1138-1170 Yarrabilba Drive. Yarrabilba

Stormwater Management Plan (SWMP)





CWD Group

Unit 2/61-63 Commercial Drive, Shailer Park, 4128 reception@cwdgroup.com.au

Telephone 07 3472 5918

Document Control:

Engineering Excellence

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				Name	Initials	Name	RPEQ No.	
11784	29/11/2021	Sajeel Cherakadavath	SC	Lewis Hamilton	LH	Jeremy Cox	14732	





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1 Introduction

This Stormwater Management Plan (SWMP) has been prepared by CWD Group for the proposed development at 1138-1170 Yarrabilba Drive, Yarrabilba. The purpose of this report is to assess stormwater quantity and quality impacts associated with the proposed development. The scope of the project can be summarised as an investigation of the pre and post-development stormwater discharge and preliminary design and commentary of any mitigation strategies required to control site discharge. The site is located at the south of intersection between Mill Street and Yarrabilba Drive and is comprised of the following parcel of land:

• Lot 11 on SP 304357

The proposed works will include the following components:

• Construction of five storage building in two stages with associated driveways and landscaping

This SBSMP has been developed to support the Development Application (DA) for the development, and specifically to address:

- Logan City Plan 2015 v6.0, Planning scheme policy 5 Infrastructure section 3.6: Stormwater infrastructure standards;
- Logan City Plan 2015 v6.0, Planning scheme Part 9.4.3 Infrastructure Code;
- Yarrabilba Priority Development Area Development Guidelines;
- Planning Act 2016 and the associated State Planning Policy (SPP 2017); and
- Environmental Protection Act 1994, Environmental Protection (Water) Policy 2009 (EP water) and associated State Planning Policy (Queensland Government 2013).

1.1 Background Information

This report has been prepared based on the following information:

- LCC & Logan Water as-constructed information;
- Dial Before You Dig (DBYD) information;
- Detail Survey; and
- Ariel imagery obtained from Google Earth and Nearmap.

In accordance with the Logan City Council Planning Scheme and applicable standards, notably:

- Queensland Urban Drainage Manual (QUDM 2017);
- Australian Rainfall and Runoff (2019);
- Yarrabilba Development Guidelines: Precinct 3D;
- Yarrabilba Stormwater Infrastructure Masterplan (Designflow, 2012);
- State Planning Policy (2017);
- SEQ Water Supply and Sewerage Design and Construction Code (2013);
- International Erosion Control Association (IECA) Best Erosion and Sediment Control; and
- AS3798 Guidelines on Earthworks for Commercial and Residential Developments.





2 Site Description

2.1 Location

The subject site (1138-1170 Yarrabilba Drive, Yarrabilba) is located south of intersection between Mill Street and Yarrabilba Drive. It is approximately 10,640m² in size. Figure 1 shows the location of the subject site and surrounding area.



Figure 1: Site Location

2.2 Existing and Proposed Land Use

The site is currently vacant. The proposed storage facility consists of five storage buildings constructed in two stages, with associated access and internal driveways.

2.3 Topography and Site Drainage

Elevations on site range from the highest point of RL 33.06 metres AHD (south-east boundary of the site) and lowest at RL 30.74 metres AHD (near the north-west corner of the site). Runoff drains from south-east to north-west, discharging towards the Yarrabilba Drive. Runoff generated from the lot is currently captured by two 1050mm diameter manholes with 600x600 grates which conveys flows to gully pits in Yarrabilba Drive via a 375mm diameter (middle of the site) and a 450mm diameter (northern corner) pipe.

As constructed plans showing the surface levels and existing stormwater infrastructure can be found in **Appendix C**.

2.4 Flooding

The Logan City Council Planning Scheme Overlay Map OM-05 'Flood Hazard Overlay' does not identify the site as being affected by flood or storm tide hazard. It is not anticipated that flooding will affect the storage facility.





3 Stormwater Management Constraints and Data

3.1 Site Constraints

Constraints identified for the site regarding stormwater management include;

- Development will result in increased impervious area, and subsequently an increase in peak discharges;
- Development will result in an impact on the quality of the stormwater runoff generated within the site

3.2 Design Response

The design response for the stormwater management constraints have been identified as the following:

- Collect and convey site generated runoff to the lawful point of discharge and ensure that no adverse impacts occur to neighbouring properties;
- Treat stormwater runoff to meet State Planning Policy water quality objectives;
- Stormwater quantity mitigation to ensure the development does not cause an actionable nuisance on any adjacent properties

This Stormwater Management Plan (SWMP) has been developed to demonstrate the design response is appropriate in responding to the flooding constraints onsite and are consistent with Logan City Council Planning Scheme and EDQ requirements.

