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STORMWATER MANAGEMENT PLAN

FOR

109 Old Peterborough Road, Peterborough

Project Number: 22-158

Date: 30th of August 2023

QUALITY ISO 9001
SAFETY AS/NZS 4801
ENVIRONMENT ISO 14001

Document Verification

Project Name	109 Old Peterborough Road, Peterborough
Client Contact	[redacted]
Project Number	22-158
Document Name	22-158 Preliminary SWMP REV-B

Document History

Issued To	Date	Version	Author	Reviewer
[redacted]	10/3/23	-	G.S	J.B
[redacted]	30/8/23	A	G.S	J.B
[redacted]	25/3/24	B	G.S	J.B

Accreditation

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Reviewer: [redacted]

Accreditation: BEng (Civil)(Hons), MIEAust

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1.0 Introduction

SITEC has been engaged to compile a Storm Water Management Plan for the 5.876 Ha site, along Old Peterborough Road, Peterborough on behalf of Westrock Pty Ltd.

This report is to accompany the planning permit application documents and associated planning information submitted to the Moyne Shire Council for the subdivision and development of the land into residential allotments.

This report provides information about the site and the way in which storm water run-off will be conveyed to the proposed outfall points. It also provides explanation of stormwater treatment methods prior to entry into the neighbouring land. Figure 1 provides a locality plan and indicates the location of the proposed development.

Figure 1 - Locality Plan

2.0 Site Description

The site is currently zoned General Residential Zone (GRZ1) which borders the existing Old Peterborough Road to the east, the existing Antares Estate to the south, the existing caravan park subdivision to the west and the Couch farm land to the north.

2.1 Proposed Development

Figure 2 below demonstrates the preliminary layout for the proposed development. It will consist of approximately 57 residential lots with vehicle access streets throughout the currently vacant site. The site will also contain a pedestrian footpath, two stormwater treatment areas and landscaping opportunities.

Figure 2 – Preliminary Development Concept Layout

2.2 Existing Catchment and Outfalls

The existing site to be development contains paddocks that have been used for agricultural purposes with shallow depressions across the site that act as natural dams. This site can be accessed by Old Peterborough Road as indicated in figure 1 & 2. The site's approximate high point is located through the southwest corner of the development with a height of 10.46m. Whilst the approximate low point is located in the northeast corner of the development with a height of 4.80m. Hence the stage naturally falls from the southwest corner to the northeast corner. As there are multiple low area across the site stormwater currently is contained in these areas and soaks away. A stormwater drainage network has previously been installed through the development site to collect the stormwater from this proposed development and the upstream existing subdivision (Antares Estate) to the south. The outfall of this existing stormwater network is then directed into the swales in the northern property. The stormwater then drains into the pipe network beneath Old Peterborough Road and into Antares Street. This network was created through the Moyne Shires Peterborough Drainage Scheme (Project number 07-566). The stormwater from this drainage network discharges into the Curdies River (Peterborough Coastal Reserve).

In addition, prior to this stormwater entering the Antares Street pipe network, there is another catchment that joins this swale before crossing the Old Peterborough Road. This catchment includes the development runoff from the nearby caravan Park, the associated caravan park subdivision, the proposed future subdivision located west of MacGillivary Road and the upgrade/extension of MacGillivary Road. Following these catchments combining on the west of the Old Peterborough Road, the stormwater is directed under this road in a 1050mm concrete pipe. The stormwater continues down Antares Street, collecting stormwater from the neighbouring houses before reaching the twin 750mm diameter outfall pipes that discharge into Curdies River. The overall catchment plan is shown in Appendix E.

