DALTON CONSULTING ENGINEERS

Tramway Road Hazelwood North – BESS Facility
STORMWATER MANAGEMENT STRATEGY (SWMS)

May 2025

DCE Ref: 24100

FOR

Eku & CO

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Dalton Consulting Engineers Pty Ltd

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T Pham AN: 5741001
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Executive Summary

This report presents the hydraulic impact assessment for the proposed Battery Energy Storage System (BESS) project at Tramway Road, Hazelwood North, VIC. The proposed project (subject site) comprises approximately 20.0 hectares (ha) Of that area, approximately 4.8 ha is planned to become the BESS facility. Located just south of the existing Hazelwood Terminal Station and just north of Eel Hole Creek. The subject site is located within the Latrobe City Council.

The stormwater management strategy (SWMS) for the proposed development addresses conditions below:

- Includes details and computations of how works on the land are to be drained, including stormwater drainage. See Section 4 and Appendix C.
- Assesses the impacts of on-site infiltration and surface water quality, including water quality in adjacent land and waterways
- Includes details of how polluted or contaminated runoff will be managed.
- Includes hydraulic modelling to determine existing condition ponding at the subject and project site. See Section 5.

In the proposed condition:

- The subject site will be graded to slope the south and southwest. Developed flows from the subject site will be conveyed via existing overland flow paths. Stormwater from the proposed project will be conveyed by vegetated swales with 1% annual exceedance probability (AEP) capacity around the western and eastern edge of the project site discharging into Eel Hole Creek.
- External flows from the north of the subject site will be conveyed and diverted around the proposed project site by the proposed swale and proposed berm.
- Preliminary hydraulic modelling using HEC-RAS 2D indicates that the proposed project site does not pond and that any development there will not have any negative impacts on surrounding areas.

This SWMS demonstrates that stormwater can be managed at the subject site as part of the proposed project. The strategy has been developed to provide opportunities for stormwater quality treatment and demonstrates that the development will not have adverse impacts on the existing flood levels and surrounding environment.

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1. Introduction

This report presents the stormwater management strategy for the proposed Battery Energy Storage System (BESS) project at Tramway Road, Hazelwood North, VIC. The proposed project (subject site) comprises approximately 20.0 hectares (ha). Located just south of the existing Hazelwood Terminal Station and just north of Eel Hole Creek, as shown in Figure 1. The subject site is located within the Latrobe City Council.

Currently the subject site is rural and is zoned as a Farming Zone. There is also a Bushfire Management Overlay and State Resource Overlay on the subject site. The subject site is bounded by farmland to the north (with the Hazelwood Terminal Station further north), Eel Hole Creek to the south and undeveloped farmland to the east and west.

As the subject site is located within the City of Latrobe, the *Infrastructure Design Manual (IDM)* is the relevant guiding document for flow calculations and drainage design. All calculations and drainage design in this report are also compliant with *Australian Rainfall and Runoff 2019 (ARR19)* and reflect industry best practice approaches.

Figure 1: Subject site in existing condition

The subject site grades from the northern boundary southwards to Eel Hole Creek that traverses the property from east to west. Gradients ranging from approximately flat at the eastern end, to approximately 1 in 55 towards the western end. The 1-m contour lines shown in Figure 1 are from the publicly accessible ELVIS data and form the basis of the preliminary hydrological investigation.

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2. Site Overview

2.1 Subject Site

The subject site generally falls towards the south with a relatively flat southern portion. As shown in the aerial image included in Figure 2, majority of the site falls towards Eel Hole Creek, with a mound within the parcel directly north of the subject site.

Based off existing surface contours, due to the existing mound on parcel north of the site, a portion of that parcel may contribute flows to the subject site. The external catchment is discussed below.

Other surrounding parcels are undeveloped farmland except for the Hazelwood Terminal Station at a parcel further north of the subject site.

2.2 External Catchments

Owing to the existing mound directly north of the subject site, the subject site is not isolated from external flows. Stormwater from the external catchment to the north drain through the subject site in the existing condition. This external catchment consists of approximately 5.47ha of farmland. Stormwater from the external catchment and subject site will ultimately discharge into Eel Hole Creek.

Figure 2 shows the external catchment in the vicinity of the subject site. Note that it is only a portion of the northern parcel that is treated as an external catchment contributing flows to the subject site.

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Figure 2: External Catchment

3. Proposed Project

The proposed project layout plan is shown in Figure 3. A full-size plan and a zoomed-out plan are included as Appendix A. As shown in Figure 3, 4.8 ha of the subject site will be developed as a BESS facility. In addition to the BESS units, the facility includes a switching station towards north-west corner of the site. An access road and operations and maintenance building, including carparking will be located to the north.

It is proposed that minor regrading of the site be undertaken to ensure external and internal stormwater be managed towards the south-west corner and southern border of the subject site.

