

Our Ref: J7604b
15 August 2024

TECHNICAL NOTE

West Churchill Avenue, Lake Coogee Structure Plan Amendment - Stormwater Management

This Technical Note has been prepared on behalf of Darriwell Investments Pty Ltd to outline the stormwater management strategy for the proposed structure plan amendment for West Churchill Avenue, Lake Coogee.

PLANNING BACKGROUND

A structure plan report was prepared for the “Lake Coogee Estate – Proposed Structure Plan Development Area 5 Munster” (Urban Focus, 2007). It covers an area of approximately 21.76 ha and the existing structure plan is shown in Figure 1.

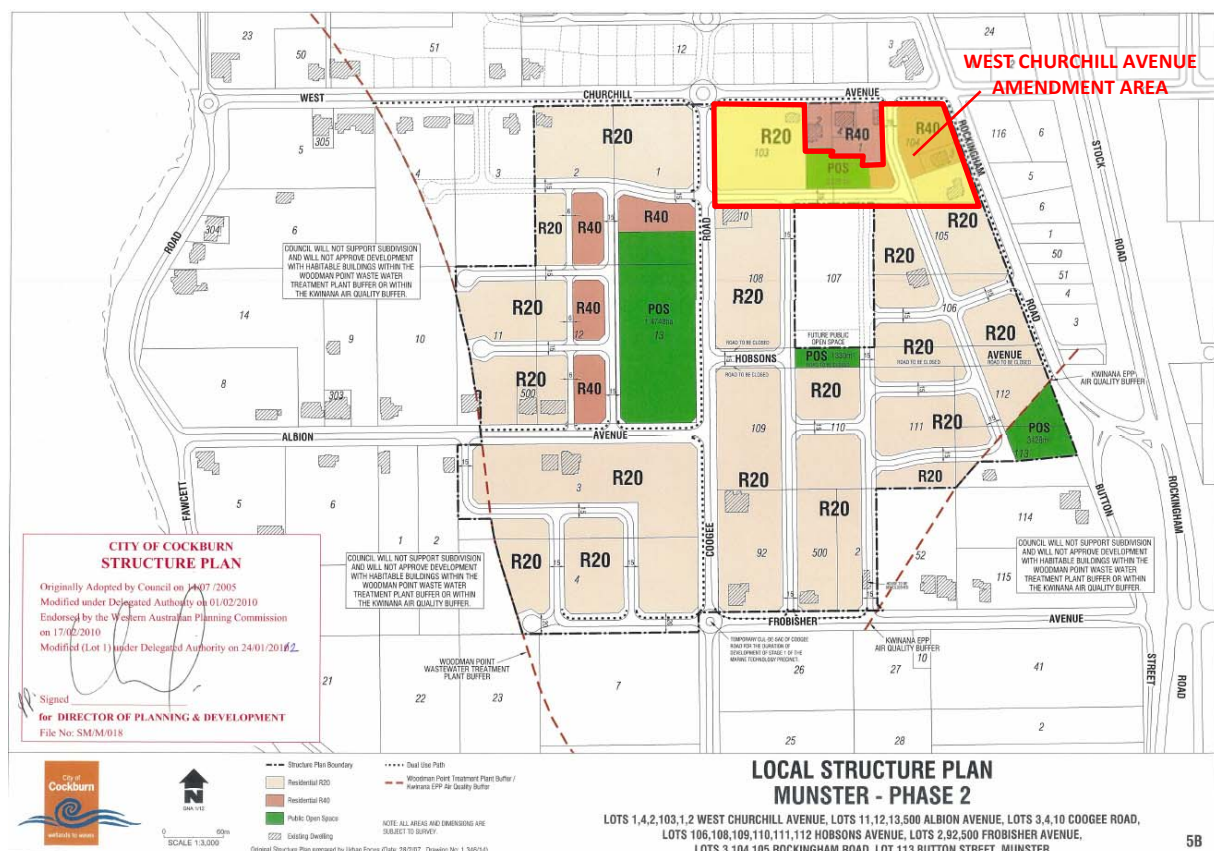


Figure 1: Local Structure Plan Munster – Phase 2 (City of Cockburn, 2012)

The *West Churchill Avenue Structure Plan Amendment, Lake Coogee* (Urbis, 2024) covers an area of approximately 2.14 ha and is comprised of 66 West Churchill Avenue and 645 Rockingham Rd, Lake Coogee (Figure 2). It proposes a mix of Residential Lots (R30 and R40) and Public Open Space, consistent with the existing structure plan.

