposed landscaped areas will be maintained in a manner that will minimise erosion.

5.6 Lifecycle Costs

A lifecycle cost analysis is not a part of the scope of this report. All the recommended water quality treatment infrastructure lies within the development site and it shall be maintained and serviced by the owners of the development at **no cost to Council**.

5.7 Water Quality Monitoring

No water quality monitoring is proposed for this development at this stage due to the nature of the development and the fact that no monitoring currently takes place.

5.8 Maintenance

Following successful off-maintenance of the project, the proposed basin and associated stormwater infrastructure will be transferred to Council. It will be the responsibility of Council to maintain the proposed basins.

6 CONCLUSIONS

Detailed design is to confirm the water quality and quantity recommendations. In preparing this report, we have achieved all requirements for stormwater management plans as described in Council Planning Scheme, the Tasmanian Regional Subdivisional Guidelines, and the State Stormwater Strategy.

Detailed engineering diagrams and management requirements for the proposed development are to be submitted to Council for approval prior to any works commencing on site with design certification prepared by a qualified stormwater engineer or scientist.

Appendix A
Concept Lot Layout

place design group.

BRISBANE
131 Robertson Street
PO Box 419
Fortitude Valley Qld 4006
T + 61 7 3852 3922
F + 61 7 3852 4766

PROJECT

PROSPECT VALE

ISSUE	CODE	ISSUE DESCRIPTION	BY	CHK	DATE
A	PRE	PRE CONCEPT	JB	CK	12.11.20
B	PRE	PRE CONCEPT	JB	CK	12.11.20

PLAN

INDICATIVE CONCEPT MASTER PLAN

DESIGN	:	CK
DOCUMENT	:	JB
PROJECT	:	1019084
DATE	:	12/11/20

NORTH

DRAWING NUMBER	REVISION
1019084_116	B

SCALE : 1:2500 @ A1
1:5000 @ A3

The contents of this plan are preliminary and for discussion purposes only. The development extent, layout and yield outcome are based on preliminary technical studies. Further technical input may vary these preliminary assumptions.
Subject to detail design, engineering design, consultant inputs and all relevant planning and government approvals.

SOURCE BASE INFORMATION:

1. THE BOUNDARY AND CONTOUR INFORMATION SHOWN ON THIS PLAN HAS BEEN PROVIDED BY WOOLCOTT SURVEYS FROM A COMBINATION OF EXISTING RECORDS AND FIELD SURVEY FOR THE PURPOSES OF SHOWING THE PHYSICAL FEATURES OF THE LAND AND SHOULD NOT USED FOR ANY OTHER PURPOSE

2. TITLE BOUNDARIES SHOWN WERE NOT VERIFIED OR MARKED AT THE TIME OF THIS SURVEY.

3. SERVICES SHOWN ON THIS PLAN WERE LOCATED WHERE POSSIBLE BY FIELD SURVEY. THEY ARE NOT A COMPLETE PICTURE OF SERVICES ON SITE. ALL SERVICE LOCATIONS ARE TO BE VERIFIED BEFORE COMMENCEMENT OF ANY WORK ON SITE, IN PARTICULAR THOSE SERVICES NOT PREVIOUSLY LOCATED THROUGH FIELD SURVEY.

4. UNDERGROUND ASSETS WERE NOT LOCATED AT THE TIME OF THE SURVEY, ALL SERVICES WERE LOCATED AT GROUND LEVEL WHERE VISIBLE

5. WOOLCOTT SURVEYS CAN NOT ACCEPT LIABILITY WHATSOEVER FOR LOSS OR DAMAGE CAUSED TO ANY UNDERGROUND SERVICES WHETHER SHOWN BY THIS SURVEY OR NOT.

6. THIS NOTE IS AN INTEGRAL PART OF THIS PLAN/DATA. REPRODUCTION OF THIS PLAN OR ANY PART OF IT WITHOUT THIS NOTE BEING INCLUDED IN FULL WILL RENDER THE INFORMATION SHOWN ON SUCH A REPRODUCTION INVALID AND NOT SUITABLE FOR USE WITHOUT PRIOR AUTHORITY OF WOOLCOTT SURVEYS.

6. HORIZONTAL BEARING DATUM IS PLANE MGA AS PER RTK GPS.

7. VERTICAL DATUM IS AHD AS PER SPM9987.

8. CONTOUR INTERVAL IS 1.0 METRES, INDEX IS 5.0 METRES

9. CONTOURS WERE DERIVED FROM A MIXTURE OF LIDAR AND RTK GPS. LIDAR IS ACCURATE TO ±0.1m, RTK GPS ACCURATE TO ±0.02m.

10. BOUNDARIES AND EASEMENTS ARE COMPILED FROM SP.20213, SP.15388, SP.175463, SP.129784, SP.41551, 101/26D, P.29925, P.23068, P.133064, SP.36367, SP.33678, SP.18481, AND SP.25267 AND ARE APPROXIMATE AND SUBJECT TO SURVEY.

11. CO-ORDINATES ARE PLANE BASED ON MGA SCALED AROUND SPM9987.

PARADE
CASINO RISE
COUNTRY CLUB AVENUE
HARLEY PARADE
Stormwater Management Area
Retirement Living
1.1ha
BUSHLAND RESERVE
8.87ha
GOLF COURSE
31.15ha
COUNTRY CLUB FACILITY
8.50ha
Activated Open Space Buffer
2.9HA
Stormwater Management Area
0.4ha
BUSHLAND RESERVE
1.19ha
Activated Open Space Buffer
1.9HA
RESERVOIR
22.4HA
Activated Open Space Buffer
0.49HA
Stormwater Management Area
0.6ha
Proposed Sewer Pump Station
PEDESTRIAN & EMERGENCY ACCESS TO HARLEY PDE
23m BUSHFIRE INDICATIVE SETBACK
32m BUSHFIRE INDICATIVE SETBACK

	Easement Area (Private Balance Lot)
	Country Club Facility (Private Balance Lot)
	Golf Course
	Bushland Reserve - Park
	Activated Open Space Buffer
	Indicative Stormwater Management Area
	Sewer Pump Station
	Retirement Living
	Residential Lots
	Subject Site
	Indicative BAL Lines (23 & 32m setback)
	Major Water Infrastructure Alignment
	Easements

Appendix B
Detailed Survey

LEGEND:

- TITLE BOUNDARY
- NEIGHBOURING BOUNDARY
- CONTOURS
- FENCING
- TRACK
- INDIVIDUAL TREE
- WOODED AREA

CASINO RISE

DRAINAGE EASEMENT (2.00 WIDE)

EXISTING DAM WATER RL (20/10/20) 164.87

CLUB COUNTRY AVENUE

ELECTRICAL WAYLEAVE EASEMENT (VARIABLE WIDTH)

PIPELINE EASEMENT (3.00 WIDE)

DRAINAGE EASEMENT (3.00 WIDE)

EXISTING DAM WATER RL (20/10/20) 175.38

EXISTING DAM WATER RL (20/10/20) 169.87

CO-AXIAL CABLE WAYLEAVE EASEMENT

PAGE 2

PAGE 3

PAGE 4

SEE RELEVANT PAGES FOR DETAILS

WOODED AREA

HARLEY PARADE

STURGIS PLACE

WOODED AREA

TASWATER OWNED

WOODED AREA

PIPELINE EASEMENT (4.00 WIDE)

Notes:
- HORIZONTAL BEARING DATUM IS PLANE MGA BASED ON RTK GPS.
- VERTICAL DATUM IS AHD PER SPM9987.
- CONTOUR INTERVAL STATED IN RELEVENT AREA PAGES.

OVERALL SITE PLAN
OWNER: TASMANIAN COUNTRY CLUB
100 COUNTRY CLUB AVENUE, PROSPECT 7250
C.T. 119422/1

N

WOOLCOTT SURVEYS
10 Goodman Court Invermay TAS 7248
PO Box 593 Mowbray Heights TAS 7248
Phone (03) 6332 3760
Fax (03) 6332 3764
Email: office@woolcottsurveys.com.au

Job Number L200315

Drawn	File name	Date	Scale	Edition	Sheet
NJK	L200315SitePlans_281020.dwg	28/10/20	1:5000@A3	V1	1/4

Appendix C
ADG Preliminary Civil Plans

PROPOSED DEVELOPMENT

100 COUNTRY CLUB AVE, PROSPECT VALE, TASMANIA, 7250

CIVIL WORKS

NOTE:

THE FOLLOWING INSPECTIONS MUST BE COMPLETED BY ADG ENGINEERS BEFORE ENGINEERING CERTIFICATION WILL BE ISSUED. THE CONTRACTOR IS TO PROVIDE A MINIMUM OF 72 HOURS NOTICE TO ADG FOR REQUIRED INSPECTIONS. SHOULD THE CONTRACTOR FAIL TO REQUEST AN INSPECTION, THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL COSTS TO ALLOW FOR THE WORKS TO BE INSPECTED TO THE SATISFACTION OF ADG. ANY INSPECTIONS THAT FAIL ARE TO BE RE-INSPECTED WITH ALL REINSPECTION COSTS TO BE PAID BY THE CONTRACTOR.

a) PRESTART
b) EARTHWORKS - FINAL STRIPPING OF TOPSOIL, INSTALLATION OF SEDIMENT AND EROSION CONTROL MEASURES
c) UNSUITABLE GROUND
d) SIDE AND CUT OFF DRAINS
e) STORMWATER PIPE LAID ON BEDDING PRIOR TO BACKFILL
f) STORMWATER TRENCH BACKFILLED PRIOR TO PAVEMENT PLACEMENT
g) STORMWATER STRUCTURE BASE SLABS
h) STORMWATER DETENTION TANKS
i) BIO-RETENTION PRIOR TO INSTALLATION OF EACH LAYER
j) SEWER RETICULATION
k) WATER RETICULATION
l) PAVEMENT SUBGRADE
m) PAVEMENT REINFORCING
n) PAVEMENT PRIOR TO SEALING (PRESEAL)
o) RETAINING WALL FOOTING REINFORCING
p) RETAINING WALL BLOCKWORK PRIOR TO CORE FILL
q) STEEL REINFORCEMENT OF CONCRETE STRUCTURES
r) PRACTICAL COMPLETION
s) ON MAINTENANCE
t) OFF MAINTENANCE
u) ANY OTHER INSPECTION AS SPECIFIED BY LOCAL COUNCIL (REFER DEVELOPMENT APPROVAL)
v) ANY OTHER INSPECTION AS REQUIRED BY THE WATER AUTHORITY AND WHERE RELEVANT TO THEIR CERTIFICATION SCHEME

GENERAL NOTES:

G1. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE SHOWN.

G2. ALL SETOUT ON SITE IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTOR TO ALLOW FOR ALL MEANS NECESSARY TO ACCURATELY SETOUT THE WORKS.

G3. ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH PROJECT SPECIFICATIONS AND WHERE FURTHER DETAILS ARE REQUIRED THE CONTRACTOR SHALL REFER TO MEANDER VALLEY COUNCIL (MVC) DEVELOPMENT GUIDELINES, LOCAL WATER AUTHORITY GUIDELINES, ASSOCIATED STANDARD DRAWINGS AND SPECIFICATIONS U.N.O.

G4. SHOULD ANY OF THE CONSTRUCTED WORKS BE CONSTRUCTED OUTSIDE OF THE TOLERANCES SPECIFIED WITHIN THE PROJECT SPECIFICATION AND LOCAL AUTHORITY REQUIREMENTS, THE CONTRACTOR WILL RECTIFY AT THEIR COST INCLUSIVE OF ANY ADDITIONAL COSTS INCURRED BY ADG.

G5. EXISTING SERVICES HAVE BEEN PLOTTED FROM SUPPLIED DATA AND AS SUCH THEIR ACCURACY CANNOT BE GUARANTEED. NO RESPONSIBILITY IS TAKEN BY ADG OR THE PRINCIPAL FOR THE ACCURACY AND COMPLETENESS OF THIS INFORMATION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ACCURATELY ESTABLISH THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CONTRACTOR TO LOCATE AND PROTECT SERVICES AS REQUIRED DURING PROPOSED WORKS.

G6. THE CONTRACTOR IS TO CHECK THROUGH LOCATING, POTHOLING AND SURVEY ALL CRITICAL CONNECTION POINTS FOR ALL CIVIL WORKS SHOWN ON THE DRAWINGS INCLUDING ANY POTENTIAL EXISTING SERVICES CLASHES PRIOR TO COMMENCEMENT OF CIVIL WORKS. CONTRACTOR TO IMMEDIATELY REPORT ANY DISCREPANCIES TO ADG AND AWAIT FORMAL DIRECTION PRIOR TO COMMENCING CIVIL WORKS.

G7. ON COMPLETION OF SERVICES INSTALLATION, ALL DISTURBED AREAS SHALL BE RESTORED TO ORIGINAL LEVEL, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL AREAS, GRASSED AREAS AND ROAD PAVEMENTS.

G8. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OF ANY DAMAGE TO AUTHORITY/COUNCIL'S INFRASTRUCTURE. SUCH REPAIR OR REINSTATEMENT TO BE CARRIED OUT IMMEDIATELY TO THE SATISFACTION OF INFRASTRUCTURE OWNER/MANAGER / AUTHORITY/COUNCIL.

G9. CONTRACTOR TO UNDERTAKE ALL WORKS IN ACCORDANCE WITH ALL WORKPLACE HEALTH AND SAFETY REQUIREMENTS.

G10. WHERE ANY EXCAVATION OR CONSTRUCTION WORKS ARE TO BE IN CLOSE PROXIMITY TO NEIGHBOURING LOT BOUNDARIES OR INFRASTRUCTURE, CONTRACTOR TO ALLOW IN SCOPE OF WORKS TO PROVIDE ALL MEASURES NECESSARY TO ENSURE THE INTEGRITY OF EXISTING BOUNDARIES AND INFRASTRUCTURE. THIS MAY INCLUDE THE USE OF LOW VIBRATION EQUIPMENT, TRENCH SHORING ETC AS REQUIRED.

G11. PRIOR TO THE CONTRACTOR COMMENCING ANY WORKS DETAILED ON THESE DRAWINGS, THE CONTRACTOR IS TO NOTIFY ADG ENGINEERS (AUST.) Pty. Ltd. AND RECEIVE WRITTEN CONFIRMATION THAT WORKS CAN COMMENCE

G12. CONTRACTOR TO PROVIDE AS CONSTRUCTED DRAWINGS FOR ALL CONSTRUCTED WORKS IN ACCORDANCE WITH LOCAL GOVERNMENT REQUIREMENTS. UNLESS OTHERWISE ADVISED BY ADG ENGINEERS (AUST.) Pty. Ltd. CONTRACTOR TO NOTE COUNCILS ADAC REQUIREMENTS.

G13. CONTRACTOR TO UNDERTAKE ALL WORKS IN ACCORDANCE WITH RELEVANT APPROVALS.

