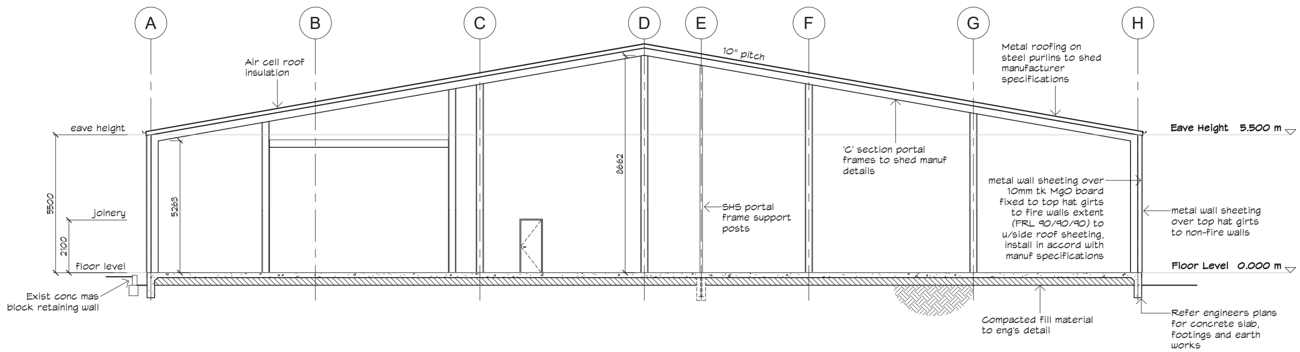


Section L
1 : 100

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

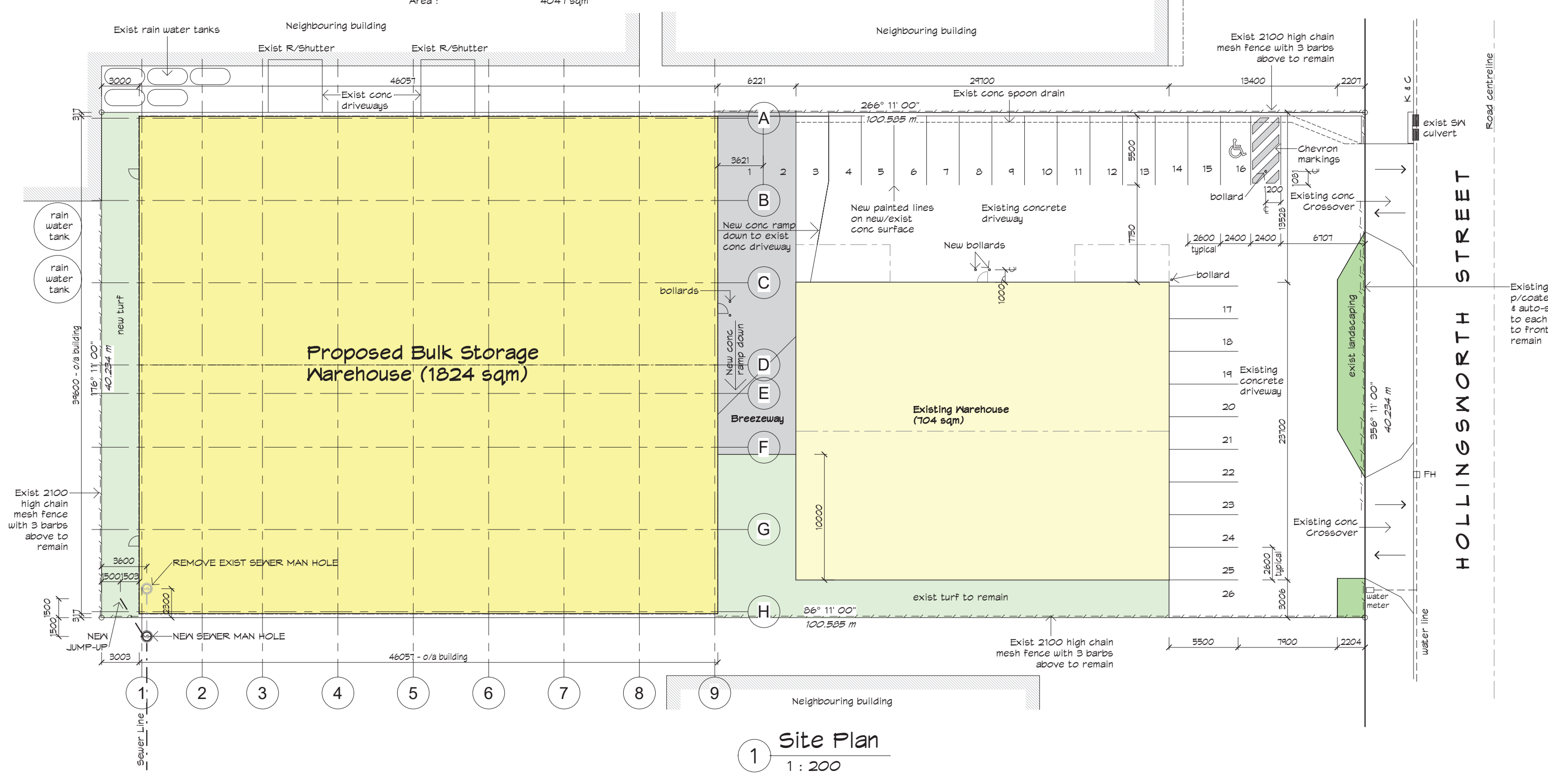
These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/91-2018