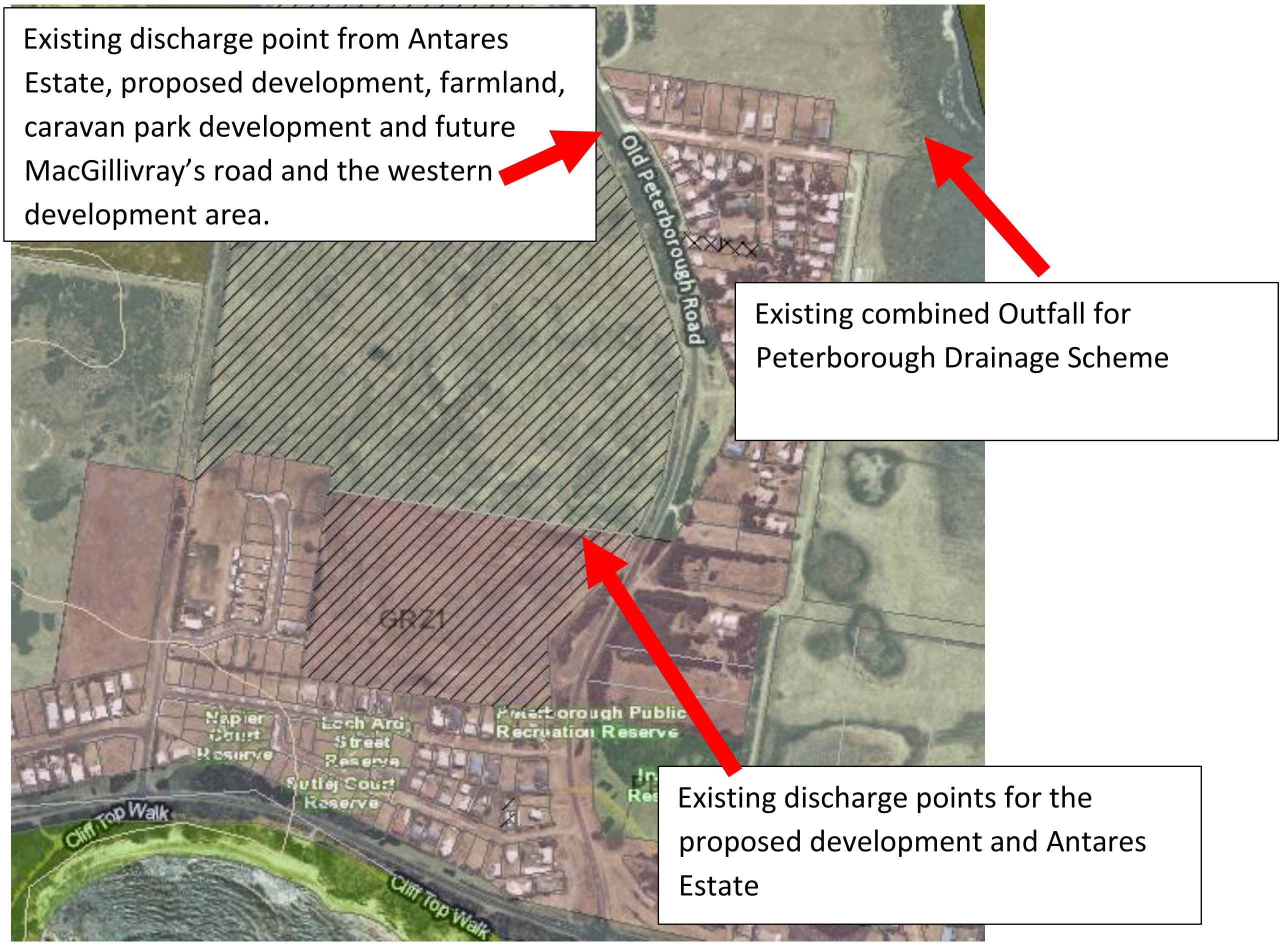

Figure 3 – Development site showing the proposed outfall locations for each catchment

Currently the majority of the stormwater remains within the subject site and soaks into the soil during a minor rain event. In major events, storm water flows from the site and into the existing swale drain and into the neighbouring paddocks to the north.

There are several items requiring attention for this development which will be addressed in this report. These items include the storm water retention on site and the treatment of the storm water before it enters the existing storm water network.

3.0 Requirements and Constraints

The proposed subdivision include:

- The storm water discharge from the development will be limited to predevelopment runoff for a 20% AEP storm event.
- If the post development runoff is greater than the predevelopment runoff, on-site retention (storage) will be required.
- The underground stormwater network will be required to convey the stormwater from a 20% AEP event to the LPOD.
- The stormwater generated from the proposed development will not further impede on the existing, neighbouring properties.
- Measures to enhance stormwater discharge quality from the site to protect downstream waterways will be required.
- Stormwater from a 1% AEP storm event is required to pass through the development via the road or drainage reserves without further impeding on facilities or neighbouring properties.

3.1 Flood Storage Requirements

Council will require runoff from the site to be restricted to pre-development levels. This has been taken as the 20% AEP post-development outflows from the subject site must be restricted to pre-development flow rates prior to entering the existing stormwater network.

3.2 Flood Level Requirements

The 1% AEP flood event will be required to be contained in the road reserve and drainage infrastructure.

3.3 Water Sensitive Urban Design (WSUD) Requirements

Clause 56.07-4 of the Victorian State Planning provisions states that urban stormwater management systems must be designed to meet current best practice management performance objectives for stormwater quality management in the Urban Stormwater – Best Practice Environmental Management Guidelines (CSIRO 1999). The Best Practice Environmental Management Guidelines (BPEMG) objectives for environmental management of stormwater pollutants are:

- Total Suspended Solids (TSS) 80% retention of the typical urban annual load
- Total Phosphorus (TP) 45% retention of the typical urban annual load
- Total Nitrogen (TN) 45% retention of the typical urban annual load
- Gross Pollutants 70% retention of the typical urban annual load

3.4 Asset Ownership and Maintenance

As this site will be constructed to IDM requirements and to council's satisfaction, the stormwater network including treatment areas will be owned by the Moyne Shire Council once statement of compliance is reached. Hence the maintenance for the drainage and WSUD assets will be the responsibility of the Moyne Shire Council.

3.5 Applicable Standards

All stormwater treatment elements and overland flow paths will be designed to the following:

- Australian Rainfall and Runoff 2019 (Ball et al. 2019);
- Infrastructure Design Manual (Local Government Infrastructure Design Association, V5.4, 2022);
- WSUD Engineering Procedures: Stormwater Melbourne (Melbourne Water, 2005).