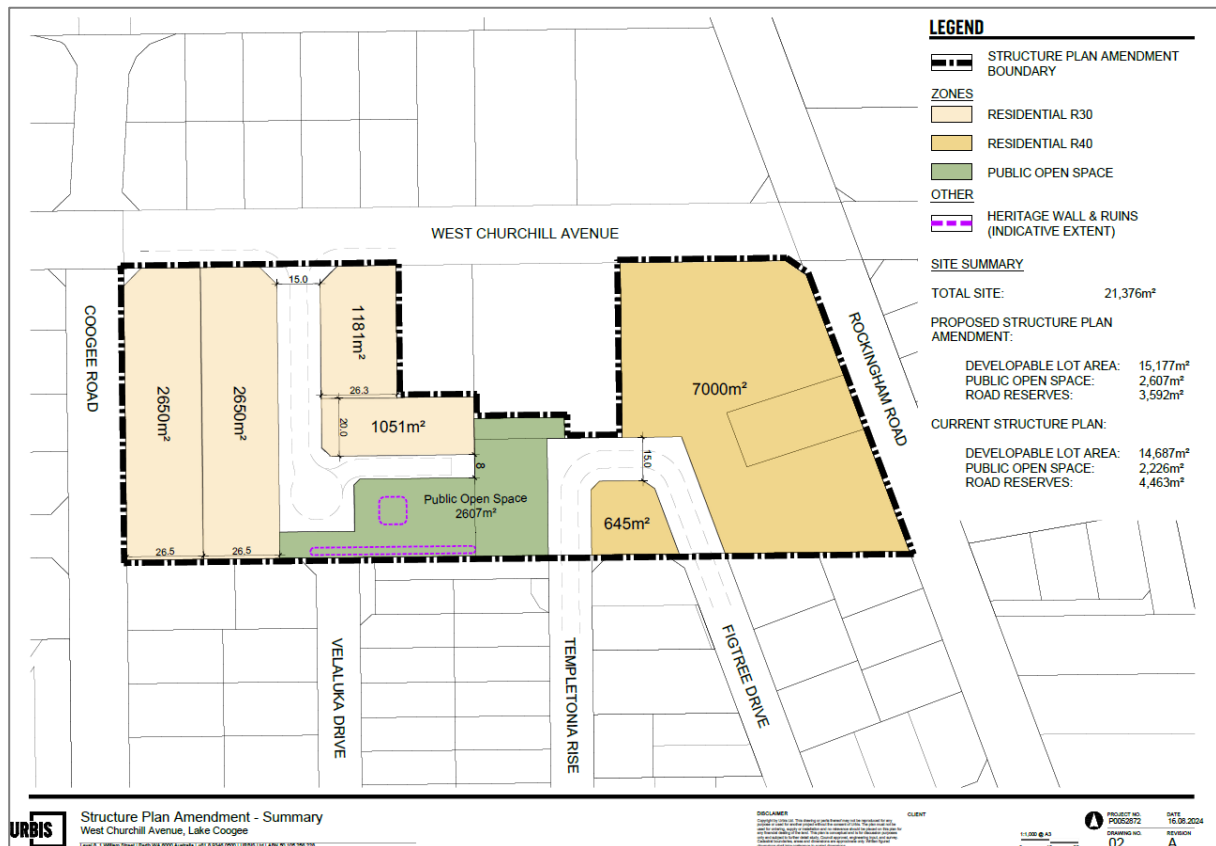


Figure 2: Structure Plan Amendment – West Churchill Avenue, Lake Coogee (Urbis, 2024)

EXISTING SITE CHARACTERISTICS

Natural surface contours show topography ranges from 10 m AHD in the centre of the site to 4 m AHD in the west and 7 m AHD to the east. Long term annual average rainfall since 1974 to 2023 is 812 mm based on Bureau of Meteorology Jandakot Aero station.

Surface geology mapping by Gozzard (1983) indicates the site is situated in the Tamala Limestone System with Limestone (Ls1) under 66 West Churchill Avenue and Sand (S7) under 645 Rockingham Rd. Presence of limestone and sand is generally conducive to high infiltration rates.

The site is classified as 'no known risk' of acid sulphate soil occurring less than 3m from the surface. There are no classified wetlands or surface water features located within the Study Area. The nearest conservation wetland is Lake Coogee which is approx. 500m west from study area.

DWER online mapping indicates groundwater flow east to west with maximum groundwater level of approximately 1.7 m AHD, indicating 2.3 m to 8.3 m separation to natural surface.

STORMWATER MANAGEMENT

The “Lake Coogee Draft Structure Plan – Drainage Area” (DEC, 18 July 2004) (attached as Appendix A) outlined a drainage strategy to support the structure plan report (Urban Focus, 2007). It divided the area into eastern and western drainage catchments with stormwater disposal via soakage in two drainage basins.

