

Project: Yanchep Central Shopping Centre

Project No: 301250349

To: Jess Garner

Date: 30 June 2021

From: David North

RE: Proposed Stormwater Management Strategy

This preliminary stormwater management strategy is for Yanchep Central Shopping Centre, which is located over Lots 50 & 395 Marmion Avenue in Yanchep. This strategy has been prepared based on compliance with City of Wanneroo requirements for post-development flows being equivalent to -pre-developments flows.

In this case, the site soils consist of sandy, free-draining soils which would not generate runoff from site. It is therefore proposed that the stormwater runoff from site be retained for up to the 1 in 100 year ARI (1% AEP) storm.

The current proposed strategy for the Yanchep Central site is to retain the required volume for the 1 in 100-year storm in underground storage cells (Graf EcoBlocc or similar product) underneath the proposed carpark areas. The carpark runoff is to be picked up by grated stormwater pits, and roof runoff to be picked up by gutters and downpipes to be routed into the underground cells.

The majority of the site grade gently to the west. Overflow runoff from storms exceeding the 1 in 100 year ARI storm will flow to the west towards the existing road.

The attached sketch shows the proposed locations and volumes of the underground cells. Please also refer to attached calculations for reference.

Please do not hesitate to contact the undersigned if you have any queries.

Yours sincerely

Stantec Australia Pty Ltd



David North
Civil Engineer



25.11 - Existing Levels from Survey

24.52 - Proposed Preliminary Levels

REV	DESCRIPTION	DRAWN	APPD	DATE

CONSULTANT ARCHITECT/CIENT



PROJECT

TITLE



SCALE @ A1 PROJECT No DRAWING No REV

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE
DOCUMENTS HAVE BEEN OBTAINED FROM STANTEC

Graf EcoBloc Maxx Cell Design

Estimation by **Rational Method** - 1987 Australian Rainfall and Runoff

Job : Yanchep Central Shoppii **Client :** CBRE (GCS) Pty Ltd **By :** DMN
Job # : 3E+08 **Date :** 31/05/2021 **Design Storm Event:** 1 in 100 Year ARI
Drainage Array: total
Catchment: Catchment 1

Wood & Grove ENGINEERS 226 St Adelaide Terrace, Perth WA 6000

Design Rainfall Intensity

Location : Wanneroo **Duration** : 1 hour

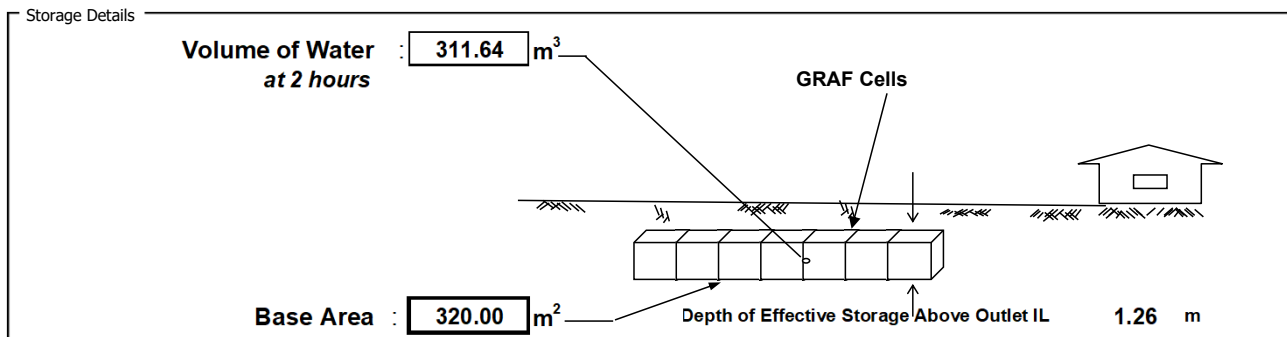
Storm Event : 100 year **Intensity** : **47.6** mm/hr

Catchment Details

Area : **7,450** m²
Run-off Coefficient : **1.00**
Flow rate : **98.66** L/s

Outflow Details

Soil Type : Fine/Very Fine Sand **5.0 m/day**
Soakage Rate : 0.00005787 m/s → **0.0185** m³/s
Outlet : **0.0** m³/s (Total Soakage)