4.0 Proposed Strategy

The SWMP proposed is briefly shown in detail in Appendix A and further shown in the associated documents (Detailed Design). The sections below provide commentary on key aspects of the strategy.

4.1 Stormwater Treatment Elements

The developments stormwater will be collected in two separate catchments. The first catchment collects stormwater from the western section of the development which includes Road B and area to the west of this road. Whilst the second catchment collects stormwater from the eastern section of the development which includes the area to the east of Road B. A catchment plan demonstrating the breakdown of the catchment and the treatment areas for each catchment is available in Appendix E. Each of these simple catchments (both the western catchment and eastern catchment) will incorporate 2 types of stormwater treatment elements prior to the stormwater entering the existing stormwater network. These treatment elements include a detention basin and sedimentation basin. A sedimentation basin will be constructed at the stormwaters intermediate outfall to provide treatment prior to the stormwater entering the detention basin. Once the stormwater is treated it will enter the existing stormwater network to be traversed to the existing drainage outfall at the northeast section of the development. This is demonstrated in figure 7.

4.2 Flood Storage Elements

As the post development flows for 20% AEP storm event being 0.372m^3/s are greater than the predevelopment flows for the 20% AEP storm event being 0.120m^3/s, storage is required. The stormwater for the network will be retained and released at the predevelopment flow rate of 0.120m^3/s. The existing pipeline going through the development has been designed to accommodate the development flows for the site being 0.377m^3/s, however due to updated requirements for new subdivisions and updated rainfall data, only the 20% AEP predevelopment flows will be released. As the drainage system is required to cater for a 20% AEP event, 397m^3 of storage is required to contain the storm water generated onsite during this event. The calculations that were used to determine the storage requirements are located in Appendix B. This storage will be located across two basins in Reserve A and Reserve B that will satisfy the storage requirements for the development. Reserve A will satisfy the storage requirements for the western catchment whilst the Reserve B will satisfy the storage -requirements for the eastern catchment. The water will be retained by an appropriately sized pipe at the correct grade to allow predevelopment flows to exit the basin whilst post development flows to be retained. Both basins will discharge the predevelopment flows at different rates in order to achieve the overall predevelopment flows of 0.120m^3/s. The western catchment will discharge the stormwater at a lower rate being 0.02m^3/s and will require a storage capacity of 265m^3. Whilst the eastern catchment will discharge the stormwater at a higher rate of 0.1m^3/s and will require a storage capacity of 132 m^3.

The effect of this flood storage is that the 20% AEP flood event is retarded to pre-development flows as detailed in Table 2 (reproduced from Appendix B).

Table 1 - Pre- and Post-Development Flow Estimates

Location	***20% AEP Flow Estimate (m^3/sec)***			
	Pre Development	***Critical Duration***	***Post Development***	***Critical Duration***
Peterborough	**0.120**	**46-minutes**	**0.372**	**21-minutes**

Note: All flows rounded to the nearest 0.001 m3/s due to storage modelling detail.

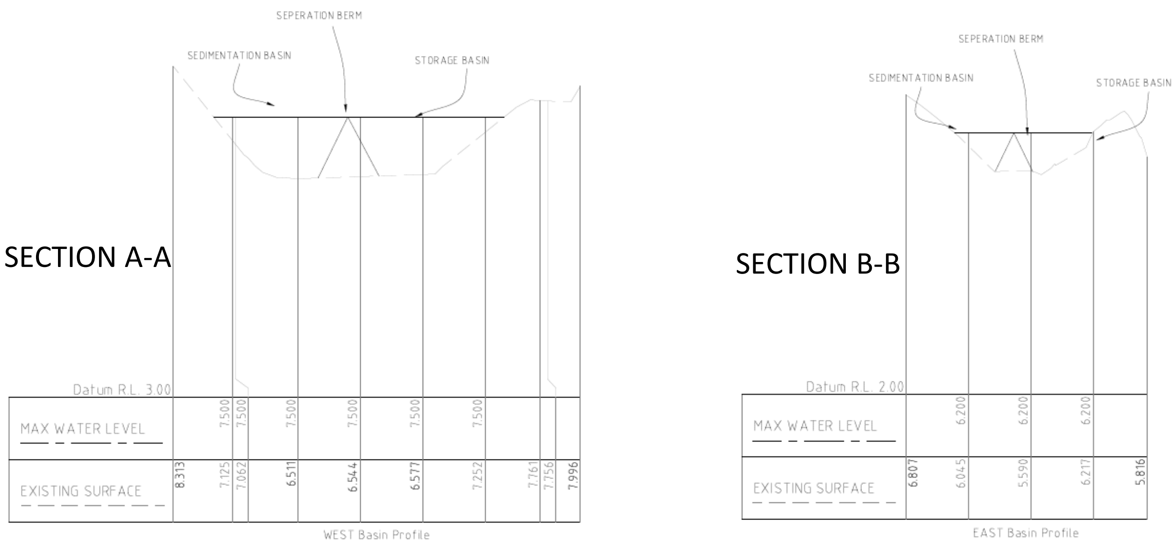

Figure 4 – Cross-section of the two proposed Basins.