The West Churchill Avenue Amendment Area is also located within both catchments. The majority is within the East Catchment as shown in extract of the DEC (2004) East drainage catchment plan (see Figure 3). A proposed road in the south-west portion of the amendment area is located in the West Catchment.

City of Cockburn Online Mapping Hub indicates both the east and west drainage basins have already been constructed. A pipe drainage system also exists in Figtree Avenue from the southern boundary of the amendment area to the east drainage basin to allow for stormwater flow from the amendment area (Appendix B).

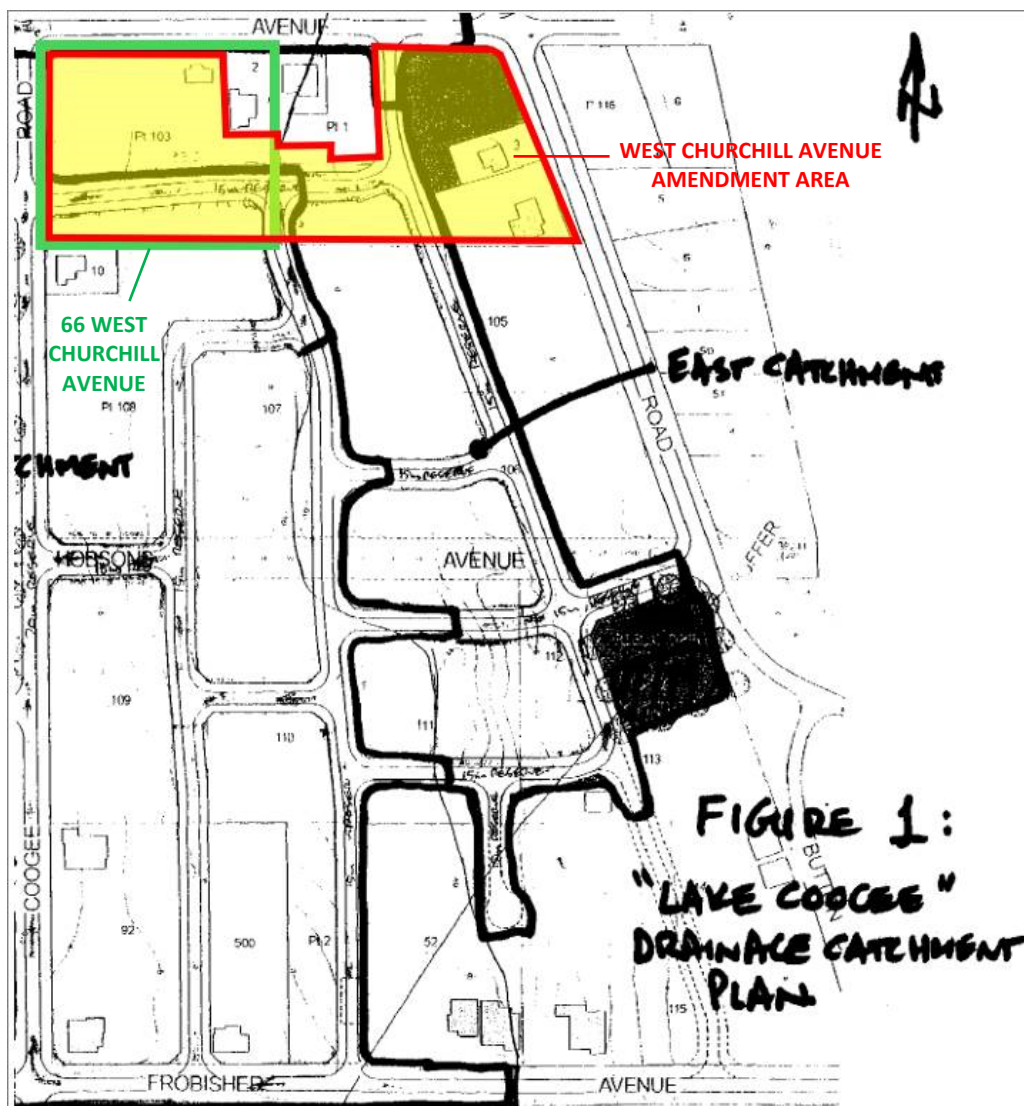


Figure 3: Lake Coogee Draft Structure Plan – Drainage Areas (DEC, 2004)

The contributing impervious road area calculated by DEC (2004) for the East Catchment is 11,100 m².

Within the amendment area, the road area based on the current structure plan is 4,463 m², and will reduce by approximately 20% to 3,592 m² in the proposed structure plan amendment (Figure 2).

In addition, it is proposed that stormwater runoff generated within the amendment area will be infiltrated and managed at source in the public open space area and may include underground infiltration cells. Whilst no discharge to the greater structure plan area is proposed for the small event (15 mm) and minor rainfall events, overland flow to existing street connections may occur in the major event to pre-development rates consistent with DEC (2004).