3.3 Data

Data used in the preparation of this report and information about the site was gathered from the following sources:

- As constructed plans;
- Proposed Site Layout;
- Rainfall and Meteorological Data by the Australian Bureau of Meteorology; and
- Aerial Imagery by Nearmap (Accessed November 2021).





4 Stormwater Quantity Management

This section of the report will provide an assessment of the stormwater discharge pre and post-development, determine the preliminary design of stormwater quantity infrastructure and any management strategies required to control discharge from the development.

4.1 Lawful Point of Discharge

In accordance with Queensland Urban Drainage Manual (QUDM 2017) section 3.9, lawful discharge of stormwater is required. A Lawful Point of Discharge Test (LPD Test) is outlined in Section 3.9.1 to ensure the stormwater is discharged from the site lawfully and at a lawful location in addition to needing to meet other statutory requirements such as the SPP and Planning Act.

The test in Section 3.9.1 of QUDM is in sequential order. If a condition can be met, then subsequent items need not be tested. This should be read in full but is summarised here to provide context for this site. It can be summarised as:

- *Test 1:* Will the proposed development alter the site's stormwater discharge characteristics in a manner that may substantially damage a third-party property? (if yes go to Test 2, if not then LPD is satisfied)
- *Test 2:* Is the location of the discharge from the development site under the lawful control of the local government or other statutory authority from whom permission to discharge has been received?
- *Test 3:* An authority to discharge over affected properties will be necessary.

The lawful point of discharge has been identified as the existing gully pits in the Yarrabilba Drive in accordance with section 7.13.14 of QUDM.

4.2 Stormwater Runoff

Peak discharges from the external catchments contributing flows toward the site were calculated using the Rational Method. Rational Method calculations were also undertaken for the site catchment discharging flow toward the downstream boundary. The discharge location for calculation purposes was assumed as the north-eastern site boundary. This is consistent with the topography onsite. The Rational Method calculations were undertaken in accordance with the Queensland Urban Drainage Manual (QUDM 2017) and Logan City Planning Scheme 2015 v5.1 (LCPS), assuming that the proposed works are undertaken as planned for a range of storm events.

4.2.1 Detailed Rational Assumptions

Under existing conditions, the site is completely pervious. In the developed scenario, the site will have an overall impervious percentage of 85% as per the current design plans.

A summary of the assumptions for the rational method calculations are shown in Table 4.1 to Table 4.3.

Catchment	Catchment	Fraction	Impervious	Runoff Coefficient		
	Area (ha)	Existing	Developed	Existing	Developed	
Site	1.06	0	0.85	0.66	0.86	

Table 4-1: Catchment Details





Catchment	Catchment Slope (%) Length (m)		Horton's surface roughness factor	Time of Concentration, t _c (min)	
Site – Existing	2.31	27	0.015	6.0	
Site - Developed	-	-	-	5.0	

Table 4-2: Time of Concentration

Table 4-3: Rainfall Intensities

Time of Concentration, t_c (min)	1-year ARI (mm/hr)	1.44-year ARI (mm/hr)	4.48- year ARI (mm/hr)	10-year ARI (mm/hr)	20-year ARI (mm/hr)	50-year ARI (mm∕hr)	100-year ARI (mm/hr)
5.0	96.9	110.0	151.0	179.0	206.0	241.0	268.0
6.0	101.0	114.0	157.0	186.0	215.0	253.0	282.0

4.2.2 Discussion of Expected Peak Discharges

Table 4.4 shows the peak discharges for the site catchment. Further details of the runoff calculations can be found in **Appendix D**.

