



REF : C7011-2390

# **STORMWATER DESIGN CALCULATIONS**

**AT 19a-23 MEMORIAL AVENUE**

**BLACKWALL**

**FOR MR KERR**

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### **Files On Disk**

C7011-2390 -DRAINS.DRN

**1.0 Detention System Requirements**

## 1.1 Storage-Area calcs.

### DATA:

Site Area Assessed due to easements

Site Area = 0.2532 ha 2532 sq.m

Impervious Area Pre Development = 0 sqm

Percentage Impervious Pre Development = 0%

Impervious Area POST Development = 1532 sqm

Percentage Impervious POST Development = 61%

Catchment directed through OSD = 2244.00 sqm 146.5 %

OSD Bypass Areas :	Impervious	30.00 sqm	10.4 %
	Pervious	258.00 sqm	89.6 %
	<b>Total</b>	<b>288 sqm</b>	

Slope of Site =	1.0 %	Time of Concentration tc =	
Effective Flow Length =	41 m	2 min.	1:5
Hortons n=	0.1	2 min.	1:100

FFL of house =	4.7 m
Roof Gutter Level =	7.1 m
Invert of outlet =	3 m
Raintank Pad Level =	4.53 m

### Detention A

Volume Required 28.60 cu.m

Total Area 195.00 sq.m

Stage Storage-Discharge Relationship

Stage (m)	Storage Area (sq.m)	Avg. Depth (m)	Storage (cu.m)
3.10	7.5	0	0.000
4.20	7.5	0.8	6.000
4.30	195.0	0.033	6.440
4.40	215.0	0.13	28.600

Invert of pit =	3.10 m	$Q=d^2 \cdot \sqrt{h}/0.48$
Orifice Dia. =	155 mm	$d=\sqrt{((0.48 \cdot Q)/\sqrt{h})}$
Max. Water Level achieved	4.40 m	
Storage achieved	28.600 cu.m	

### Basix Allowance

Raintank Basix =	12000 L	
Raintank Provided =	12000 L	
Water Level in Tank RL for Basix =	4.59 m = orifice IL.	Depth=0.06m
Nominal tank Volume used =	12000 L	
50% OSD Concession=	6000 L	
Total Tank Height =	2.020 m	
OSD Tank Height =	1.85 m	
Total Effective Tank Required =	40600 L	OK

### 1.2 DRAINS Data File for Pre & Post Developed Conditions

PIT / NODE DETAILS													Version 9	
Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	Part Full Shock Loss	
Pre	Node					10		0		256	-139		2	
Ground	Node					4.50		0		444	-153		8	
N1	Node					4.3		0		571	-185		12	
Outlet	Node					4.25		0		617.232	-211.091		45	
Roof	Node					7.10		0		440	-74		9	

  

DETENTION BASIN DETAILS														
Name	Elev	Surf. Area	Init Vol. (cu.m)	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Lid
OSD Basin	3.10	7.5000	0	Orifice		155	3.1775				558	-103 No		5
	4.20	7.5000												
	4.30	195.0000												
	4.40	215.0000												

  

SUB-CATCHMENT DETAILS																				
Name	Pit or Node	Total Area (ha)	Paved Area (%)	Grass Area (%)	Supp Area (%)	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%)	Grass Slope (%)	Supp Slope (%)	Paved Rough	Grass Rough	Supp Rough	Lag or Factor	Time Length (m)	Gutter Slope (%)
Pre Site	Pre	0.2532	0	100	0	0	0	0	0	41	41	0	1.0	1.0	0	0.01	0.07	0	0	0
Bypass	Ground	0.0288	10.4	89.6	0	0	0	0	0	41	41	0	1.0	1.0	0	0.01	0.1	0	0	0
Roof Area	Roof	0.2244	100	0	0	0	0	0	0	21	0	0	20	0	0	0.01	0	0	0	0

  

PIPE DETAILS																			
Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	RI (m)	Chg (m)	RL (m)	etc (m)
Pipe1	Roof	OSD Basin	20	3.30	3.10	3.6	uPVC, not un	225	242	0.03	NewFixed	1	Roof		0				
Pipe2	Ground	N1	41	4.25	3.05	8	uPVC, not un	150	154	0.03	New	1	Ground		0				
Pipe3	OSD Basin	N1	10	3.10	3.05	66	uPVC, not un	225	242	0.03	NewFixed	1	OSD Basin		0				
Pipe4	N1	Outlet	5	3.05	3	1	uPVC, not un	300	303	0.03	New	1	N1		0				

  

DETAILS of SERVICES CROSSING PIPES										
Pipe	Chg (m)	Bottom Elev (m)	Height of Ser (m)	Chg (m)	Bottom Elev (m)	Height of Ser (m)	Chg (m)	Bottom Elev (m)	Height of Ser (m)	etc

  

CHANNEL DETAILS													
Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

### 1.3 DRAINS Summary of Pre & Post Developed Discharges

#### 5 YEAR

DRAINS results prepared from Version 2016.08

PIT / NODE DETAILS							
Name	Max HGL	Max Pond HGL	Version 8		Min Freeboard (m)	Overflow (cu.m/s)	Constraint
			Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)			
Ground	4.28		0.004				
Pit1	3.26		0		1.04	0	None
Outlet	3.12		0				
Roof	4.69		0.094				

  

SUB-CATCHMENT DETAILS							
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Bypass	0.004	0.001	0.004	3.45	18.86		0 AR&R 5 year, 1 hour storm, average 47.8 mm/h, Zone 1
Roof Area	0.094	0.094	0	0.59	0		0 AR&R 5 year, 5 minutes storm, average 150 mm/h, Zone 1

  