Therefore, with an overall reduction in the contributing road catchment to existing drainage basins, and stormwater infiltrated and managed on site, the proposed structure plan amendment does not adversely impact existing drainage infrastructure.

Further detail on the stormwater management design for the proposed structure plan amendment area, will be presented as part of the subdivision approval process in an Urban Water Management Plan (UWMP), consistent with the *Better Urban Water Management* (WAPC, 2008) water reporting framework.

The UWMP will include detail on groundwater level, infiltration rate, catchment area, hydraulic modelling and required storage volumes for water quality treatment of the first 15 mm of rainfall and the critical 20% AEP and 1% AEP storm events.

References

City of Cockburn (2012) *Local Structure Plan Munster – Phase 2*, Modified (Lot 1) under delegated authority on 24/01/2012.
Development Engineering Consultants [DEC] (2004) *Lake Coogee Draft Structure Plan – Drainage Area*, 18 July 2004, Report ref: Pro13804.

Urban Focus (2007) *Lake Coogee Estate – Proposed Structure Plan Development Area 5, Munster*, March 2007.

Urbis (2024) *Structure Plan Amendment, West Churchill Avenue, Lake Coogee*, P0052872 Drawing 02, 16 August 2024.

West Australian Planning Commission [WAPC] (2008) *Better Urban Water Management*

Attachments

Appendix A: *Lake Coogee Draft Structure Plan – Drainage Area* (DEC, 2004)

Appendix B: City of Cockburn Online Mapping Hub – Drainage Infrastructure

Should you have any queries, please do not hesitate to contact Matthew Yan on 6380 3423 or by email matt@jdahydro.com.au.

Yours sincerely,



JDA Consultant Hydrologists

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APPENDIX A

20-7-04



DEVELOPMENT
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Suite 3, 123A Colin Street

West Perth W.A. 6005

Our Ref: Pro13804

July 18, 2004

Mr Colin Evans
Urban Focus
14 Prowse Street
WEST PERTH WA 6005

Dear Colin,

URBAN FOCUS

LAKE COOGEE DRAFT STRUCTURE PLAN - DRAINAGE AREA

Further to our conversation in regard to the drainage for the area south of West Churchill Ave in Munster, we confirm that we have assessed your plan entitled "Lake Coogee Draft Structure Plan" dated 12 May 2004.

As requested we have further analysed the drainage and attached a comprehensive report for your information and submission to the various authorities.

We trust that this is to your satisfaction.

If you have any queries on this matter, please call me on the above numbers at any time.

Yours faithfully,

DEVELOPMENT ENGINEERING CONSULTANTS PTY LTD


STEPHEN R. ALLEN
PRINCIPAL CIVIL ENGINEER



**LAKE COOGEE - AREA SOUTH OF WEST CHURCHILL AVE AND WEST OF
ROCKINGHAM ROAD, MUNSTER**

DRAINAGE STRATEGY REPORT

1. General

The drainage strategy is to dispose of stormwater by soakage and use of water sensitive design methods. The total area will be directed to two drainage areas, one is for the western catchment which is a large drainage basin located in the area of central Public Open Space off Hobsons Ave. The second basin, being for the eastern catchment is proposed to be located in the area of Public Open Space located just north of the intersection between Button Street and Rockingham Road. Figure 1 shows the design catchments and the location of the proposed drainage areas.

The required footprint area for each of the basins is dependent on the strategy adopted for the drainage basin, that is whether the drainage is "wet" or "dry". A dry basin is typically installed as a swale. Its base is located a minimum of 0.4m above maximum recorded groundwater level, thereby ensuring the area is dry in all situations. To maximise usability as public open space, underfloor storage such as soakwells and other soakage mechanisms such as Atlantis Cells or other proprietary products are installed. This means that each time it rains, water does not flood the basin until the capacity of the soakage areas is exceeded.

The various alternatives are listed in the table below:

Basin Description	Catchment (Ha)	Storage required (100Yr)	Storage required (10Yr)	Site Area Required (100Yr)(Sqm)	Site Area Required (10Yr) (Sqm)
Western Basin - LWL0.9mAHD (Wet Basin)	6.11	6,900	3,700	5,700	4,600
Western Basin - LWL1.9mAHD (Dry Basin)	6.11	5,000	2,500	9,000	8,200
Eastern Basin - LWL2.0mAHD (Dry Basin)	1.11	1,350	780	1,540	1,200
Total	7.22	8,250	4,480	7,240	5,800

In addition to the soakage areas, the practice approved by the Waters and Rivers Commission of installing baseless manholes and maximising soakage prior to outflow to the drainage system will be used for this development. Where suitable roads abut open space, flush kerbs will be installed to maximize soakage opportunities.