Average recurrence Interval (ARI.	Annual Exceedance Probability	Peak Discha	nrge, m3/s	Change		
Year)	(AEP)	Existing	Developed	m3/s	%	
1	63.2%	0.151	0.205	0.054	35.82%	
1.44	50%	0.182	0.245	0.064	35.04%	
4.48	20%	0.279	0.378	0.099	35.48%	
10	10%	0.348	0.471	0.123	35.40%	
20	5%	0.420	0.572	0.151	36.00%	
50	2%	0.539	0.737	0.198	36.79%	
100	1%	0.625	0.830	0.205	32.86%	

Table 4-4: Peak Rational Stormwater Comparison – Existing vs. Developed Site only

As shown in Table 4.4 above, peak discharges from the project site increase by up to 36%. The increase of peak discharge is due to the increased impervious area within the site.

4.3 Management of Increased Runoff

It has been confirmed through Lendlease and Kn Group that the overarching Reconfiguration of Lot for Precinct 3D has addressed stormwater quantity management and provided infrastructure to service the site for the ultimate development scenario. It is considered that no additional on-site mitigation through detention or hydraulic control is required, and the development will not result in any nuisance or annoyance to adjoining or downstream properties. Minor flows from the roofwater and surface runoff will be collected and conveyed in an internal pit and pipe network and discharged to the existing 375mm diameter pipes within in the site. Runoff is then conveyed to the stormwater infrastructure network within Yarrabilba Drive.

4.4 Detailed Engineering Design

The information contained in this report addresses the stormwater quantity management strategy and characteristics. Further details of the stormwater drainage networks including pit and pit systems will be confirmed during the detailed design phase of the development. A preliminary layout of the proposed stormwater network is shown on drawing CWD-11784-DA-400.





5 Stormwater Quality Management

5.1 State Planning Policy Compliance

The stormwater quality management strategy for Precinct 3 of the Yarrabilba Priority Development Area as it relates to the State Planning Policy has been addressed in the Yarrabilba Precinct 3 Stormwater Quality Management Plan Version 2 (DesignFlow, 2016). This report covers stormwater quality management for the operational phase of the development.

This report focuses on the stormwater quality strategy for the construction phase of the development only.

5.2 Construction Phase

Key pollutants generated by various types of developments are listed in Part C, Section 4 of the Subdivision and Development Guidelines. Pollutant generation for both construction and operation phases of the development are summarised below.

Pollutant	Potential Sources
Litter	Paper, construction packaging, food packaging, cement bags, off-cuts
Sediment	Unprotected exposed soils and stockpiles during earthworks and building
Hydrocarbons	Fuel and oil spills, leaks from construction equipment
Toxic materials	Cement slurry, asphalt prime, solvents, cleaning agents, wash waters (e.g. from tile works)
pH altering substances	Cement slurry and wash waters

Table 5.1: Pollutants Typically Generated During the Construction Phase

Prior to commencement of construction, an Erosion and Sediment Control Plan (ESCP) will be prepared and implemented to minimise the impacts of the development on stormwater quality. The plan will address site and catchment specific erosion control measures, generally adhering to the following control measures.

5.2.1 Pre-Construction

Before construction, the following measures will be established and maintained for the duration of construction until such time as any disturbed areas are stabilised and/or established with revegetation/turfing:

- Sediment fences to be erected;
- Stockpile areas to be designated to minimise impacts on site runoff;
- Provision of shakedown pit for any entry/exit points to the site; and
- Toolbox talk to inform any regular site personnel

5.2.2 During Construction

During construction, the following measures will be established and maintained for the duration of construction until such time as any disturbed areas are stabilised and/or established with revegetation/turfing:

- Construction related activities will be contained within the subject site where possible to minimise areas of disturbance;
- Topsoil retention for site rehabilitation;
- Regular inspection of sediment control measures; and
- Dynamic response to any changing site conditions

5.2.3 Post-Construction

Following construction any disturbed areas will be stabilised through revegetation or other measures which is to be maintained until established.





6 Conclusion

This report demonstrates that the drainage proposed for this development has been designed in accordance with the relevant manuals and guidelines and is therefore consistent with the Logan City Planning Scheme 2015 and Yarrabilba Priority Development Area Development Guidelines;

This report demonstrates that the proposed development is adequate to satisfy the 'lawful point of discharge' and 'no worsening' as per the Logan City Planning Scheme and QUDM. As discussed, it is demonstrated that the proposed development will not cause changes to flooding characteristics on adjacent properties to any significant degree.

Stormwater quality under the Queensland State Planning Policy water quality objects is considered applicable and best management practices should be stormwater quality management strategy which is outlined in Section 6 of this report.