G14. CONTRACTOR TO ALLOW TO LIAISE/CO-ORDINATE WITH ELECTRICAL, LANDSCAPE AND OTHER SERVICE CONTRACTORS THROUGHOUT CIVIL CONSTRUCTION.

G15. CONTRACTOR TO ORGANISE ALL DEMOLITION PERMITS PRIOR TO ANY DEMOLITION WORKS COMMENCING ON SITE.

G16. CONTRACTOR TO ALLOW TO DEMOLISH ALL EXISTING STRUCTURES, ROADS AND SERVICES WITHIN LIMIT OF WORKS AND REMOVE FROM SITE U.N.O.

G17. CONTRACTOR TO UNDERTAKE DILAPIDATION REPORT FOR ADJOINING PROPERTIES AND COUNCIL ROADS AND VERGES PRIOR TO COMMENCEMENT OF ANY WORKS ON SITE.

G18. CONTRACTOR TO UNDERTAKE POST CONSTRUCTION DILAPIDATION REPORT AND COUNCIL ROADS AND VERGES AT PRACTICAL COMPLETION.

G19. CONTRACTOR TO CLEAR AND GRUB ALL VEGETATION ON SITE AS IDENTIFIED IN THE APPROVED VEGETATION MANAGEMENT PLAN. CONTRACTOR TO ENSURE ALL TREE ROOTS AND STUMPS ARE COMPLETELY REMOVED AND BACKFILLED TO LEVEL 1 SUPERVISION. CONTRACTOR TO ALLOW TO MULCH ALL CLEARED VEGETATION AND STOCKPILE ON SITE OR REMOVE FROM SITE AS DIRECTED.

G20. DRAWINGS TO BE READ IN CONJUNCTION WITH THE FOLLOWING CONSULTANTS/CONTRACTORS DRAWINGS:

SURVEYOR - WOOLCOTT SURVEYS
ARCHITECT - PLACE DESIGN GROUP
HYDRAULICS - TBC
STRUCTURAL - TBC
ELECTRICAL - TBC
COMMUNICATIONS - TBC
LANDSCAPE - TBC
GAS - TBC

G21. CONTRACTOR TO PREPARE AND HAVE APPROVED BY RELEVANT AUTHORITY: ROAD OPENING PERMIT AND TRAFFIC MANAGEMENT PLAN FOR ALL WORKS WITHIN COUNCIL ROAD RESERVES. CONTRACTOR TO ALLOW FOR ALL COSTS ASSOCIATED WITH IMPLEMENTATION OF THE TMP.

G22. ALL WORKS TO BE COMPLETED IN ACCORDANCE WITH THE FOLLOWING LOCAL AUTHORITY APPROVALS: T.B.A

G23. CONTRACTOR TO UNDERTAKE ALL WORKS IN ACCORDANCE WITH OPW APPROVALS BY COUNCIL.

G24. NO WORKS ARE TO BE UNDERTAKEN ON LAND OUTSIDE OF THE SITE BOUNDARY WITHOUT FORMAL APPROVAL BY THE OWNER/CUSTODIAN OF THAT LAND INCLUDING BUT NOT LIMITED TO PRIVATE PROPERTY, ROAD RESERVE, PARKS/OPEN SPACE, EASEMENTS.

G25. THE CONTRACTOR SHALL HAVE AN APPROVED SET OF CONSTRUCTION DRAWINGS AND APPROVALS ON SITE AT ALL TIMES.

G26. ALL WATER AND SEWER RETICULATION WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH THE CURRENT SEQ WATER SUPPLY AND SEWERAGE DESIGN AND CONSTRUCTION CODE.

G27. CONTRACTOR TO INSTALL INFORMATION SIGNAGE IN ACCORDANCE WITH LOCAL AUTHORITY STANDARDS PRIOR TO COMMENCEMENT OF WORKS.

G28. CONTRACTOR TO PREPARE CONSTRUCTION MANAGEMENT PLAN IN ACCORDANCE WITH LOCAL AUTHORITY REQUIREMENTS AND HAVE APPROVED BY LOCAL AUTHORITY WHERE REQUIRED.

LOCALITY PLAN

NOT TO SCALE

PROPERTY DESCRIPTION

LOT: C.T. 119422/1

DRAWING SCHEDULE

DRAWING No.	DRAWING TITLE
DA01	DRAWING SCHEDULE NOTES AND LOCALITY PLAN
DA02	PRELIMINARY FEATURES LAYOUT PLAN
DA03	PRELIMINARY OVERALL LAYOUT AND ROAD GRADING
DA04	PRELIMINARY EARTHWORKS LAYOUT PLAN
DA05	PRELIMINARY TYPICAL ROAD CROSS SECTIONS
DA06	PRELIMINARY PRE DEVELOPMENT CATCHMENT PLAN
DA07	PRELIMINARY POST DEVELOPMENT CATCHMENT PLAN
DA09	PRELIMINARY SEWER NETWORK LAYOUT
DA10	PRELIMINARY WATER RETICULATION PLAN

ADG CIVIL SERVICES

PRELIMINARY
NOT FOR CONSTRUCTION

Rev	Date	Description	By	Chk
01	02.11.20	PRELIMINARY - ISSUED FOR INFORMATION	AGC	ST

KIN CAPITAL
Federal Group
ENGINE ROOM VM

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E info@adgce.com W www.adgce.com

BRISBANE / DARWIN / GOLD COAST / MELBOURNE / PERTH / SUNSHINE COAST / SYDNEY / TOOWOOMBA

Client: ENGINE ROOM VM (NSW) PTY LTD	Discipline: CIVIL		Status: PRELIMINARY
Project Name: 100 COUNTRY CLUB AVE, PROSPECT VALE, TASMANIA, 7250 BRYCE GORHAM GOLF CENTRE AND COUNTRY CLUB TASMANIA	Designed By: MRB	Checked By: ST	Approved By: JG
	Project No.: 23337	Drawn By: AGC	Scale at A1: NTS

Title: DRAWING SCHEDULE, NOTES AND LOCALITY PLAN

Drawing No.: DA01 | Revision: 01

PLOT DATE: 11/13/2020 10:36 AM FILENAME: J:\23000\23337\CVL\DWG\DA\23337_DA01_DRAWING SCHEDULE NOTES AND LOCALITY PLAN.DWG

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

LEGEND

- SITE BOUNDARY
- EXISTING SURFACE CONTOURS
- LIMIT OF WORKS
- EXISTING SEWER
- EXISTING WATER
- EXISTING TELECOMMUNICATIONS
- EXISTING ELECTRICITY (RECORDS)

PRELIMINARY
NOT FOR CONSTRUCTION

Rev	Date	Description	By	Chk
01	02.11.20	PRELIMINARY - ISSUED FOR INFORMATION	AGC	ST

KIN CAPITAL
Federal Group
ENGINE ROOM VM

0 100 200 300m
SCALE 1:5000
AT ORIGINAL SIZE (A1)

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Client	ENGINE ROOM VM (NSW) PTY LTD		
Project Name	100 COUNTRY CLUB AVE PROSPECT VALE, TASMANIA, 7250 BRYCE GORHAM GOLF CENTRE AND COUNTRY CLUB TASMANIA		
Discipline	CIVIL	Status	PRELIMINARY
Designed By	MRB	Checked By	ST
Approved By	JG		
Project No.	23337	Drawn By	AGC
Scale at A1	1:5000		

Title: PRELIMINARY EXISTING FEATURES LAYOUT PLAN

Drawing No. DA02 | Revision 01

PLOT DATE: 11/13/2020 10:36 AM FILENAME: J:\23000\23337\CVL\DWG\DA\23337_DA02_PRELIMINARY EXISTING FEATURES LAYOUT PLAN.DWG

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

LEGEND

- LIMIT OF WORKS
- SITE BOUNDARY
- EXISTING PROPERTY BOUNDARY
- EXISTING EASEMENT BOUNDARY
- SWD — EXISTING STORMWATER DRAINAGE
- S — EXISTING SEWER
- W — EXISTING WATER
- T — EXISTING TELECOMMUNICATION
- dE — dE — EXISTING ELECTRICITY (RECORDS)
- SWD — PROPOSED STORMWATER DRAINAGE
- S — PROPOSED SEWER
- W — PROPOSED WATER MAIN
- PROPOSED EASEMENTS
- INDICATIVE BUSH FIRE SET BACK

PRELIMINARY
NOT FOR CONSTRUCTION

Rev	Date	Description	By	Chk
02	13.11.20	PRELIMINARY - ISSUED FOR INFORMATION	DE	ST
01	02.11.20	PRELIMINARY - ISSUED FOR INFORMATION	AGC	ST

KINCAPITAL
Federal Group
ENGINE → ROOM VM

0 50 100 150 200m
SCALE 1:4000
AT ORIGINAL SIZE (A1)

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BRISBANE / DARWIN / GOLD COAST / MELBOURNE / PERTH / SUNSHINE COAST / SYDNEY / TOOWOOMBA

Client: ENGINE ROOM VM (NSW) PTY LTD	Discipline: CIVIL		Status: PRELIMINARY
Project Name: 100 COUNTRY CLUB AVE PROSPECT VALE, TASMANIA, 7250 BRYCE GORHAM GOLF CENTRE AND COUNTRY CLUB TASMANIA	Designed By: MRB	Checked By: ST	Approved By: JG
	Project No.: 23337	Drawn By: AGC	Scale at A1: 1:4000

Title: PRELIMINARY OVERALL LAYOUT AND ROAD GRADING

Drawing No.: DA03 | Revision: 02

PLOT DATE: 11/13/2020 10:36 AM FILENAME: z:\23000\23337\CVL\DWG\DA\23337_DA03_PRELIMINARY OVERALL LAYOUT AND ROAD GRADING.DWG

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

LEGEND

- SITE BOUNDARY
- EXISTING PROPERTY BOUNDARY
- EXISTING EASEMENT BOUNDARY
- EXISTING SURFACE CONTOURS (12.0)
- EARTHWORKS CONTOURS (12.0)
- EXISTING SURFACE LEVEL (3.42)
- FINISHED SURFACE LEVEL (3.42)
- EXISTING NOMINAL KERB LINE
- EXISTING EDGE OF BITUMEN LINE
- EXISTING ROAD CENTERLINE
- EXISTING EDGE OF BUILDING
- EXISTING EDGE OF BUILDING EAVE
- PROPOSED NOMINAL KERB LINE
- PROPOSED ROAD CENTRE LINE
- GRADE CHANGE
- EXISTING STORMWATER DRAINAGE (SWD)
- EXISTING SEWER (S)
- EXISTING WATER (W)
- EXISTING TELECOMMUNICATION (T)
- EXISTING ELECTRICITY (RECORDS) (dE)
- EXISTING BATTER
- EXISTING FENCE
- EXISTING EARTHWORKS DRAIN
- PROPOSED EARTHWORKS DRAIN
- PROPOSED BATTER
- BUILDING OUTLINE
- PROPOSED EARTHWORKS PAD
- PROPOSED EARTHWORKS CUT
- PROPOSED EARTHWORKS FILL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev	Date	Description	By	Chk
02	13.11.20	PRELIMINARY - ISSUED FOR INFORMATION	DE	ST
01	02.11.20	PRELIMINARY - ISSUED FOR INFORMATION	AGC	ST

KIN CAPITAL
Federal Group
ENGINE ROOM VM

0 20 40 60 80 100m
SCALE 1:2000
AT ORIGINAL SIZE (A1)

ADG
Sydney Office
Suite 1301, Level 13, 20 Berry Street
North Sydney, New South Wales 2060, Australia
T 1300 657 402 F +617 3871 2266
E info@adgce.com W www.adgce.com
BRISBANE / DARWIN / GOLD COAST / MELBOURNE / PERTH / SUNSHINE COAST / SYDNEY / TOOWOOMBA

Client: ENGINE ROOM VM (NSW) PTY LTD	Discipline: CIVIL		Status: PRELIMINARY
Project Name: 100 COUNTRY CLUB AVE PROSPECT VALE, TASMANIA, 7250 BRYCE GORHAM GOLF CENTRE AND COUNTRY CLUB TASMANIA	Designed By: MRB	Checked By: ST	Approved By: JG
	Project No.: 23337	Drawn By: AGC	Scale at A1: 1:2000

Title: PRELIMINARY EARTHWORKS LAYOUT PLAN

Drawing No.: DA04 | Revision: 02

PLOT DATE: 11/13/2020 10:36 AM FILENAME: J:\23000\23337\CVL\DWG\DA\23337_DA04_PRELIMINARY EARTHWORKS LAYOUT PLAN.DWG

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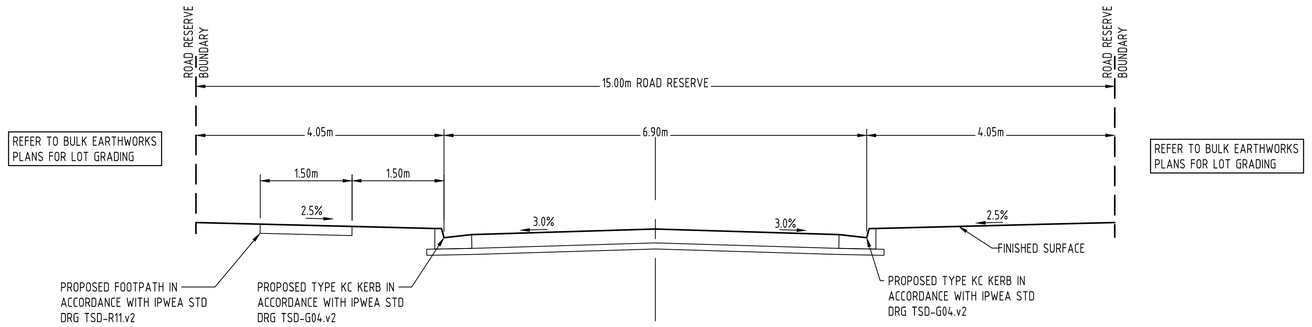
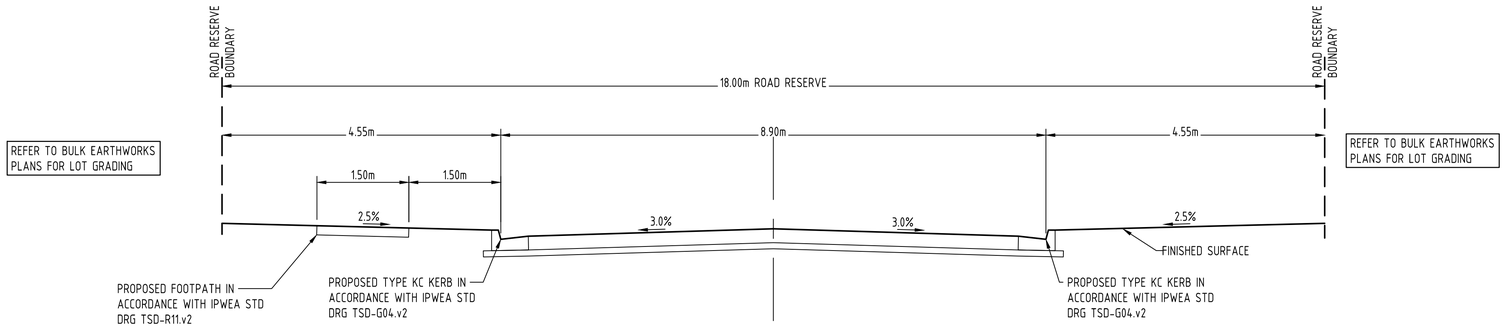