2. Western Basin

According to the Water and Rivers Commission Groundwater Atlas, the maximum groundwater level at the site is RL 1.5m AHD. Based on the geotechnical work undertaken in March 2000 the groundwater level was recorded at approximately RL 0.3m AHD. The WRC information probably represents an absolute maximum figure, however the recorded level is more likely to be the lower annual level. Some investigation on the likely groundwater fluctuations in the area was undertaken by Rockwater Pty Ltd in August 1996 for the City of Cockburn. In this study, they found that there was generally a 0.7m fluctuation between summer minimum and winter



maximum groundwater levels. Assuming that this is correct, the groundwater level in the proximity of the proposed basin will fluctuate between 0.3m AHD and 1.0m AHD. Rockwater had advised that the general summer minimum for Market Garden Swamps 1 and 2 would be between 0.6m and 0.75m AHD for wetter periods. This is consistent with the levels used for this investigation. An ambient level of 0.9m AHD has been used for the purposes of our calculations.

Given that the road levels in the vicinity of the western basin will be at around RL2.5m AHD, there is minimal opportunity to provide cover and grade for drainage pipework to grade to the basin. There is also minimal level difference between maximum groundwater level and minimum road levels. In addition, groundwater levels could feasibly fluctuate from say RL0.0m AHD to RL1.5m AHD there will be a difficulty in presentation of the basin.

Two main options have been examined:

- (a) The first is to excavate a lake. In this instance the base would need to be excavated to say RL-2.0 to ensure that water will be in place year round, however we understand that the new Waters and Rivers Commission guidelines do not support drainage basins intersecting the water table. This is defined as a "wet" basin. In this case, the area of the lake would be approximately 3200 square metres at RL0.9m AHD. In the event that a lake is not supported, the 10 year basin area could be constructed as a wetland. The base would be set at RL0.9m AHD and planted with wetland vegetation. Its ecological operation would be similar to that of the surrounding market garden swamps although during periods of high water table, as per the market garden swamps it will not dry out which may cause some eutrophication issues.
- (b) The second alternative examined was to construct a true "dry" basin. The base of the basin would need to be conservatively set at around RL1.9m AHD, being 0.4m above the maximum likely groundwater level, thereby ensuring a dry oval area all year around year in and year out. Given the excellent soakage characteristics in the area, water would not be expected to stand in the area for much longer than 24hours for a major storm.

3. Eastern Basin

The groundwater in the vicinity of the eastern basin is slightly higher than that of the western basin, but probably only 0.1m. Therefore the maximum likely groundwater level in the area will be around 0.1m above those discussed above.

The minimum road levels in the area are however much higher, making it simpler and more practical to install a dry park basin area. The basin will be approximately 1.5m deep for the 1 in 100 year storm. Detention times will also be minimal given the good soakage characteristics of the area. Subsurface storage will be installed in conjunction with subdivision works.