Dated: 5 December 2018

PRELIM 07
DATE: 27/07/18
NOT FOR CONSTRUCTION

R.P.D.
Lot Number : 17
Reg./Survey Plan Number : RP 601940
Parish : Murchison
County : Livingstone
Area : 4047 sqm



Site Plan
1 : 200

Site Analysis

Existing Floor Area	= 704.0 sqm
Proposed Floor Area	= 1824.0 sqm
Total Building Footprint Area	= 2528.0 sqm
Total Site Coverage	= 62.5 %
Total Landscaped Area Required	= 404.7 sqm
Total Landscaped Area Provided	= 332.6 sqm
Total Site Area	= 4047.0 sqm

Car Parking

Car parking spaces required	= 26
Total car spaces provided	= 26

Driveways

Existing concrete driveway area	= 1017.0 sqm
New concrete driveway area	= 170.4 sqm
Total driveway area	= 1187.4 sqm

REVISIONS		
No.	DESCRIPTION	DATE

NEW STORAGE WAREHOUSE
FOR DOBINSON SPRINGS
AT 68 HOLLINGSWORTH STREET,
KAWANA

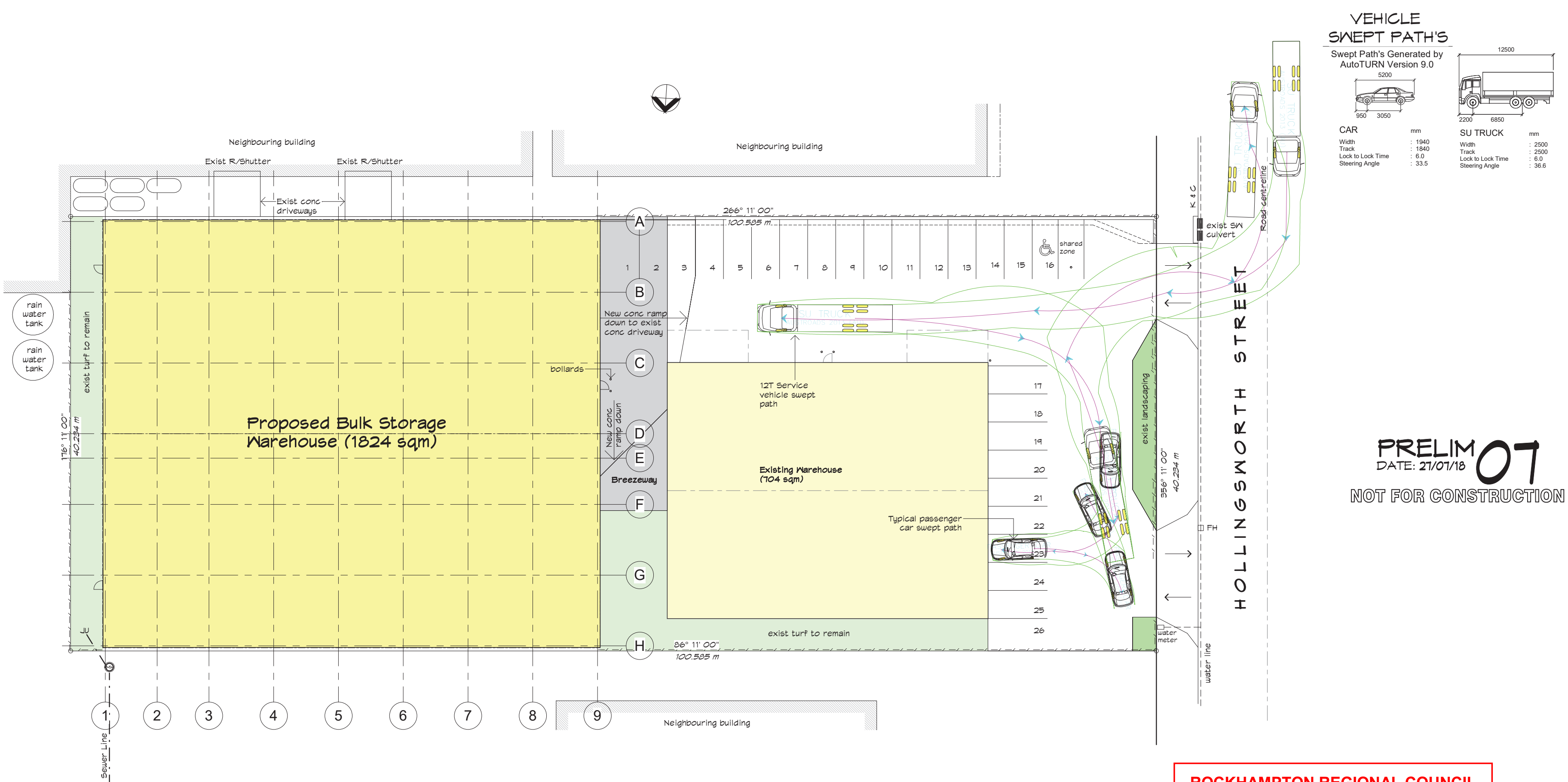
this drawing
Site Plan & Section L

Rufus Design Group