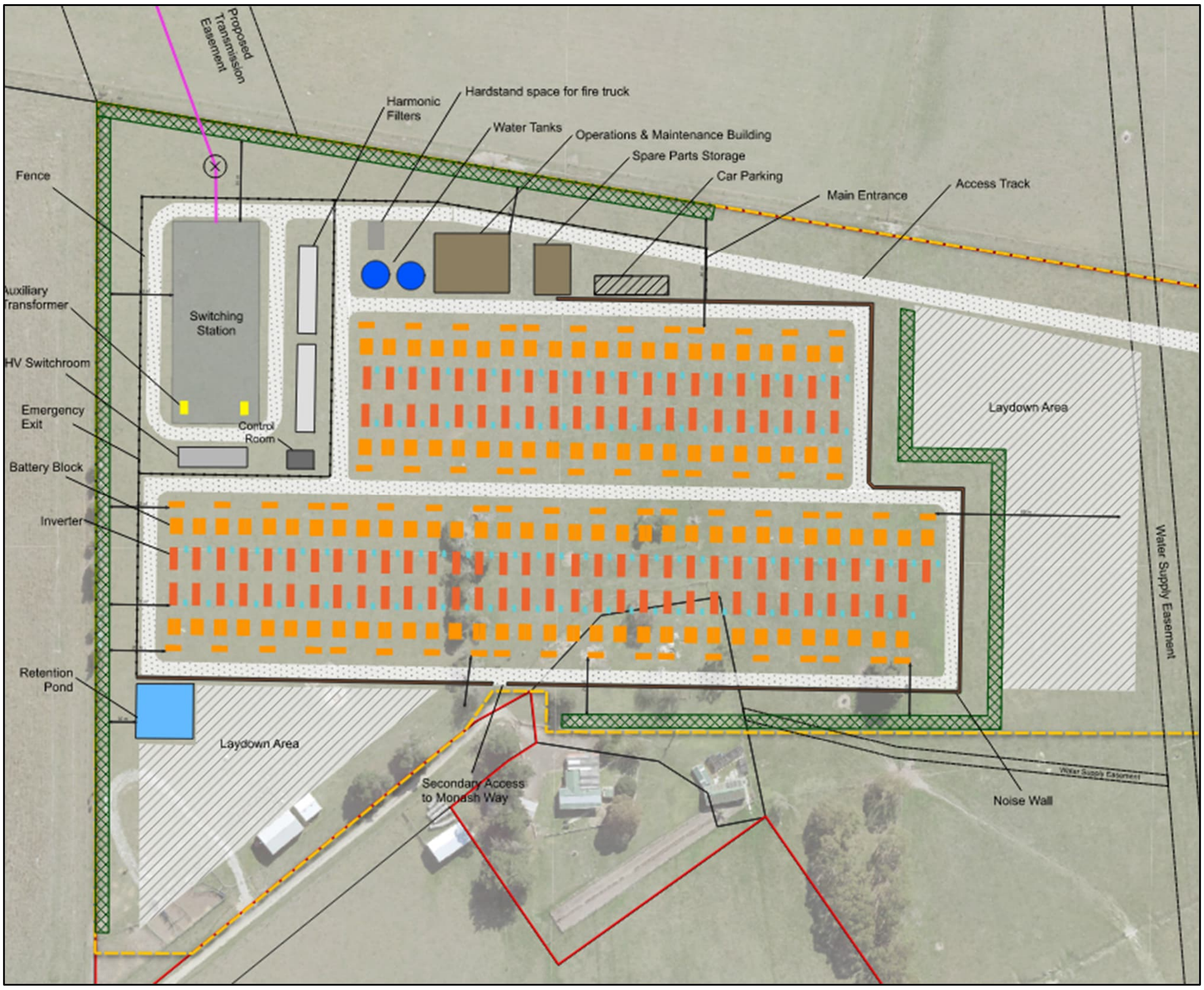

Figure 3: Proposed Project Layout Plan

4. Stormwater Management

Stormwater can be effectively managed at the subject site in the proposed condition. Management of stormwater can both protect the project from major flows while causing minimal changes to existing flow regimes. The treatment train used to manage stormwater will swales and a retention pond (Figure 4). Grading of the site should ensure that the site will drain towards the retention pond.

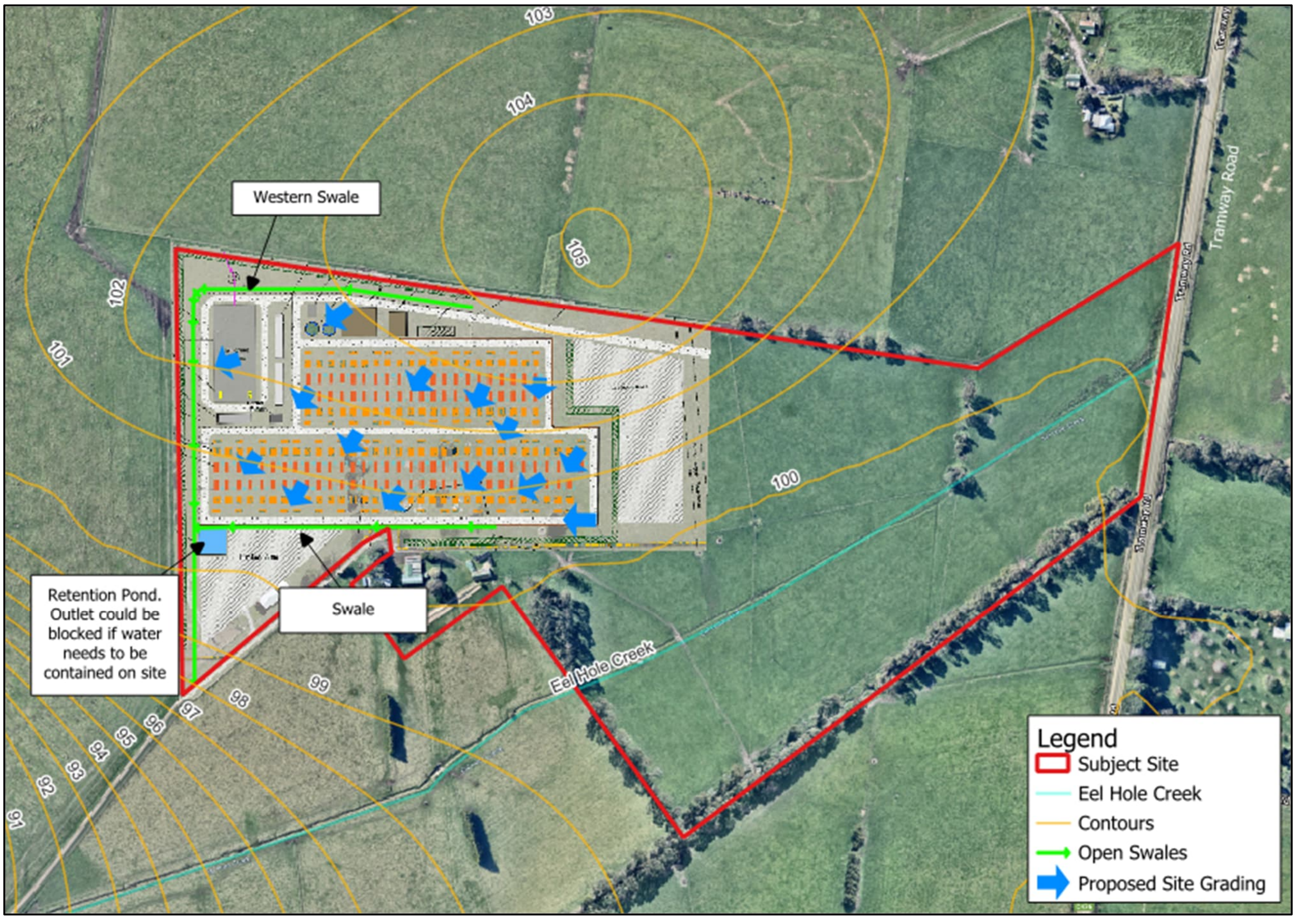

Figure 4: Proposed Stormwater Management Strategy Layout Plan

4.1 Swales

As shown in Figure 4, vegetated swales will be provided around the western side of the project area to manage runoff. The western swale will also provide an alternative flow path for a portion of the external catchment that contributes flows towards the subject site, providing a new dedicated overland flow path around the project.

The swales will be sized to convey stormwater runoff up to and including the 1% AEP stormwater generated by the subject site. The western swale will also be sized to cater for a portion of the external flows that currently contribute to the subject site. Rational Method computations have been used to calculate proposed flows and to inform sizing of the swales. Swale catchment areas are shown in Figure 5. Peak flows from the existing and developed subject site are shown in Table 1 for comparison. The complete peak flow calculations are included in Appendix B.