Type of Module Proposed:	Triple	Module Dimensions (m)	Effective Volume (m ³)
Length of Cells Required:	400.00 m	Single 0.800 x 0.800 x 0.350	0.213
# of Modules:	500	Double 0.800 x 0.800 x 0.700	0.426
Number of Rows Proposed:	13	Triple 0.800 x 0.800 x 1.050	0.638
Length of Rows:	31.20 m	Quadruple 0.800 x 0.800 x 1.400	0.851
Array Details:	1500 modules (13 rows x 39 lines x 3 vertical)		Penta 0.800 x 0.800 x 1.750 1.064
			Hexa 0.800 x 0.800 x 2.100 1.277
			Hepta 0.800 x 0.800 x 2.450 1.490
		W x L x H	

Current base area and depth of modules can hold a Volume of : 319.20 m³
The Volume required to store a 100 year storm is : 311.64 m³
Do the proposed modules hold the design storm ? Yes

Graf EcoBloc Maxx Cell Design

Estimation by Rational Method - 1987 Australian Rainfall and Runoff

Job : Yanchep Central Shoppii Client : CBRE (GCS) Pty Ltd By : DMN
Job # : 3E+08 Date : 31/05/2021 Design Storm Event: 1 in 100 Year ARI
Drainage Array: total
Catchment: Catchment 2

Wood & Griev
ENGINEERS
226 St Adelaide Terrace, Perth WA 6000

Design Rainfall Intensity

Location : Wanneroo

Duration : 1 hour

Storm Event : 100 year

Intensity : 47.6 mm/hr

Catchment Details

Area : 3,070 m²

Run-off Coefficient : 1.00

Flow rate : 40.66 L/s

Outflow Details

Soil Type : Fine/Very Fine Sand

Soakage Rate : 0.00005787 m/s → 0.0075 m³/s

Outlet : 0.0 m³/s (Total Soakage)

Storage Details

Volume of Water at 2 hours : 129.20 m³

Base Area : 130.00 m²

Depth of Effective Storage Above Outlet IL : 1.26 m

GRAF Cells

Type of Module Proposed:	Triple	Module Dimensions (m)	Effective Volume (m ³)
Length of Cells Required:	162.50 m	Single 0.800 x 0.800 x 0.350	0.213
# of Modules:	204	Double 0.800 x 0.800 x 0.700	0.426
Number of Rows Proposed:	9	Triple 0.800 x 0.800 x 1.050	0.638
Length of Rows:	18.40 m	Quadruple 0.800 x 0.800 x 1.400	0.851
Array Details:	612 modules (9 rows x 23 lines x 3 vertical)		Penta 0.800 x 0.800 x 1.750
			Hexa 0.800 x 0.800 x 2.100
			Hepta 0.800 x 0.800 x 2.450
			W x L x H

Current base area and depth of modules can hold a Volume of : 130.23 m³

The Volume required to store a 100 year storm is : 129.20 m³

Do the proposed modules hold the design storm ? Yes

Graf EcoBloc Maxx Cell Design

Estimation by **Rational Method** - 1987 Australian Rainfall and Runoff

Job : Yanchep Central Shoppii **Client :** CBRE (GCS) Pty Ltd **By :** DMN
Job # : 3E+08 **Date :** 31/05/2021 **Design Storm Event:** 1 in 100 Year ARI
Drainage Array: total
Catchment: Catchment 3

Wood & Grove ENGINEERS 226 St Adelaide Terrace, Perth WA 6000

Design Rainfall Intensity

Location : Wanneroo **Duration** : 1 hour

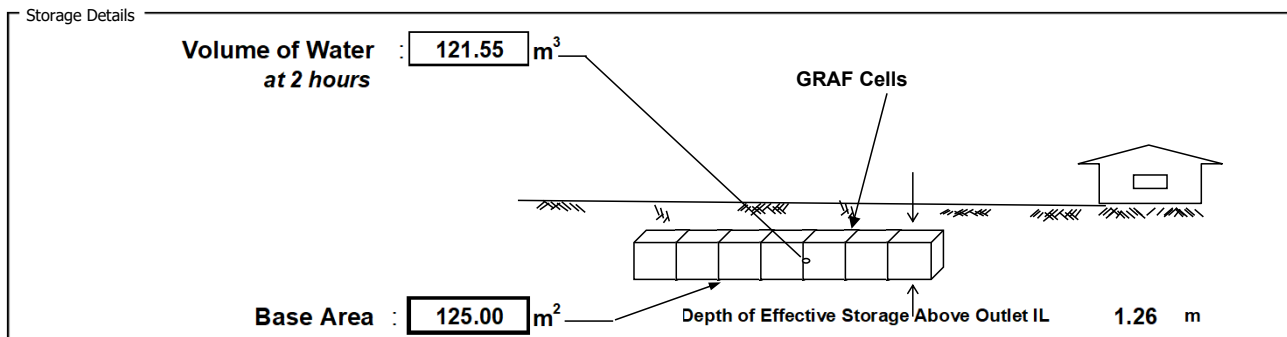
Storm Event : 100 year **Intensity** : 47.6 mm/hr