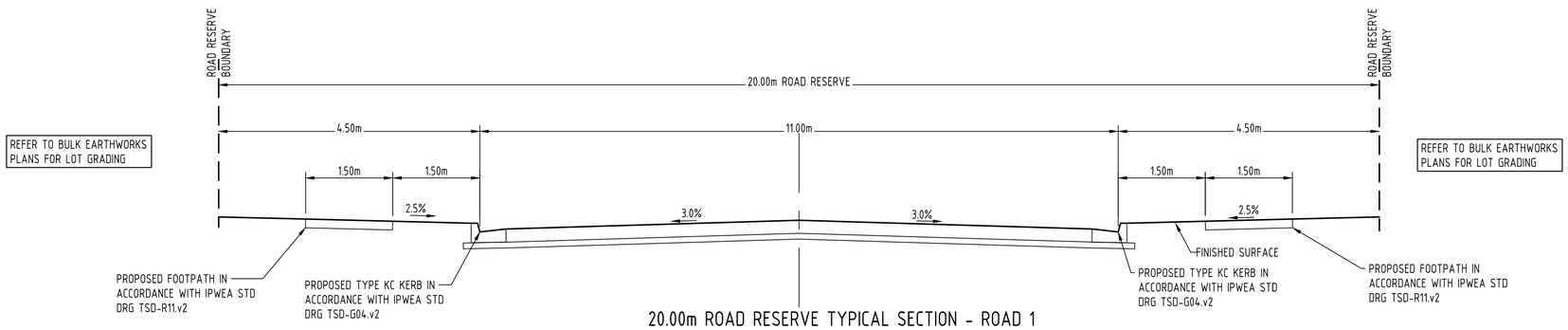
15.00m ROAD RESERVE TYPICAL SECTION - ROADS 1 & 3

6.9m PAVEMENT (15m ROAD RESERVE)
SCALE 1:50



18.00m ROAD RESERVE TYPICAL SECTION - ROADS 2-13

8.9m PAVEMENT (18m ROAD RESERVE)
SCALE 1:50



20.00m ROAD RESERVE TYPICAL SECTION - ROAD 1

11.0m PAVEMENT (20m ROAD RESERVE)
SCALE 1:50

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01	02.11.20	PRELIMINARY - ISSUED FOR INFORMATION	AGC	ST

KIN CAPITAL
Federal Group
ENGINE → ROOM VM

0 1 2 3m
SCALE 1:50
AT ORIGINAL SIZE (A1)

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E info@adgce.com W www.adgce.com
BRISBANE / DARWIN / GOLD COAST / MELBOURNE / PERTH / SUNSHINE COAST / SYDNEY / TOOWOOMBA

Client	ENGINE ROOM VM (NSW) PTY LTD
Project Name	100 COUNTRY CLUB AVE PROSPECT VALE, TASMANIA, 7250 BRYCE GORHAM GOLF CENTRE AND COUNTRY CLUB TASMANIA

Discipline: CIVIL		Status: PRELIMINARY
Designed By: MRB	Checked By: ST	Approved By: JG
Project No.: 23337	Drawn By: AGC	Scale at A1: 1:50

Title: PRELIMINARY TYPICAL ROAD CROSS SECTIONS
Drawing No.: DA05
Revision: 01

PLOT DATE: 11/13/2020 10:36 AM FILENAME: J:\23000\23337\CVL\DWG\DA\23337_DA05_PRELIMINARY TYPICAL ROAD CROSS SECTIONS.DWG

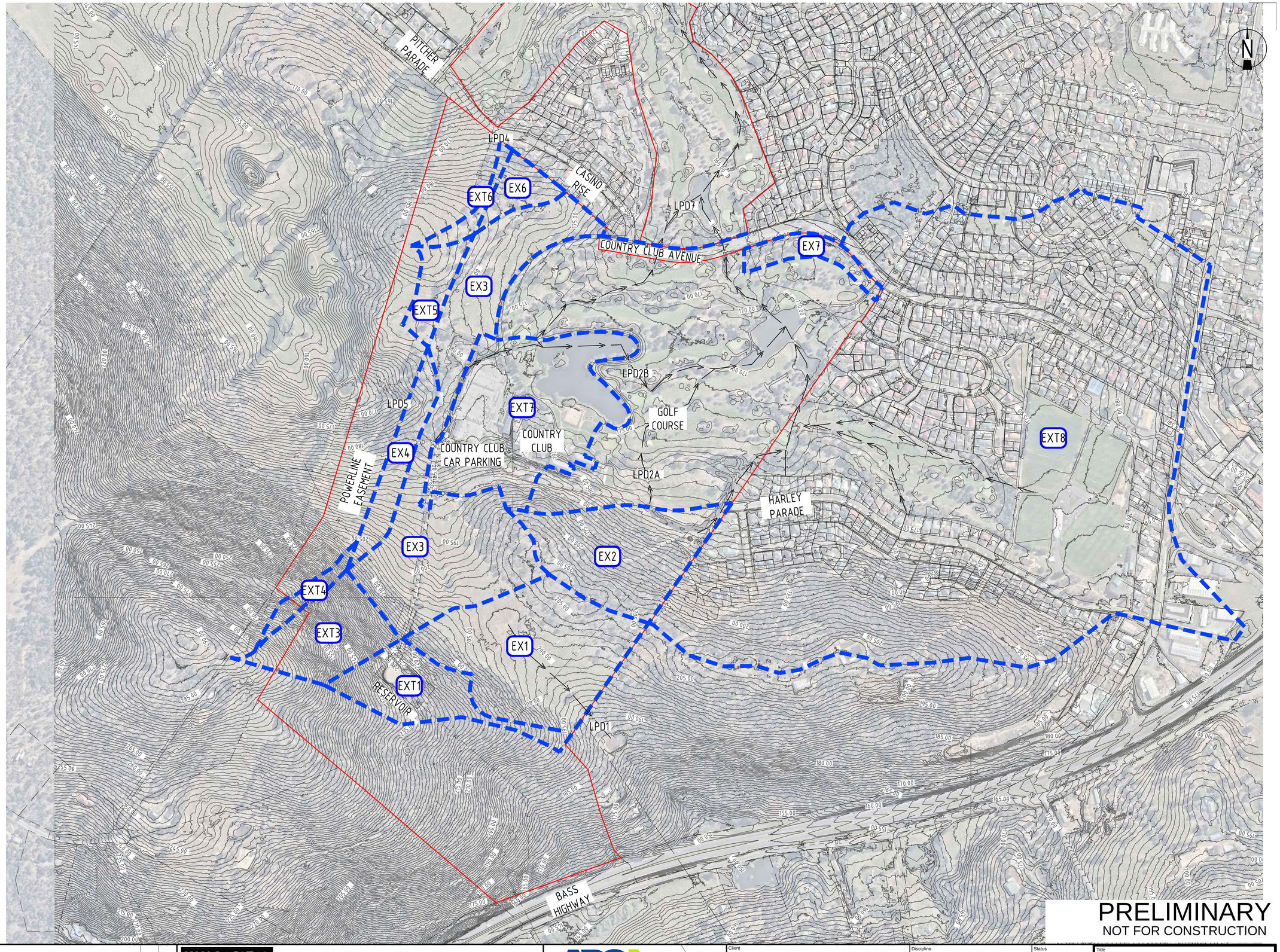
FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

LEGEND

- PREDEVELOPMENT CATCHMENT BOUNDARY
- WATER COURSE
- C1 — CATCHMENT LABEL
- FLOW DIRECTION

CATCHMENT TABLE (POST DEVELOPMENT)

CATCHMENT	AREA (ha)	FRACTION IMPERVIOUS
EX1	10.27	0.00
EX2	7.22	0.00
EX3	15.23	0.00
EX4	2.30	0.00
EX6	1.38	0.00
EX7	1.42	0.00
EXT1	4.22	0.09
EXT3	4.38	0.00
EXT4	0.79	0.00
EXT5	1.26	0.00
EXT6	1.06	0.00
EXT7	11.36	0.30



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Rev	Date	Description	By	Chk
02	13.11.20	PRELIMINARY - ISSUED FOR INFORMATION	DE	ST
01	02.11.20	PRELIMINARY - ISSUED FOR INFORMATION	AGC	ST

KINCAPITAL
Federal Group
ENGINE ROOM VM

0 50 100 150 200m
SCALE 1:4000
AT ORIGINAL SIZE (A1)

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North Sydney, New South Wales 2060, Australia
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E info@adgce.com W www.adgce.com
BRISBANE / DARWIN / GOLD COAST / MELBOURNE / PERTH / SUNSHINE COAST / SYDNEY / TOOWOOMBA

Client: ENGINE ROOM VM (NSW) PTY LTD
Project Name: 100 COUNTRY CLUB AVE PROSPECT VALE, TASMANIA, 7250 BRYCE GORHAM GOLF CENTRE AND COUNTRY CLUB TASMANIA

Discipline		Status
CIVIL		PRELIMINARY
Designed By	**Checked By**	**Approved By**
MRB	ST	JG
Project No.	**Drawn By**	**Scale at A1**
23337	AGC	1:4000

Title: PRELIMINARY PRE DEVELOPMENT CATCHMENT PLAN
Drawing No.: DA06
Revision: 02

PLOT DATE: 11/13/2020 11:01 AM FILENAME: J:\23000\23337\CVL\DWG\DA\23337_DA06_PRELIMINARY PRE DEVELOPMENT CATCHMENT PLAN.DWG

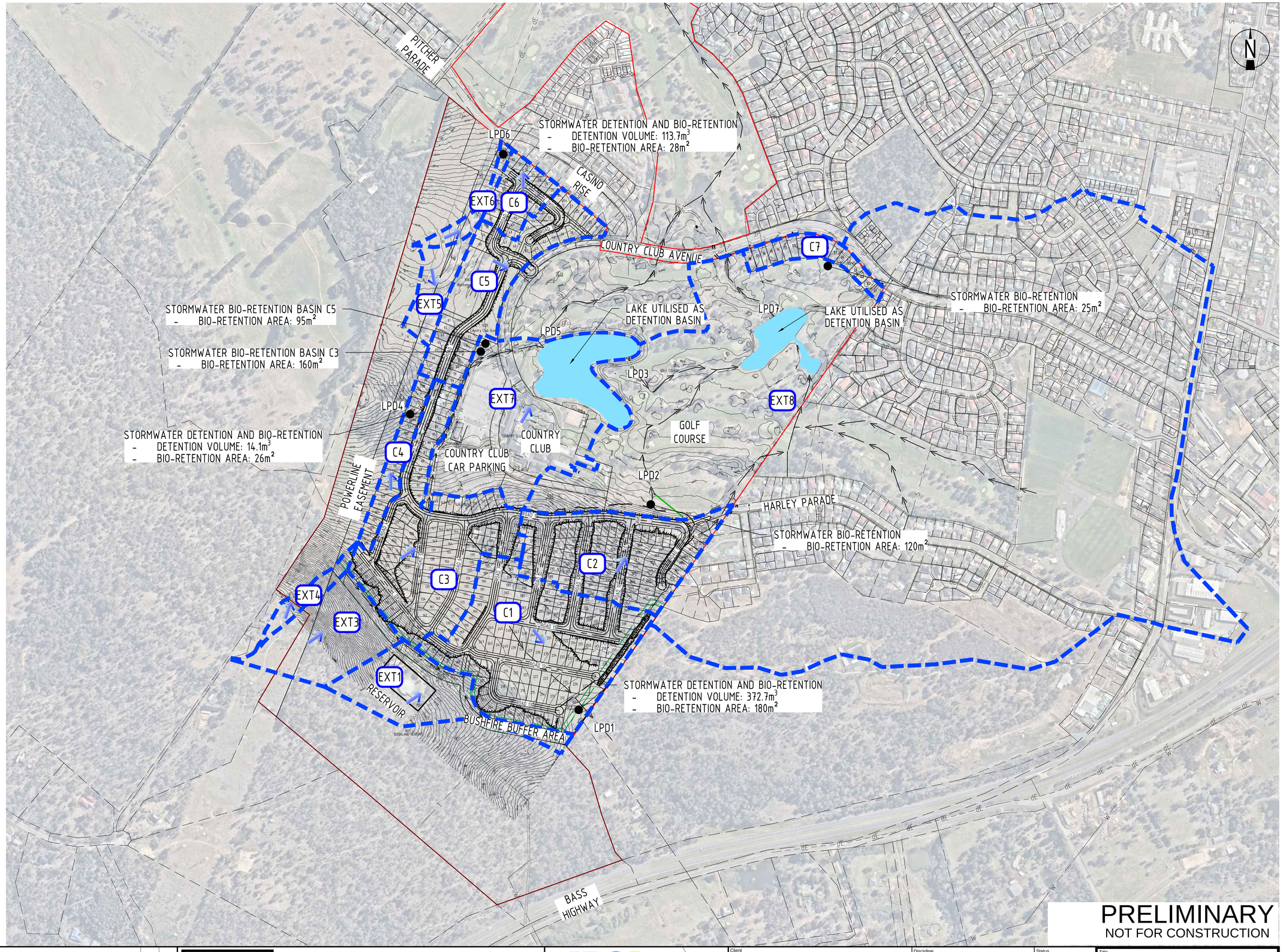
FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

LEGEND

- PREDEVELOPMENT CATCHMENT BOUNDARY
- WATER COURSE
- C1 — CATCHMENT LABEL
- FLOW DIRECTION
- SITE BOUNDARY

CATCHMENT TABLE (POST DEVELOPMENT)

CATCHMENT	AREA (ha)	FRACTION IMPERVIOUS
C1	10.96	0.50
C2	6.92	0.50
C3	9.37	0.50
C4	1.46	0.50
C5	5.43	0.50
C6	1.67	0.50
C7	1.45	0.50
EXT1	4.22	0.09
EXT3	4.38	0.00
EXT4	0.79	0.00
EXT5	1.26	0.00
EXT6	1.06	0.00
EXT7	11.36	0.30
EXT8	110.21	0.27



PRELIMINARY
NOT FOR CONSTRUCTION

Rev	Date	Description	By	Chk
02	13.11.20	PRELIMINARY - ISSUED FOR INFORMATION	DE	ST
01	02.11.20	PRELIMINARY - ISSUED FOR INFORMATION	AGC	ST

KIN CAPITAL
Federal Group
ENGINE ROOM VM

0 50 100 150 200m
SCALE 1:4000
AT ORIGINAL SIZE (A1)

