STORMWATER ASSESSMENT

Lot 10, 3027 Channel Highway

Kettering

October 2024

GES

GEO-ENVIRONMENTAL

SOLUTIONS

Investigation Details

Client:	Bayden Reardon
Site Address:	Lot 10, 3027 Channel Highway, Kettering
Date of Inspection:	16/01/2024
Proposed Works:	Proposed new dwelling
Investigation Method:	Geoprobe 540UD - Direct Push
Inspected by:	M. Campbell

Site Details

Certificate of Title (CT):	60358/10
Title Area:	Approx. 1462 m²
Applicable Planning Overlays:	None identified
Slope & Aspect:	Approx. 12% N facing slope
Vegetation:	Grass & Weeds

Background Information

Geology Map:	MRT
Geological Unit:	Jurassic dolerite
Climate:	Annual rainfall approx. 900mm
Water Connection:	Tank
Sewer Connection:	Unserviced-On-site required

Investigation

A representative of bore hole was completed to identify the distribution and variation of the soil materials at the site. See soil profile conditions presented below.

Soil Profile Summary

BH 3 Depth (m)	USCS	Description
0.00-0.20	SM	**Silty SAND**: trace of gravel, grey, brown, slightly moist, loose,
0.20-0.30	Cl	**Silty CLAY**: trace of gravel, medium plasticity, grey, brown, slightly moist, stiff,
0.30-0.40	GW	**Sandy GRAVEL**: yellow, brown, slightly moist, dense, refusal.

Soil Conditions

Soils on the site are developing from Jurassic dolerite sandstone and consist of shallow silty clays over weathered gravels. The soil has a moderate estimated permeability of between 0.12 – 0.5m/day.

GES have identified the following at the site:

- The site has a gentle slope with an average grade of 12%. The site presents a low risk to slope stability and landslip.
- There are known proposals for a change of grade which may impact on any proposed onsite stormwater absorption.
- The site soils have been identified as comprising of silty topsoils overlying a silty clay layer underlain by weathered gravel materials.
- No soil dispersion was identified.
- No evidence of a water table was observed at the time of the investigation
- There is a low risk of the natural soils being impacted by contamination
- Bedrock was encountered at approximately 0.40m depth.

Soil Dispersion

The soils on site have not been identified as dispersive.

Summary

The soil and site are suitable for in-ground absorption of stormwater from the proposed structure. A hydraulic assessment and design for the absorption system has been completed by Flussig Engineers and can be found attached to this report with a form 35.

It is also recommended that regular inspection and maintenance is conducted to ensure the stormwater system is operating without obstruction. A schematic of recommended checks is also attached.

Please contact me if you have any further questions.

Dr John Paul Cumming B.Agr.Sc (hons) PhD CPSS GAICD

Director

GES Stormwater Maintenance Plan Checklist

Indicative frequency	Inspection and criteria	Maintenance activities (where required)
Annual	Check whether any tree branches overhang the roof or are likely to grow to overhang the roof	If safe and where permitted, consider pruning back any overhanging branches
	Check that access covers to storage tanks are closed	Secure any open access covers to prevent risk of entry
	Check that screens on inlets, overflows and other openings do not have holes and are securely fastened	Repair any defective screens to keep out mosquitoes
	Inspect tank water for presence of rats, birds, frogs, lizards or other vermin or insects	Remove any infestations, identify point of entry and close vermin and insect-proof mesh
	Inspect tank water for presence of mosquito larvae (inspect more frequently in sub-tropical and tropical northern Australia, based on local requirements)	Identify point of entry and close with insect-proof mesh with holes no greater than 1.6 mm in diameter
	Inspect gutters for leaf accumulation and ponding	Clean leaves from gutters-remove more regularly if required. If water is ponding, repair gutter to ensure water flows to downpipe
	Check signage at external roof water taps and that any removable handle taps are being properly used	Replace or repair the missing or damaged signage and fittings
	Check plumbing and pump connections are watertight/without leakage	Repair any leaks as necessary
	Check suction strainers, in-line strainers and pump location for debris	Clean suction strainers, in-line strainers or debris from pump location
	Check pump installation is adequate for reliable ongoing operation	Modify and repair as required
	Check first flush diverter, if present	Clean first flush diverter, repair and replace if necessary
	Check health of absorption trench area and surrounding grass or plants	Investigate any adverse impacts observed that might be due to irrigation
	Check condition of roof and coatings	Investigate and resolve any apparent changes to roof condition, such as loss of material coatings

Triennial	Drain, clean out and check the condition of the tank walls and roof to ensure no holes have arisen due to tank deterioration	Repair any tank defects
	Check sediment levels in the tank	Organise a suitable contractor to remove accumulated sediment if levels are approaching those that may block tank outlets
	Undertake a systematic review of operational control of risks to the system	Identify the reason for any problems during inspections and take actions to prevent failures occurring in future
After 20 years and then every 5 years	Monitor the effectiveness of the stormwater absorption area to assess for any clogging due to algal growth, or blocking due to tree roots/grass growth/trench failure.	Clean or replace clogged equipment
Ongoing	Inspect and follow up on any complaints or concerns raised that could indicate problems with the system	Repair or replace any problems that are notified