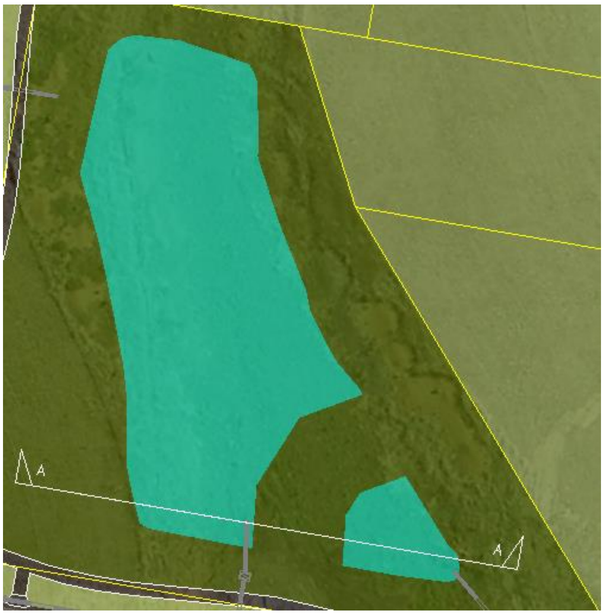

Figure 5 – West Sedimentation and Detention Basin

Figure 6 - East Sedimentation and Detention Basin

4.3 Flood Impact

4.3.1 Flood Levels

All residential buildings floor levels are to be 300mm above design surface of the property boundaries.

4.3.2 Road Inundation and Road Overland Flow Paths

No inundation of the proposed roads and intersection is expected as stormwater flows will traverse down the internal roads to the outfall point. The internal road reserves and stormwater network will be designed to have the capacity to convey the stormwater in the 1% AEP event.

4.4 Subdivision Drainage Layout

Appendix A shows the location of the drainage pipes to service each lot and further demonstrated in the associated civil plans once the detailed design is submitted. All lots will drain the stormwater caught into the drainage network. As this stormwater requires treatment it will achieve the treatment targets as it flows through the basins prior to it entering a swale located at the outfall of the proposed subdivision. Similarly, the stormwater runoff from the internal road will traverse along the road and into the basins for treatment. Following this treatment, the stormwater will transverse into the neighbouring property to the north via the existing stormwater network.

4.5 Proposed Easement or Reserve

The stormwater drainage network is located both in the road reserve, drainage reserve and internal allotments. As the stormwater network will be located through some allotments, drainage easements will be required.

4.6 Wider Catchment Issues

Even though downstream pipe lines have been designed to cater for the development flows from this site and surrounding sites, the township of Peterborough has previously been susceptible to localised flooding. This mainly occurs after large storm events creating high water levels in the nearby Curdies River correlating with the river mouth not being open.

5.0 Concluding Remarks and Further Work Required

The SWMP detailed within this report and associated documents, details the designs of assets required to service the proposed development. To ensure all applicable planning controls are met, the proposed development is to incorporate:

- A stormwater treatment facility to service this development will enable WSUD treatment to occur and WSUD targets be met.
- The development flows will be restricted to the 20% AEP predevelopment flow rates by an appropriately sized pipe at the correct grade at the outfalls of the internal stormwater network.
- In a stormwater event that generates flows greater than the allowable flow rate, excess flow will be stored in the basins.
- Overland flows will not inundate the development or existing establishments in the 1% AEP storm event.

As such, it is requested that Council approve the SWMP presented herein, allowing the planning process to progress.

6.0 References

Melbourne Water (2005). "*WSUD Engineering Procedures: Stormwater Melbourne*", CSIRO Publishing.

Local Government Infrastructure Design Association, *Infrastructure Design Manual V5.4, 2022*

7.0 Abbreviations, Descriptions and Definitions

The following table lists some common abbreviations and drainage system descriptions and their definitions which may be referred to in this report.

Table 2 - Common Abbreviations Associated with Stormwater Management Plans

Abbreviation / Descriptions	**Definition**
AHD - Australian Height Datum	Common base for all survey levels in Australia. Height in metres above mean sea level.
ARI - Average Recurrence Interval.	The average length of time in years between two floods of a given size or larger. A 100 Year ARI event has a 1 in 100 chances of occurring in any one year.
AEP – Annual Exceedance Probability	The chance of a storm (flow) of that magnitude (or larger) occurring in a given year. $\boldsymbol{AEP = 1 - e^{(\frac{-1}{ARI})}}$. i.e. 18.13% AEP = 5 Year ARI
BPEMG	Best Practice Environmental Management Guidelines available from CSIRO (2009).
DSS or DS	Development Services Scheme (DSS) or Drainage Scheme (DS) is a master plan developed my MWC for drainage within a catchment area.
ED	Extended detention. A hight that corresponds to the vertical limit of a volume of water stored for treatment within a treatment element.
EY – Exceedances per year	The amount of times a storm (flow) of that magnitude is expected to be exceeded per year. i.e. 4 EY = 3 Month ARI
Hectare (ha)	10,000 square metres
HECRAS	A hydraulic software package that enables the calculations of flood levels and velocities along a waterway given a specified flow.
LPOD	Legal Point Of Discharge
m^3/s -cubic metre/second	Unit of discharge usually referring to a design flood flow along a stormwater conveyance system
Megalitre (ML) (1000 cubic metres)	1,000,000 litres = 1000 cubic metres. Often a unit of water body (e.g. pond) size
MUSIC	Hydrologic computer program used to calculate stormwater pollutant generation in a catchment and the amount of treatment which can be attributed to the WSUD elements placed in that catchment
MWC	Melbourne Water Corporation