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Client	ENGINE ROOM VM (NSW) PTY LTD
Project Name	100 COUNTRY CLUB AVE PROSPECT VALE, TASMANIA, 7250 BRYCE GORHAM GOLF CENTRE AND COUNTRY CLUB TASMANIA
Discipline	CIVIL
Status	PRELIMINARY
Designed By	MRB
Checked By	ST
Approved By	JG
Project No.	23337
Drawn By	AGC
Scale at A1	1:4000

Title: PRELIMINARY POST DEVELOPMENT CATCHMENT PLAN
Drawing No.: DA07
Revision: 02

PLOT DATE: 11/13/2020 11:01 AM FILENAME: z:\23000\23337\CVL\DWG\DA\23337_DA07_PRELIMINARY POST DEVELOPMENT CATCHMENT PLAN.DWG

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

Appendix D
MUSIC Model Data

MUSIC Model Information

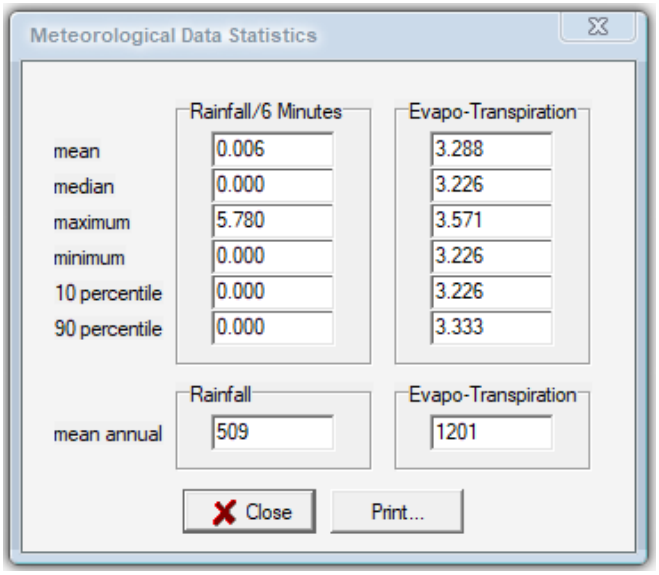
Introduction:

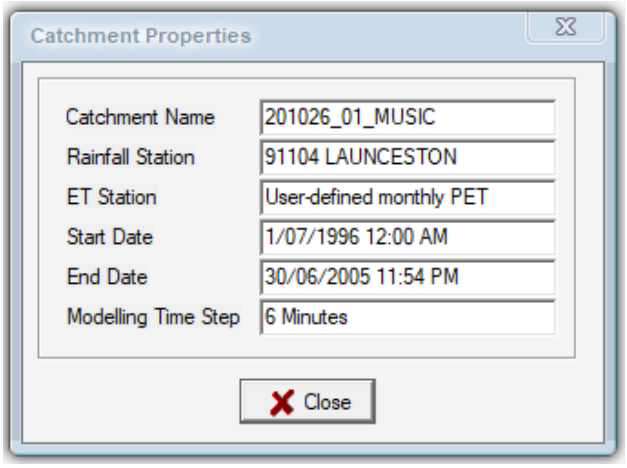
The quality of stormwater runoff and the impact of the proposed stormwater quality improvement measures were analyzed using MUSIC Version 6.3.0 according to the *MUSIC Modeling Guidelines Version 1.0, Water by Design 2010.* The source nodes in the model are split into various types and a summary of the area breakdown is presented below:

Meteorological Data:

The MUSIC model was carried out using the following parameters:

- Modeling period should be 10 years with a time step of 6 minutes
- The nearest available 6 minute time step rainfall series to the subject site is Launceston Airport, with a mean annual rainfall of 509 mm, and data from: 01/07/1996 to 30/06/2005





The mean annual evaporation was 1,201mm.

Source Nodes, Fractions Impervious:

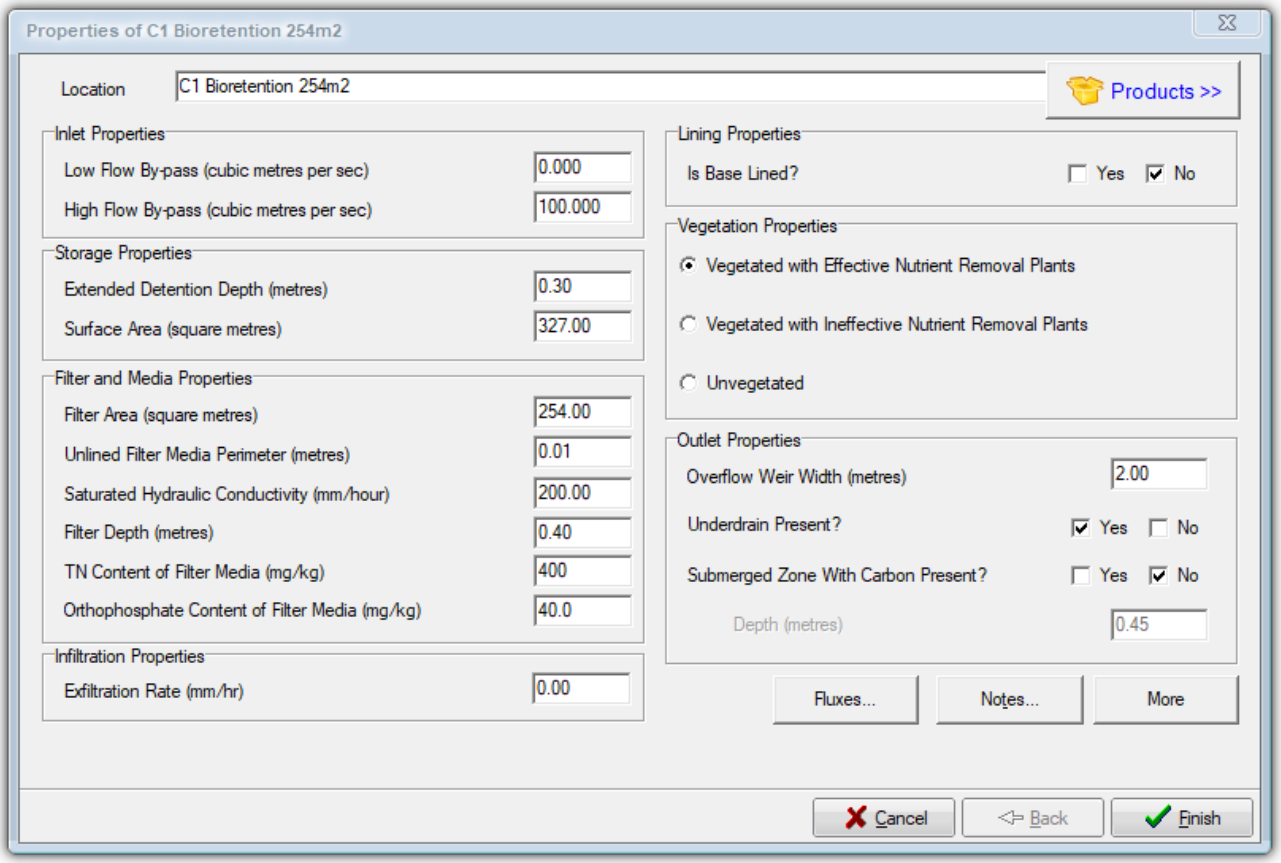
The areas of the source nodes were estimated based on Table 2 of the SMP by ADG Engineers and DA07 as shown in **Appendix C**.

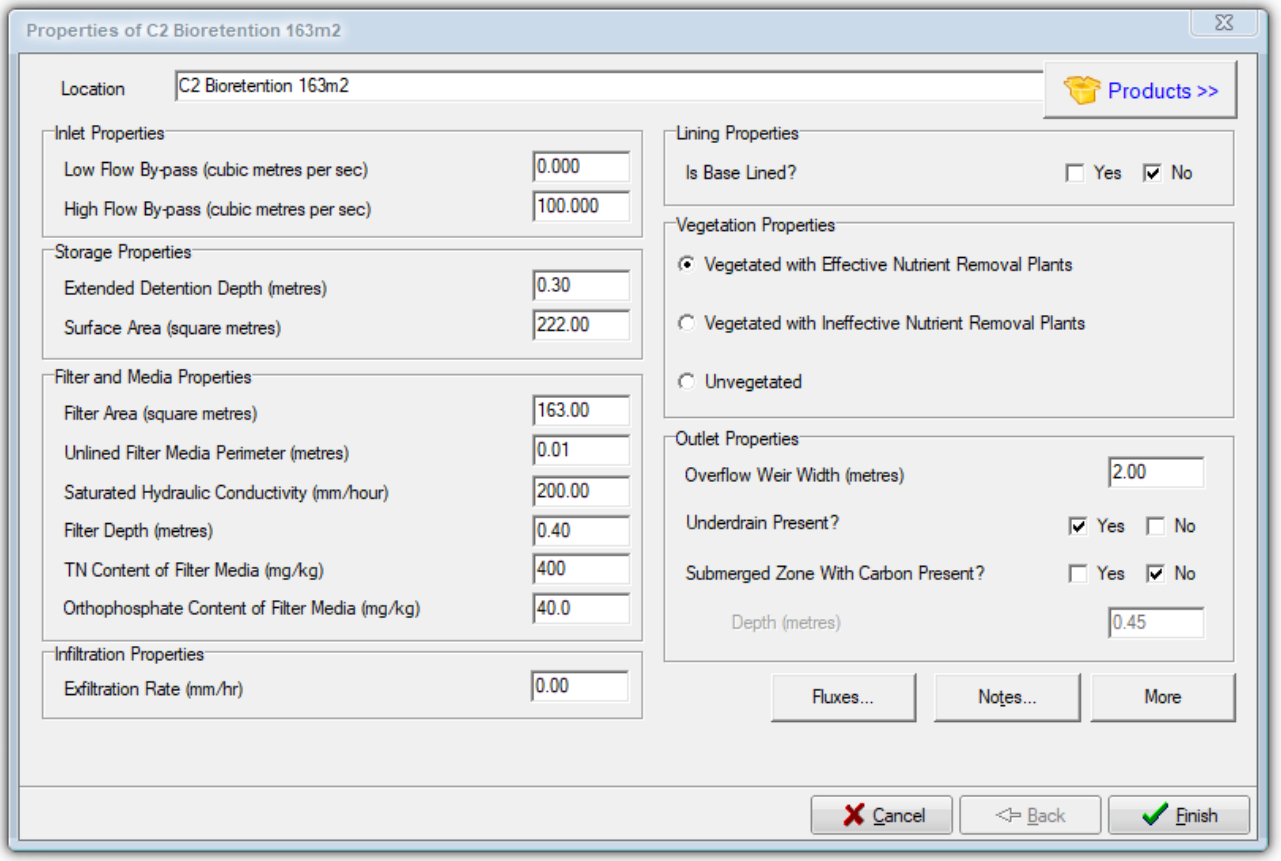
Source Nodes - Pollutant Exports:

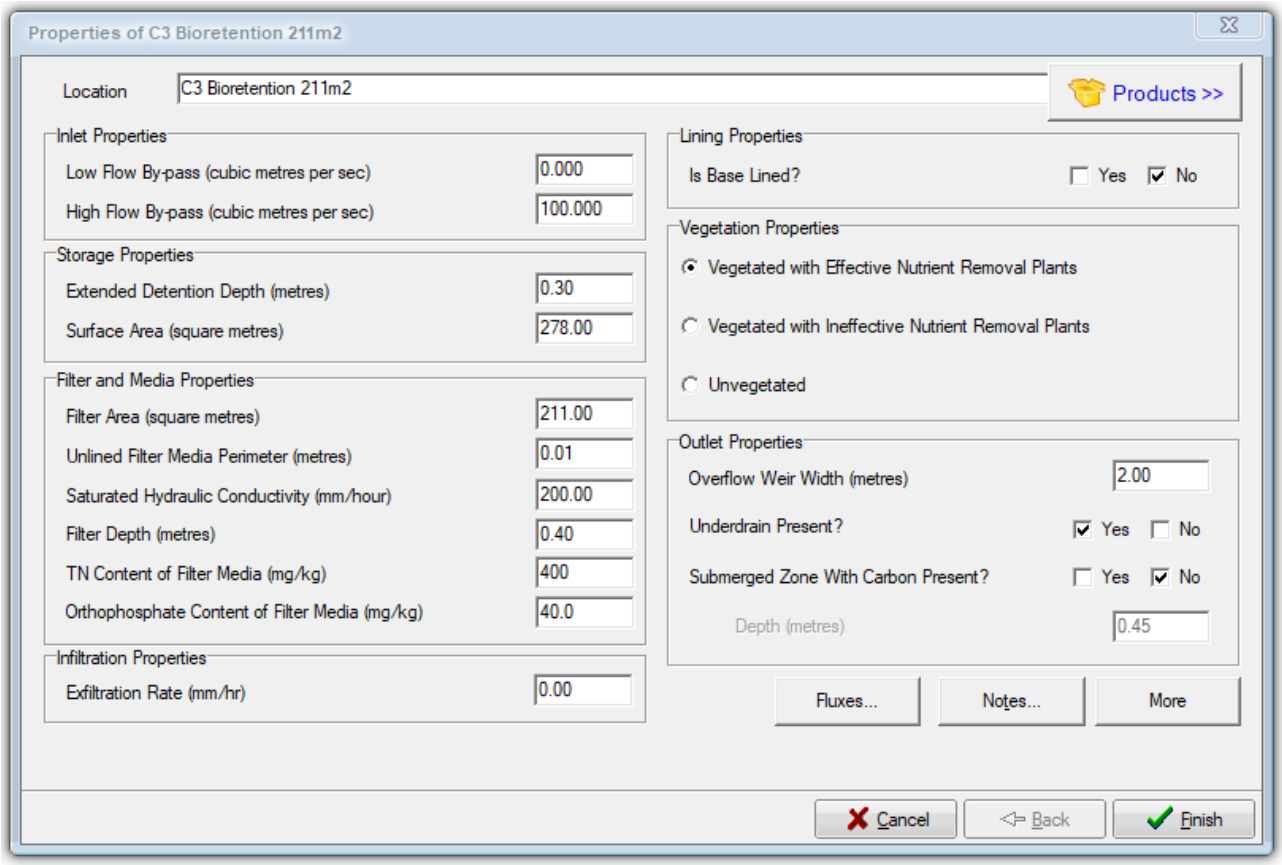
Rainfall runoff and pollutant export parameters were assigned per **Tables 3.7** and **3.8** of the Water by Design MUSIC Modeling Guidelines Version 1.0 (2010).