Outflow Volumes for Total Catchment (0.23 impervious + 0.28 pervious = 0.51 total ha)

Storm	Total Rainfal	Total Runoff	Impervious Rur	Pervious Runoff
	cu.m	cu.m (Runoff %)	cu.m (Runoff %)	cu.m (Runoff %)
AR&R 5 year, 5 minut	63.3	31.02 (49.0%)	26.15 (92.0%)	4.87 (14.0%)
AR&R 5 year, 10 mini	97.9	56.79 (58.0%)	41.69 (94.8%)	15.10 (28.0%)
AR&R 5 year, 20 mini	143.48	90.31 (62.9%)	62.15 (96.5%)	28.15 (35.6%)
AR&R 5 year, 30 mini	174.71	108.88 (62.3%)	76.18 (97.1%)	32.70 (34.0%)
AR&R 5 year, 1 hour :	242.06	154.29 (63.7%)	106.42 (97.9%)	47.86 (35.9%)
AR&R 5 year, 2 hours	327.13	207.01 (63.3%)	144.62 (98.5%)	62.39 (34.6%)

PIPE DETAILS								
Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm			
Pipe2	0.004	1.45	4.281	3.26	AR&R 5 year, 1 hour storm, average 47.8 mm/h, Zone 1			
Pipe4	0.052	1.86	3.187	3.125	AR&R 5 year, 20 minutes storm, average 85 mm/h, Zone 1			
Pipe1	0.093	2.02	4.69	4.33	AR&R 5 year, 5 minutes storm, average 150 mm/h, Zone 1			
Pipe3	0.048	1.14	3.331	3.26	AR&R 5 year, 20 minutes storm, average 85 mm/h, Zone 1			
CHANNEL DETAILS								
Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm					
OVERFLOW ROUTE DETAILS								
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF48	0	0	0	0	0	0	0	0
OF1	0	0	0	0	0	0	0	0
DETENTION BASIN DETAILS								
Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level			
OSD Basin	4.33	22.1	0.048	0.048	0			
CONTINUITY CHECK for AR&R 5 year, 1 hour storm, average 47.8 mm/h, Zone 1								
Node	Inflow (cu.m)	Outflow (cu.m)	Storage Chang (cu.m)	Difference %				
Pre	43.47	43.47	0	0				
Ground	5.8	5.8	0	-0.1				
Pit1	110.87	110.97	0	-0.1				
Outlet	110.97	110.97	0	0				
Roof	105.02	105.11	0	-0.1				
OSD Basin	105.11	105.07	0.04	0				
N1	0	0	0	0				

Run Log for C7011 run at 22:12:37 on 22/8/2016

No water upwelling from any pit. Freeboard was adequate at all pits.

Flows were safe in all overflow routes.

### 100 YEAR

DRAINS results prepared from Version 2016.08

#### PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Ground	4.3		0.01				
Pit1	3.46		0.076		0.84	0.024	Inlet Capacity
Outlet	3.19		0.024				
Roof	5.39		0.15				

#### SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Pre Site	0.115	0	0.115	2.25	7.25		0 AR&R 100 year, 20 minutes storm, average 138 mm/h, Zone 1
Bypass	0.01	0.002	0.009	2.25	12.34		0 AR&R 100 year, 20 minutes storm, average 138 mm/h, Zone 1
Roof Area	0.15	0.15	0	0.49	0		0 AR&R 100 year, 5 minutes storm, average 240 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.23 impervious + 0.28 pervious = 0.51 total ha)

Storm	Total Rainfal cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 5 min	101.28	69.12 (68.2%)	43.21 (95.0%)	25.92 (46.4%)
AR&R 100 year, 10 min	157.83	116.49 (73.8%)	68.60 (96.8%)	47.89 (55.1%)
AR&R 100 year, 20 min	232.94	177.92 (76.4%)	102.33 (97.8%)	75.59 (58.9%)
AR&R 100 year, 30 min	286.12	218.28 (76.3%)	126.20 (98.2%)	92.07 (58.4%)
AR&R 100 year, 1 hoi	400.06	307.79 (76.9%)	177.37 (98.7%)	130.43 (59.2%)
AR&R 100 year, 2 hoi	546.91	421.75 (77.1%)	243.31 (99.1%)	178.44 (59.2%)



PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe2	0.01	1.92	4.301	3.462	AR&R 100 year, 20 minutes storm, average 138 mm/h, Zone 1
Pipe4	0.105	2.22	3.352	3.19	AR&R 100 year, 1 hour storm, average 79 mm/h, Zone 1
Pipe1	0.149	3.24	5.39	4.4	AR&R 100 year, 5 minutes storm, average 240 mm/h, Zone 1
Pipe3	0.05	1.09	3.532	3.462	AR&R 100 year, 10 minutes storm, average 187 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF48	0.024	0.024	0	0.015	0.01	4		0.39 AR&R 100 year, 1 hour storm, average 79 mm/h, Zone 1
OF1	0.076	0.076	0	0.03	0.02	4		0.64 AR&R 100 year, 1 hour storm, average 79 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD Basin	4.4	36.7	0.126	0.05	0.076

CONTINUITY CHECK for AR&R 100 year, 20 minutes storm, average 138 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Chang (cu.m)	Difference %
Pre	68.75	68.75	0	0
Ground	8.2	8.2	0	0
Pit1	109.08	109.21	0	-0.1
Outlet	109.21	109.21	0	0
Roof	100.98	100.92	0	0.1
OSD Basin	100.92	100.88	0.04	0
N1	0	0	0	0

Run Log for C7011 run at 22:12:25 on 22/8/2016

No water upwelling from any pit. Freeboard was adequate at all pits.

Flows were safe in all overflow routes.