STYLE • QUALITY • INNOVATION

MEMBER BUILDING DESIGNERS ASSOC. OF QLD INC.
Licenced under the QBSA Act Lic No. 1180286
Telephone 61 7 49288011
Facsimile 61 7 49266579
E-mail mailbox@rufusdesigngroup.com

PROJECT MANAGER: DAW
DRAWN: DAW
CHKD:
WIND SPEED: C1
PLAN SIZE: A1
PROJECT NUMBER 170214 - 01
SHEET 01 OF 04 SHEETS
REVISION

PRINT DATE : 27/07/2018 9:14:33 AM



1 Vehicle Swept Path Plan
1 : 200

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/91-2018

Dated: 5 December 2018

REVISIONS		
No.	DESCRIPTION	DATE

NEW STORAGE WAREHOUSE FOR DOBINSON SPRINGS AT 68 HOLLINGSWORTH STREET, KAWANA

this drawing: Vehicle Swept Path Plan

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PROJECT MANAGER: DAW
DRAWN: DAW
CHKD:
WIND SPEED: C1
PLAN SIZE: A1
PROJECT NUMBER: 170214 - 02
SHEET 02 OF 04 SHEETS
REVISION

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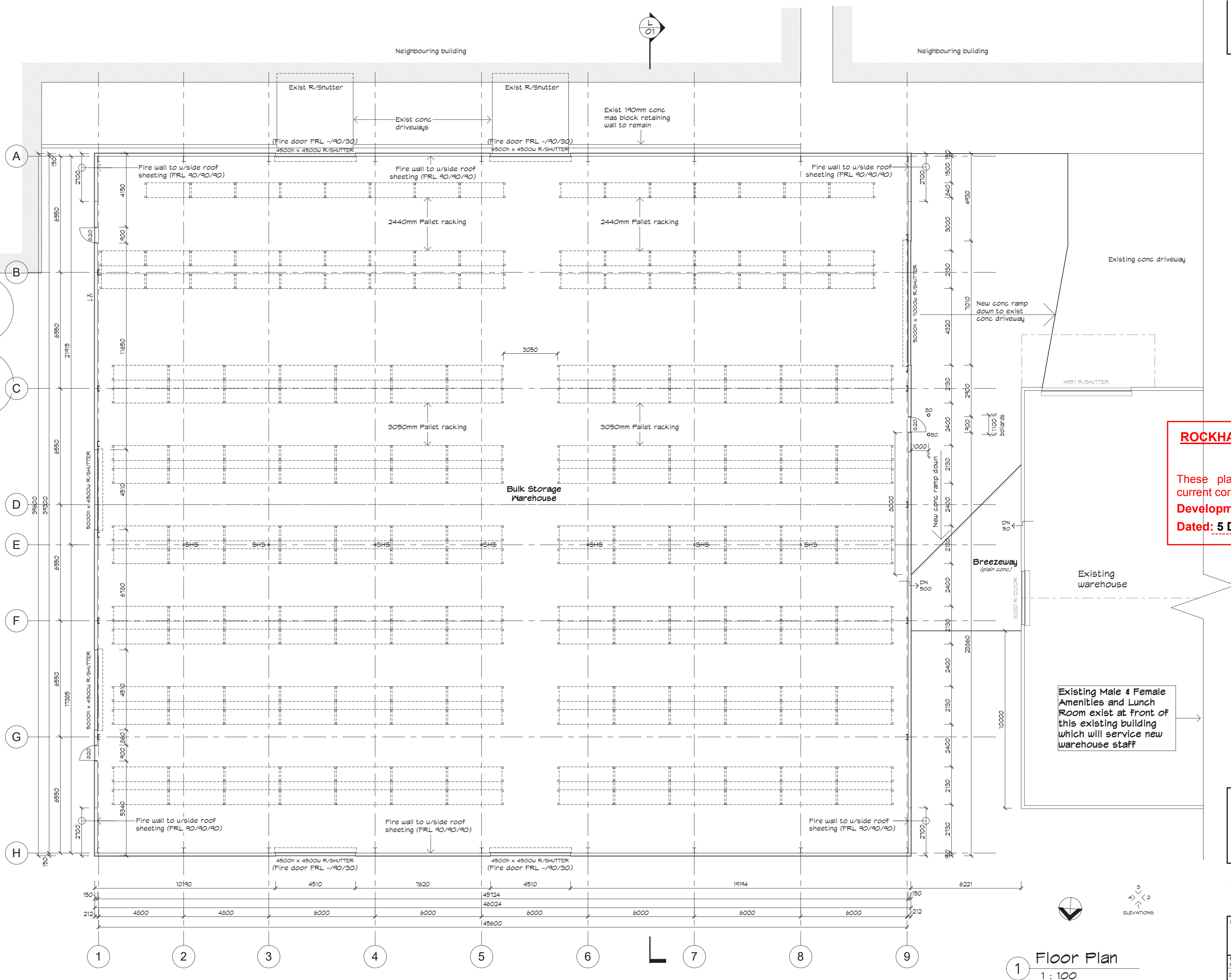