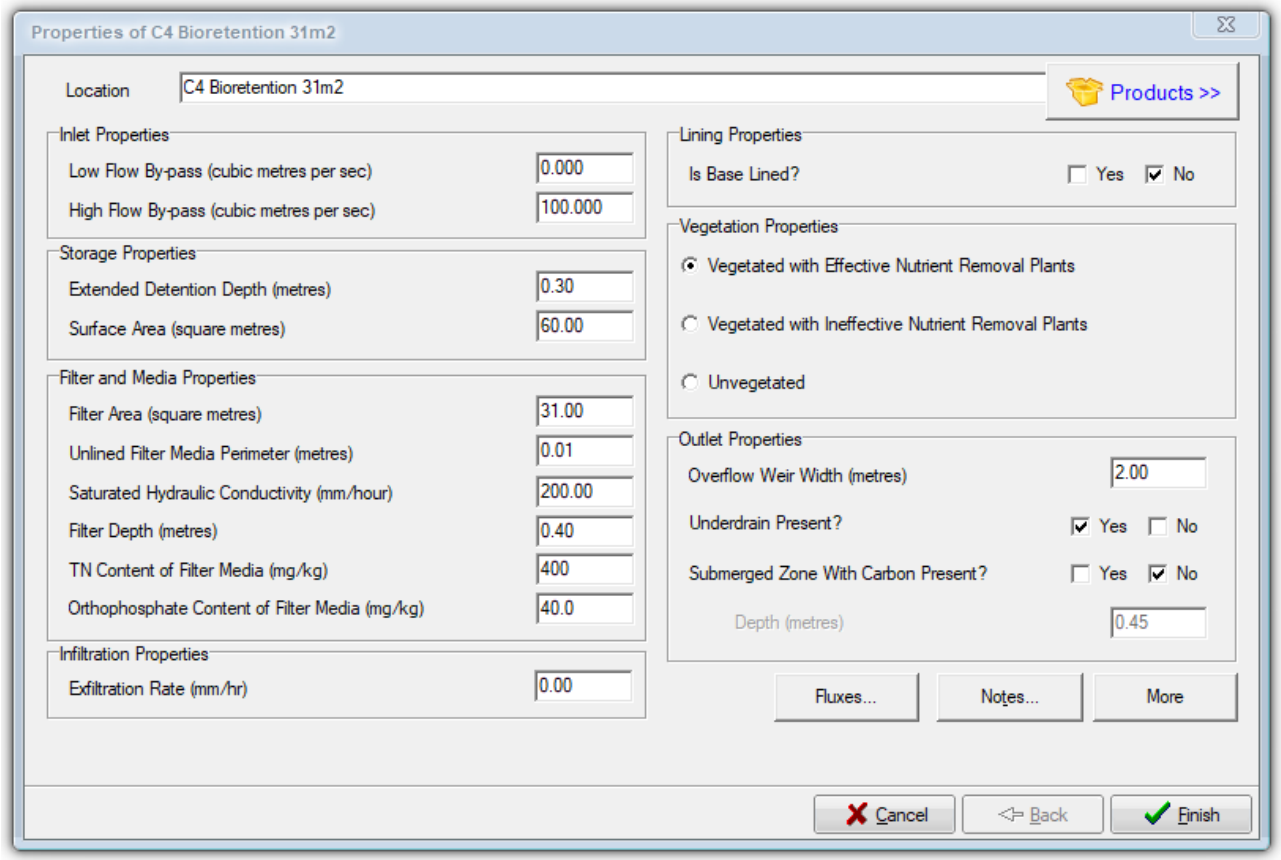
The rainfall runoff and pollutant export parameters for an urban residential development were adopted.

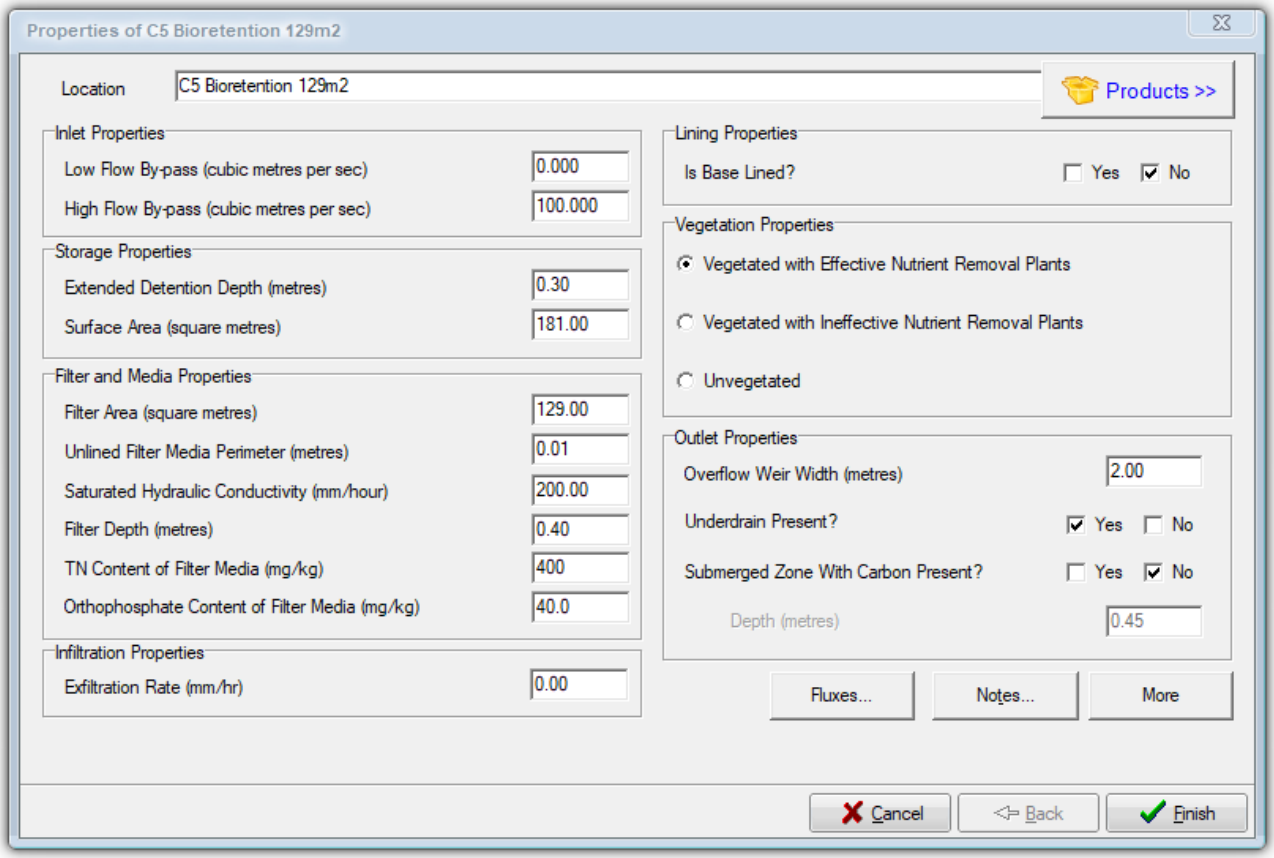
Modelled Bioretention Attributes:

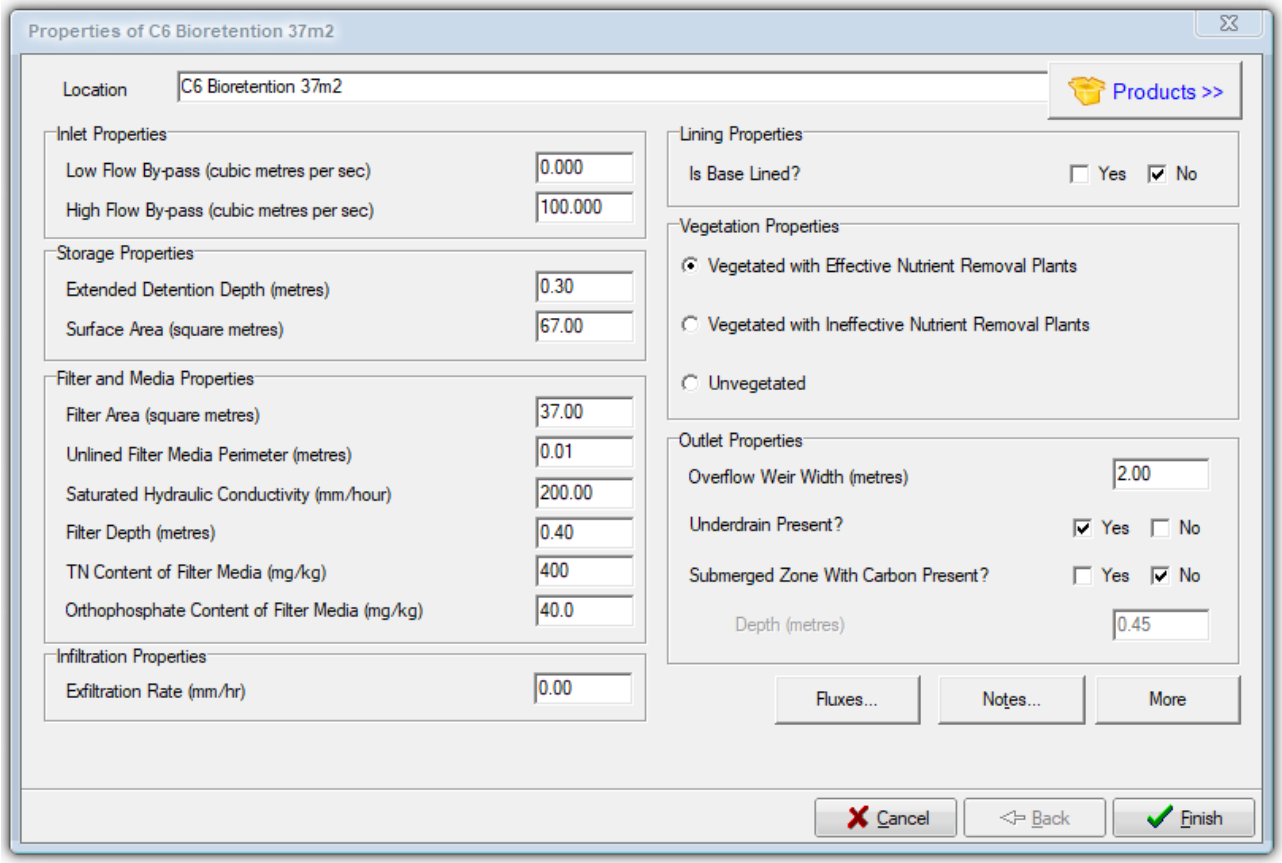


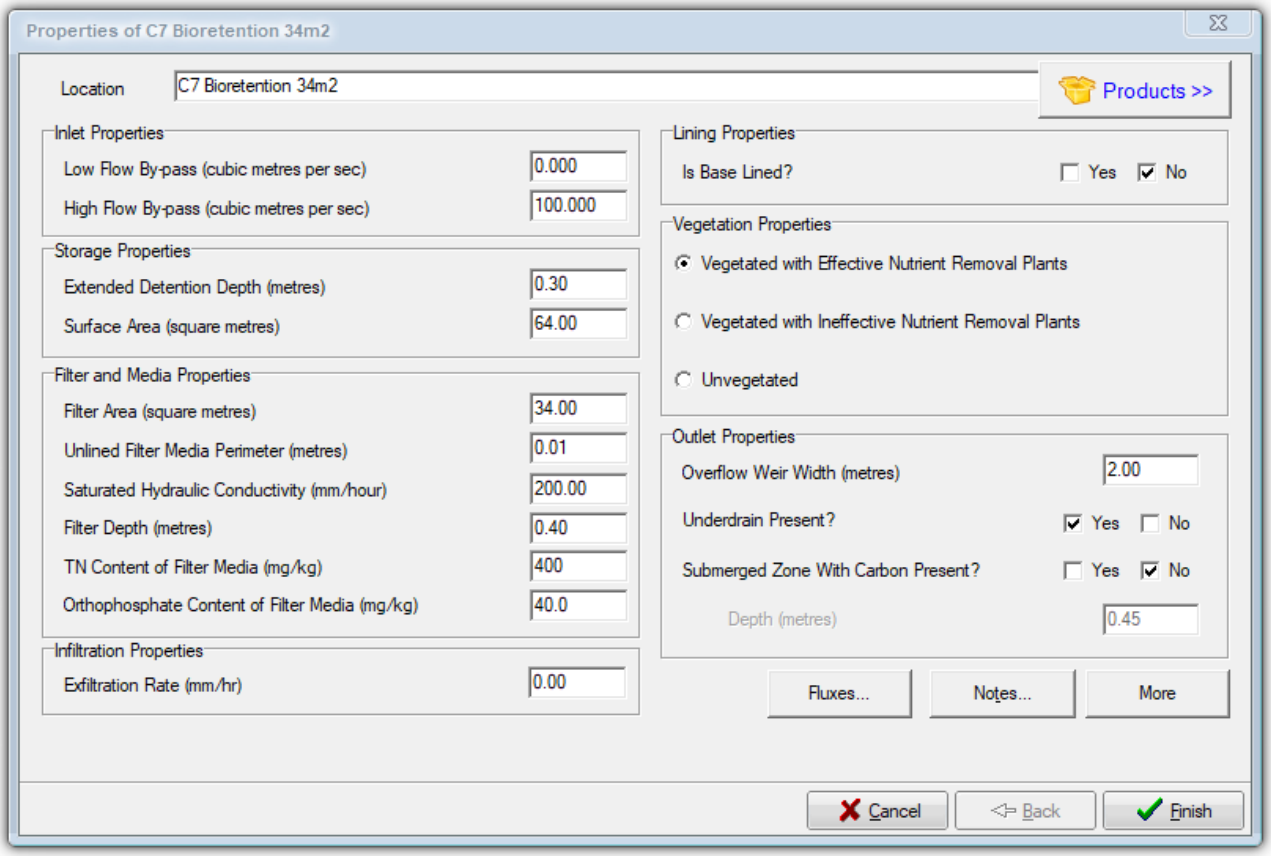



Properties of C3 Bioretention 211m2
Location
C3 Bioretention 211m2
Products >>
Inlet Properties
Low Flow By-pass (cubic metres per sec)
0.000
High Flow By-pass (cubic metres per sec)
100.000
Storage Properties
Extended Detention Depth (metres)
0.30
Surface Area (square metres)
278.00
Filter and Media Properties
Filter Area (square metres)
211.00
Unlined Filter Media Perimeter (metres)
0.01
Saturated Hydraulic Conductivity (mm/hour)
200.00
Filter Depth (metres)
0.40
TN Content of Filter Media (mg/kg)
400
Orthophosphate Content of Filter Media (mg/kg)
40.0
Infiltration Properties
Exfiltration Rate (mm/hr)
0.00
Lining Properties
Is Base Lined?
Yes
No
Vegetation Properties
Vegetated with Effective Nutrient Removal Plants
Vegetated with Ineffective Nutrient Removal Plants
Unvegetated
Outlet Properties
Overflow Weir Width (metres)
2.00
Underdrain Present?
Yes
No
Submerged Zone With Carbon Present?
Yes
No
Depth (metres)
0.45
Fluxes...
Notes...
More
Cancel
Back
Finish