Catchment Details

Area : 2,907 m²
Run-off Coefficient : 1.00
Flow rate : 38.50 L/s

Outflow Details

Soil Type : Fine/Very Fine Sand **5.0 m/day**
Soakage Rate : 0.00005787 m/s → 0.0072 m³/s
Outlet : 0.0 m³/s (Total Soakage)



Type of Module Proposed:	Triple	Module Dimensions (m)	Effective Volume (m ³)
Length of Cells Required:	156.25 m	Single 0.800 x 0.800 x 0.350	0.213
# of Modules:	196	Double 0.800 x 0.800 x 0.700	0.426
Number of Rows Proposed:	9	Triple 0.800 x 0.800 x 1.050	0.638
Length of Rows:	17.60 m	Quadruple 0.800 x 0.800 x 1.400	0.851
Array Details:	588 modules (9 rows x 22 lines x 3 vertical)		Penta 0.800 x 0.800 x 1.750 1.064
			Hexa 0.800 x 0.800 x 2.100 1.277
			Hepta 0.800 x 0.800 x 2.450 1.490
		W x L x H	

Current base area and depth of modules can hold a Volume of : 125.13 m³
The Volume required to store a 100 year storm is : 121.55 m³
Do the proposed modules hold the design storm ? Yes

Graf EcoBloc Maxx Cell Design

Estimation by Rational Method - 1987 Australian Rainfall and Runoff

Job : Yanchep Central Shoppii Client : CBRE (GCS) Pty Ltd By : DMN
Job # : 3E+08 Date : 31/05/2021 Design Storm Event: 1 in 100 Year ARI
Drainage Array: total
Catchment: Catchment 4

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Design Rainfall Intensity

Location : Wanneroo ▼

Duration : 1 hour ▼

Storm Event : 100 year ▼

Intensity : 47.6 mm/hr

Catchment Details

Area : 2,490 m²

Run-off Coefficient : 1.00

Flow rate : 32.98 L/s

Outflow Details

Soil Type : Fine/Very Fine Sand ▼

Soakage Rate : 0.00005787 m/s → 0.0061 m³/s

Outlet : 0.0 m³/s (Total Soakage)

Storage Details

Volume of Water at 2 hours : 104.97 m³

Base Area : 105.00 m²

Depth of Effective Storage Above Outlet IL : 1.26 m

GRAF Cells

Type of Module Proposed:	Triple	Module Dimensions (m)	Effective Volume (m ³)
Length of Cells Required:	131.25 m	Single 0.800 x 0.800 x 0.350	0.213
# of Modules:	165	Double 0.800 x 0.800 x 0.700	0.426
Number of Rows Proposed:	9	Triple 0.800 x 0.800 x 1.050	0.638
Length of Rows:	15.20 m	Quadruple 0.800 x 0.800 x 1.400	0.851
Array Details:	495 modules (9 rows x 19 lines x 3 vertical)		Penta 0.800 x 0.800 x 1.750
			Hexa 0.800 x 0.800 x 2.100
			Hepta 0.800 x 0.800 x 2.450
			W x L x H

Current base area and depth of modules can hold a Volume of : 105.34 m³

The Volume required to store a 100 year storm is : 104.97 m³

Do the proposed modules hold the design storm ? Yes

Graf EcoBloc Maxx Cell Design

Estimation by Rational Method - 1987 Australian Rainfall and Runoff

Job : Yanchep Central Shoppii Client : CBRE (GCS) Pty Ltd By : DMN
Job # : 3E+08 Date : 31/05/2021 Design Storm Event: 1 in 100 Year ARI
Drainage Array: total
Catchment: Catchment 5