1 Floor Plan
1 : 100

REVISIONS

No.	DESCRIPTION	DATE

PRELIM 07
DATE: 27/07/18
NOT FOR CONSTRUCTION

Plan Legend

BO	Bollard
DP	Down Pipe
HC	Hose Cock

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

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Development Permit No.: D/91-2018

Dated: 5 December 2018

NEW STORAGE WAREHOUSE
FOR DOBINSON SPRINGS
AT 68 HOLLINGSWORTH STREET, KAWANA

Rufus Design Group
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MEMBER BUILDING DESIGNERS ASSOC. OF QLD INC.
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Telephone 61 7 49288011
Facsimile 61 7 49266579
E-mail mailbox@rufusdesigngroup.com

this drawing
Floor Plan

PROJECT MANAGER : DAW
DRAWN : DAW
CHKD :
WIND SPEED C1
PLAN SIZE: A1
PROJECT NUMBER 170214 - 03
SHEET 03 OF 04 SHEETS
REVISION

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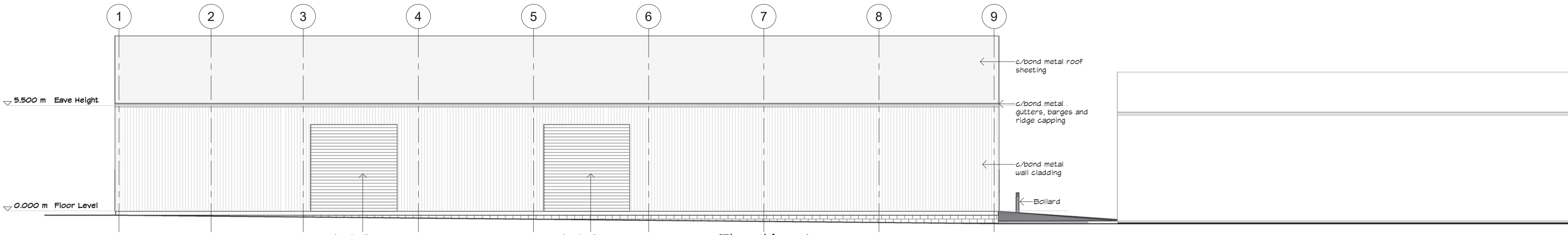

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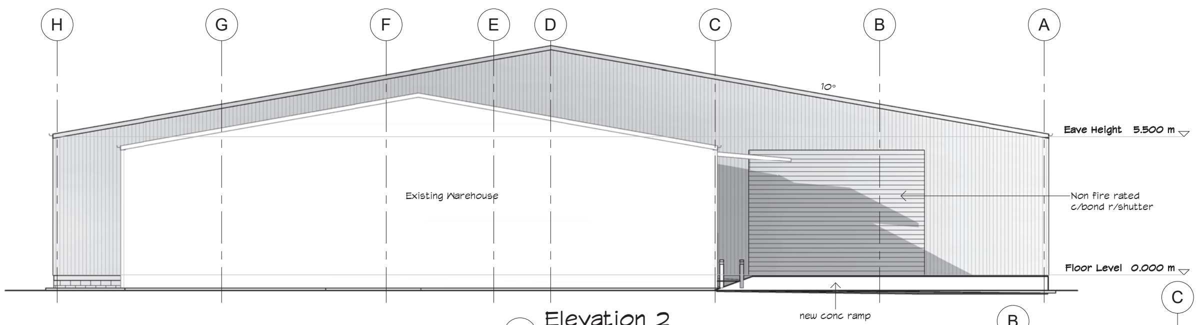

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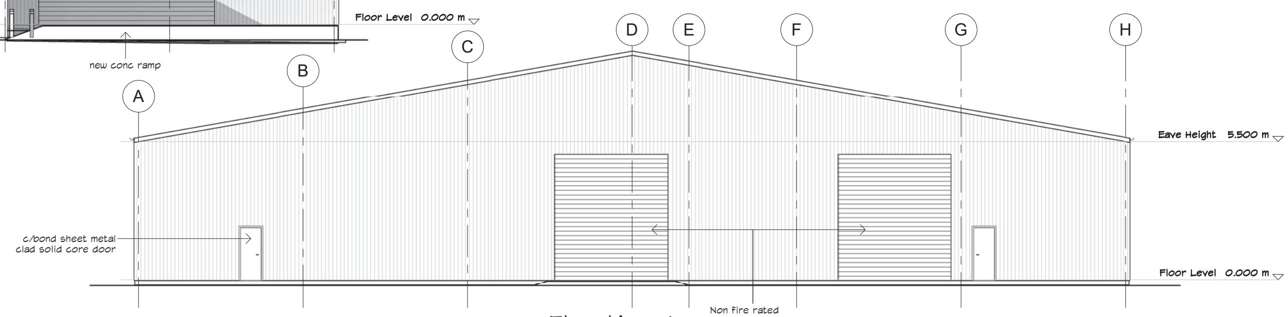
PRELIM 07
DATE: 27/07/18
NOT FOR CONSTRUCTION