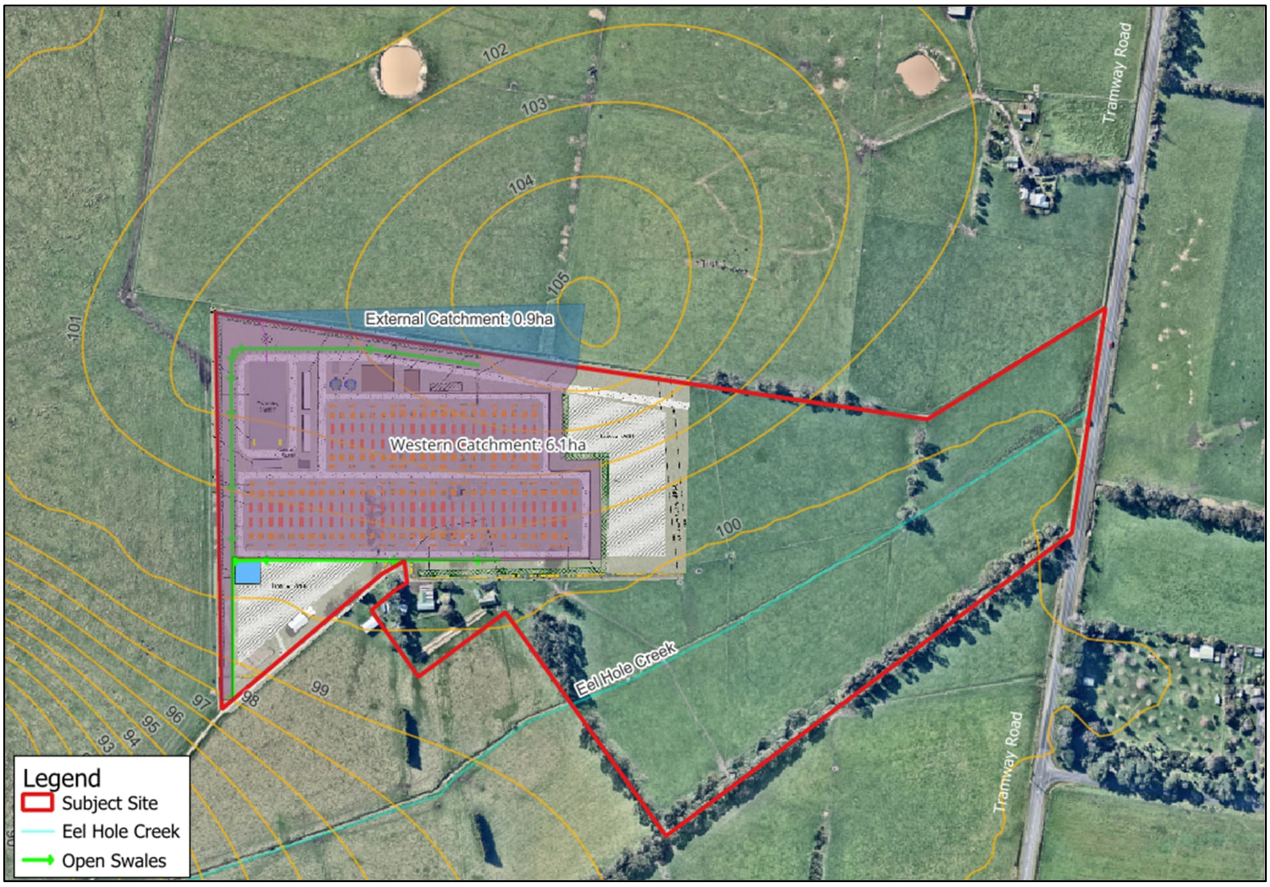

Figure 5: Vegetated Swale Catchments

PC-Convey calculations have been undertaken to indicatively size the conveyance swales. The modelling results are included in Appendix C. Properties for each swale are detailed in

Table 2. The swale dimensions and construction methodology will be finalised during detailed design to ensure adequate freeboard is required to the BESS.

Table 1: Peak flows at the subject site

Location	Upstream Catchment Area (ha)	Proposed 1% AEP Flow (m^3/s)	Existing 1% AEP Flow (m^3/s)
Western Project Site	6.1	1.34	0.51
External Catchment (contributing to Western Swale)	0.9	-	0.11
Western Project Site & External Catchment	7.0	1.37	0.56

Table 2: Conveyance swale properties

Attribute	Western Swale	Unit
Base width	1	m
Depth	0.8	m
Batters	1 in 3	n/a
Longitudinal Slope	1 in 115	m/m
TOTAL WIDTH	6	m
DEPTH OF FLOW	0.49	m

The maximum depth of water in the swales in the 1% AEP must be below the finished surface level of the adjacent road and the concrete supports for the BESS units at the project site to ensure that stormwater drains appropriately.

4.2 On-Site Detention / Retention Pond

Clause 53.18 of the Victorian Planning Provisions, which sets the stormwater management objectives for new developments, indicates that the Clause does not apply for a utility installation. Since the proposed development is a utility installation, On-Site Detention (OSD) is not required.

However, a small pond of ~300 m^2 has been nominated at the south-west of the site. The small pond will discharge to Eel Hole Creek. Preliminary calculations indicate that a pond with a volume of 1,200 m^3 is required to retain 1% AEP flows from the proposed utility installation to those experienced in the existing condition. Storage calculations are included in Appendix B.

Inclusion of the pond allows for runoff from the utility installation to be contained on site. The outlet from the pond can be blocked to protect downstream waterways, if necessary. The proposed pond offers some stormwater attenuation above the requirement, and it provides an isolation point that can be blocked to protect downstream waterways.

4.3 Stormwater Quality Treatment

Stormwater quality treatment to achieve Best Practice Environmental Management Guidelines (BPEMG) standards is not applicable to the proposal, since the proposed development is a utility installation.

Nevertheless, the proposed stormwater management at the subject site provides an opportunity to integrate stormwater quality treatment into the engineering of the site at minimal additional cost. Vegetated swales provide stormwater quality treatment. The western swale, the swale that will collect stormwater from the subject site, will be vegetated and will provide stormwater quality treatment.

MUSIC modelling was undertaken to define the amount of treatment provided by the swales. The 2024 Melbourne Water rainfall template for Narre Warren North (1984-1993) was used due to its proximity to the project. The MUSIC model schematic is shown in Appendix D. During detailed design, the exact treatment performance of the proposed swale can be assessed in additional detail. Stormwater quality treatment results are shown in Table 3.

Table 3: Stormwater Quality Treatment at the subject site

Pollutant	BPEM Target reduction %	Project Site reduction %
Total Suspended Solids (TSS)	80%	90%
Total Phosphorus (TP)	45%	64%
Total Nitrogen (TN)	45%	30%

The stormwater quality results are good for what is essentially a flow-on-effect of the proposed conveyance swales.