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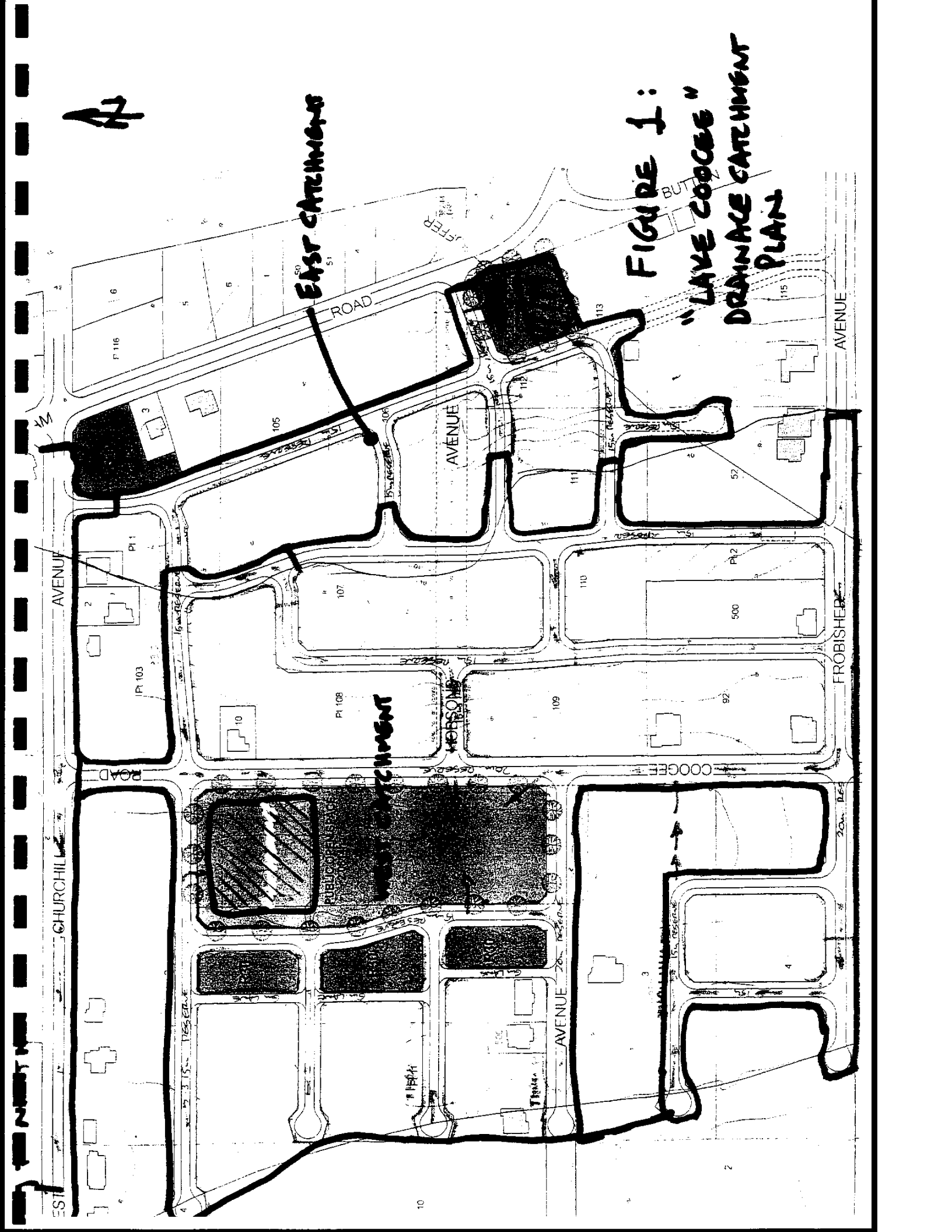
ATTACHMENT 1: CATCHMENT PLAN

7

EST. CATCHMENT

FIGURE 1:
"LAKE COOGEE"
DRAINAGE CATCHMENT
PLAN

LAKE COOGEE





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ATTACHMENT 2: DRAINAGE CALCULATIONS

Development Engineering Consultants - Drainage Basin Spreadsheet



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Project: Urban Focus Management

Location: South of West Churchill Ave "Lake Coogee" - West Catchment

Option 1: Lake for Storage LWL 0.9m AHD TWL: 2.5m AHD (100Yr), 1.85m AHD (10Yr)

Data to be Input

Rainfall ARI (Years)	100
Run-off Coefficient	0.9
Impervious Area(Ha):	6.11
Req'd Storage (10 year) (m3)	3,665.52
Req'd Storage (100 year) (m3)	8,125.24
Soakage Rate (l/s/m2)	0.005

Data From A, R & R Volume 2

Location	Perth WA
Map 1 2_{11}	20.6
Map 2 2_{12}	4.5
Map 3 2_{12}	1.3
Map 4 50_{11}	35.5
Map 5 50_{12}	7
Map 6 50_{12}	2.1
Map 7 G	0.66
Map 8 F2	4.82
Map 9 F50	17

Tc(mins)	Tc(hrs)	I(mm/hr)	Q(l/s)	Total V in	Preliminary Height(m)	Q out (Soakage)(l/s)	V out	Net Storage
40	0.667	61.34	936.81	2248.333216	0.63	15.77	37.84567684	2210.487539
50	0.833	52.08	795.49	2386.476997	0.66	15.77	47.31018543	2339.166812
60	1.000	45.44	693.97	2498.283204	0.69	15.77	56.77518894	2441.508015
90	1.500	38.81	592.69	3200.52536	0.85	15.78	85.18976019	3115.3356
120	2.000	31.59	482.46	3473.73218	0.91	15.78	113.5997845	3360.132395
240	4.000	19.11	291.94	4203.866699	1.07	15.78	227.2686914	3976.598008
480	8.000	11.66	176.58	5085.597271	1.25	15.79	454.6951329	4630.902138
960	16.000	8.08	123.37	7106.214504	1.63	15.80	910.053546	6196.160959
1440	24.000	6.08	92.85	8021.845337	1.79	15.80	1365.499223	6656.346114
2880	48.000	3.65	55.69	9623.719793	2.05	15.81	2732.393425	6891.326368
4320	72.000	2.62	40.08	10388.7784	2.18	15.82	4099.651479	6289.226916

West of Ridge

Catchment Area:	RR Width(m)	Length(m)	Area (Total)
	24	0	-
	22	0	-
	20	1300	26,000
	18	0	-
	15	2700	40,500
	14	0	-
	11	0	-
	10	0	-
	6	230	1,380
			67,880