4 Elevation 4
1 : 100

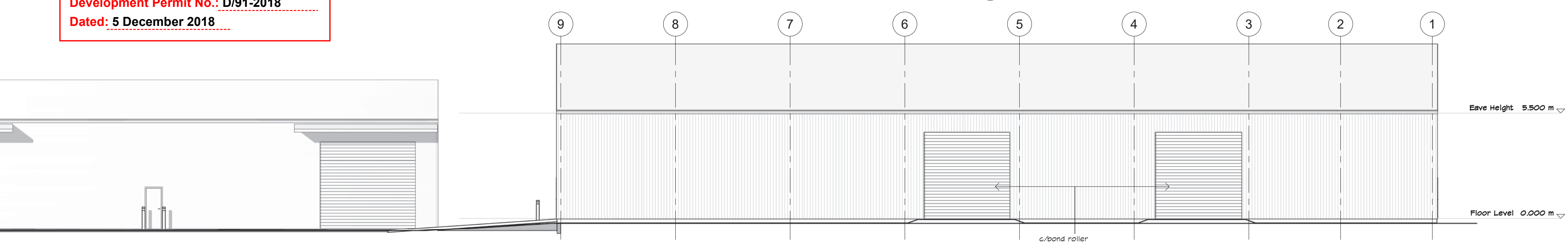
ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/91-2018

Dated: 5 December 2018



3 Elevation 3
1 : 100

REVISIONS			
No.	DESCRIPTION	DATE	

NEW STORAGE WAREHOUSE FOR DOBINSON SPRINGS AT 68 HOLLINGSWORTH STREET, KAWANA

this drawing: Elevations

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PROJECT MANAGER: DAW
DRAWN: DAW
CHKD:
WIND SPEED: C1
PLAN SIZE: A1
PROJECT NUMBER: 170214 -04
SHEET 04 OF 04 SHEETS
REVISION

PRINT DATE: 27/07/2018 9:19:42 AM

mcmurtrie
CONSULTING ENGINEERS

Stormwater Management Plan

Proposed Bulk Storage Warehouse
68 Hollingsworth Street, Rockhampton

Prepared For: Rufus Design Group

Job No. 012-18-19
16 October 2018
Revision D

ABN 69 958 286 371
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PO Box 2149
Wandal Q 4700
63 Charles Street
North Rockhampton Q 4701

Stormwater Management Plan

Rev.	Description	Signature	RPEQ no:	Date
D	Moved tanks to back of proposed Warehouse		1347	16.10.18
C	Responding to Council Information Request D/91-2018 dated 18 September 2018	INM	1347	05.10.18
B	Issued For Approval	INM	1347	23.08.18
A	Draft issue	-	-	23.08.18

CONTENTS

Stormwater Management Plan

Proposed Bulk Storage Warehouse

1.0 INTRODUCTION AND APPROACH

1.1. PROJECT OVERVIEW

McMurtrie Consulting Engineers (MCE) have been commissioned by Rufus Design Group to undertake a site based Stormwater Management Plan (SMP) for a proposed bulk storage warehouse which is located at 68 Hollingsworth Street, Rockhampton on Lot 17 on RP601940.

The aim of this SMP is to demonstrate that the proposed development will comply with Capricorn Municipal Development Guidelines (CMDG), Queensland Urban Drainage Manual (QUDM 2016), Australian Rainfall and Runoff 2016 (ARR'16) and State Planning Policy (SPP 2017).

1.2. METHODOLOGY

The assessment methodology adopted for this SMP is summarised below.

- Broadly identify the contributing catchments to the project.
- Identify Lawful Point of Discharge (LPOD) for the site stormwater runoff.
- Identify the critical storm event and duration for this project
- Estimate peak discharge runoff for pre-development and post-development scenarios.
- Identify potential mitigation and management strategies to be implemented during the construction and operational phases to ensure no worsening to downstream catchments and infrastructure.
- Assess the stormwater quality treatment requirements for the project.

1.3. DATA SOURCES

The background data used to undertake this assessment were collected from the following sources:

- ARR'16 data hub
    - Rainfall data
    - Design storm ensemble temporal patterns
- DTM survey
- Preliminary overall layout plan (completed by MCE)
- Pluviograph rainfall data for the 'Rockhampton Aero' station

2.0 SITE CHARCTERISTICS

2.1. SITE LOCATION

The proposed site is located on Lot 17 on RP601940, at 68 Hollingsworth Street, Rockhampton. Site details have been summarised within Table 1 and a Google Earth extract is presented as Figure 1.