4.4 Infiltration and Groundwater

The majority of the proposed BESS site is proposed to be crushed rock. A crushed rock surface allows continued permeability of the subject site. In addition, the proposed use of open vegetated swales for conveyance of stormwater both internal and external promotes infiltration and minimises impacts of the development on existing groundwater conditions.

If a detailed assessment of existing and proposed groundwater conditions is required, or if monitoring needs to be undertaken, a geotechnical professional should be engaged.

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5. Preliminary Hydraulic Modelling

Preliminary hydraulic modelling was undertaken using rain-on-grid modelling in HEC-RAS 2D. Existing condition preliminary hydraulic modelling results are shown in Figure 6. Note that there is no ponding at the proposed location of the BESS project. This would suggest that the there is no negative impact or changes in flood level downstream due to the proposed project.

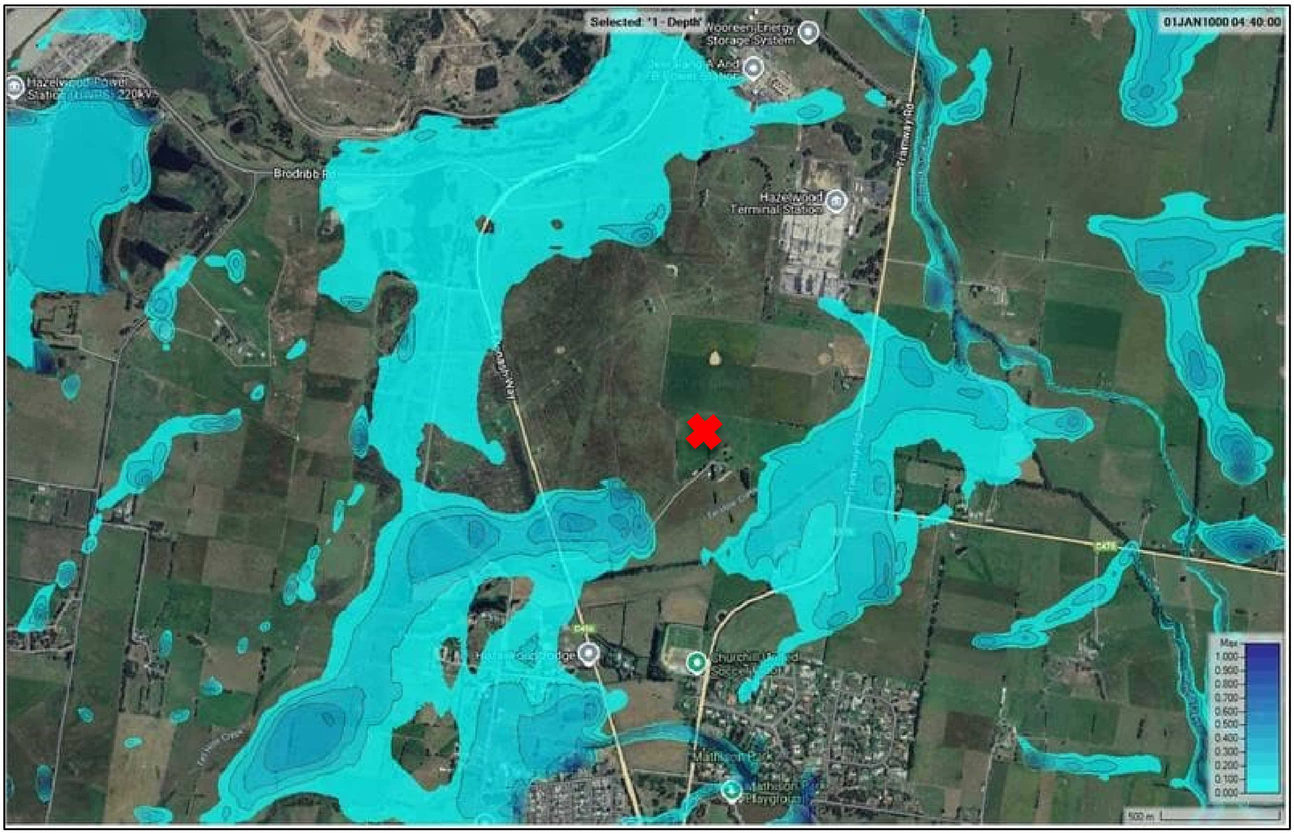

Figure 6: Existing Condition Preliminary Hydraulic Modelling Results

Conclusion

This report presents the SWMS for the proposed BESS project at Tramway Road, Hazelwood North. The proposed project (subject site) comprises approximately 20.0 hectares (ha). Of that area approximately 4.8 ha is planned to become the BESS facility. The remainder of the site will remain undeveloped and be used as a transmission connection. The SWMS has been prepared to demonstrate that stormwater can be managed appropriately by the project.

In the proposed condition, the subject site will be graded to slope towards the south and southwest. Developed flows from the project site will be conveyed by swales with 1% annual exceedance probability (AEP) capacity. Stormwater from the proposed project will be conveyed and discharged into existing Eel Hole Creek at the southwest corner and southern border of the subject site.

External flows from the northern parcel will be conveyed by the proposed western swale and diverted around the proposed project site. The proposed grading of the subject site and methodology for managing internal and external stormwater has been developed to allow for stormwater quality treatment to be provided through swales and proposed retention pond.

The preliminary hydraulic investigation indicates that the location is flood free and the development of the proposed project site will not have negative impacts flood risk to adjacent lots.