Drainage Basin Base Dimensions: (Option 1 - Wet Lake Available Storage Depth From RL0.9 to RL2.5m AHD)

Side Slopes	Length(m)	Breadth(m)
6	63	50

Height(m)	A(TWL)	Average Area	Vol(m ³)	Revised H	Site Area (0m freeboard, 0m berm)	Minimum Breadth	Constraining Breadth	Other Dimension
2.18772266	6805.7547	19222.307	10638.9176	1.417090661	6805.754703	83.85267188	80	85.07193379
1.41709066	5360.74795	16732.323	5961.95332	1.637992401	5360.747952	74.60508793	80	67.00934839
1.6379924	5757.47245	17428.59	7189.71173	1.570012908	5757.472447	77.25590881	80	71.96840558
1.57001291	5633.88894	17212.826	6802.52979	1.590507016	5633.88894	76.44015489	80	70.42361174
1.59050702	5671.00612	17277.734	6918.37145	1.584289456	5671.006123	76.68608419	80	70.88757654
1.58428946	5659.73263	17258.029	6883.14668	1.586172169	5659.732625	76.61147347	80	70.74665782
1.58617217	5663.14513	17263.995	6893.80555	1.585601743	5663.145131	76.63406603	80	70.78931414
1.58560174	5662.1111	17262.187	6890.57544	1.585774541	5662.1111	76.62722092	80	70.77638875
1.58577454	5662.42433	17262.735	6891.55387	1.585722193	5662.424327	76.62929449	80	70.78030409
1.58572219	5662.32944	17262.569	6891.25745	1.585738051	5662.329436	76.62866632	80	70.77911795

Development Engineering Consultants - Drainage Basin Spreadsheet



Project: Urban Focus Management

Location: South of West Churchill Ave "Lake Googee" - West Catchment

Option 2: Dry Park for Storage LWL: 1.9mAHD TWL: 2.5mAHD (100Yr), 2.2mAHD (10Yr)

Data to be Input

Rainfall ARI (Years)	100
Run-off Coefficient	0.9
Impervious Area(Ha):	6.11
Req'd Storage (10 year) (m3)	3,665.52
Req'd Storage (100 year) (m3)	8,125.24
Soakage Rate (l/s/m2)	0.005

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Map 9 F50	17

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40	0.667	61.34	936.81	2248.333216	0.29	37.51	90.02097832	2158.312238
50	0.833	52.08	795.49	2386.476997	0.30	37.51	112.5277658	2273.949231
60	1.000	45.44	693.97	2498.283204	0.32	37.51	135.034811	2363.248393
90	1.500	38.81	592.69	3200.52536	0.40	37.51	202.5660814	2997.959278
120	2.000	31.59	482.46	3473.73218	0.43	37.51	270.095185	3203.636995
240	4.000	19.11	291.94	4203.866699	0.52	37.52	540.2275867	3663.639112
480	8.000	11.56	176.58	5085.597271	0.62	37.52	1080.542824	4005.054447
960	16.000	8.08	123.37	7106.214504	0.84	37.53	2161.470569	4944.743935
1440	24.000	6.08	92.85	8021.845337	0.94	37.53	3242.456976	4779.388361
2880	48.000	3.65	55.69	9623.719793	1.10	37.53	6485.76428	3137.955513
4320	72.000	2.62	40.08	10388.7784	1.17	37.54	9729.237879	659.5405163