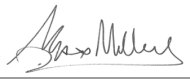
HYDRAULIC DESIGN REPORT

FE-24001-76 PERFORMANCE SOLUTION REPORT

Document Information

Title	Client	Document Number	Project Manager
Lot 10, 3027 Channel Hwy, Kettering TAS 7155 Performance Solution Report	**Geo Environmental Solutions PTY LTD**	FE-24001-76	**Manuri Alwis** *BEng (Hons)* *Civil Engineer*

Document Initial Revision

REVISION 00	Staff Name	Signature	Date
Prepared by	Manuri Alwis ***Civil Engineer***		08/11/2024
Reviewed by	Ash Perera ***Senior Hydraulic Engineer***		15/11/2024
Authorised by	Max W. Möller ***Principal Hydraulic Engineer***		15/11/2024

Document Revision History

Rev No.	Description	Reviewed by	Authorised by	Date

INTRODUCTION

This report details the stormwater management strategies for the proposed development located **Lot 10, 3027 Channel Hwy, Kettering TAS 7155**. The objective of the report is to demonstrate how stormwater runoff would be captured and conveyed from the subject site safely to the receiving drainage network while considering stormwater quantity management and the incorporation of stormwater tank and dispersive raingarden pit elements.

EXISTING CONDITIONS AND ASSUMPTIONS

The full site covers an area of approximately 1,424m² with proposed roof, gravel and concrete driveway of 220m², 29m² and 36m² respectively.

Stormwater from the site would be routed through the proposed conventional underground drainage system comprising of Grated Sumps and PVC Pipes, coupled with dispersive raingarden pit elements for on-site detention.

The stormwater management report is prepared in accordance with the design criteria listed below:

- The stormwater drainage system is designed using Bureau of Meteorology (BOM) published rainfall Intensity Frequency Duration (IFD) data as a minor / major system to accommodate the 5% AEP / 20 min storm events.
- The flow rate of stormwater leaving the site shall be designed so that it does not exceed the pre-developed flow rate for both the minor and major rain events.
- The total site discharges are modelled as described in *Storm Drainage Design in Small Urban Catchments,* a handbook for Australian practice by *Australian Rainfall and Runoff (ARR2019)*, Book 9 – Runoff in Urban Areas.

DETENTION COMPUTATIONS

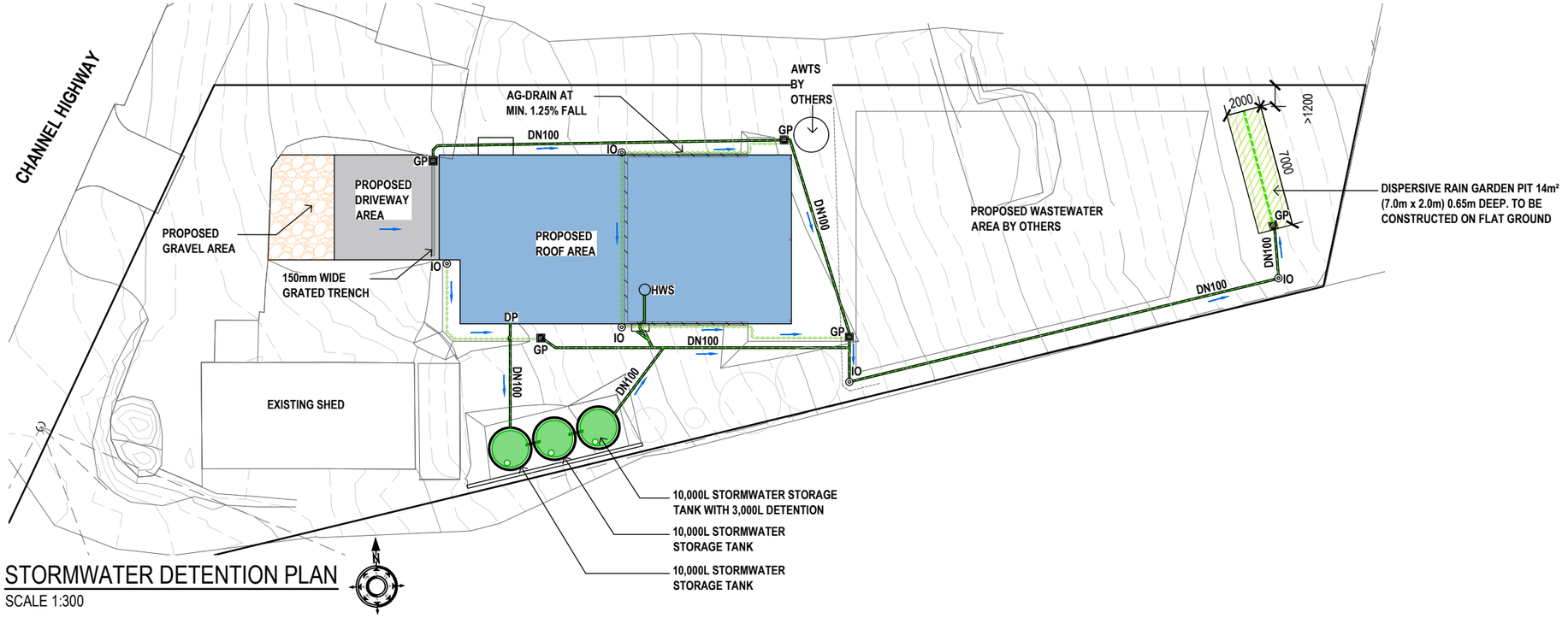
Detention calculations are provided in **Appendix B**