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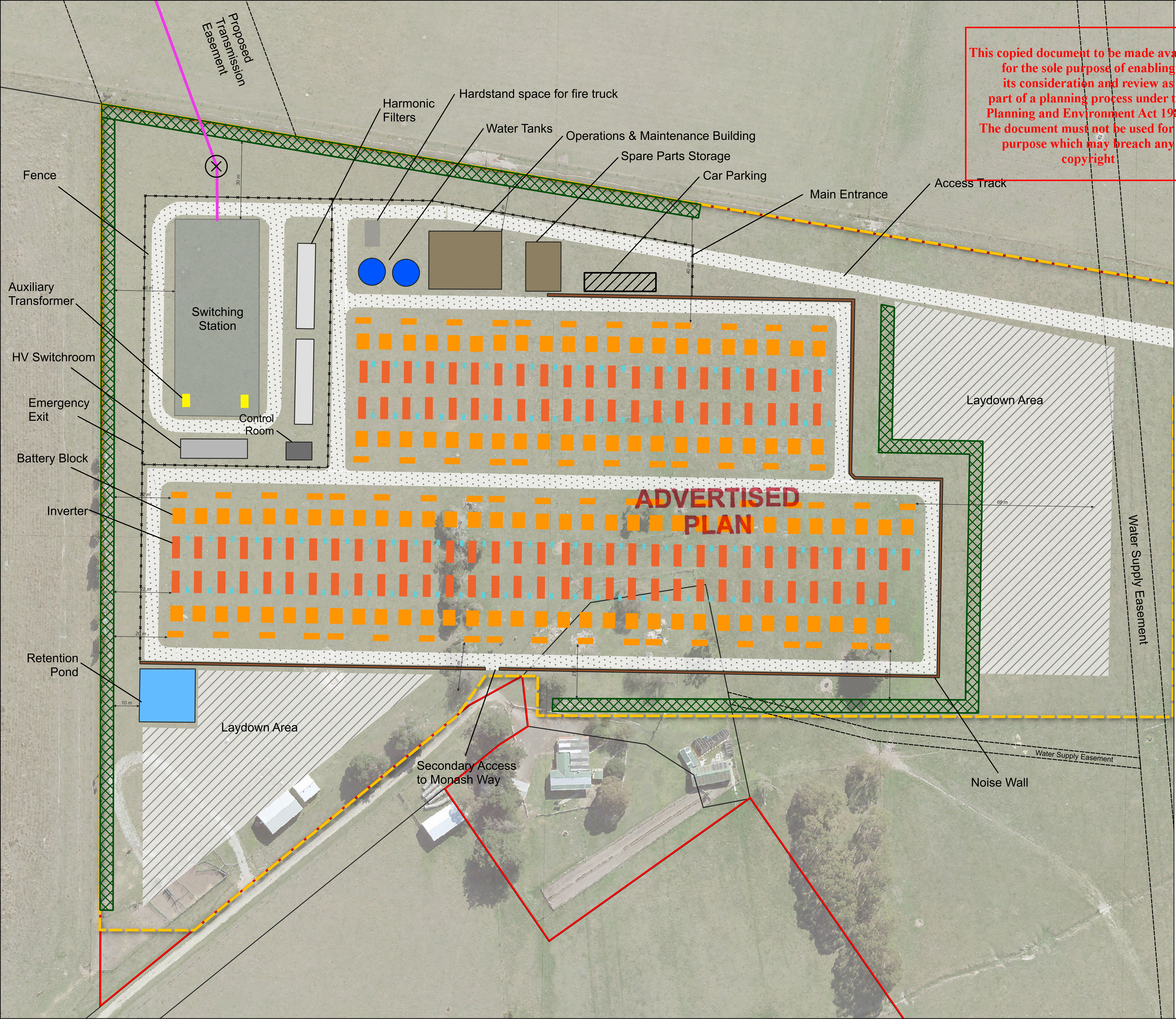
Appendices

Appendix A Project Layout Plan



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Concept Layout Plan

2408 - Tramway Road BESS

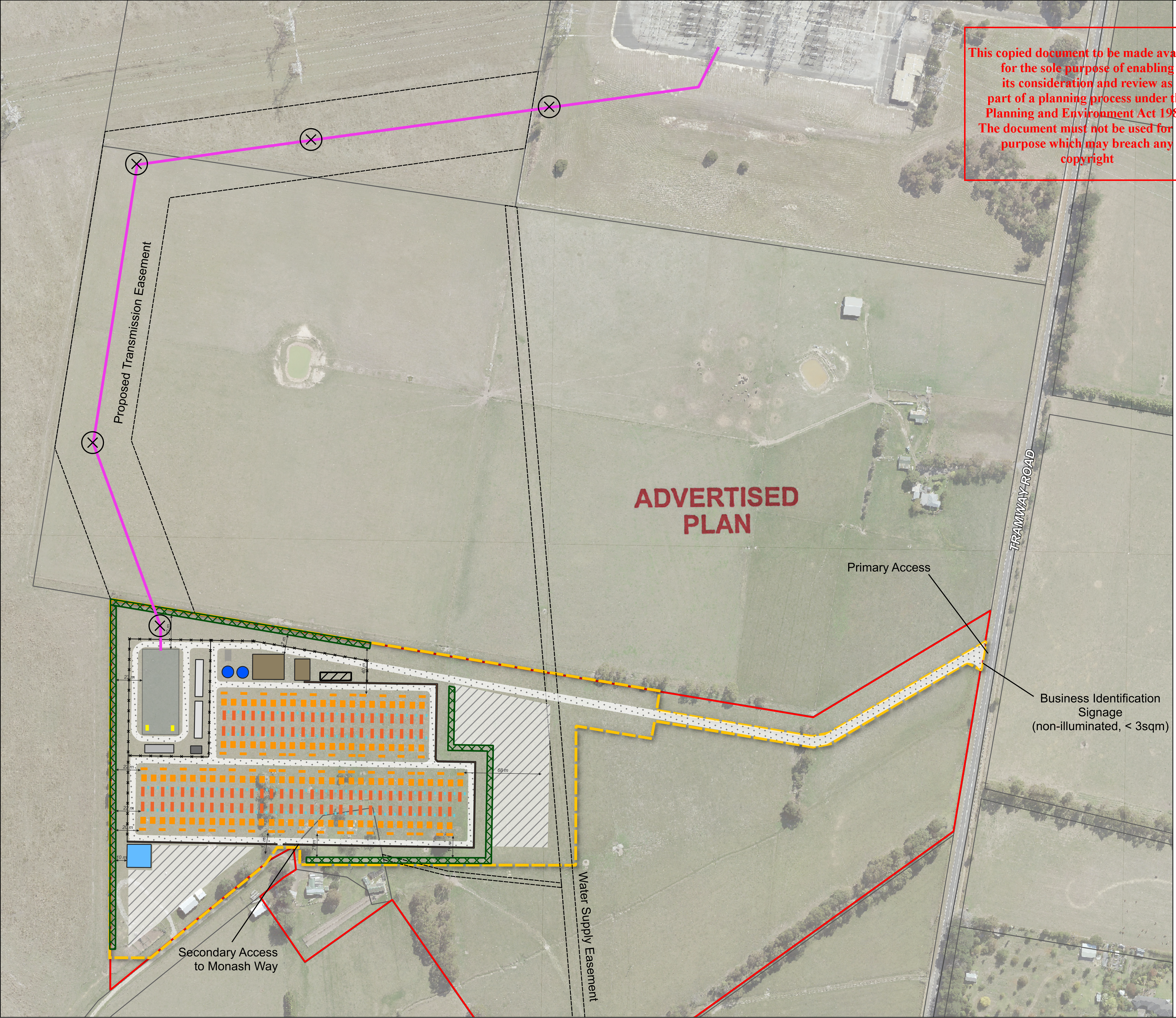
- Development Area
- BESS Site
- 500kV Transmission Route
- Transmission Towers
- Proposed Transmission Easement
- Auxiliary Transformer
- Battery Block
- Inverter
- BMS Panel
- Operations and Maintenance
- Water Tank
- Retention Pond
- Switching Station
- Harmonic Filters
- Control Room
- HV Switching Room
- Hard Stand
- Fence
- Noise Wall
- Vegetation Screening
- Temporary Lay Down Area
- Car Parking
- Access Roads