Retarding basin	A flood storage dam which is normally empty. May contain a lake or wetland in its base
NWL - Normal Water Level	Water level of a wetland or pond defined by the lowest invert level of the outlet structure
NSL – Natural Surface Level	The surface level of the natural (existing) surface before works.
RORB	Hydrologic computer program used to calculate the design flood flow (in m^3/s) along a stormwater conveyance system (e.g. waterway)
RCP	Representative Concentration Pathway. A relative greenhouse gas concentration into the future. RCP 8.5 represents no significant reduction in emissions until 2100 resulting in significant global warming.
Sedimentation basin (Sediment pond)	A pond that is used to remove coarse sediments from inflowing water mainly by settlement processes.
Swale	A small shallow drainage line designed to convey stormwater discharge. A complementary function to the flood conveyance task is its WSUD role (where the vegetation in the base acts as a treatment swale).
TSS	Total Suspended Solids – a term for a particular stormwater pollutant parameter
TP	Total Phosphorus – a term for a particular stormwater pollutant parameter
TN	Total Nitrogen – a term for a particular stormwater pollutant parameter
WSUD - Water Sensitive Urban Design	Term used to describe the design of drainage systems used to: o Convey stormwater safely o Retain stormwater pollutants o Enhance local ecology o Enhance the local landscape and social amenity of built areas
Wetland	WSUD element, which is used to collect TSS, TP and TN. Usually incorporated at normal water level (NWL) below which the system is designed as shallow marsh, marsh, deep marsh and open water areas.

Appendix A – Concept Drawings

Figure 7 – Layout Plan (Refer to associated document "22-158 FLP REV-" for the detailed concept)

Appendix B – Hydrologic Modelling

The hydrologic calculations have been undertaken below on the proposed subdivision. The rational method (with current BoM rainfall intensity) and Boyd's method (or similar) can be used to define flood storage requirements. The storage indicated by these methods suggest it will be required to fit on site and consideration has been given to how the outlet may be configured. As there has been a initial concept layout plan already designed for the site, the development site conditions can be utilised to better design the storage and treatment assets.

Predevelopment Flows

Upstream Catchment

As this subdivision is located approximately midway through the overall catchment (as shown in figure 3), the upstream stormwater flowing through the proposed subdivision has been addressed in the calculations. These calculations were done as part of the upstream development back in 2006. As a result an appropriately sized stormwater pipe was installed to convey the stormwater through this site. Hence no further calculations are required, or allowances made to convey the upstream stormwater.

Site Catchment

The site falls in multiple directs to different low spots throughout the site. Earth works will be undertaken to direct the stormwater into the two drainage reserves prior to it entering the existing underground drainage infrastructure. Whilst the overland flows will be directed through the road reserves to the low area in the northeast corner of the development and discharged into the neighbouring property to the north. As the earth works will be undertaken to direct the stormwater to the different drainage reserves, the site will be split into two catchments. Both of the catchments will be calculated for storage and outfall flow rate purposes. The predevelopment flows for the site will be calculated using the rational method:

Site Catchment

$$\boldsymbol{Q_{PRE-DEV}} = \frac{CAI_{20\%}}{360}$$

Where:

$Q_{PRE-DEV}$	= Pre development discharge (*m*^{3}/*s*)
C	= Run off co-efficient = 0.30
A	= Total Area (*Ha*) = 5.876Ha
$I_{20\%}$	= 20% AEP Rainfall Intensity (mm/hr)

To calculate the 20% AEP Intensity, the Time of Concentration is calculated using iterations of the Kinetic Wave method:

- $T_c = \frac{6.94\,(L\,F_R)^{0.6}}{I^{0.4}S^{0.3}}$

  Where:

  T_c = Time of concentration

L	= Length of Overland Flow	*= 204m*
F_R	= Retardance Factor (VicRoads Manual)	= 0.1
I	= Rainfall Intensity for 20% AEP storm (Peterborough)	*= 24.42 mm/hr*
S	= Slope of Hydraulic Grade line	*= 0.026m/m*

T_c = 45.57 minutes
I_{20} = 24.42 mm/hr

$$Q_{PRE-DEV} = \frac{0.3\ \times 5.876\ \times 24.42}{360} = 0.120m^3/s$$

This yields a total of $Q_{PRE-DEV}$ = **0.120*m³/s*** of flow from the development site. These flows must be catered for in the drainage networks for the subdivision and conveyed to the discharge points.