SUMMARY AND CONCLUSIONS

- The proposed 10,000 L stormwater tank is sized over a 20-minute stormwater duration with dedicated 3,000L detention for the proposed all proposed impervious roof area and the tank overflow will outflow into proposed dispersive raingarden pit of 14 m² base (7.00 m x 2.00 m) 0.65m deep. The gravel and concrete driveway areas are also detained in the dispersive raingarden pit.
- A DN100 slotted PVC pipe with geotextile covering on top of aggregate is to be installed within the dispersive raingarden pit.
- The performance solution drawing is schematic only and must be read in conjunction with construction plans provided by others.

APPENDIX A

STORMWATER CONCEPT DRAWING



STORMWATER DETENTION PLAN

SCALE 1:300

NEW SERVICES

- STORMWATER PIPE
- STORMWATER FLOW DIRECTION
- GRATED STORMWATER PIT. 450X450 CLASS A
  ACO GALVANISED HEELGUARD OR SIMILAR ENGINEER APPROVED
- STORMWATER STORAGE TANK

STORMWATER SERVICES NOTES:

1. ALL SITE SAFETY & MANAGEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE DEPARTMENT OF STATE GROWTH SPECIFICATIONS:
   SECTION 168 OCCUPATIONAL HEALTH AND SAFETY
   & SECTION 176 ENVIRONMENTAL MANAGEMENT.
2. ALL PIPES UNDER TRAFFIC ABLE AREAS ARE TO BE BACK FILLED FULL DEPTH WITH 20 F.C.R. AND FULLY COMPACTED.
3. ALL STORM WATER PIPES TO BE PVC-U-SWJ CLASS "SN8" TO AS 1254 UNO.
4. ALL DRAIN AND TRENCH CONSTRUCTION SHALL COMPLY WITH THE LGAT STANDARD DRG TSD G01.
5. ANY EXCAVATED TRENCHES IN EXCESS OF 1.5M IN DEPTH ARE TO BE ADEQUATELY SHORED TO PREVENT COLLAPSE DURING WORKS.

PERFORMANCE SOLUTION COMPLIANCE NOTES:

AS 3500.3 - CL 7.10

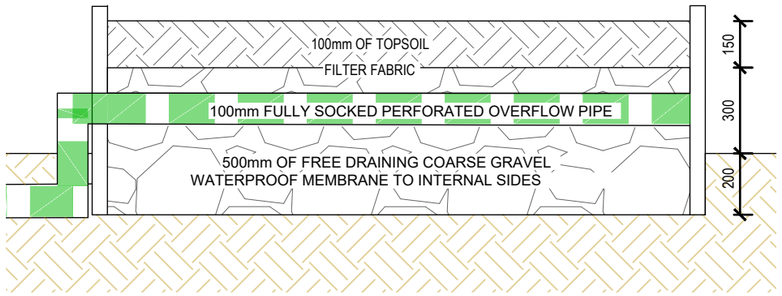
- 7.10.1 - OVERFLOW IS SAFE AND DOES NOT COMPROMISE FREEBOARD TO HABITABLE SPACES.

GENERAL

- AS/NZS 3500.3: PART 3 STORMWATER DRAINAGE AUSTRALIAN RAINFALL AND RUN-OFF VOLUME 8: URBAN STORMWATER MANAGEMENT
- AUSTRALIAN RUNOFF QUALITY - A GUIDE TO WATER SENSITIVE URBAN DESIGN
- STORM DRAINAGE DESIGN IN SMALL URBAN CATCHMENTS: A HANDBOOK FOR AUSTRALIAN PRACTICE
- WATER SENSITIVE URBAN DESIGN (WSUD) ENGINEERING PROCEDURE: STORMWATER
- WATER SERVICES ASSOCIATION OF AUSTRALIA CODE (WSAA).