Version: 7.2

Date: 29/04/2025

0 20 40 m

cogency



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Version: 7.2

Date: 29/04/2025

0 50 100 m

cogency

Appendix B Peak Flow Calculations

MAJOR STORM EVENT HYDROLOGY COMPUTATIONS

PROJECT DETAILS	
Job Description:	Tramway
Job Number:	24100
Compiled by:	T Pham
Date:	
Council:	WYNDHAM
Design Standard	EDCM
WSUD Storm Frequency	4EY
Minor Storm Frequency 1:	10% AEP
Minor Storm Frequency 2:	20% AEP
Major Storm Frequency:	1% AEP
Climate Change Factor (Y/N)	Y
Blockage Factor (%):	

C'10	0.15445632

RAINFALL DATA							
Source	Australian Government - Bureau of Meteology, Design Rainfall Data System (2016)						
Easting	449494.92	Northing	5762208.77	Zone	55H	Date	27/11/2024

CATCHMENT DETAILS (ALL AREAS IN HECTARES)

	Sub-Catch 1	Sub-Catch 2	Sub-Catch 3	Sub-Catch 4	Sub-Catch 5
Name	Rural	Drainage Reserve	Open Space	Local Roads	Industrial
Fraction Imp. (f)	0.1	0.25	0.25	0.7	0.9
C'10	0.229	0.341	0.341	0.676	0.825
C WSUD	0.183	0.273	0.273	0.541	0.660
C Minor 1	0.229	0.341	0.341	0.676	0.825
C Minor 2	0.218	0.324	0.324	0.643	0.784
C Major	0.275	0.409	0.409	0.812	0.991

CATCHMENT	DESCRIPTION	CATCHMENT AREA					Total (Ha)	Composite Fimp	Minor 1/2?	WSUD Ae	Minor 1 Ae	Minor 2 Ae	Major Ae
A	Western Project Site	6.100					6.100	0.100	1	1.397	1.397	0.000	1.676
B	External Catchment	0.871					0.871	0.100	1	0.199	0.199	0.000	0.239
C							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
D							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
E							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
F							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
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AX							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
Total (Ha)		6.971	0.000	0.000	0.000	0.000							

KINEMATIC WAVE EQUATION

$$T o\, I^{0.4} = 6.94 \frac{(L\, x\, n)^{0.6}}{S^{0.3}}$$

Where....

T = Overland Flow Time (min)
I = Rainfall Intensity, (mm/hr)
L = Length of flow path, (m)
n = Manning
S = Slope, (m/m)

Section	Descirption	Catchment Summary	Total Rural (Ha)	Total Drainage Reserve (Ha)	Total Open Space (Ha)	Total Local Roads (Ha)	Total Industrial (Ha)	Total Area (Ha)	Catchment Characteristics: Length (m)	U/S Height (m)	D/S Height (m)	Surface	n	Slope (m/m)	Slope %
1	Western Project Site	A,	6.100	0.000	0.000	0.000	0.000	6.100	350	104	100.5	Grass Channel	0.035	0.010	1.00%
2	Western Swale & External	A, B,	6.971	0.000	0.000	0.000	0.000	6.971	400	105	100.5	Grass Channel	0.035	0.011	1.20%
3	External catchment	B,	0.871	0.000	0.000	0.000	0.000	0.871	120	105	104	Grass Channel	0.035	0.008	0.90%

Kinematic Wave Equation: $TcI^{0.4}$	Calculated WSUD Tc	$TcI^{0.4}$	Calculated Minor 1 Tc	$TcI^{0.4}$	Calculated Minor 2 Tc	$TcI^{0.4}$	Calculated Major Tc
124.23	47.00	124.23	24.00	124.23	27.00	124.23	19.00
129.92	49.00	129.92	26.00	129.92	29.00	129.92	20.00
69.03	22.00	69.03	11.00	69.03	12.00	69.03	9.00

Time of Concentration: Method	Adopted WSUD Tc	Adopted Minor 1 Tc	Adopted Minor 2 Tc	Adopted Major Tc		MAJOR 1% AEP: Ae (ha)	I (mm/hr)	Q (m^3/s)
Kinematic Wave	47.00	24.00	27.00	19.00	[redacted]	1.68	109.07	0.51
Kinematic Wave	49.00	26.00	29.00	20.00		1.92	105.94	0.56
Kinematic Wave	22.00	11.00	12.00	9.00		0.24	158.67	0.11

MAJOR STORM EVENT HYDROLOGY COMPUTATIONS

PROJECT DETAILS	
Job Description:	Tramway
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Compiled by:	T Pham
Date:	
Council:	WYNDHAM
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Minor Storm Frequency 1:	10% AEP
Minor Storm Frequency 2:	20% AEP
Major Storm Frequency:	1% AEP
Climate Change Factor (Y/N)	Y
Blockage Factor (%):	

C'10	0.15445632

RAINFALL DATA							
Source	Australian Government - Bureau of Meteology, Design Rainfall Data System (2016)						
Easting	449494.92	Northing	5762208.77	Zone	55H	Date	27/11/2024

CATCHMENT DETAILS (ALL AREAS IN HECTARES)													
		Sub-Catch 1	Sub-Catch 2	Sub-Catch 3	Sub-Catch 4	Sub-Catch 5							
Name		BESS	Drainage Reserve	Rural	Local Roads	Industrial							
Fraction Imp. (f)		0.7	0.25	0.1	0.7	0.9							
C'10		0.676	0.341	0.229	0.676	0.825							
C WSUD		0.541	0.273	0.183	0.541	0.660							
C Minor 1		0.676	0.341	0.229	0.676	0.825							
C Minor 2		0.643	0.324	0.218	0.643	0.784							
C Major		0.812	0.409	0.275	0.812	0.991							
CATCHMENT	DESCRIPTION	CATCHMENT AREA					Total (Ha)	Composite Fimp	Minor 1/2?	WSUD Ae	Minor 1 Ae	Minor 2 Ae	Major Ae
A	Western Swale	6.100					6.100	0.700	1	4.126	4.126	0.000	4.951
B	External Catchment			0.871			0.871	0.100	1	0.199	0.199	0.000	0.239
C	Western and External Catchment						0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
D							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
E							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
F							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
G							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
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O							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
P							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
Q							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
R							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
S							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
T							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
U							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
V							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
W							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
X							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
Y							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
Z							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AA							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AB							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AC							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AD							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AE							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AF							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AG							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AH							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AI							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AJ							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AK							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AL							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AM							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AN							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AO							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AP							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AQ							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AR							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AS							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AT							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AU							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AV							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AW							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
AX							0.000	#DIV/0!	1	0.000	0.000	0.000	0.000
Total (Ha)		6.100	0.000	0.871	0.000	0.000							