Properties of C4 Bioretention 31m2
Location
C4 Bioretention 31m2
Products >>
Inlet Properties
Low Flow By-pass (cubic metres per sec)
0.000
High Flow By-pass (cubic metres per sec)
100.000
Storage Properties
Extended Detention Depth (metres)
0.30
Surface Area (square metres)
60.00
Filter and Media Properties
Filter Area (square metres)
31.00
Unlined Filter Media Perimeter (metres)
0.01
Saturated Hydraulic Conductivity (mm/hour)
200.00
Filter Depth (metres)
0.40
TN Content of Filter Media (mg/kg)
400
Orthophosphate Content of Filter Media (mg/kg)
40.0
Infiltration Properties
Exfiltration Rate (mm/hr)
0.00
Lining Properties
Is Base Lined?
Yes
No
Vegetation Properties
Vegetated with Effective Nutrient Removal Plants
Vegetated with Ineffective Nutrient Removal Plants
Unvegetated
Outlet Properties
Overflow Weir Width (metres)
2.00
Underdrain Present?
Yes
No
Submerged Zone With Carbon Present?
Yes
No
Depth (metres)
0.45
Fluxes...
Notes...
More
Cancel
Back
Finish

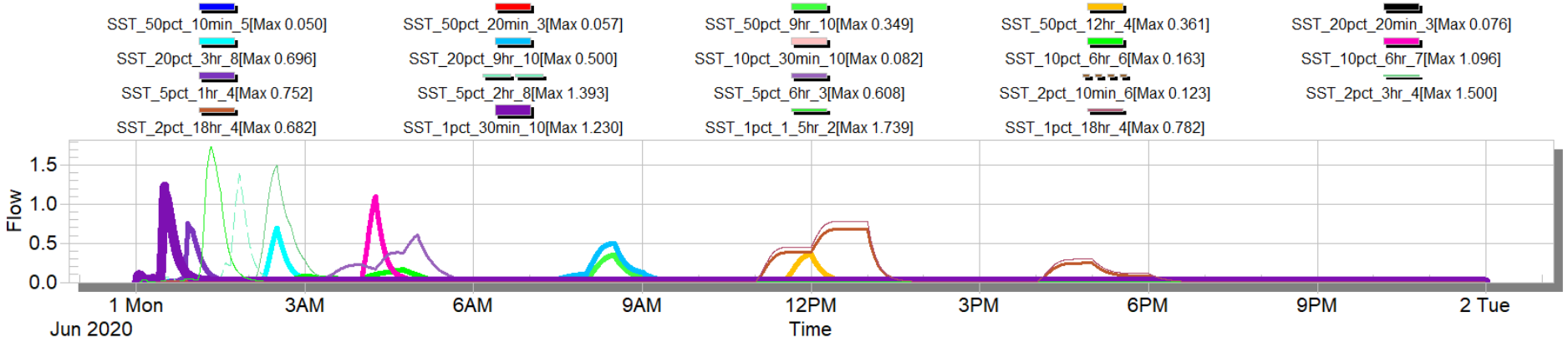

Properties of C5 Bioretention 129m2
Location
C5 Bioretention 129m2
Products >>
Inlet Properties
Low Flow By-pass (cubic metres per sec)
0.000
High Flow By-pass (cubic metres per sec)
100.000
Storage Properties
Extended Detention Depth (metres)
0.30
Surface Area (square metres)
181.00
Filter and Media Properties
Filter Area (square metres)
129.00
Unlined Filter Media Perimeter (metres)
0.01
Saturated Hydraulic Conductivity (mm/hour)
200.00
Filter Depth (metres)
0.40
TN Content of Filter Media (mg/kg)
400
Orthophosphate Content of Filter Media (mg/kg)
40.0
Infiltration Properties
Exfiltration Rate (mm/hr)
0.00
Lining Properties
Is Base Lined?
Yes
No
Vegetation Properties
Vegetated with Effective Nutrient Removal Plants
Vegetated with Ineffective Nutrient Removal Plants
Unvegetated
Outlet Properties
Overflow Weir Width (metres)
2.00
Underdrain Present?
Yes
No
Submerged Zone With Carbon Present?
Yes
No
Depth (metres)
0.45
Fluxes...
Notes...
More
Cancel
Back
Finish


Properties of C6 Bioretention 37m2
Location
C6 Bioretention 37m2
Products >>
Inlet Properties
Low Flow By-pass (cubic metres per sec)
0.000
High Flow By-pass (cubic metres per sec)
100.000
Storage Properties
Extended Detention Depth (metres)
0.30
Surface Area (square metres)
67.00
Filter and Media Properties
Filter Area (square metres)
37.00
Unlined Filter Media Perimeter (metres)
0.01
Saturated Hydraulic Conductivity (mm/hour)
200.00
Filter Depth (metres)
0.40
TN Content of Filter Media (mg/kg)
400
Orthophosphate Content of Filter Media (mg/kg)
40.0
Infiltration Properties
Exfiltration Rate (mm/hr)
0.00
Lining Properties
Is Base Lined?
Yes
No
Vegetation Properties
Vegetated with Effective Nutrient Removal Plants
Vegetated with Ineffective Nutrient Removal Plants
Unvegetated
Outlet Properties
Overflow Weir Width (metres)
2.00
Underdrain Present?
Yes
No
Submerged Zone With Carbon Present?
Yes
No
Depth (metres)
0.45
Fluxes...
Notes...
More
Cancel
Back
Finish

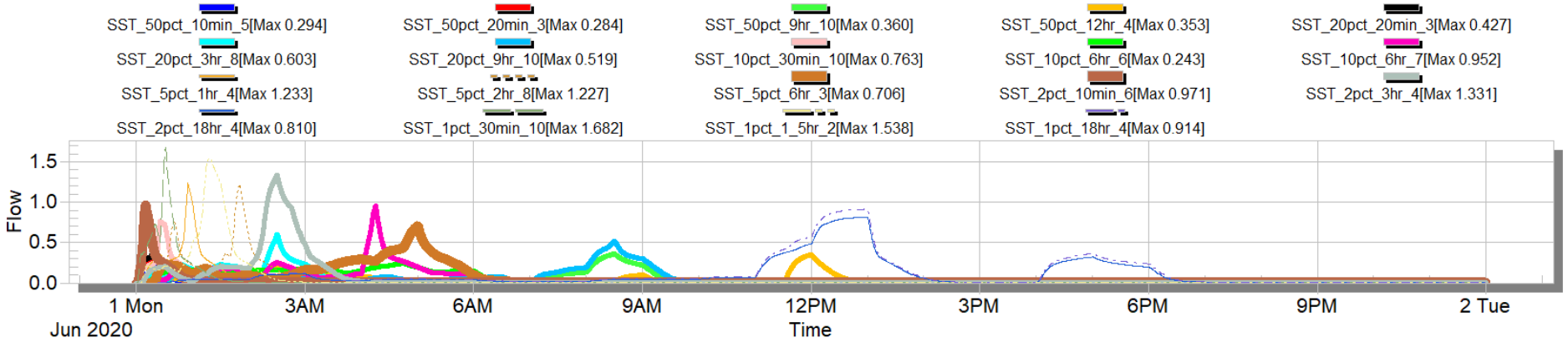

Properties of C7 Bioretention 34m2
Location
C7 Bioretention 34m2
Products >>
Inlet Properties
Low Flow By-pass (cubic metres per sec)
0.000
High Flow By-pass (cubic metres per sec)
100.000
Storage Properties
Extended Detention Depth (metres)
0.30
Surface Area (square metres)
64.00
Filter and Media Properties
Filter Area (square metres)
34.00
Unlined Filter Media Perimeter (metres)
0.01
Saturated Hydraulic Conductivity (mm/hour)
200.00
Filter Depth (metres)
0.40
TN Content of Filter Media (mg/kg)
400
Orthophosphate Content of Filter Media (mg/kg)
40.0
Infiltration Properties
Exfiltration Rate (mm/hr)
0.00
Lining Properties
Is Base Lined?
Yes
No
Vegetation Properties
Vegetated with Effective Nutrient Removal Plants
Vegetated with Ineffective Nutrient Removal Plants
Unvegetated
Outlet Properties
Overflow Weir Width (metres)
2.00
Underdrain Present?
Yes
No
Submerged Zone With Carbon Present?
Yes
No
Depth (metres)
0.45
Fluxes...
Notes...
More
Cancel
Back
Finish

Appendix E
XP Model Outputs

Pre-Development Outflow (LPD 1)



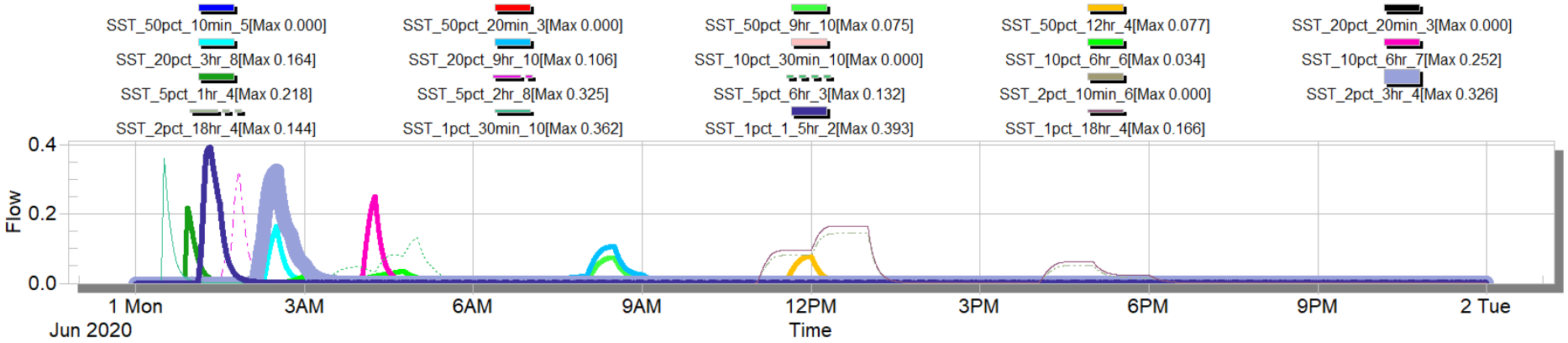
Post-Development Outflow (LPD 1)



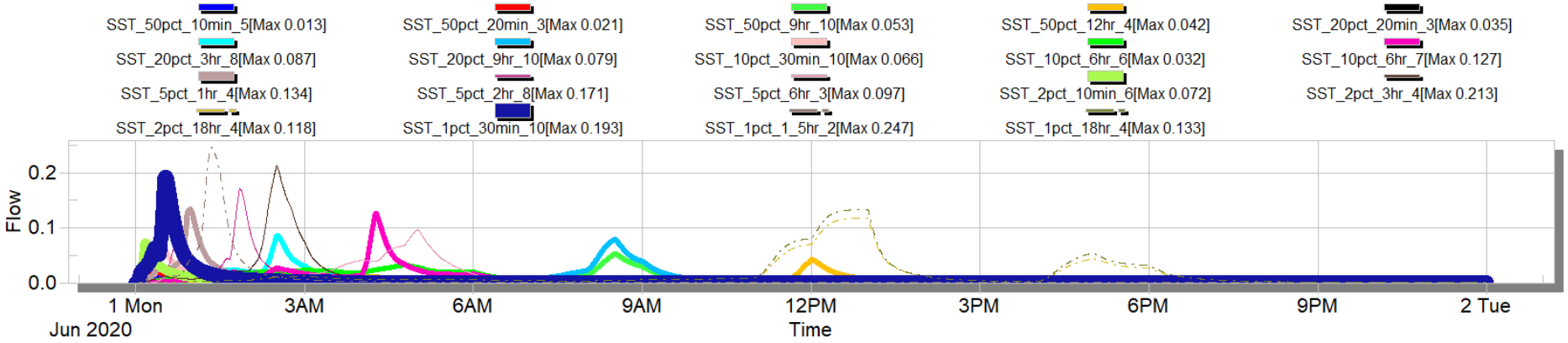
On-Site Detention Storage (Basin LPD 1)

Name	Storm	Flood Loss	Max Volume	Max Water Depth
C1 (BASIN)	SST_50pct_10min_5	0.000	183.807	0.626
C1 (BASIN)	SST_50pct_20min_3	0.000	142.541	0.501
C1 (BASIN)	SST_50pct_9hr_10	0.000	164.220	0.567
C1 (BASIN)	SST_50pct_12hr_4	0.000	162.991	0.564
C1 (BASIN)	SST_20pct_20min_3	0.000	204.503	0.686
C1 (BASIN)	SST_20pct_3hr_8	0.000	245.907	0.801
C1 (BASIN)	SST_20pct_9hr_10	0.000	228.819	0.754
C1 (BASIN)	SST_10pct_30min_10	0.000	300.811	0.946
C1 (BASIN)	SST_10pct_6hr_6	0.000	84.568	0.312
C1 (BASIN)	SST_10pct_6hr_7	0.000	328.292	1.015
C1 (BASIN)	SST_5pct_1hr_4	0.000	343.992	1.054
C1 (BASIN)	SST_5pct_2hr_8	0.000	349.858	1.068
C1 (BASIN)	SST_5pct_6hr_3	0.000	254.188	0.824
C1 (BASIN)	SST_2pct_10min_6	0.000	359.499	1.091
C1 (BASIN)	SST_2pct_3hr_4	0.000	353.990	1.078
C1 (BASIN)	SST_2pct_18hr_4	0.000	284.306	0.904
C1 (BASIN)	SST_1pct_30min_10	0.000	372.709	1.121
C1 (BASIN)	SST_1pct_1_5hr_2	0.000	359.411	1.090
C1 (BASIN)	SST_1pct_18hr_4	0.000	318.297	0.991

Pre-Development Outflow (LPD 4)



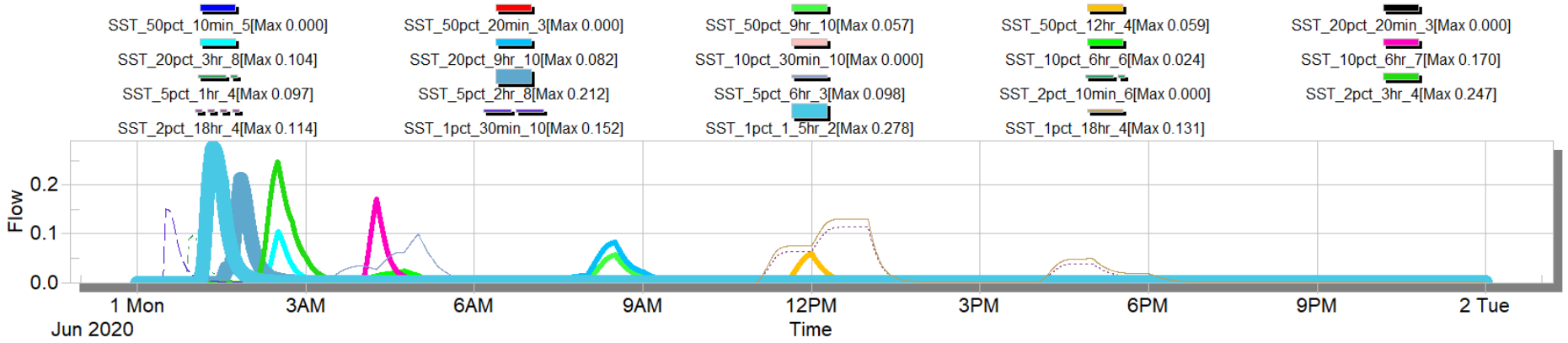
Post-Development Outflow (LPD 4)