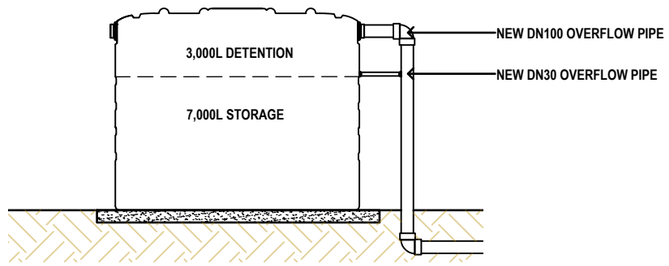
SITE AREA=1424 m²

- PROPOSED SHED ROOF AREA 220 m²
- PROPOSED CONCRETE AREA 36 m²
- PROPOSED DRIVEWAY GRAVEL AREA 29 m²



DISPERSIVE RAINGARDEN PIT CROSS SECTION TYPICAL

SCALE 1:20



STORMWATER TANK WITH DETENTION CROSS SECTION TYPICAL

NTS

NOTE:

REPORT AND DESIGN TO BE READ IN CONJUNCTION WITH CONSTRUCTION PLANS BY OTHERS

NOTES :

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2. WORK TO FIGURED DIMENSIONS ONLY.
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REV:	DESCRIPTION:	BY:	DATE:
STATUS:	CONSTRUCTION		

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CLIENT: GEO ENVIRONMENTAL SOLUTIONS PTY LTD	SITE: LOT 10, 3027 CHANNEL HWY, KETTERING TAS 7155
	TITLE: PERFORMANCE SOLUTION DESIGN
PROJECT: PROPOSED NEW DWELLING	SCALE AT A3: AS SHOWN / DATE: 11.11.2024 / DRAWN: MA / CHECKED: MM
	PROJECT NO: FE-24001- 76 / DRAWING NO: C-100 / REVISION: 00

APPENDIX B
DETENTION COMPUTATIONS

STORMWATER DETENTION V5.05

Flussig Engineers

Location: **Kettering TAS**
Site: **220m² with tc = 20 and tcs = 15 mins.**
PSD: **AEP of 5%, Above ground PSD = 0.86L/s**
Storage: **AEP of 5%, Above ground volume = 2.81m³**

Design Criteria

(Custom AEP IFD data used)

Location = Kettering TAS
Method = E (A)RI 2001,A(E)P 2019

PSD annual exceedance probabiliy (APE) = 5 %
Storage annual exceedance probabiliy (APE) = 5 %

Storage method = A (A)bove,(P)ipe,(U)nderground,(C)ustom

Site Geometry

Site area (As) = 220 m² = 0.022 Ha
Pre-development coefficient (Cp) = 0.30
Post development coefficient (Cw) = 1.00

Total catchment (tc) = 20 minutes
Upstream catchment to site (tcs) = 15 minutes

Coefficient Calculations

Pre-development

Zone	Area (m²)	C	Area * C
Concrete	0	0.90	0
Roof	0	1.00	0
Gravel	0	0.50	0
Garden	220	0.30	66
Total	220 m²		66

Cp = ΣArea*C/Total = 0.300

Post development

Zone	Area (m²)	C	Area * C
Concrete	0	0.90	0
Roof	220	1.00	220
Gravel	0	0.50	0
Garden	0	0.30	0
Total	220 m²		220

Cw = ΣArea*C/Total = 1.000

Permissible Site Discharge (PSD) (AEP of 5%)

PSD Intensity (I) = 45.0 mm/hr For catchment tc = 20 mins.
Pre-development (Qp = Cp*I*As/0.36) = 0.83 L/s
Peak post development (Qa = 2*Cw*I*As/0.36) = 5.51 L/s =(0.122 x I) Eq. 2.24

Storage method = A (A)bove,(P)ipe,(U)nderground,(C)ustom
Permissible site discharge (Qu = PSD) = 0.861 L/s

Above ground - Eq 3.8

$0 = PSD^2 - 2*Qa/tc*(0.667*tc*Qp/Qa + 0.75*tc+0.25*tcs)*PSD + 2*Qa*Qp$
Taking x as = PSD and solving
a = 1.0 b = -11.4 c = 9.1
$PSD = -b \pm \sqrt{(b^2-4ac)}/(2a)$
PSD = 0.861 L/s

Below ground pipe - Eq 3.3

$Qp = PSD*[1.6*tcs/\{tc*(1-2*PSD/(3*Qa))\}-0.6*tcs^{2.67}/\{tc*(1-2*PSDp/(3*Qa))\}^{2.67}]$
= 0.83
PSD = 0.855 L/s

Below ground rectangular tank - Eq 3.4

$t = tcs/(tc*(1-2*PSD/(3*Qa))) =$ 0.834
$Qp = PSD*[0.005-0.455*t+5.228*t^2-1.045*t^3-7.199*t^4+4.519*t^5]$
= 0.83
PSD = 0.829 L/s

Design Storage Capacity (AEP of 5%)