Post Development Flows

Site Catchment

The site will be designed to store the difference between the 20% AEP post development flows and the 20% AEP pre-development flows. The post development flows for the site will be calculated using the rational method across both the eastern and western catchment:

Site-Catchment

$$Q_{POST-DEV} = \frac{CAI_{20\%}}{360}$$

Where:

$Q_{PRE-DEV}$ = Post development discharge (*m³/s*)
C = Run off co-efficient = 0.75 (Road reserve and Residential lots 450 – 600m2)
= 0.70 (Residential lots 600 –1000m2)
= 0.50 (Residential lots 1000 – 2000m2)
= 0.35 (Public Open Space)
A = Total Area (*Ha*) = 5.876Ha
$I_{20\%}$ = 20% AEP Rainfall Intensity (mm/hr)

To calculate the 20% AEP Intensity, the Time of Concentration is calculated using iterations of the Kinetic Wave method:

- $T_c = \frac{6.94\,(L\,F_R)^{0.6}}{I^{0.4}S^{0.3}}$

  Where:

  T_c = Time of concentration

L	= Length of Overland Flow	*= 499m*
F_R	= Retardance Factor (VicRoads Manual)	= 0.013
I	= Rainfall Intensity for 20% AEP storm (Peterborough)	*= 33.98 mm/hr*
S	= Slope of Hydraulic Grade line	*= 0.01m/m*

T_c = 20.57 minutes
I_{20} = 33.98 mm/hr

$$\boldsymbol{Q_{POST-DEV}} = \frac{3.941 \times 33.98}{360} = 0.372m^3/s$$

This yields a total of $\boldsymbol{Q_{POST-DEV}}$ = **0.372 *m³/s*** of flow from the development site. These flows must be catered for in the drainage networks for the subdivision and conveyed to the discharge points.

The post developments flows for the site’s catchment is 0.372m^3/s.

1% AEP Capacity Checks

The capacity of each road will need to be designed to ensure the internal road can transverse the 1% AEP event. It is assumed that the underground drainage network will take the full 20% AEP event and the remainder will flow down the road reserve. As no overland flow is allowed within private property, the capacity checks will only be from boundary line to boundary line. The critical cross section and the critical slope will be checked for each of the following roads once the road designs are complete.

Figure 8 - Development flow path

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ABN 79 079 369 717

Stormwater Detention - Boyds Formula (20% AEP)

Boyds Formula (20% AEP)

Project: Peterborough - East Catchment
Job No: 22-158

IFD Region= Camperdown
Catchment Area (A) = 3.159 ha

Runoff Coefficient = 0.688

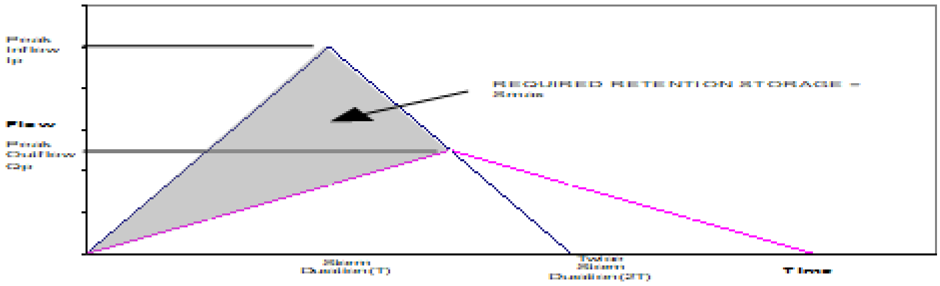
Effective Catchment Area = ∑CA = 2.173 ha

Restricted outflow requirement = 0.1 m^3/s

Storage requirement is highest value of S_{max} calculated in the table below
Critical storm duration is the storm duration when S_{max} occurs

Continue table until a clear Smax is calculated

Storm Duration (min)	20% AEP Intensity (mm/hr)	I_p (m^3/s)	Q_p (m^3/s)	V_1 (m^3)	S_{max} (m^3)
5	70.2	0.42	0.100	127.143	97.143
10	51	0.31	0.100	184.738	124.738
14	42.5	0.256581	0.1	215.52804	131.52804
15	40.9	0.246921	0.1	222.229332	132.229332
16	39.4	0.24	0.100	228.351	132.351
17	38	0.23	0.100	234.002	132.002
18	36.8	0.222169	0.100	239.942477	131.942477
20	34.5	0.21	0.100	249.940	129.940



$$S_{max} = V_1 (1 - Q_p/I_p)$$

S_{max} = Maximum Volume of temporary Storage (m^3)
V_1 = Volume of inflow flood (m^3)
I_p = Peak discharge of inflow hydrograph (m^3/s)
Q_p = Peak discharge of outflow hydrograph (m^3/s)

Figure 9 – Music Modelling and Results

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ABN 79 079 369 717

Stormwater Detention - Boyds Formula (20% AEP)
Boyds Formula (20% AEP)