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Design Rainfall Intensity

Location : Wanneroo ▼

Duration : 1 hour ▼

Storm Event : 100 year ▼

Intensity : 47.6 mm/hr

Catchment Details

Area : 5,027 m²

Run-off Coefficient : 1.00

Flow rate : 66.57 L/s

Outflow Details

Soil Type : Fine/Very Fine Sand ▼

Soakage Rate : 0.00005787 m/s → 0.0124 m³/s

Outlet : 0.0 m³/s (Total Soakage)

Storage Details

Volume of Water at 2 hours : 210.67 m³

Base Area : 215.00 m²

Depth of Effective Storage Above Outlet IL : 1.26 m

GRAF Cells

Type of Module Proposed:	Triple	Module Dimensions (m)	Effective Volume (m ³)
Length of Cells Required:	268.75 m	Single 0.800 x 0.800 x 0.350	0.213
# of Modules:	336	Double 0.800 x 0.800 x 0.700	0.426
Number of Rows Proposed:	12	Triple 0.800 x 0.800 x 1.050	0.638
Length of Rows:	22.40 m	Quadruple 0.800 x 0.800 x 1.400	0.851
Array Details:	1008 modules (12 rows x 28 lines x 3 vertical)		Penta 0.800 x 0.800 x 1.750
			Hexa 0.800 x 0.800 x 2.100
			Hepta 0.800 x 0.800 x 2.450
			W x L x H

Current base area and depth of modules can hold a Volume of : 214.50 m³

The Volume required to store a 100 year storm is : 210.67 m³

Do the proposed modules hold the design storm ? Yes

Graf EcoBloc Maxx Cell Design

Estimation by **Rational Method** - 1987 Australian Rainfall and Runoff

Job : Yanchep Central Shoppii **Client :** CBRE (GCS) Pty Ltd **By :** DMN
Job # : 3E+08 **Date :** 31/05/2021 **Design Storm Event:** 1 in 100 Year ARI
Drainage Array: total
Catchment: Catchment 6

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Design Rainfall Intensity

Location : Wanneroo **Duration** : 1 hour

Storm Event : 100 year **Intensity** : 47.6 mm/hr

Catchment Details

Area : 472 m²
Run-off Coefficient : 1.00
Flow rate : 6.25 L/s

Outflow Details

Soil Type : Fine/Very Fine Sand **5.0 m/day**
Soakage Rate : 0.00005787 m/s → 0.0012 m³/s
Outlet : 0.0 m³/s (Total Soakage)

Storage Details

Volume of Water at 2 hours : 19.86 m³

Base Area : 20.00 m²

Depth of Effective Storage Above Outlet IL : 1.26 m

GRAF Cells

Type of Module Proposed:	Triple	Module Dimensions (m)	Effective Volume (m
Length of Cells Required:	25.00 m	Single 0.800 x 0.800 x 0.350	0.213
# of Modules:	32	Double 0.800 x 0.800 x 0.700	0.426
Number of Rows Proposed:	9	Triple 0.800 x 0.800 x 1.050	0.638
Length of Rows:	3.20 m	Quadruple 0.800 x 0.800 x 1.400	0.851
Array Details:	96 modules (9 rows x 4 lines x 3 vertical)		Penta 0.800 x 0.800 x 1.750 1.064
		Hexa 0.800 x 0.800 x 2.100 1.277	
		Hepta 0.800 x 0.800 x 2.450 1.490	
		W x L x H	

Current base area and depth of modules can hold a Volume of : 20.43 m³
The Volume required to store a 100 year storm is : 19.86 m³
Do the proposed modules hold the design storm ? Yes

Graf EcoBloc Maxx Cell Design

Estimation by Rational Method - 1987 Australian Rainfall and Runoff

Job : Yanchep Central Shoppii Client : CBRE (GCS) Pty Ltd By : DMN
Job # : 301250349 Date : 31/05/2021 Design Storm Event: 1 in 100 Year ARI
Drainage Array: total
Catchment: Catchment Northwest

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Design Rainfall Intensity

Location : Wanneroo ▼

Duration : 1 hour ▼

Storm Event : 100 year ▼

Intensity : 47.6 mm/hr

Catchment Details

Area : 1,650 m²

Run-off Coefficient : 1.00

Flow rate : 21.85 L/s

Outflow Details

Soil Type : Fine/Very Fine Sand ▼

Soakage Rate : 0.00005787 m/s → 0.0041 m³/s

Outlet : 0.0 m³/s (Total Soakage)