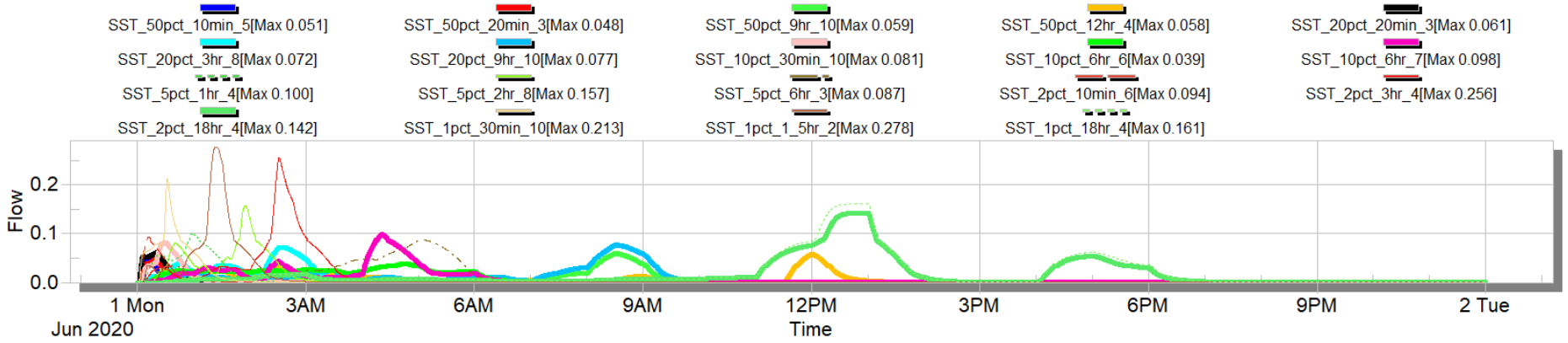
On-Site Detention Storage (Basin LPD 4)

Name	Storm	Flood Loss	Max Volume	Max Water Depth
C4	SST_50pct_10min_5	0.000	2.304	0.032
C4	SST_50pct_20min_3	0.000	3.056	0.042
C4	SST_50pct_9hr_10	0.000	6.057	0.081
C4	SST_50pct_12hr_4	0.000	5.278	0.071
C4	SST_20pct_20min_3	0.000	4.151	0.057
C4	SST_20pct_3hr_8	0.000	7.498	0.098
C4	SST_20pct_9hr_10	0.000	7.773	0.101
C4	SST_10pct_30min_10	0.000	5.853	0.078
C4	SST_10pct_6hr_6	0.000	4.700	0.064
C4	SST_10pct_6hr_7	0.000	9.287	0.119
C4	SST_5pct_1hr_4	0.000	9.022	0.116
C4	SST_5pct_2hr_8	0.000	11.185	0.140
C4	SST_5pct_6hr_3	0.000	8.805	0.113
C4	SST_2pct_10min_6	0.000	5.857	0.078
C4	SST_2pct_3hr_4	0.000	13.212	0.161
C4	SST_2pct_18hr_4	0.000	10.142	0.128
C4	SST_1pct_30min_10	0.000	11.083	0.139
C4	SST_1pct_1_5hr_2	0.000	14.064	0.170
C4	SST_1pct_18hr_4	0.000	10.886	0.137

Pre-Development Outflow (LPD 6)



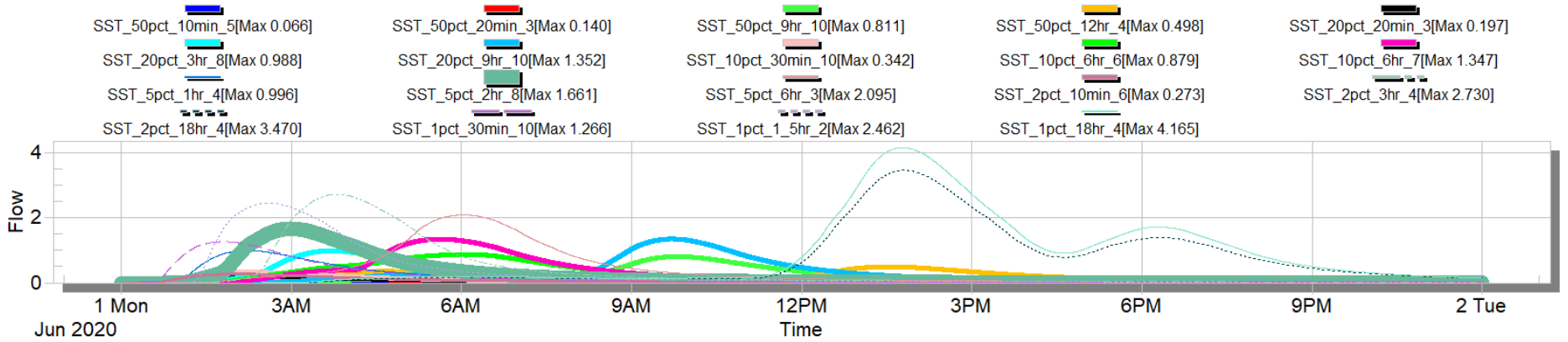
Post-Development Outflow (LPD 6)



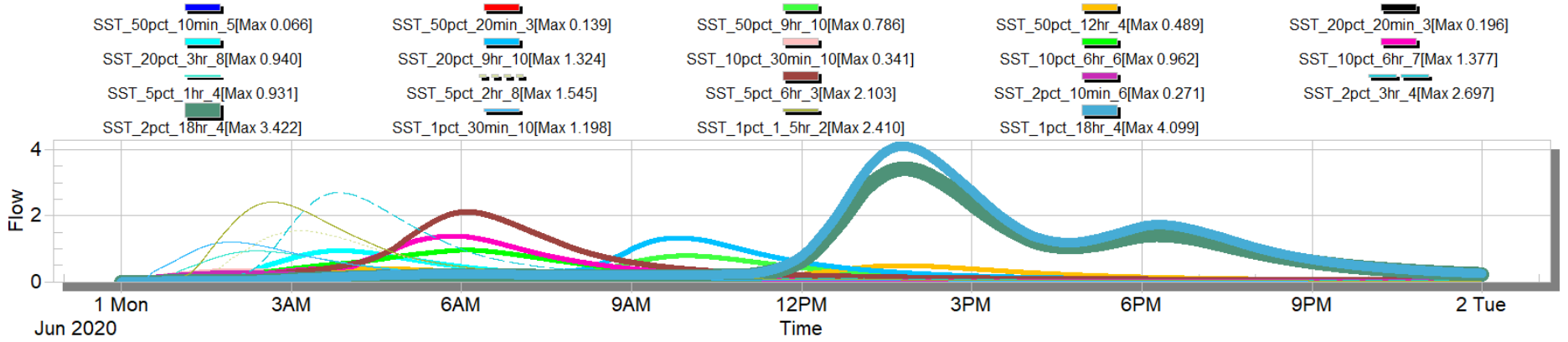
On-Site Detention Storage (Basin LPD 6)

Name	Storm	Flood Loss	Max Volume	Max Water Depth
C6 (BASIN)	SST_50pct_10min_5	0.000	30.660	0.120
C6 (BASIN)	SST_50pct_20min_3	0.000	25.849	0.104
C6 (BASIN)	SST_50pct_9hr_10	0.000	43.292	0.157
C6 (BASIN)	SST_50pct_12hr_4	0.000	42.175	0.154
C6 (BASIN)	SST_20pct_20min_3	0.000	35.603	0.135
C6 (BASIN)	SST_20pct_3hr_8	0.000	60.236	0.201
C6 (BASIN)	SST_20pct_9hr_10	0.000	67.703	0.218
C6 (BASIN)	SST_10pct_30min_10	0.000	59.202	0.198
C6 (BASIN)	SST_10pct_6hr_6	0.000	23.792	0.097
C6 (BASIN)	SST_10pct_6hr_7	0.000	92.255	0.271
C6 (BASIN)	SST_5pct_1hr_4	0.000	79.179	0.244
C6 (BASIN)	SST_5pct_2hr_8	0.000	101.349	0.288
C6 (BASIN)	SST_5pct_6hr_3	0.000	85.794	0.258
C6 (BASIN)	SST_2pct_10min_6	0.000	80.324	0.246
C6 (BASIN)	SST_2pct_3hr_4	0.000	112.114	0.308
C6 (BASIN)	SST_2pct_18hr_4	0.000	97.529	0.281
C6 (BASIN)	SST_1pct_30min_10	0.000	100.115	0.286
C6 (BASIN)	SST_1pct_1_5hr_2	0.000	113.664	0.311
C6 (BASIN)	SST_1pct_18hr_4	0.000	100.178	0.286

Pre-Development Outflow (LPD7)



Post-Development Outflow (LPD7)



On-Site Detention Storage (West Basin)

Pre-Development

Name	Storm	Flood Loss	Max Volume	Max Water Depth
EXT7+West Lake	SST_50pct_10min_5	0.000	172.506	0.007
EXT7+West Lake	SST_50pct_20min_3	0.000	255.058	0.010
EXT7+West Lake	SST_50pct_9hr_10	0.000	2310.523	0.094
EXT7+West Lake	SST_50pct_12hr_4	0.000	2421.786	0.099
EXT7+West Lake	SST_20pct_20min_3	0.000	351.837	0.014
EXT7+West Lake	SST_20pct_3hr_8	0.000	2433.345	0.099
EXT7+West Lake	SST_20pct_9hr_10	0.000	3910.847	0.159
EXT7+West Lake	SST_10pct_30min_10	0.000	514.456	0.021
EXT7+West Lake	SST_10pct_6hr_6	0.000	2908.683	0.118
EXT7+West Lake	SST_10pct_6hr_7	0.000	3635.977	0.148
EXT7+West Lake	SST_5pct_1hr_4	0.000	2184.285	0.089
EXT7+West Lake	SST_5pct_2hr_8	0.000	3866.829	0.157
EXT7+West Lake	SST_5pct_6hr_3	0.000	5538.014	0.224
EXT7+West Lake	SST_2pct_10min_6	0.000	438.909	0.018
EXT7+West Lake	SST_2pct_3hr_4	0.000	6116.270	0.247
EXT7+West Lake	SST_2pct_18hr_4	0.000	7586.166	0.304
EXT7+West Lake	SST_1pct_30min_10	0.000	2727.419	0.111
EXT7+West Lake	SST_1pct_1_5hr_2	0.000	5404.537	0.218
EXT7+West Lake	SST_1pct_18hr_4	0.000	8726.875	0.349

Post-Development

Name	Storm	Flood Loss	Max Volume	Max Water Depth
EXT7+West Lake.	SST_50pct_10min_5	0.000	683.924	0.028
EXT7+West Lake.	SST_50pct_20min_3	0.000	1008.762	0.041
EXT7+West Lake.	SST_50pct_9hr_10	0.000	4926.149	0.199
EXT7+West Lake.	SST_50pct_12hr_4	0.000	5068.438	0.205
EXT7+West Lake.	SST_20pct_20min_3	0.000	1391.944	0.057
EXT7+West Lake.	SST_20pct_3hr_8	0.000	4430.380	0.180
EXT7+West Lake.	SST_20pct_9hr_10	0.000	6639.664	0.267
EXT7+West Lake.	SST_10pct_30min_10	0.000	2047.528	0.084
EXT7+West Lake.	SST_10pct_6hr_6	0.000	5946.407	0.240
EXT7+West Lake.	SST_10pct_6hr_7	0.000	6419.962	0.259
EXT7+West Lake.	SST_5pct_1hr_4	0.000	3957.270	0.161
EXT7+West Lake.	SST_5pct_2hr_8	0.000	5691.288	0.230
EXT7+West Lake.	SST_5pct_6hr_3	0.000	8091.703	0.324
EXT7+West Lake.	SST_2pct_10min_6	0.000	1737.018	0.071
EXT7+West Lake.	SST_2pct_3hr_4	0.000	8125.603	0.325
EXT7+West Lake.	SST_2pct_18hr_4	0.000	11258.261	0.445
EXT7+West Lake.	SST_1pct_30min_10	0.000	4455.982	0.181
EXT7+West Lake.	SST_1pct_1_5hr_2	0.000	7200.032	0.289
EXT7+West Lake.	SST_1pct_18hr_4	0.000	12153.585	0.479

On-Site Detention Storage (East Basin)

Pre-Development

Name	Storm	Flood Loss	Max Volume	Max Water Depth
East Lake.	SST_50pct_10min_5	0.000	332.792	0.027
East Lake.	SST_50pct_20min_3	0.000	553.041	0.044
East Lake.	SST_50pct_9hr_10	0.000	1854.232	0.141
East Lake.	SST_50pct_12hr_4	0.000	1316.480	0.102
East Lake.	SST_20pct_20min_3	0.000	695.841	0.055
East Lake.	SST_20pct_3hr_8	0.000	2133.483	0.161
East Lake.	SST_20pct_9hr_10	0.000	2775.996	0.206
East Lake.	SST_10pct_30min_10	0.000	1016.051	0.079
East Lake.	SST_10pct_6hr_6	0.000	1961.079	0.149
East Lake.	SST_10pct_6hr_7	0.000	2770.833	0.205
East Lake.	SST_5pct_1hr_4	0.000	2146.391	0.162
East Lake.	SST_5pct_2hr_8	0.000	3280.670	0.239
East Lake.	SST_5pct_6hr_3	0.000	4281.784	0.300
East Lake.	SST_2pct_10min_6	0.000	870.536	0.068
East Lake.	SST_2pct_3hr_4	0.000	6052.932	0.397
East Lake.	SST_2pct_18hr_4	0.000	8095.662	0.493
East Lake.	SST_1pct_30min_10	0.000	2625.381	0.195
East Lake.	SST_1pct_1_5hr_2	0.000	5318.180	0.359
East Lake.	SST_1pct_18hr_4	0.000	10111.801	0.573