Project: Peterborough-West Catchment
Job No: 22-158

IFD Region= Camperdown
Catchment Area (A) = 2.717 ha

Runoff Coefficient = 0.651

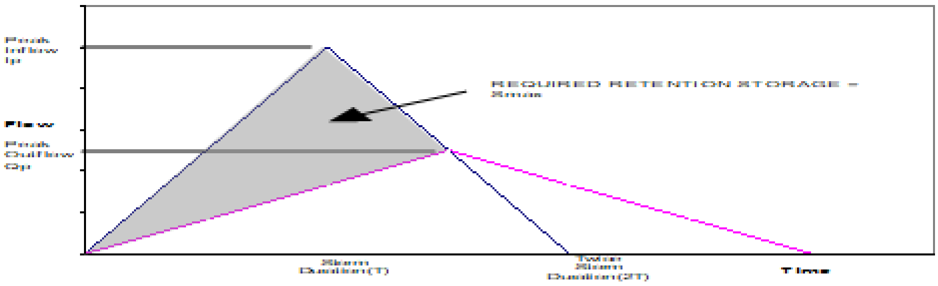
Effective Catchment Area = ∑CA = 1.769 ha

Restricted outflow requirement = 0.02 m^3/s

Storage requirement is highest value of S_{max} calculated in the table below
Critical storm duration is the storm duration when S_{max} occurs

Continue table until a clear Smax is calculated

Storm Duration (min)	20% AEP Intensity (mm/hr)	I_p (m^3/s)	Q_p (m^3/s)	V_1 (m^3)	S_{max} (m^3)
60	17.5	0.09	0.020	309.534	237.534
120	11.5	0.06	0.020	406.816	262.816
130	10.95	0.05	0.020	419.640	263.640
138	10.6	0.05208	0.02	431.225395	265.625395
139	10.5	0.05	0.020	430.253	263.453
140	10.5	0.05	0.020	433.348	265.348
141	10.4	0.051098	0.020	432.286655	263.086655
142	10.3	0.05	0.020	431.166	260.766



$$S_{max} = V_1 \left(1 - Q_p/I_p\right)$$

S_{max} = Maximum Volume of temporary Storage (m^3)
V_1 = Volume of inflow flood (m^3)
I_p = Peak discharge of inflow hydrograph (m^3/s)
Q_p = Peak discharge of outflow hydrograph (m^3/s)

Figure 10 – Boyd's Formula

Appendix C – Music Modelling

The Music model shown below reflects the proposed treatment system.

Figure 11 – Music Modelling and Results

Appendix D – Existing Pipeline Through Development

Prior to this development being proposed an existing stormwater pipeline was installed as part of a previous development. This pipeline was constructed in 2006 to accommodate the upstream subdivision (Antares Estate) and the proposed subdivision that was forecasted for this land. As part of the drainage design there was a total of 0.377m^3/s allowed through this pipeline that this proposed subdivision could release flows at. The calculations used back in 2006 to calculate these design flows used lower coefficients being 0.52 for the housing areas whilst the road reserve areas remained the same at 0.75. As the coefficients have now increased for the housing lots to 0.75 (IDM 5.4 Table 10 – Residential area 450m^2 to 600m^2), the flowrate will also increase off the site.

The upstream existing development (Antares Estate) drainage calculations are below to demonstrate the additional flows allowed to be contributed from the proposed estate.
Pit 9 allows an area of 2.105ha of residential land and 0.541ha of road reserve, Pit 5 allows 2.27ha of residential land whilst Pit 4 allows and area of 0.401ha road reserve to enter the pipe at development flow rates. Combined the allowable flow rates through this pipe are 0.377m^3/s. The plans and associated documents for this constructed pipeline are apart of the previous subdivision project number 06-140 Antares Estate -MacGillivray Road Peterborough.