West of Ridge

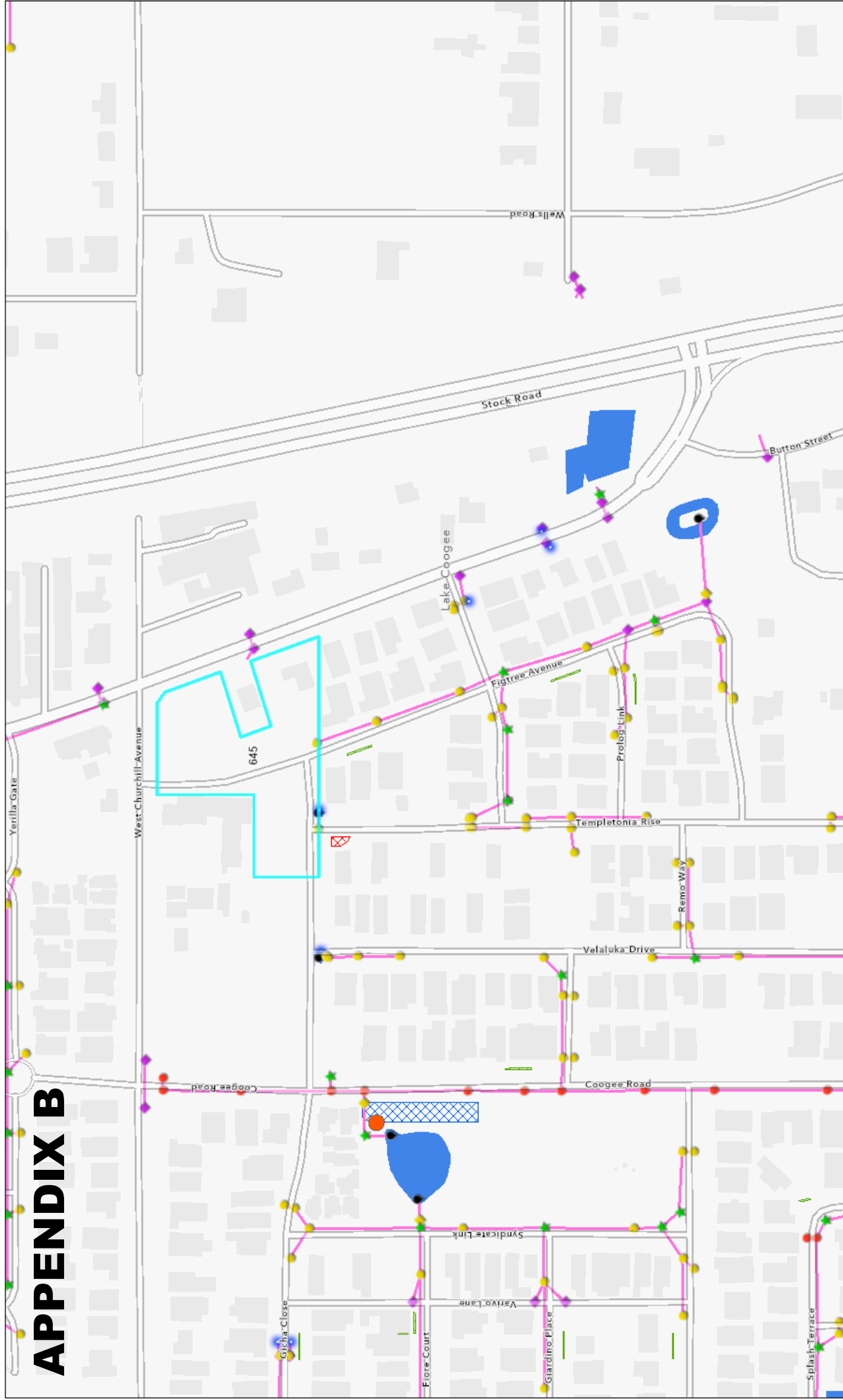
Catchment Area:	RR Width(m)	Length(m)	Area (Total)
	24	0	-
	22	0	-
	20	1300	26,000
	18	0	-
	15	2700	40,500
	14	0	-
	11	0	-
	10	0	-
	6	230	1,380
			67,880

Drainage Basin Base Dimensions: (Option 2 - Dry Parkland Area Available Storage Depth From RL1.9 to RL2.5m AHD)

Side Slopes	Length(m)	Breadth(m)
6	125	60

Height(m)	A(TWL)	Average Area	Vol(m ³)	Revised H	Site Area (0.0m freeboard, 0m berm)	Minimum Breadth	Constraining Breadth	Other Dimension
0.65929919	9026.23747	32989.882	5440.98955	0.599167789	9026.237466	75.5115903	80	112.8279683
0.59916779	8881.84878	32712.001	4902.5756	0.604321388	8881.848785	74.79001346	80	111.0231098
0.60432139	8894.18291	32735.776	4948.38087	0.603877228	8894.182906	74.85185666	80	111.1772863
0.60387723	8893.11959	32733.727	4944.43066	0.603915489	8893.119595	74.84652673	80	111.1639949
0.60391549	8893.21119	32733.904	4944.77092	0.603912193	8893.21119	74.84698587	80	111.1651399
0.60391219	8893.2033	32733.888	4944.74161	0.603912477	8893.203299	74.84694632	80	111.1650412
0.60391248	8893.20398	32733.89	4944.74414	0.603912452	8893.203979	74.84694972	80	111.1650497
0.60391245	8893.20392	32733.89	4944.74392	0.603912455	8893.20392	74.84694943	80	111.165049
0.60391245	8893.20393	32733.89	4944.74394	0.603912454	8893.203925	74.84694945	80	111.1650491
0.60391245	8893.20392	32733.89	4944.74393	0.603912454	8893.203925	74.84694945	80	111.1650491

APPENDIX B



- Drainage Pits**
- BUP
 - CHUT
 - CFT
 - CSBP
 - DGP

City of Cockburn

Date Printed: 3/07/2024
 Scale: 1:2,610
 Datum: WGS 1984