Storage Details

Volume of Water at 2 hours : 69.38 m³

Base Area : 70.00 m²

Depth of Effective Storage Above Outlet IL : 1.26 m

GRAF Cells

Type of Module Proposed:	Triple	Module Dimensions (m)	Effective Volume (m ³)
Length of Cells Required:	87.50 m	Single 0.800 x 0.800 x 0.350	0.213
# of Modules:	110	Double 0.800 x 0.800 x 0.700	0.426
Number of Rows Proposed:	9	Triple 0.800 x 0.800 x 1.050	0.638
Length of Rows:	10.40 m	Quadruple 0.800 x 0.800 x 1.400	0.851
Array Details:	330 modules (9 rows x 13 lines x 3 vertical)		Penta 0.800 x 0.800 x 1.750
			Hexa 0.800 x 0.800 x 2.100
			Hepta 0.800 x 0.800 x 2.450
			W x L x H

Current base area and depth of modules can hold a Volume of : 70.22 m³

The Volume required to store a 100 year storm is : 69.38 m³

Do the proposed modules hold the design storm ? Yes

Graf EcoBloc Maxx Cell Design

Estimation by Rational Method - 1987 Australian Rainfall and Runoff

Job : Yanchep Central Shoppii Client : CBRE (GCS) Pty Ltd By : DMN
Job # : 301250349 Date : 31/05/2021 Design Storm Event: 1 in 100 Year ARI
Drainage Array: total
Catchment: Catchment Southwest

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Design Rainfall Intensity

Location : Wanneroo ▼

Duration : 1 hour ▼

Storm Event : 100 year ▼

Intensity : 47.6 mm/hr

Catchment Details

Area : 3,185 m²

Run-off Coefficient : 1.00

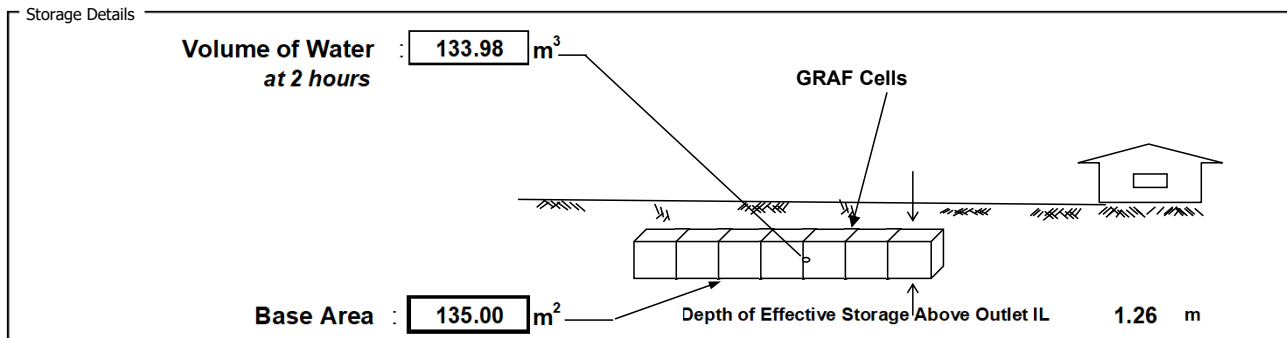
Flow rate : 42.18 L/s

Outflow Details

Soil Type : Fine/Very Fine Sand ▼

Soakage Rate : 0.00005787 m/s → 0.0078 m³/s

Outlet : 0.0 m³/s (Total Soakage)



Type of Module Proposed:	Triple	Module Dimensions (m)	Effective Volume (m ³)
Length of Cells Required:	168.75 m	Single 0.800 x 0.800 x 0.350	0.213
# of Modules:	211	Double 0.800 x 0.800 x 0.700	0.426
Number of Rows Proposed:	6	Triple 0.800 x 0.800 x 1.050	0.638
Length of Rows:	28.80 m	Quadruple 0.800 x 0.800 x 1.400	0.851
Array Details:	633 modules (6 rows x 36 lines x 3 vertical)		Penta 0.800 x 0.800 x 1.750
			Hexa 0.800 x 0.800 x 2.100
			Hepta 0.800 x 0.800 x 2.450
			W x L x H

Current base area and depth of modules can hold a Volume of : 134.70 m³

The Volume required to store a 100 year storm is : 133.98 m³

Do the proposed modules hold the design storm ? Yes