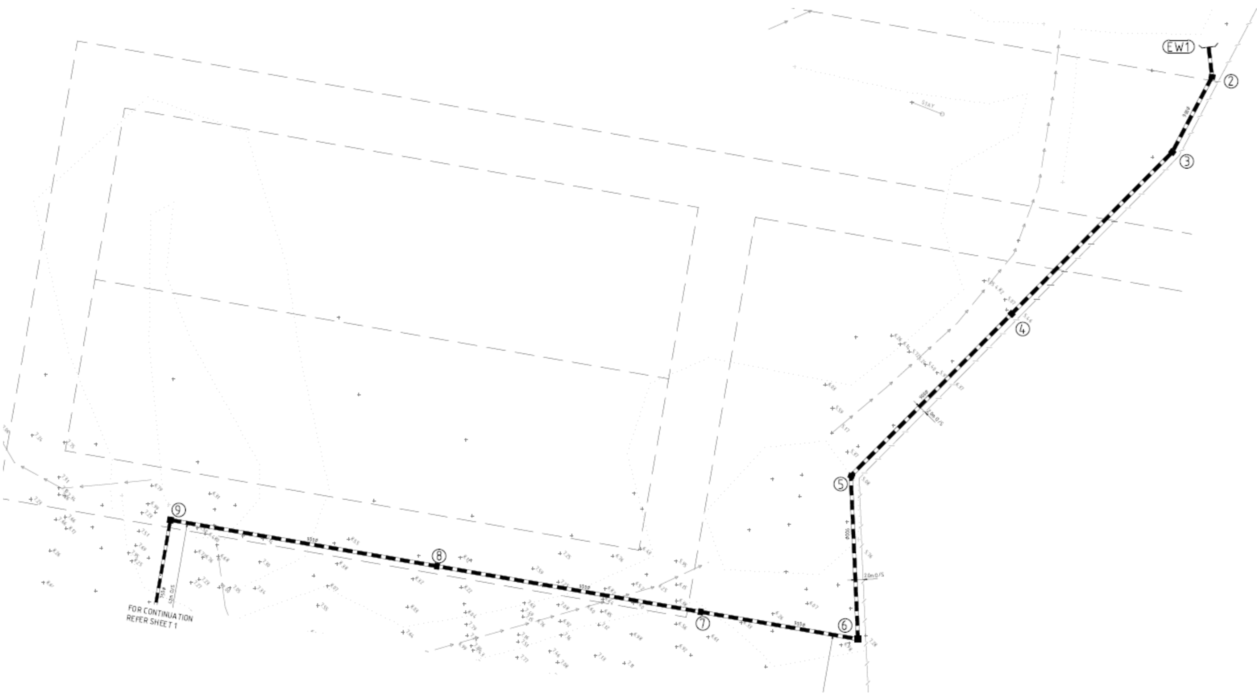


Figure 12 – Existing Stormwater network beneath the proposed development

SITEC CONSULTING ENGINEERS

COMBINED RUNOFF & PIPEFLOW CALCULATIONS REPORT

ANTARES ESTATE, PETERBOROUGH 6140

ZONE : HEYWOOD
MANNINGS FACTOR : 0.013

PIT	D/S PIT	REF	A (ha)	CofR (ha)	Ae (ha)	Ae-tot (ha)	Tc (min)	RETURN (yr)	INTY (mm/h)	FLOW (l/s)	SIZE (mm)	SLOPE (1 in)	CAPACITY (l/s)	Q/Qf	VEL (m/s)	L (m)	TiP (min)	TiP+Tc (min)
...	.....	....	....	......	......	....	....	.....	....	....	.....	....	....	....	....	......	......	.....
10	9	Pt15	0.4	0.52	0.208	2.366	10.47	5	49.18	323.3	750	450	525.7	0.61	1.19	44.51	0.62	11.1
9	8	Pt13	2.105	0.52	1.095													
			0.541	0.75	0.406	3.867	11.1	5	48.02	515.8	900	550	773.3	0.67	1.22	70	0.96	12.05
8	7	Pt4	0	0.52	0	3.867	12.05	5	46.35	497.9	900	550	773	0.64	1.21	70	0.96	13.02
7	6	Pt3	0	0.52	0	3.867	13.02	5	44.83	481.5	900	550	773.3	0.62	1.22	40.57	0.56	13.57
6	5	Pt10	0	0.52	0	3.867	13.57	5	44	472.6	900	550	773.3	0.61	1.22	42.29	0.58	14.15
5	4	Pt9	2.27	0.52	1.18	5.047	14.15	5	43.17	605.3	900	500	811.1	0.75	1.27	59.04	0.77	14.92
4	3	Pt6	0.401	0.75	0.301	5.348	14.92	5	42.13	625.9	900	500	811.1	0.77	1.27	59.02	0.77	15.7
3	2	Pt8	0	0.52	0	5.348	15.7	5	41.15	611.3	900	500	810.8	0.75	1.27	22.02	0.29	15.98
2	1	Pt7	0	0.52	0	5.348	15.98	5	40.79	606	900	500	811.4	0.75	1.28	7.72	0.1	16.08

Table 3- Existing Stormwater network beneath the proposed development calculation sheet

Appendix E – Catchment Plan

WEST CATCHMENT
AREA: 2.717HA

EAST CATCHMENT
AREA: 3.159HA

SITEC
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REVISION	DESCRIPTION	DATE
-	INITIAL SUBMISSION	AUG 23

	NAME	DATE
DESIGN		
DRAWN		
CHECKED		

CAD FILE 22-158 FLP CONCEPT.dwg

HOR 0 13 26
VER 0 13 26

PROPOSED SUBDIVISION
109 OLD PETERBOROUGH ROAD
PETERBOROUGH
CATCHMENT PLAN

SCALE	SIZE	PROJECT No.	SHEET No.	REV
1 : 500	A1	22-158	1 OF 5	-

PROPOSED DEVELOPMENT
AREA: 5.8HA

ANTARES ESTATE
AREA: 3.2HA

CARAVAN PARK AND SUBDIVISION	AREA: 3.2HA
FUTURE SUBDIVISION WEST	AREA: 2.1HA
MACGILLVRAY ROAD	AREA: 0.3HA

FARMLAND
AREA: 22HA

ANTARES STREET
AREA: 2.6HA

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	NAME	DATE
DESIGN	---	---
DRAWN	---	---
CHECKED	---	---

CAD FILE ---.dwg

REVISION	DESCRIPTION	DATE
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HOR 0 10 20
VER 0 10 20

OVERALL CATCHMENT PLAN

SCALE	SIZE	PROJECT No.	SHEET No.	REV
1 : 500	A1	---	- OF -	-