This SBSMP is considered consistent with the Stormwater Code of the Logan City Planning Scheme 2015 and relevant guidelines for the Yarrabilba Priority Development Area.

Sincerely,

Jeremy Cox MEngSc, BEng (Civil), MIEAust, NER, CPEng, RPEQ Director CWD Group





7 Bibliography

LCPS (2015v5.1). Logan City Planning Scheme 2015 v5.1.

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Appendix A Proposed Site Layout Plan





Appendix B Concept Stormwater Layout



1138-1170 YARRABILBA DRIVE, YARRABILBA DEVELOPMENT APPLICATION

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LOT 11 SP304357

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 - THE CONTRACTOR SHALL CONFIRM THAT ALL RELEVANT INFORMATION TO COMPLETE THE PROPOSED WORKS IS PROVIDED ON THE DRAWINGS PRIOR TO THE START OF CONSTRUCTION.
 - ALL WORKS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS & SPECIFICATIONS OF LOGAN CITY COUNCIL (LCC), FUTURE ASSET OWNER OR AUSTRALIAN
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APPROVAL FROM THE CIVIL ENGINEER FOR ANY VARIATION TO THE REQUIREMENTS STIPULATED WITHIN THE TABLE BELOW PRIOR TO CONSTRUCTION.

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DRAINAGE TYPE

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PE (SLOTTED)

SUB-SURFACE

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> ¢100 ¢100

SN8 200

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ALL RENEARCE CONCRETE PRES STATULE RE PROVIDE UTH TYPE TAY SUPPORT. ALL PPE BEDDING A ALL PRE ALMICH MATERIAL SHALL BE NON-CONFEXING GRANULAR MATERIAL SUCH AS NASHED TAYNE TREA SHAN OR TERAL UNARATIN'S CONFEXING TARGET AND HAVE A MINIHUYO BEST PARSON OF TAXAN UNARANIS'S CONFEXING TARGET HAVE A MINIHUYO BEST PARSON OF TAXAN DATES CONFEXING TARGET AND HAVE A MINIHUYO BEST PARSON OF TAXAN DATES CONFEXING TARGET AND HAVE A MINIHUYO BEST PARSON OF TAXAN DATES CONFEXING TARGET AND HAVE A MINIHUYO BEST PARSON OF TAXAN DATES CONFEXING TARGET AND HAVE A MINIHUYO BEST PARSON OF TAXAN DATES CONFEXING TARGET AND TAXAN DATES CONFERENCE AND TAXAN D 0.075mm SIEVE. BEDDING & HAUNCH MATERIAL SHALL BE COMPACTED FOR THE FULL WIDTH OF

THE TRENCH BY TWO (2) PASSES OF A VIBRATING PLATE OR HAND TAMPING

METHOD TO THE SATISFACTION OF THE SUPERINTENDENT.

ALL DRAINGE PIPES SHALL BE LAID WITH THE MINIMUM COVER REQUIREMENTS AS DETALED WITHIN LCG DIBLEMES FOR POLIC DRAINAGE INPRASTRUCTURE OR AS35003 STORMWATER DRAINAGE FOR PRIVATE PROPERTY DRAINAGE.

ALL DRAINAGE PIPES SHALL BE PROVIDED WITH RUBBER-RING JOINTS (RRJ) UNLESS NOTED

OTHERWISE

NOTWITHSTANDING THE DETAILS PROVIDED ON THE DRAWINGS, SUB-SURFACE DRAINAGE SHALL BE INSTALLED BELLOW HIL KIERD ALIGNMENTS & EDGE TRATINENTS SEPARTING LANDSCAPRE & PARYENTST THE CONTRACTOR SHALL ALLOW ALL COST 50 INSTALL & LOWINGT & POINT OF DISCLARGE TO THE SATISFACTION OF THE DRAWENE

SCREW CAP FLUSH WITH THE ADJACENT FINISHED SURFACE LEVEL.