KINEMATIC WAVE EQUATION

$$To\, I^{0.4} = 6.94 \frac{(L \times n)^{0.6}}{S^{0.3}}$$

Where....
- T = Overland Flow Time (min)
- I = Rainfall Intensity, (mm/hr)
- L = Length of flow path, (m)
- n = Manning
- S = Slope, (m/m)

Section	Descirption	Catchment Summary	Total BESS (Ha)	Total Drainage Reserve (Ha)	Total Rural (Ha)	Total Local Roads (Ha)	Total Industrial (Ha)	Total Area (Ha)	Catchment Characteristics: Length (m)	U/S Height (m)	D/S Height (m)	Surface	n	Slope (m/m)	Slope %
1	Western Swale	A,	6.100	0.000	0.000	0.000	0.000	6.100	415	104	100.5	Grass Channel	0.035	0.008	0.90%
2	Western Swale & External	A, B,	6.100	0.000	0.871	0.000	0.000	6.971	475	105	100.5	Grass Channel	0.035	0.009	1.00%

Kinematic Wave Equation: $Tcl^{0.4}$	Calculated WSUD Tc	$Tcl^{0.4}$	Calculated Minor 1 Tc	$Tcl^{0.4}$	Calculated Minor 2 Tc	$Tcl^{0.4}$	Calculated Major Tc
144.82	55.00	144.82	30.00	144.82	33.00	144.82	23.00
151.66	60.00	151.66	32.00	151.66	35.00	151.66	24.00

Time of Concentration: Method	Adopted WSUD Tc	Adopted Minor 1 Tc	Adopted Minor 2 Tc	Adopted Major Tc		MAJOR 1% AEP: Ae (ha)	I (mm/hr)	Q (m^3/s)
Kinematic Wave	55.00	30.00	33.00	23.00	[redacted]	4.95	97.65	1.34
Kinematic Wave	60.00	32.00	35.00	24.00	[redacted]	5.19	95.21	1.37

STORAGE CALCULATIONS

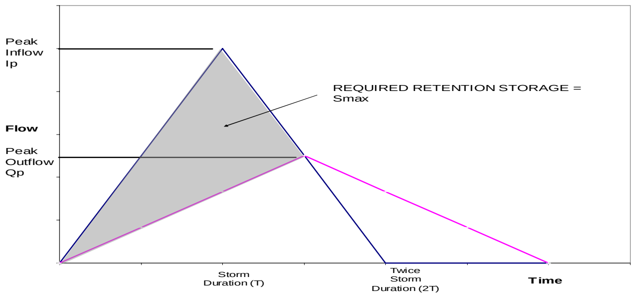
PROJECT DETAILS	
Job Description:	Tramway
Job Number:	24100
Compiled by:	T Pham
Date:	5/05/2025
Council:	OTHER
Existing Storm Frequency:	1% AEP
Developed Storm Frequency:	1% AEP

C'10	0.131590535

STORAGE
Based on Boyds Formula:

$$Smax = v1(1 - \frac{Qp}{Ip})$$

Where....
Smax = Max Volume of Temporary Storage (cu,m)
V1 = Co-Efficient of Runoff
I = Volume of Inflow Flood (cu.m)
Ip = Peak Discharge of Inflow Hydrograph (cu.m/s)
Qp = Peak Discharge of Outflow Hydrograph (cu.m/s)



CATCHMENT DETAILS (ALL AREAS IN HECTARES)	SubCatchment 1	SubCatchment 2	SubCatchment 3	SubCatchment 4	SubCatchment 5	
Name	Rural	BESS	Lot <450sq.m	Lot <450sq.m	Lot <450sq.m	
Fraction Imp. (f)	0.1	0.7	0.8	0.8	0.8	
C10	0.208	0.669	0.746	0.746	0.746	
C Existing	0.250	0.803	0.896	0.896	0.896	
C Developed	0.250	0.803	0.896	0.896	0.896	Eff. Area
Existing Catchment Area	6.100					1.526
Developed Catchment Area		6.100				4.901

ALLOWABLE OUTFLOW

Existing Time of Concentration (Kinematic Wave Equation)

Length (m) =	400		Lookup Value Below				Interpolated	
F_R =	Grass Channel	0.035	$T_O l^{0.4}{}_{(BELOW)}$=	130.802	T_o (mins.) =	22.000	T_o (mins.) =	22.840
Slope (m/m) =	0.010		Lookup Value Above				T_i (mins.) =	7.000
$T_O l^{0.4}{}_{(CALC)}$=	134.60		$T_O l^{0.4}{}_{(ABOVE)}$=	135.321	T_o (mins.) =	23.000	T_c (mins.) =	30.000

