



Ibrahim Stormwater Consultants



REF : M9915-714763

STORMWATER DESIGN CALCULATIONS

AT 38 Lindley Avenue

Narrabeen

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1.0 Detention System Requirements

- 1.1 Storage-Area calcs.
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Files On Disk

M9915-714763 -DRAINS.DRN

2.0 Infiltration System Requirements

Borehole Report suggests rock within close proximity so Level Spreader design proposed

1.0 Detention System Requirements

1.1 Storage-Area calcs.

DATA:

Site Area Assessed due to easements

Site Area = **0.0619** ha **618.7** sq.m

Impervious Area Pre Development = **358.62** sqm

Percentage Impervious Pre Development = **0%** assumed

Impervious Area POST Development = **239.17** sqm

Percentage Impervious POST Development = **39%**

Catchment directed through OSD A = **151.4** sqm **63.3 %**

OSD Bypass Areas :	Impervious	87.77 sqm	37.0 %
	Pervious	149.53 sqm	63.0 %
	Total	237.3 sqm	

Area bypassing OSD B = **230** sqm
1

Slope of Site =	10.0 %	Time of Concentration t_c =
Effective Flow Length =	43.3 m	1 min. 1:5
Hortons n=	0.1	1 min. 1:100

FFL of house =	27.385 m
Roof Gutter Level =	30.375 m
Invert of Outlet =	26.2 m
Raintank Pad Level =	27.22 m
Freeboard to Roof Gutter=	1.135 m

Detention A

Volume Required **3.85** cu.m
Total Area **3.71** sq.m

Stage Storage-Discharge Relationship

Stage	Storage Area	Avg. Depth	Storage
(m)	(sq.m)	(m)	(cu.m)
28.08	0	0	0.000
29.08	3.71	1.000	3.710
29.12	3.71	1.04	3.854

Invert of pit = **28.08** m
Orifice Dia. = **38** mm
Max. Water Level achieved = **29.120** m
Storage achieved **3.85** cu.m

Basix Allowance

Raintank Basix = **3000** L
Raintank Provided = **3200** L
Water Level in Tank RL for Basix = **28.08** m = orifice IL.

Net OSD required **654** L -RL. **29.12** m
Nominal tank Volume used = **7500** L
Total Tank Height = **2.020** m TOP OF TANK.=29.24m

Overflow to ---> **OSD**, then Level Spreader

Trench Length = **4** m x **1** rows x **0.25** m wide

Detention B

Volume Required **7.50** cu.m
Total Area **30.00** sq.m

Stage Storage-Discharge Relationship

Stage	Storage Area	Avg. Depth	Storage
(m)	(sq.m)	(m)	(cu.m)
25.37	0	0	0.000
25.70	0.4	0.000	0.000
25.80	30.0	0.070	2.100
26.00	30.0	0.25	7.500

Invert of pit = **25.37** m
Orifice Dia. = **54** mm
Max. Water Level achieved = **26.000** m
Storage achieved **6.30** cu.m

1.2 DRAINS Data File for Pre & Post Developed Conditions

PIT / NODE DETAILS										Version 9											
Name	Type	Family	Size	Ponding	Pressure	Surface	Max Pond	Base	Blocking	x	y	Bolt-down	id	Part Full	Shock Loss						
				Volume	Change	Elev (m)	Depth (m)	Inflow	Factor												
				(cu.m)	Coeff. Ku			(cu.m/s)													
Pre	Node					10		0			256	-139		2							
Ground	Node					27.22		0			444	-153		8							
Level Spreader	OnGrade	Sutherland grate	Grated pit with 0.9 m x 0.4		1.5	25.67		0	0		618.441	-210.487	No	566686	1 x Ku						
Dummy Node	Node					25.37		0			664.978	-235.87		45							
Roof	Node					30.375		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 Length	id						
OSD -2	25.37		0.00	0.3 Orifice		54	25.397				571.865	-185.735	No		36990						
	25.70		0.36																		
	25.80		30.00																		
	26.00		30.00																		
OSD -1	28.08		3.71	0 Orifice		38	28.1008667				558	-103	No		5						
	29.08		3.71																		
	29.12		3.71																		
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 Time or Factor	Gutter Length (m)	Gutter Slope (%)	Gutter FlowFactor
Pre Site	Pre	0.0619	0	100	0	5	5	5	5	43.3	43.3	0	10.0	10.0	0	0.01	0.33	0	0		
Ground -2	Ground	0.02373	37.0	63.0	0	0	0	0	0	25	25	0	10.0	10.0	0	0.01	0.33	0	0		
bypass-2	Level Spreader	0.0230	0	100	0	0	0	0	0	43.3	43.3	0	7.0	7.0	0	0.01	0.33	0	0		
Roof Area	Roof	0.01514	100	0	0	0	0	0	0	21	0	0	20	0	0	0.01	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)		
Pipe2	Ground	OSD -2	45	25.67	25.37	1.44	uPVC, not un	150	154		0.03 NewFixed	1	Ground		0						
Pipe4	OSD -2	Level Spreader	5	25.37	25.27	2	uPVC, not un	150	154		0.03 NewFixed	1	OSD -2		0						
Pipe5	Level Spreader	Dummy Node	5	25.27	25.17	2	uPVC, not un	225	230		0.03 New	1	Level Spreader		0						
Pipe1	Roof	OSD -1	20	29.875	28.08	1	uPVC, not un	150	154		0.03 NewFixed	1	Roof		0						
Pipe3	OSD -1	OSD -2	10	28.08	25.47	9.8	uPVC, not un	150	154		0.03 NewFixed	1	OSD -1		0						
DETAILS of SERVICES CROSSING PIPES																					
Pipe	Chg (m)	Bottom Elev (m)	Height of St (m)	Chg (m)	Bottom Elev (m)	Height of : (m)	Chg (m)	Bottom Elev (m)	Height of \$ (m)	etc (m)											
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								
OVERFLOW ROUTE DETAILS																					
Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major (m)	SafeDepth Minor (m)	Safe Ston DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id								
OSD Overflow	OSD -2	Level Spreader	1	26	4	1.7	Pathway 6 m	0.1	0.05	0.4	1	0	37044								