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- UNLESS AGREED OTHERWISE, THE CONTARCTOR SHALL ALLOW FOR A MINIMUM OF ONE (1) 4-DAY SOMSOR DIS TEST FISE MOMO OF DEVELORENTI MORIS AGAT 7THE MOMATED 14-DAY SOMSOLE LEVEL. THE SAMPLING & TESTING SHALL BE UNDERTAREN BY A QUILIFED GOTEGNADE LEVEL. THE SAMPLING & TESTING SHALL BE UNDERTAREN BY A QUILIFED GOTEGNADE LEVEL. œ
 - THE CONTRACTOR SHALL PROVIDE NECESSARY MAINTENANCE OF THE SUBGRADE AFTER PLATFORM PREPARATION SO AS TO MAINTAIN ALL ENGINEERING REQUIREMENTS & PROVIDED TO THE CIVIL ENGINEER FOR REVIEW & FURTHER INSTRUCTION.
- SPECIFICATIONS SUCH MAINTENANCE PROVISIONS SHALL INCORPORATE REMORKING & DRYING OF THE SUBGRADIE CLUONMER MAIN VENUST OT RETURNIN THE SUBGRADIE DA NA PAPROVED STATE ALL COSTS ASSICIATED WITH REMORKMEREDATION & DELAYS THAT MAY ENSUE SHALL EE ALLONDED FOR AT THE CONTRACTOR'S EXPENSE.

TRENCH BACKFILL REQUIREMENTS

ALL SERVICES CROSSING PAVEMENT AREAS ARE THE RESPONSIBILITY OF THE CIVIL CONTACTOR TO THE RESING PAVEMENT COMPACING S PROVIDED BY OTHER CONTRACTORS OF THE CIVIL CURTRACTOR ALLOWS FOR THIS BACKFLLING OFERATION CONTRACTORS OF THE CIVIL CURTRACTOR ALLOWS FOR THIS BACKFLLING OFERATION SERVET REXING PARCHLL: T TERENTES -540 MPTORTED SELECT FILL OR SITE MATERIAL AT THE SOLE TRENTHES -450 APPROVED MPORTED SELECT FILL OR SITE MATERIAL AT THE SOLE TRENCHES -450 APPROVED MPORTED SELECT FILL OR SITE MATERIAL

UNLESS NOTED OTHERWISE. UNLESS NOTED OTHERWISE. FREE NOT SECTED ON DRAMMING. THE CONTRACTOR SHALL REQUEST THE SPECIFICATION FOR ALL DRAMMAGE STRUCTURE LOADING CLASS TYPES FOR LUS, GRAATES 3 THE ASSOCIATED FRAMMG. THE CONTRACTOR SHALL NOT ASSUME A TYPE FOR LUS, GRAATED M ACCORDANCE ALL TORDWATER DRAMMAGE METS & OUTLETS SHALL BE CONSTRUCTED M ACCORDANCE ANTH THE DETALS PROVIDED ON THE WASTINGT OF POLIC, WORKS FORMEREM M AUSTRALIA ANTH THE DETALS PROVIDED ON THE WASTINGT OF POLIC.

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PUBLIC WORKS ENGINEERING AUSTRALIA (QLD DIVISION) IPWEAQ STANDARD DRAWING D-0050,

ALL STORMWATER DRAINAGE FIELD INLETS & OVERFLOW GULLIES SHALL BE 'TYPE 2' WITH

ANY THE TO INSPECT CONSTRUCTED PPED DRAMAGE WHERE CONSTRUCTION HAS PRECLUDED DRECT INSECTION OF THE GNAMUNE. THE CONTRACTOR SHALL ALLOW ALL CGSTS TO COPPEY WITH THIS CONDITION. WHERE OMITTED ON DRAWINGS, THE CONTRACTOR SHALL UNDERTARE ALLACTIONS & ALLOW THE CONTROL ON DRAWINGS, THE CONTRACTOR SHALL UNDERTARE APPROVED BY THE FIGURER.

ALL STOPMALTER DRAINAGE INFRASTRUCTURE SMALL BE CLEANED/FLUSHED WITH MATER & BE LEFT FREG OF DERISE S. 2011. AT THE COMPLETION OF THE CONSTRUCTION PROGRAMME. THE ENGMERE RESERVES THE RIGHT TO REQUEST A PIPE SURVEY (CUTV) AT

(aLD DIVISION) IPWEAD STANDARD DRAWING D-0080, UNLESS NOTED OTHERWISE.

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 - DISCRETION OF THE ENGINEER ALL BACKELL USING OTHE THAN STRABLISED SAND TO BE COMPACTED TO LEVEL 1 GEOTECHNICAL REQUIREMENTS IN ACCORDANCE WITH AS3798.