Above ground (Vs) = [0.5*Qa*td-[(0.875*PSD*td)(1-0.917*PSD/Qa)+(0.427*td*PSD²/Qa)]]*60/10³ m³ Eq 4.23
Below ground pipe (Vs) = [(0.5*Qa-0.637*PSD+0.089*PSD²/Qa)*td]*60/10³ m³ Eq 4.8
Below ground rect. tank (Vs) = [(0.5*Qa-0.572*PSD+0.048*PSD²/Qa)*td]*60/10³ m³ Eq 4.13

td (mins)	I (mm/hr)	Qa (L/s)	Above Vs (m³)	Pipe Vs (m³)	B/G Vs (m³)
5	87.8	10.7	1.39		
21	43.8	5.4	2.49		
29	36.1	4.4	2.64		
37	31.2	3.8	2.73		
45	27.8	3.4	2.77		
53	25.3	3.1	2.80		
61	23.3	2.8	2.81		
69	21.7	2.7	2.81		
77	20.5	2.5	2.81		
85	19.4	2.4	2.80		

Table 1 - Storage as function of time for AEP of 5%

Type	td (mins)	I (mm/hr)	Qa (L/s)	Vs (m³)
Above	68.2	21.9	2.7	**2.81**
Pipe				
B/ground				

Table 2 - Storage requirements for AEP of 5%

Frequency of operation of Above Ground storage

Qop2 = 0.75 Cl 2.4.5.1
Qp2 =Qop2*Qp1 (where Qp1=PSD) = 0.65 L/s at which time above ground storage occurs
I = 360*Qp2/(2*Cw*As*10³) = 5.3 mm/h Eq 4.24

Period of Storage

Time to Fill:

Above ground (tf) = td*(1-0.92*PSD/Qa) Eq 4.27
Below ground pipe (tf) = td*(1-2*PSD/(3*Qa)) Eq 3.2
Below ground rect. tank (tf) = td*(1-2*PSD/(3*Qa)) Eq 3.2

Time to empty:

Above ground (te) = (Vs+0.33*PSD²*td/Qa*60/10³)*(1.14/PSD)*(10³/60) Eq 4.28
Below ground pipe (te) = 1.464/PSD*(Vs+0.333*PSD²*td/Qa*60/10³)*(10³/60) Eq 4.32
Below ground rect. tank (te) = 2.653/PSD*(Vs+0.333*PSD²*td/Qa*60/10³)*(10³/60) Eq 4.36

Storage period (Ps = tf + te) Eq 4.26

Type	td (mins)	Qa (L/s)	Vs (L/s)	tf (mins)	te (mins)	Ps (mins)
Above	68.2	2.7	2.8	48.0	70.4	118.4
Pipe						
B/ground						

Table 3 - Period of Storage requirements for AEP of 5%

Orifice

Permissible site discharge (Qu=PSD) = 0.86 L/s (Above ground storage)
Orifice coefficient (CD) = 0.61 For sharp circular orifice
Gravitational acceration (g) = 9.81 m/s²
Maximum storage depth above orifice (H) = 666 mm
Orifice flow (Q) = CD*Ao*√(2*g*H)

Therefore:
Orifice area (Ao) = 390 mm²
Orifice diameter (D = √(4*Ao/π)) = 22.3 mm

STORMWATER DETENTION V5.05

Flussig Engineers

Location: **Kettering TAS**
Site: **65m² with tc = 20 and tcs = 15 mins.**
PSD: **AEP of 5%, Underground rectangular tank PSD = 0.24L/s**
Storage: **AEP of 5%, Underground rectangular tank volume = 0.62m³**

Design Criteria

(Custom AEP IFD data used)

Location =	Kettering TAS	
Method =	E	(A)RI 2001,A(E)P 2019
PSD annual exceedance probabiliy (APE) =	5	%
Storage annual exceedance probabiliy (APE) =	5	%
Storage method =	U	(A)bove,(P)ipe,(U)nderground,(C)ustom

Site Geometry

Site area (As) =	65	m²	=	0.0065 Ha
Pre-development coefficient (Cp) =	0.30			
Post development coefficient (Cw) =	0.72			
Total catchment (tc) =	20	minutes		
Upstream catchment to site (tcs) =	15	minutes		

Coefficient Calculations

Pre-development

Zone	Area (m²)	C	Area * C
Concrete	0	0.90	0
Roof	0	1.00	0
Gravel	0	0.50	0
Garden	65	0.30	20
Total	65 m²		20

Cp = ΣArea*C/Total = 0.300

Post development

Zone	Area (m²)	C	Area * C
Concrete	36	0.90	32
Roof	0	1.00	0
Gravel	29	0.50	15
Garden	0	0.30	0
Total	65 m²		47

Cw = ΣArea*C/Total = 0.722

Permissible Site Discharge (PSD) (AEP of 5%)