1.3 DRAINS Summary of Pre & Post Developed Discharges

5 YEAR

DRAINS results prepared from Version 2020.061

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	25.81		0.007				
Level Spreader	25.34		0.004		0.33	0	None
Dummy Node	25.21		0				
Roof	29.91		0.007				

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	0.014		0	0.014	5	5	5 20% AEP, 10 min burst, Storm 8
Ground -2	0.006	0.003	0.003	0.89	7.22		0 20% AEP, 10 min burst, Storm 8
bypass-2	0.003	0	0.003	1.56	12.72		0 20% AEP, 20 min burst, Storm 10
Roof Area	0.006	0.006	0	0.59	0		0 20% AEP, 5 min burst, Storm 1

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	0.005		0.29	25.815	25.806 20% AEP, 10 min burst, Storm 8
Pipe4	0.004		0.47	25.626	25.341 20% AEP, 25 min burst, Storm 5
Pipe5	0.007		1.4	25.341	25.211 20% AEP, 20 min burst, Storm 10
Pipe1	0.007		2.27	29.908	28.544 20% AEP, 5 min burst, Storm 1
Pipe3	0.002		0.11	28.285	25.806 20% AEP, 20 min burst, Storm 6

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
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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
OSD Overflow	0	0	0.268		0	0	0	0
DISPERSAL	0	0	0.256		0	0	0	0

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD -2	25.81	1.3	0.004	0.004	0
OSD -1	28.54	1.7	0.002	0.002	0

Run Log for M9915 run at 08:29:13 on 8/5/2021 using version 2020.061

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 2020.061

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Version 8		Min Freeboard (m)	Overflow (cu.m/s)	Constraint
			Max Surface	Max Pond			
			Flow Arrivin	Volume			
			(cu.m/s)	(cu.m)			
Ground	26.03			0.018			
Level Spreader	25.37			0.012	0.3	0	None
Dummy Node	25.23			0			
Roof	29.92			0.013			

SUB-CATCHMENT DETAILS

Name	Max		Grassed		Grassed		Supp.	Due to Storm
	Flow Q	Paved	Max Q	Tc	Tc	Tc		
	(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)		
Pre Site	0.033		0	0.033	5	5		5 1% AEP, 10 min burst, Storm 1
Ground -2	0.013		0.005	0.007	0.7	5.72		0 1% AEP, 10 min burst, Storm 7
bypass-2	0.01		0	0.01	1.09	8.85		0 1% AEP, 10 min burst, Storm 9
Roof Area	0.011		0.011	0	0.48	0		0 1% AEP, 5 min burst, Storm 1

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S		Due to Storm
			HGL (m)	HGL (m)	
Pipe2	0.012		0.67	26.029	25.996 1% AEP, 5 min burst, Storm 1
Pipe4	0.005		0.36	25.749	25.373 1% AEP, 45 min burst, Storm 10
Pipe5	0.014		1.73	25.373	25.227 1% AEP, 10 min burst, Storm 3
Pipe1	0.012		2.75	29.918	29.115 1% AEP, 5 min burst, Storm 1
Pipe3	0.003		0.17	28.794	25.996 1% AEP, 25 min burst, Storm 1

CHANNEL DETAILS

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

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
OSD Overflow	0		0	0.843	0	0	0	0
DISPERSAL	0		0	7.665	0	0	0	0

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q	Max Q	Max Q	
			Total	Low Level	High Level	
OSD -2	26		7	0.005	0.005	0
OSD -1	29.12		3.8	0.003	0.003	0

Run Log for M9915 run at 08:30:07 on 8/5/2021 using version 2020.061

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

Flows were safe in all overflow routes.