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CWD-11784-DA-001

DRAWING NUMBER

 REVEW
 JC
 22/11/21

 DESIGN
 LH
 22/11/21

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 DATE
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 22/11/21

DESCRIPTION

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DEVELOPMENT APPLICATION NOT TO BE USED FOR CONSTRUCTION

STATUS

KENNARDS SELF-STORAGE

COMMERCIAL DEVELOPMENT 1138-1170 YARRABILBA DRIVE

YARRABILBA

QLD

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SURVEYOR

DRAWING TITLE GENERAL NOTES

	EROSION & SEDIMENT CONTROL	T STORMWATER	CUT FILL - 200mm	
XISTING CONTOUR (MAJOR)	SEDIMENT FENCE	EXISTING STORMWATER DRAINAGE	FILL - 0 to 200mm	
KISTING CONTOUR (MINOR)	GULLY/FIELD INLET PROTECTION	PROPOSED STORMWATER PIPE/CULVERT	FILL - 200 to 400mm	
CISTING LOT BOUNDARY	2222222222	PROPOSED MANHOLE	FILL - 400 to 600mm	
ISTING LOT BOUNDARY - ADJACENT	OVERLAND FLOW DIRECTION	PROPOSED FIELD INLET	FiLL - 600 to 800mm	
(ISTING EDGE OF BITUMEN		PROPOSED GULLY - ON-GRADE	FILL - 800 to 1000mm	
ISTING ROAD CROWN/CL		PROPOSED GULLY - SAG	FiLL - 1000 to 1200mm	
ISTING KERB INVERT			FILL - 1200 to 14,00mm	
ISTING FENCE	DESIGN	PROPOSED STRUCTURE/LINE LABEL	FilL - 1400 to 1600mm	
ISTING RETAINING WALL (TOP)		¥	FILL - 1600 to 1800mm	
STING RETAINING WALL (TOE)		SEWER	FILL - 1800 to 2000mm	
ISTING BATTER (TOP)	PROPOSED LOT BOUNDARY		FiLL - 2000mm +	
ISTING BATTER (TOE)	PROPOSED KERB & CHANNEL		CUT - 0 to 200mm	
disting sewer reticulation	PROPOSED BARRIER KERB		CUT - 200 to 400mm	
(ISTING WATER RETICULATION	PROPOSED PAVEMENT		CUT - 400 to 600mm	
KISTING WATER METER	PROPOSED SERVICE EASEMENT		CUT - 600 to 800mm	
CISTING WATER VALVE	PROPOSED CONTROL LINE		CUT - 800 to 1000mm	
(ISTING FIRE HYDRANT	CH 10.000 – Proposed chainage	PROPOSED MAINTENANCE STRUCTURE	CUT - 1000 to 1200mm	
<pre>cisting stormwater drainage</pre>	SL 15.85 × PROPOSED DESIGN LEVEL		CUT - 1200 to 14.00mm	
KISTING RODFWATER DRAINAGE	PROPOSED SEWERAGE RETICULATION		CUT - 1400 to 1600mm	
CISTING COMBINE DRAIN	PROPOSED WATER RETICULATION	WATER	CUT - 1600 to 1800mm	
ISTING OPTICAL FIBRE	SWD SWD PROPOSED STORMWATER DRAINAGE	EXISTING WATER RETICULATION	CUT - 1800 to 2000mm	
ISTING TELECOMMUNICATIONS	RVD PROPOSED ROOFWATER DRAINAGE	PROPOSED WATER RETICULATION	CUT - 2000mm +	
ISTING TELECOMMUNICATIONS PIT				
STING ELECTRICAL – OVERHEAD	LINEMARKING	PROPOSED PROPERTY CONNECTION - DUAL		
sting electrical - Underground	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PROPOSED CONDUIT		
ISTING POWER POLE	w≠≔⊐ ⊑ ⊑ DIVIDINGLINE - TWO LANE ROADS			
STING GAS RETIGN	89 \$≠ commented by the commentation of the co	O PROPOSED FIRE HYDRANT		
	8944 BARRIER LINE - SINGLE] PROPOSED END CAP		
	BARRIER LINE - ONE DIRECTION			
	BARRIER LINE - BOTH DIRECTIONS			
ISTING VEGETATION TO BE REMOVED	w≠====================================			
ISTING VEGETATION TO BE RETAINED	<i>™</i> ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★			
	<i>™</i> ‡			
	w/set=EDGE_LINE			
RTHWORKS CONTOUR (MAJOR)				
DPOSED BATTER (TOP)	sv‡cenner outline markings			
OPOSED BATTER (TOE)	Jow T. TRAVERSE LINE - STOP			
OPOSED RETAINING WALL	Jean the second			
OPOSED EARTHWORKS LEVEL				
OPOSED RETAINING WALL TO BE ILD BY BUILDER				
	KENNARDS SELF-STORAGE			\bigcap
1138-1170 YARRABILBA DRIVE	APROVED	RPED No. 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,		
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Appendix C As Constructed Plans