PSD Intensity (I) =	45.0	mm/hr	For catchment tc = 20 mins.	
Pre-development (Qp = Cp*I*As/0.36) =	0.24	L/s		
Peak post development (Qa = 2*Cw*I*As/0.36) =	1.17	L/s	=(0.026 x I)	Eq. 2.24
Storage method =	U	(A)bove,(P)ipe,(U)nderground,(C)ustom		
Permissible site discharge (Qu = PSD) =	0.243	L/s		

Above ground - Eq 3.8

$0 = PSD^2 - 2*Qa/tc*(0.667*tc*Qp/Qa + 0.75*tc+0.25*tcs)*PSD + 2*Qa*Qp$

Taking x as = PSD and solving

a = 1.0 b = -2.5 c = 0.6

$PSD = -b \pm \sqrt{(b^2-4ac)}/(2a)$

PSD = 0.252 L/s

Below ground pipe - Eq 3.3

$Qp = PSD*[1.6*tcs/\{tc*(1-2*PSD/(3*Qa))\}-0.6*tcs^{2.67}/\{tc*(1-2*PSDp/(3*Qa))\}^{2.67}]$

= 0.24

PSD = 0.981 L/s

Below ground rectangular tank - Eq 3.4

$t = tcs/(tc*(1-2*PSD/(3*Qa)))$ = 0.870

$Qp = PSD*[0.005-0.455*t+5.228*t^2-1.045*t^3-7.199*t^4+4.519*t^5]$

= 0.24

PSD = 0.243 L/s

Design Storage Capacity (AEP of 5%)

Above ground (Vs) = [0.5*Qa*td-[(0.875*PSD*td)(1-0.917*PSD/Qa)+(0.427*td*PSD²/Qa)]]*60/10³ m³ Eq 4.23
Below ground pipe (Vs) = [(0.5*Qa-0.637*PSD+0.089*PSD²/Qa)*td]*60/10³ m³ Eq 4.8
Below ground rect. tank (Vs) = [(0.5*Qa-0.572*PSD+0.048*PSD²/Qa)*td]*60/10³ m³ Eq 4.13

td (mins)	I (mm/hr)	Qa (L/s)	Above Vs (m³)	Pipe Vs (m³)	B/G Vs (m³)
5	87.8	2.3			0.30
19	46.4	1.2			0.53
26	38.6	1.0			0.57
33	33.4	0.9			0.59
40	29.8	0.8			0.61
47	27.1	0.7			0.61
54	25.0	0.6			0.62
61	23.3	0.6			0.62
68	21.9	0.6			0.62
75	20.8	0.5			0.61

Table 1 - Storage as function of time for AEP of 5%

Type	td (mins)	I (mm/hr)	Qa (L/s)	Vs (m³)
Above				
Pipe				
B/ground	60.2	23.5	0.6	**0.62**

Table 2 - Storage requirements for AEP of 5%

Frequency of operation of Above Ground storage

Qop2 = 0.75 Cl 2.4.5.1
Qp2 =Qop2*Qp1 (where Qp1=PSD) = 0.19 L/s at which time above ground storage occurs
I = 360*Qp2/(2*Cw*As*10³) = 7.3 mm/h Eq 4.24

Period of Storage

Time to Fill:

Above ground (tf) = td*(1-0.92*PSD/Qa) Eq 4.27
Below ground pipe (tf) = td*(1-2*PSD/(3*Qa)) Eq 3.2
Below ground rect. tank (tf) = td*(1-2*PSD/(3*Qa)) Eq 3.2

Time to empty:

Above ground (te) = (Vs+0.33*PSD²*td/Qa*60/10³)*(1.14/PSD)*(10³/60) Eq 4.28
Below ground pipe (te) = 1.464/PSD*(Vs+0.333*PSD²*td/Qa*60/10³)*(10³/60) Eq 4.32
Below ground rect. tank (te) = 2.653/PSD*(Vs+0.333*PSD²*td/Qa*60/10³)*(10³/60) Eq 4.36

Storage period (Ps = tf + te) Eq 4.26

Type	td (mins)	Qa (L/s)	Vs (L/s)	tf (mins)	te (mins)	Ps (mins)
Above						
Pipe						
B/ground	60.2	0.6	0.6	44.3	133.8	178.1

Table 3 - Period of Storage requirements for AEP of 5%

Orifice

Permissible site discharge (Qu=PSD) = 0.24 L/s (Underground storage)
Orifice coefficient (CD) = 1 For sharp circular orifice
Gravitational acceration (g) = 9.81 m/s²
Maximum storage depth above orifice (H) = 650 mm
Orifice flow (Q) = CD*Ao*√(2*g*H)