Table 1: Site Description

Developer	Property and Location	
	Lot and Property Description	Address
Dobinsons Springs and Suspension	Lot 17 on RP601940	68 Hollingsworth Street, Rockhampton

Figure 1: Site Location **[Source: Google Earth]**

Hollingsworth street forms the Western boundary of the site. Northern, Southern and Eastern boundaries of the site are shared with the adjacent land. Refer Appendix A for proposed development layout.

2.2. TOPOGRAPHY

The existing site is approximately 0.405ha in land area. Currently the site consists of an existing low impact industrial shed (0.07ha) in the western half, concrete finished surface (0.124ha) and light grassed surface (0.211ha). The existing site levels range from approximately 13.13m AHD in the Southeast corner and 12.20m AHD in the southwest corner adjacent Hollingsworth street.

3.0 HYDROLOGY ASSESSMENT

3.1. LAWFUL POINT OF DISCHARGE

The Lawful Points of Discharge (LPOD) for the site is the Hollingsworth street road reserve. This point is under the lawful control of the local government and satisfies the Lawful Points of Discharge in accordance with QUDM.

Post development discharge from the proposed development will be directed to detention tanks which outlet to proposed pits, which flow to an existing pit in the Hollingsworth road reserve. The detention tanks are located at the Northeastern and Southeastern corners of the site to ensure there will be no adverse impacts on downstream properties and infrastructure.

3.2. HYDROLOGIC MODELLING

Hydrologic calculations have been undertaken using XPSTORM 2017 V2.2 for pre and post development scenarios. The modelling within XPSTORM environment has been undertaken to estimate the peak discharge for storms up to 1% AEP. Hydrologic modelling has been undertaken using the Laurenson Runoff Routing Method. Laurenson's Method is an industry leading hydrologic routing method that can be used for catchments ranging between 10m^2 up to 20,000km^2. The information required to apply Laurenson's Method include:

- Rainfall Intensity Data (obtained from the Bureau of Meteorology 2016 IFD utility)
- Rainfall Temporal Patterns (obtained from the ARR'16 Data Hub)
- Catchment Area (ha)
- Catchment Slope
- Initial and Continuing Infiltration Data
- Catchment Roughness (Manning's 'n')

Given the relatively limited scope of this hydraulic impact assessment a lumped catchment approach, as defined by ARR'16 and shown in Figure 2 below, was applied to the hydrologic review of the site. The lumped approach is suitable for this site given the relative consistency in land use and the ultimate purpose of the model.

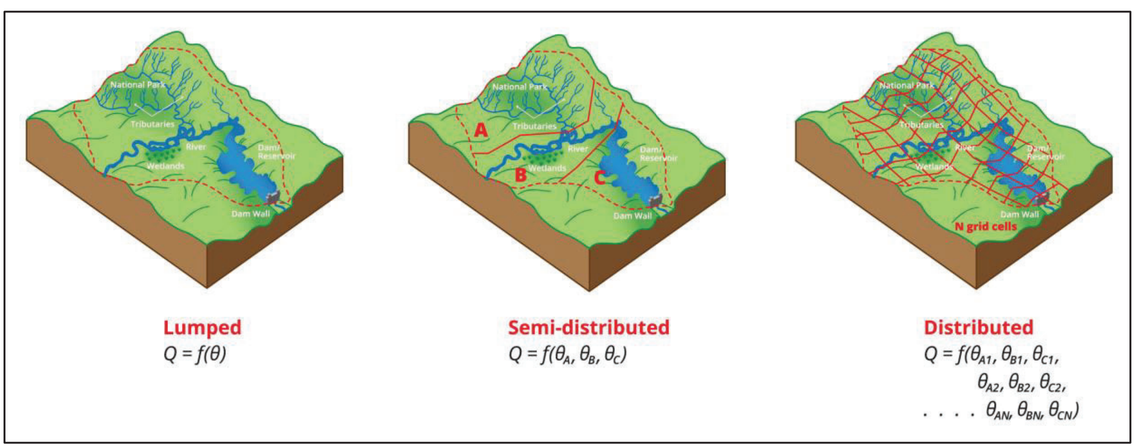


Figure 2: Catchment Analysis Options

Refer Appendix A for catchment boundaries for the site.

3.2.1. CATCHMENT HYDROLOGY PARAMETERS

Table 2 and 3 summarises the input data for the development site in pre-development and post-development conditions.