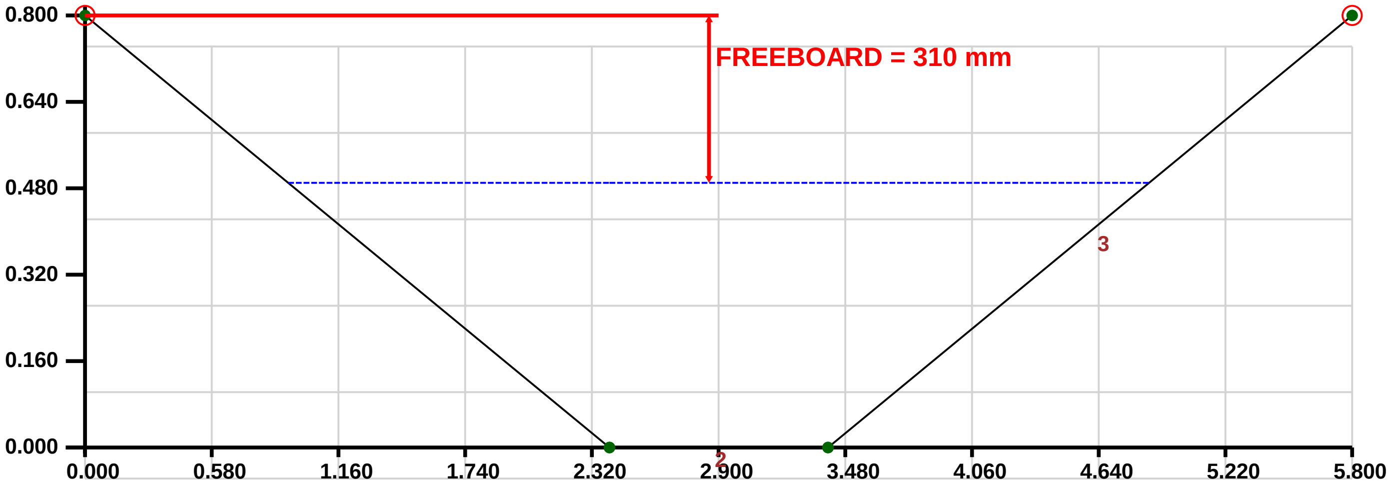
STORAGE CALCULATION

Estimated Duration (mins)	Duration	I	I_p	Q_p	V_1	S_{max}
40	(mins)	(mm/hr)	(m^3/s)	(m^3/s)	(m^3)	(m^3)
Used to populate duration column only, must be greater than 10.	30	71.391	0.972		1749.278	1205
	31	69.933	0.952		1770.680	1208
	32	68.542	0.933		1791.441	1211
	33	67.213	0.915		1811.600	1213
	34	65.942	0.898		1831.192	1214
	35	64.724	0.881		1850.250	1215
	36	63.557	0.865		1868.805	1215
	37	62.438	0.850		1886.884	1215
	38	61.363	0.835		1904.512	1215
	39	60.329	0.821		1921.714	1214
	40	59.335	0.808	0.303	1938.512	1212
	41	58.378	0.795		1954.925	1211
	42	57.456	0.782		1970.973	1209
	43	56.567	0.770		1986.673	1206
	44	55.709	0.758		2002.042	1203
	45	54.881	0.747		2017.094	1200
	46	54.080	0.736		2031.845	1197
	47	53.306	0.726		2046.308	1193
	48	52.557	0.715		2060.494	1189
	49	51.833	0.706		2074.417	1185
	50	51.131	0.696		2088.087	1180
	55	47.927	0.652		2152.984	1155
					STORAGE REQUIRED (m3) =	1216

Appendix C PC-Convey Swale Sizing

PROJECT: Western Channel Rev B
Print-out date: 02/05/2025 - Time: 4:31
Data File: Western Swale_Rev B.dat

1. CROSS-SECTION



2. DISCHARGE INFORMATION

1% AEP storm event
Design discharge going into RB

Required overland / channel / watercourse discharge = 1.37 cumecs

3. RESULTS Water surface elevation = 0.490 m

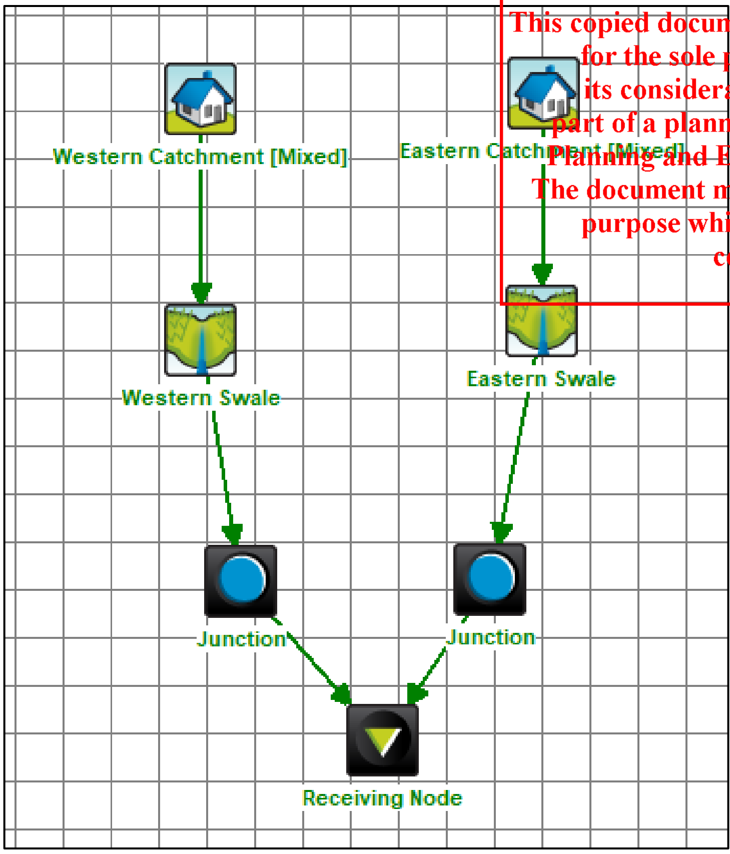
High Flow Channel grade = 1 in 115, Main Channel / Low Flow Channel grade = 1 in 115.

	LEFT OVERBANK	MAIN CHANNEL	RIGHT OVERBANK	TOTAL CROSS-SECTION
Discharge (cumecs):	0.000	1.430	0.000	1.430
D(Max) = Max. Depth (m):	0.000	0.490	0.000	0.490
D(Ave) = Ave. Depth (m):	0.000	0.307	0.000	0.307
V = Ave. Velocity (m/s):	0.000	1.181	0.000	1.181
D(Max) x V (cumecs/m):	0.000	0.579	0.000	0.579
D(Ave) x V (cumecs/m):	0.000	0.363	0.000	0.363
Froude Number:	0.000	0.681	0.000	0.681
Area (m^2):	0.000	1.210	0.000	1.210
Wetted Perimeter (m):	0.000	4.099	0.000	4.099
Flow Width (m):	0.000	3.940	0.000	3.940
Hydraulic Radius (m):	0.000	0.295	0.000	0.295
Composite Manning's n:	0.000	0.035	0.000	0.035
Split Flow?	-	-	-	No

4. CROSS-SECTION DATA

	LEFT HAND POINT		RIGHT HAND POINT		
SEGMENT NO.	CHAINAGE (m)	R.L. (m)	CHAINAGE (m)	R.L. (m)	MANNING'S N
1	0.000	0.800	2.400	0.000	0.035
2	2.400	0.000	3.400	0.000	0.035
3	3.400	0.000	5.800	0.800	0.035

Appendix D MUSIC Modelling Schematic



Treatment Train Effectiveness - Western Channel

	Sources	Residual Load	% Reduction
Flow (ML/yr)	28.6	28.6	-0.1
Total Suspended Solids (kg/yr)	5190	548	89.4
Total Phosphorus (kg/yr)	11.1	4.05	63.4
Total Nitrogen (kg/yr)	80.2	57.5	28.3
Gross Pollutants (kg/yr)	1070	0	100

Treatment Train Effectiveness - Eastern Channel

	Sources	Residual Load	% Reduction
Flow (ML/yr)	14.4	14.5	-0.2
Total Suspended Solids (kg/yr)	2620	240	90.9
Total Phosphorus (kg/yr)	5.56	1.97	64.7
Total Nitrogen (kg/yr)	40.3	27.1	32.8
Gross Pollutants (kg/yr)	541	0	100

Treatment Train Effectiveness - Project Site

	Sources	Residual Load	% Reduction
Flow (ML/yr)	43	43.1	-0.2
Total Suspended Solids (kg/yr)	7820	788	89.9
Total Phosphorus (kg/yr)	16.6	6.02	63.8
Total Nitrogen (kg/yr)	121	84.6	29.8
Gross Pollutants (kg/yr)	1610	0	100