Therefore:
Orifice area (Ao) = 68 mm²
Orifice diameter (D = √(4*Ao/π)) = 9.3 mm

Dispersive raingarden pit

Hydrology		
A1 = impervious area collected	220	sqm
C1 = coefficient (Roof)	1.0	
A2=Impervious area (Concrete & gravel)	65	sqm
C2= Coefficient	0.72	
AEP = Annual Exceedance Probability	5	%
Ground Conditions		
Hydraulic conductivity K (absorption rate)	0.2153	mm/min
Adjusted rate (15% clogging factor)	0.1830	mm/min
Pit Design		
Length, L	7	m
Width, B	2	m
Depth, h	0.65	m
Base area, BA	14	sqm
Void space	35%	
Pit Storage	3.185	cum
	3185.00	L

Detention tank data		
Tank storage	3.00	cum
Tank Underflow	1.10	L/s
Tank Underflow	66.00	L/m
Total available detention storage (tank + Pit)	6.185	cum
	6185	L

Final Check			
Criteria	**Required**	**Design**	**Check**
Total Detention Required	3,900	6185	**OK**
Trench capacity underflow for 5% AEP 20-minute storm	1971	3185	**OK**

Checking storms

	Duration (min)	Intensity (mm/hr)	Vol in System(L)	Vol in Pit (L)	Vol out Pit (L)	Storage total System (L)	Storage Pit (L)	Hours to empty Pit
5Mins	5	87.8	1952	672	13	**1939**	**660**	4
6Mins	6	83.36	2224	786	15	**2209**	**771**	5
10Mins	10	65.6	2917	1172	26	**2891**	**1146**	8
20Mins	20	45	4002	2022	51	**3951**	**1971**	13
30Mins	30	35.4	4722	1722	77	**4646**	**1646**	11
1Hr	60	23.5	6270	3270	154	**6116**	**3116**	21
2Hrs	120	16.2	8644	5644	307	**8337**	**5337**	37
3Hrs	180	13.4	10725	7725	461	**10264**	**7264**	50
6Hrs	360	9.91	15864	12864	922	**14942**	**11942**	84
12Hrs	720	7.31	23404	20404	1845	**21559**	**18559**	133
24Hrs	1440	5.06	32400	29400	3689	**28711**	**25711**	191
48Hrs	2880	3.1	39700	36700	7378	**32322**	**29322**	239
72Hrs	4320	2.19	42069	39069	11067	**31002**	**28002**	254

IFD Design Rainfall Intensity

Location

Label: Lot 10, 3027 Channel Hwy, Kettering TAS 7155

Latitude: -43.1298 [Nearest grid cell: 43.1375 (S)]

Longitude: 147.2488 [Nearest grid cell: 147.2375 (E)]

IFD Design Rainfall Intensity (mm/h)

Issued: 11 November 2024

Rainfall intensity for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
FAQ for New ARR probability terminology

Table | Chart

Unit: mm/h

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	62.5	71.0	99.5	121	143	175	201
2 min	53.7	60.7	82.8	98.0	113	133	148
3 min	47.6	53.8	74.0	88.1	102	121	136
4 min	42.9	48.6	67.3	80.7	94.3	113	128
5 min	39.2	44.4	61.9	74.6	87.8	106	121
10 min	28.2	32.1	45.2	55.1	65.6	80.9	93.8
15 min	22.8	25.9	36.5	44.5	53.1	65.6	76.1
20 min	19.5	22.1	31.1	37.9	45.0	55.5	64.3
25 min	17.2	19.5	27.4	33.3	39.5	48.5	55.9
30 min	15.6	17.7	24.7	29.9	35.4	43.3	49.8
45 min	12.5	14.2	19.7	23.7	27.8	33.6	38.3
1 hour	10.7	12.1	16.8	20.1	23.5	28.2	31.9
1.5 hour	8.68	9.86	13.6	16.2	18.8	22.3	25.0
2 hour	7.51	8.55	11.8	14.0	16.2	19.1	21.4
3 hour	6.16	7.05	9.78	11.6	13.4	15.7	17.5
4.5 hour	5.07	5.83	8.16	9.71	11.2	13.1	14.6
6 hour	4.41	5.09	7.18	8.57	9.91	11.7	13.0
9 hour	3.59	4.17	5.97	7.17	8.33	9.89	11.1
12 hour	3.09	3.59	5.18	6.26	7.31	8.74	9.83
18 hour	2.45	2.86	4.17	5.07	5.96	7.19	8.15
24 hour	2.05	2.39	3.50	4.28	5.06	6.13	6.98
30 hour	1.77	2.06	3.02	3.70	4.38	5.33	6.09
36 hour	1.56	1.82	2.65	3.25	3.86	4.70	5.38
48 hour	1.26	1.47	2.13	2.61	3.10	3.78	4.33
72 hour	0.921	1.06	1.52	1.85	2.19	2.66	3.04
96 hour	0.729	0.835	1.18	1.43	1.68	2.02	2.30
120 hour	0.608	0.693	0.968	1.16	1.36	1.63	1.84
144 hour	0.525	0.596	0.825	0.984	1.14	1.36	1.54
168 hour	0.465	0.528	0.725	0.860	0.992	1.18	1.33