Table 2: Pre-Development Model Parameters (XP Storm)

Parameter		Existing Site	
		Grass	Concrete
Area (ha)		0.201	0.013
Impervious (%)		0.0	100
Slope (%)		1	2
Laurenson 'n' (storage non-linearity exponent)		-0.285	-0.285
Infiltration	Initial Loss (mm/hr)	0.0	0.0
	Continuing Loss (mm/hr)	1.7	0.0
Manning's Roughness (n)		0.030	0.015

Table 3: Post-Development Model Parameters (XP Storm)

Parameter		Carpark		
		Grass	Concrete	Roof Area
Area (ha)		0.012	0.017	0.182
Impervious (%)		0.0	100	100
Slope (%)		0.5	10	17.63
Laurenson 'n' (storage non-linearity exponent)		-0.285	-0.285	-0.285
Infiltration	Initial Loss (mm/hr)	0.0	0.0	0.0
	Continuing Loss (mm/hr)	1.7	0.0	0.0
Manning's Roughness (n)		0.030	0.015	0.012

Applying no initial losses within the model is consistent with the requirements of both ARR'87 and ARR'16. ARR'16 states that there is no evidence that infiltration losses change with respect to the recurrence interval being modelled and that continuing losses can be applied equally to frequent and rare events. The following Manning's roughness values have been applied to the catchments:

- Grass 'n' = 0.030 (weighted average roughness of poor grass cover)
- Concrete 'n' = 0.015 (weighted average rough concrete)
- Roof Area 'n' = 0.012 (weighted average of smooth roofing material)

3.2.2. HYDROLOGY RESULTS

Applying the ARR'16 ensemble temporal patterns to the catchment allowed the identification of the critical duration for the mean minor and major storm event. Below figures are screen shots of Box and Whisker plot taken from XPSTORM software. This plot shows the comparison of storm ensembles for different durations for minor and major storm events.

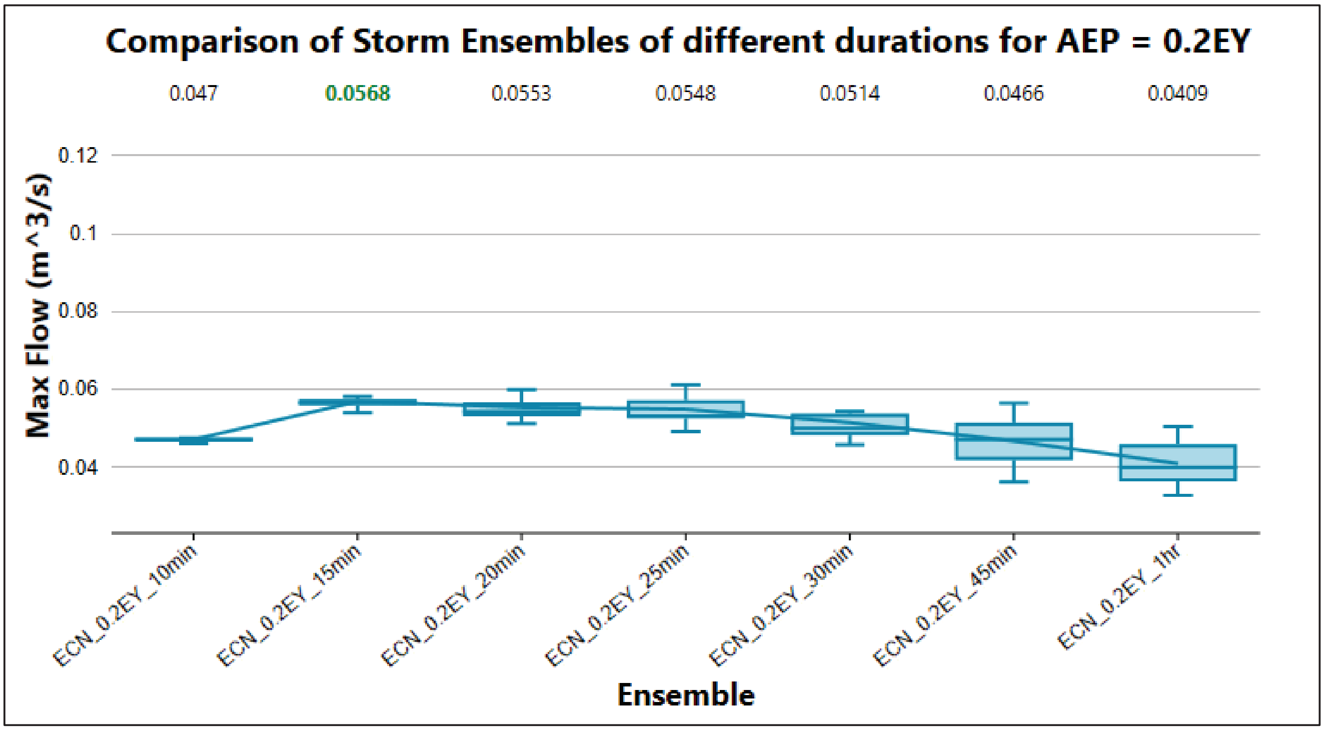


Figure 3: Comparison of Storm Ensembles of different durations for 0.2 EY (XPSTORM Model)