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Appendix D Model Information and Calculations





Duration

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RATIONAL METHOD CALCULATIONS

Project: 1138-1170 Yarrabilba Drive, Yarrabilba Location of Discharge: North-East Boundary

North-East Boundary Existing Site

Catchment Condition: Other Comments:

of Concentration	6.1 minutes		
	Upstream	Total	
-Catchment Areas	1.060	1.06	ha
Runoff Coefficients	0.660		
· 1hr Intensity (mm/hr)	68.30		

	Rainfall			Runoff Coeffici	ients		Discharges			
ARI	Intensity	Depth					(cumecs)			
(years)	(mm/hr)	(mm)	Fy	Upstream	0	0	Upstream	0	0	TOTAL
1	96.9	10	0.80	0.53	0.00	0.00	0.151	0.000	0.000	0.151
2	110.0	11	0.85	0.56	0.00	0.00	0.182	0.000	0.000	0.182
Ŋ	151.0	15	0.95	0.63	0.00	0.00	0.279	0.000	0.000	0.279
10	179.0	18	1.00	0.66	0.00	0.00	0.348	0.000	0.000	0.348
20	206.0	21	1.05	0.69	0.00	0.00	0.420	0.000	0.000	0.420
50	241.0	24	1.15	0.76	0.00	0.00	0.539	0.000	0.000	0.539
100	268.0	27	1.20	0.79	0.00	0.00	0.625	0.000	0.000	0.625

Upper Catchment Slope	2.3%		
Overland Flow	4.1 min		
Channel Travel Length	50 metres		
Channel Fall	0.75 metres		
Travel Time	1.0 min	Equiv Travel Velocity	
Delta for	2.0	0.42 m/s	Table
Time of Concentration @ u/s bdy	6.1		

Table A1

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Yarrabilba	
Drive,	,
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1138-1170	
Project:	

Location of Discharge: Catchment Condition:

North-East Boundary Developed Site

Other Comments:

Time of Concentration	6.1 r	ninutes			
	Upstream	0	0	Total	
Sub-Catchment Areas	1.060	000'0	000 ⁻ 0	1.06	ha
C10 Runoff Coefficients	0.86	0.82	0.80		
10yr 1hr Intensity (mm/hr)	<mark>68.30</mark>				

	Rainfall			Runoff Coeffic	ients		Discharges			
ARI	Intensity	Depth					(cumecs)			
(years)	(mm/hr)	(mm)	Fy	Upstream	0	0	Upstream	0	0	TOTAL
1	101.0	10	0.80	0.69	0.66	0.64	0.205	0.000	0.000	0.205
2	114.0	12	0.85	0.73	0.70	0.68	0.245	0.000	0.000	0.245
Ŋ	157.0	16	0.95	0.82	0.78	0.76	0.378	0.000	0.000	0.378
10	186.0	19	1.00	0.86	0.82	0.80	0.471	0.000	0.000	0.471
20	215.0	22	1.05	06.0	0.86	0.84	0.572	0.000	0.000	0.572
50	253.0	26	1.15	0.99	0.94	0.92	0.737	0.000	0.000	0.737
100	282.0	29	1.20	1.00	0.98	0.96	0.830	0.000	0.000	0.830

Upper Catchment Slope	2.3%		
Overland Flow	4.1 min		
Channel Travel Length	50 metres		
Channel Fall	1 metres		
Travel Time	1 min	Equiv Travel Velocity	
Delta for	2	0.42 m/s	Table
Time of Concentration @ u/s bdy	6.1		

A2