Note:
The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.
* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

CERTIFICATE OF THE RESPONSIBLE DESIGNER

Section 94
Section 106
Section 129
Section 155

Form **35**

To: Bayden Reardon *Owner name*

Address

Suburb/postcode

Designer details:

Name: Max W. Moller

Category: Civil

Business name: Flussig Engineers

Phone No: 0431 080 279

Business address: L4 116 Bathurst St

HOBART 7000

Fax No: N/A

Licence No: 650370893

Email address: max@flussig.com.au

Details of the proposed work:

Owner/Applicant Bayden Reardon

Designer's project reference No. FE_24001-76

Address: Lot 10, 3027 Channel Highway,

Lot No:

Kettering

Type of work: Building work ☐ Plumbing work ☒ *(X all applicable)*

Description of work:

On-Site stormwater system - design

(new building / alteration / addition / repair / removal / re-erection water / sewerage / stormwater / on-site wastewater management system / backflow prevention / other)

Description of the Design Work (Scope, limitations or exclusions): *(X all applicable certificates)*

Certificate Type:	Certificate	Responsible Practitioner
	☐ Building design	Architect or Building Designer
	☐ Structural design	Engineer or Civil Designer
	☐ Fire Safety design	Fire Engineer
	☒ Civil design	Civil Engineer or Civil Designer
	Hydraulic design	Building Services Designer
	☐ Fire service design	Building Services Designer
	☐ Electrical design	Building Services Designer
	☐ Mechanical design	Building Service Designer
	☐ Plumbing design	Plumber-Certifier; Architect, Building Designer or Engineer
	☐ Other (specify)	

Deemed-to-Satisfy: ☐ Performance Solution: ☒ (*X the appropriate box*)

Other details:

Onsite stormwater retention

Design documents provided:

The following documents are provided with this Certificate –

Document description:

Drawing numbers: FE-24001-76_REV00-C100 FE-24001-76_REV00-C101	Prepared by: Flussig Engineers	Date: 15.11.24
Schedules:	Prepared by:	Date:
Specifications: Performance Solution Report	Prepared by: Flussig Engineers	Date: 15.11.24
Computations: Performance solution Report	Prepared by: Flussig Engineers	Date:15.11.24
Performance solution proposals: Onsite stormwater retention	Prepared by: Flussig Engineers	Date:15.11.24
Test reports:	Prepared by:	Date:

Standards, codes or guidelines relied on in design process:

AS1547-2012 On-site domestic wastewater management.

AS3500 (Parts 0-5)-2013 Plumbing and drainage set.

Any other relevant documentation:

GES stormwater assessment 'Site assessment - Lot 10, 3027 Channel Highway, Kettering'

Attribution as designer:

I Max W. Moller, am responsible for the design of that part of the work as described in this certificate;

The documentation relating to the design includes sufficient information for the assessment of the work in accordance with the *Building Act 2016* and sufficient detail for the builder or plumber to carry out the work in accordance with the documents and the Act;

This certificate confirms compliance and is evidence of suitability of this design with the requirements of the National Construction Code.

Max W. Moller — 15.11.24

Licence No: 650370893

Assessment of Certifiable Works: (TasWater)

Note: single residential dwellings and outbuildings on a lot with an existing sewer connection are not considered to increase demand and are not certifiable.

If you cannot check ALL of these boxes, LEAVE THIS SECTION BLANK.

TasWater must then be contacted to determine if the proposed works are Certifiable Works.

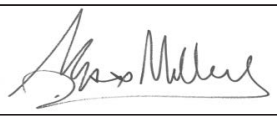
I confirm that the proposed works are not Certifiable Works, in accordance with the Guidelines for TasWater CCW Assessments, by virtue that all of the following are satisfied:

- [x] The works will not increase the demand for water supplied by TasWate
- [x] The works will not increase or decrease the amount of sewage or toxins that is to be removed by, or discharged into, TasWater's sewerage infrastructure
- [x] The works will not require a new connection, or a modification to an existing connection, to be made to TasWater's infrastructure
- [x] The works will not damage or interfere with TasWater's works
- [x] The works will not adversely affect TasWater's operations
- [x] The work are not within 2m of TasWater's infrastructure and are outside any TasWater easement
- [x] I have checked the LISTMap to confirm the location of TasWater infrastructure
- [x] If the property is connected to TasWater's water system, a water meter is in place, or has been applied for to TasWater.

Certification:

I ..... Max W. Moller..... being responsible for the proposed work, am satisfied that the works described above are not Certifiable Works, as defined within the *Water and Sewerage Industry Act 2008,* that I have answered the above questions with all due diligence and have read and understood the Guidelines for TasWater CCW Assessments.

Note: the Guidelines for TasWater Certification of Certifiable Works Assessments are available at: www.taswater.com.au

	Name: (print)	*Signed*	*Date*
Designer:	Max W. Moller		15.11.24