Post-Development

Name	Storm	Flood Loss	Max Volume	Max Water Depth
East Lake	SST_50pct_10min_5	0.000	493.024	0.039
East Lake	SST_50pct_20min_3	0.000	817.083	0.064
East Lake	SST_50pct_9hr_10	0.000	2731.388	0.203
East Lake	SST_50pct_12hr_4	0.000	1929.678	0.147
East Lake	SST_20pct_20min_3	0.000	1036.455	0.081
East Lake	SST_20pct_3hr_8	0.000	3115.278	0.228
East Lake	SST_20pct_9hr_10	0.000	3982.196	0.283
East Lake	SST_10pct_30min_10	0.000	1522.444	0.117
East Lake	SST_10pct_6hr_6	0.000	3134.925	0.229
East Lake	SST_10pct_6hr_7	0.000	4135.551	0.292
East Lake	SST_5pct_1hr_4	0.000	3100.521	0.227
East Lake	SST_5pct_2hr_8	0.000	4605.138	0.319
East Lake	SST_5pct_6hr_3	0.000	5966.045	0.393
East Lake	SST_2pct_10min_6	0.000	1299.768	0.101
East Lake	SST_2pct_3hr_4	0.000	7532.681	0.468
East Lake	SST_2pct_18hr_4	0.000	9587.868	0.553
East Lake	SST_1pct_30min_10	0.000	3714.746	0.266
East Lake	SST_1pct_1_5hr_2	0.000	6813.050	0.435
East Lake	SST_1pct_18hr_4	0.000	11768.498	0.632

Height of Water backing up behind DN800 under Country Club Drive

Pre-Development

Name	Storm	Flood Loss	Max Water Depth
Node90	SST_50pct_10min_5	0.000	0.000
Node90	SST_50pct_20min_3	0.000	0.000
Node90	SST_50pct_9hr_10	0.000	0.004
Node90	SST_50pct_12hr_4	0.000	0.006
Node90	SST_20pct_20min_3	0.000	0.000
Node90	SST_20pct_3hr_8	0.000	0.006
Node90	SST_20pct_9hr_10	0.000	0.037
Node90	SST_10pct_30min_10	0.000	0.000
Node90	SST_10pct_6hr_6	0.000	0.015
Node90	SST_10pct_6hr_7	0.000	0.030
Node90	SST_5pct_1hr_4	0.000	0.003
Node90	SST_5pct_2hr_8	0.000	0.036
Node90	SST_5pct_6hr_3	0.000	0.083
Node90	SST_2pct_10min_6	0.000	0.000
Node90	SST_2pct_3hr_4	0.000	0.099
Node90	SST_2pct_18hr_4	0.000	0.140
Node90	SST_1pct_30min_10	0.000	0.011
Node90	SST_1pct_1_5hr_2	0.000	0.079
Node90	SST_1pct_18hr_4	0.000	0.169

Post-Development

Name	Storm	Flood Loss	Max Water Depth
Dummy3	SST_50pct_10min_5	0.000	0.000
Dummy3	SST_50pct_20min_3	0.000	0.000
Dummy3	SST_50pct_9hr_10	0.000	0.065
Dummy3	SST_50pct_12hr_4	0.000	0.070
Dummy3	SST_20pct_20min_3	0.000	0.000
Dummy3	SST_20pct_3hr_8	0.000	0.052
Dummy3	SST_20pct_9hr_10	0.000	0.114
Dummy3	SST_10pct_30min_10	0.000	0.001
Dummy3	SST_10pct_6hr_6	0.000	0.094
Dummy3	SST_10pct_6hr_7	0.000	0.108
Dummy3	SST_5pct_1hr_4	0.000	0.038
Dummy3	SST_5pct_2hr_8	0.000	0.087
Dummy3	SST_5pct_6hr_3	0.000	0.153
Dummy3	SST_2pct_10min_6	0.000	0.000
Dummy3	SST_2pct_3hr_4	0.000	0.154
Dummy3	SST_2pct_18hr_4	0.000	0.228
Dummy3	SST_1pct_30min_10	0.000	0.052
Dummy3	SST_1pct_1_5hr_2	0.000	0.130
Dummy3	SST_1pct_18hr_4	0.000	0.246

Height of Water backing up behind 2x DN1125 under Country Club Drive

Pre-Development

Name	Storm	Flood Loss	Max Water Depth
Node94	SST_50pct_10min_5	0.000	0.097
Node94	SST_50pct_20min_3	0.000	0.139
Node94	SST_50pct_9hr_10	0.000	0.330
Node94	SST_50pct_12hr_4	0.000	0.258
Node94	SST_20pct_20min_3	0.000	0.163
Node94	SST_20pct_3hr_8	0.000	0.365
Node94	SST_20pct_9hr_10	0.000	0.429
Node94	SST_10pct_30min_10	0.000	0.214
Node94	SST_10pct_6hr_6	0.000	0.344
Node94	SST_10pct_6hr_7	0.000	0.429
Node94	SST_5pct_1hr_4	0.000	0.367
Node94	SST_5pct_2hr_8	0.000	0.479
Node94	SST_5pct_6hr_3	0.000	0.541
Node94	SST_2pct_10min_6	0.000	0.192
Node94	SST_2pct_3hr_4	0.000	0.625
Node94	SST_2pct_18hr_4	0.000	0.714
Node94	SST_1pct_30min_10	0.000	0.416
Node94	SST_1pct_1_5hr_2	0.000	0.592
Node94	SST_1pct_18hr_4	0.000	0.797

Post-Development

Name	Storm	Flood Loss	Max Water Depth
Node91	SST_50pct_10min_5	0.000	0.097
Node91	SST_50pct_20min_3	0.000	0.138
Node91	SST_50pct_9hr_10	0.000	0.323
Node91	SST_50pct_12hr_4	0.000	0.253
Node91	SST_20pct_20min_3	0.000	0.163
Node91	SST_20pct_3hr_8	0.000	0.355
Node91	SST_20pct_9hr_10	0.000	0.421
Node91	SST_10pct_30min_10	0.000	0.214
Node91	SST_10pct_6hr_6	0.000	0.356
Node91	SST_10pct_6hr_7	0.000	0.430
Node91	SST_5pct_1hr_4	0.000	0.354
Node91	SST_5pct_2hr_8	0.000	0.459
Node91	SST_5pct_6hr_3	0.000	0.538
Node91	SST_2pct_10min_6	0.000	0.191
Node91	SST_2pct_3hr_4	0.000	0.619
Node91	SST_2pct_18hr_4	0.000	0.705
Node91	SST_1pct_30min_10	0.000	0.403
Node91	SST_1pct_1_5hr_2	0.000	0.583
Node91	SST_1pct_18hr_4	0.000	0.783

Appendix F
Meander Valley Council Correspondence

From: Jo Oliver <jo.oliver@mvc.tas.gov.au>
Sent: Thursday, 5 November 2020 4:04 PM
To: Richard Wykes (richard.wykes@engineroomvm.com) <richard.wykes@engineroomvm.com>; Stuart Thienpont <sthienpont@adgce.com>; Nicola Smith (nicola@nicheplanningstudio.com.au) <nicola@nicheplanningstudio.com.au>; Jeremy Gammon (jeremy@nicheplanningstudio.com.au) <jeremy@nicheplanningstudio.com.au>
Cc: Cameron Oakley <cameron.oakley@h-dna.com.au>; Jarred Allen <Jarred.Allen@mvc.tas.gov.au>; Dino De Paoli <Dino.DePaoli@mvc.tas.gov.au>; Matthew Millwood <Matthew.Millwood@mvc.tas.gov.au>
Subject: Country Club Stormwater preliminary concepts

Hi all

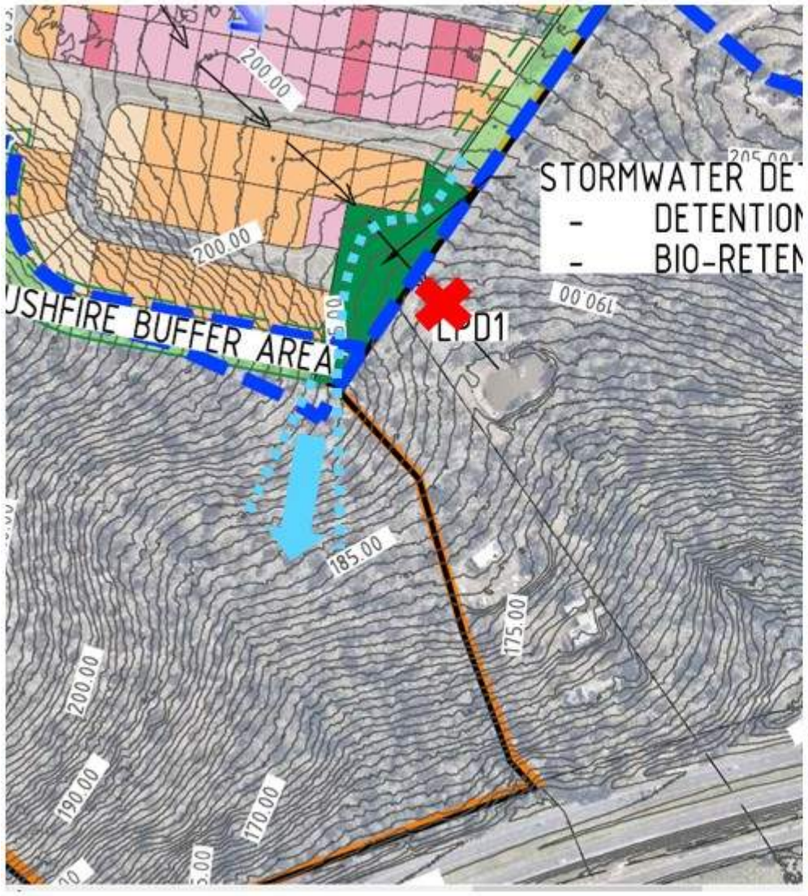
Further to Stuart's email to Cam (see below) which has included some preliminary conceptual stormwater management, we have had a look and provide the following comments as these elements will likely have an influence on the future SAP:

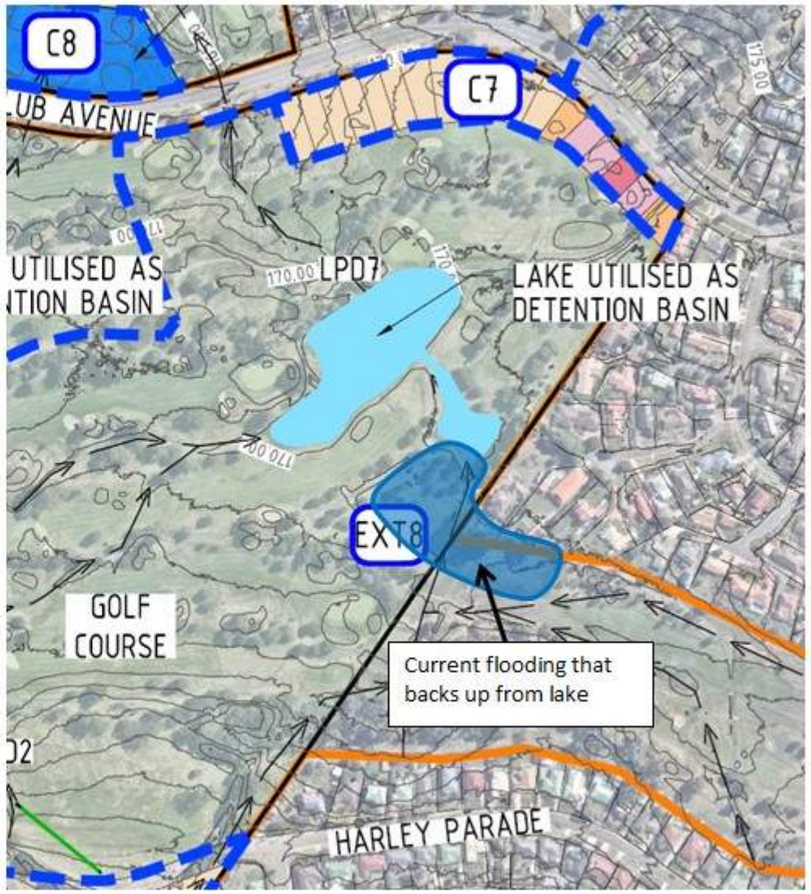
- 50% fraction impervious for blocks between 560 & 800+m2 is undercooked. We know that 66-70% is the going rate for our urban areas.
- The south eastern outlet into third party private land is not an option. It is not a public drainage course as defined in the Act and Council is not prepared to serve notice on the land owner. As a general rule we avoid taking over tight detention basin arrangements at the back of subdivisions. This is going to be bit of a difficult catchment to manage. Current position in here is that there be some sort of cut-off system that follows the contour and directs flows out through Country Club land and disperses over hillside to the south. See snip on left below. There will likely need to be some detention before discharge as the State Govt are really thingy about increasing stormwater loads to State highway drains (not impossible though if you can satisfy them that there is no adverse impact … but they'll be painful)
- Further to email request below, Cam cannot simply plug these parameters into our model, it's not that straightforward and it's not his work to do. It's the developers responsibility to figure out how the increased loads for 1% event and overland flow paths can be managed, but we'll provide what we know thus far. Treatment of current lakes or civil works is a matter for the proponent to figure out in terms of what works for the existing users of the site and the increased inputs from the future development. Cam will provide our currently modelled flow rates at the outlet crossing point at Country Club Avenue. The aim is to ensure that as a minimum, pre-development flows are maintained at this point through detention etc. upstream, or alternatively that larger openings under the road and potential increase in pond size on the other side may do the job. Reason for this is that we know that we currently have flooding of adjacent private property due to the terrain being so flat on that eastern corner next to the lake. (see snip on right below) I understand Cam has provided a visual of the extent of golf course flooding? When we looked at this before, there was very little scope to use the existing lake for any additional substantive detention as Country Club did not want the water level lowered for golf course aesthetic reasons. Have you checked with them about how you're going to use those lakes for detention given that it appears the bulk of the stormwater load goes through this area? Alternative is new detention between the existing lakes. Either way, there has to be a general understanding about how this will be managed when development is established, though we don't need to go into territory of detail design.

Food for thought. Can discuss tomorrow.

Cheers

Jo





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26 Lyall Street Westbury, TAS 7303 | PO Box 102, Westbury Tasmania 7303
www.meander.tas.gov.au

Hi Cameron,

Re: Country Club Stormwater

Please see attached preliminary pre and post development catchment plans for the proposed development with fraction impervious data included.

Regarding the stormwater management through the existing golf course as agreed with Council and subsequent to our conversations relating to the modelling outputs for this area, as we understand it forms a part of a much larger catchment, as such we would like you to enter the parameters on the attached plans into the overall model and advise if this is an acceptable outcome for the lakes and the discharge point at Country Club Avenue and receiving downstream waterways.

Catchments C1, C4, C8 & C6 and their contributing external catchments are independent of the lakes and have been treated and detained separately in accordance with MVC stormwater requirements, in our Stormwater Management Plan. All other lake catchments can be inserted to the Council flood model.

We await any advice necessary from you as to treatment of the current lakes, i.e raising of berms etc or any other civil works required for the functionality of the system as we propose.

Regards,

Stuart Thienpont
Civil Engineer

ADG Engineers (Aust) Pty Ltd

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