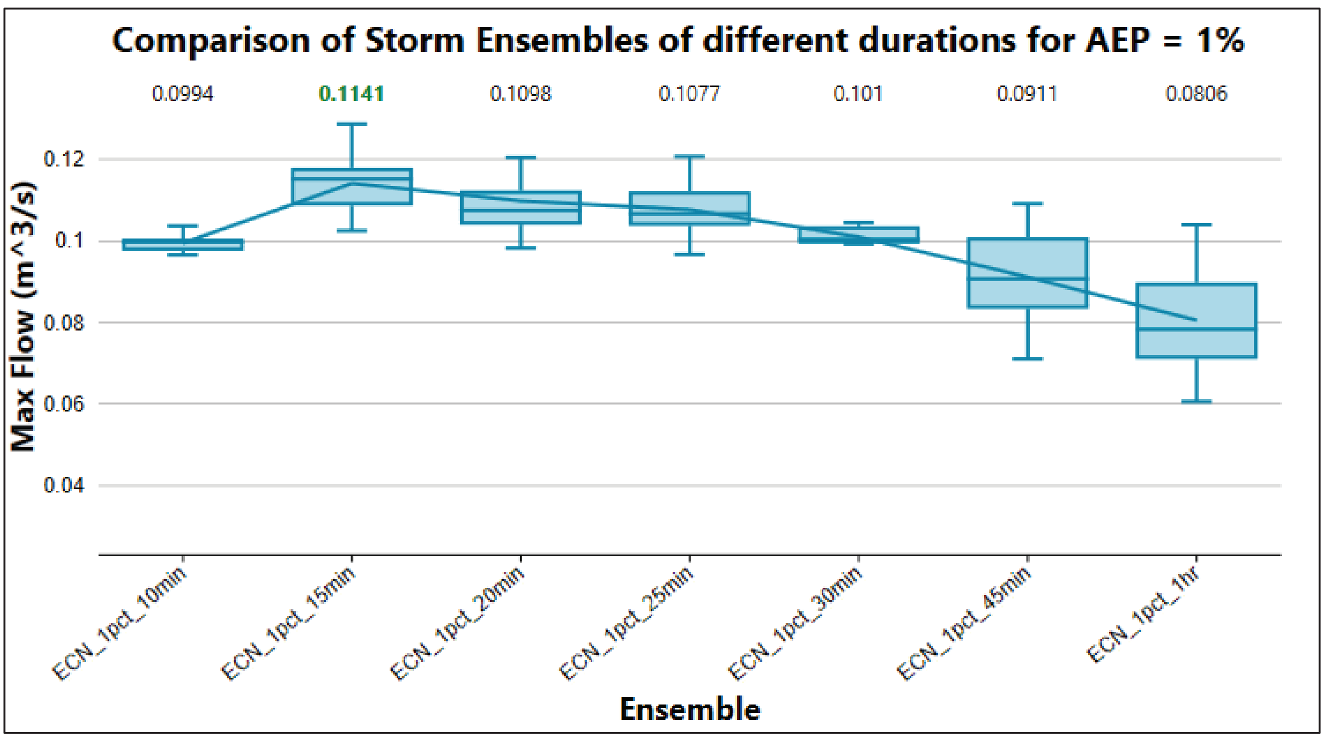


Figure 4: Comparison of Storm Ensembles of different durations for 1% AEP (XPSTORM Model)

The results of each of the ensembles are summarised in Table 4. The same storm events are applied to the hydraulic analysis.

Table 4: Critical Storm Events

Annual Exceedance Probability (AEP %)	Critical Storm Event	
	Pre-Development	Post-Development
18.13 % (0.2EY)	0.2EY_15min_9	0.2EY_10min_3
1% (Major Event)	1pct_15min_1	1pct_10min_3

3.2.3. EXTERNAL CATCHMENTS

External catchments surrounding the subject site have been analysed and shown on stormwater catchment plan. The adjacent lots to the North and South fall west to Hollingsworth Street. A subtle crest runs along the boundary to the eastern lots causing the Eastern lots to fall Southeast to Power Street. No external catchments affect the lot.

4.0 HYDRAULIC ASSESSMENT

4.1 BACKGROUND

The hydraulic assessment for the site has been carried out using XPSTORM 2017 V2.2. The main aim of the hydraulic modelling is to demonstrate that the post-development minor and major storm peak discharge at the LPOD is equal or less than peak pre-development discharge. This aim will be achieved by detaining the site runoff via detention tanks within the development site.

4.2 DETENTION

It is proposed to provide 2 groups of 5, 5,000 L detention tanks in the Northeastern and Southeastern corners of the lot. Each group of tanks outlets to an adjacent stormwater pit via a low flow 75mm dia pipe and a 150mm dia pipe for major events to ensure there will be no adverse impacts on downstream properties and infrastructure during minor and major storm events. No ponding in the roof gutters has been allowed. Table 5 summarises the peak discharge at the LPOD for different scenarios.

Table 5: Peak Discharge Rate at LPOD

Storm Event (AEP %)	Pre-Development (m^3/s)	Post-Development without Detention (m^3/s)	Post-Development with Detention (m^3/s)
18.13 % (0.2EY)	0.0568	0.095	0.050
1% (Major Event)	0.1136	0.166	0.103

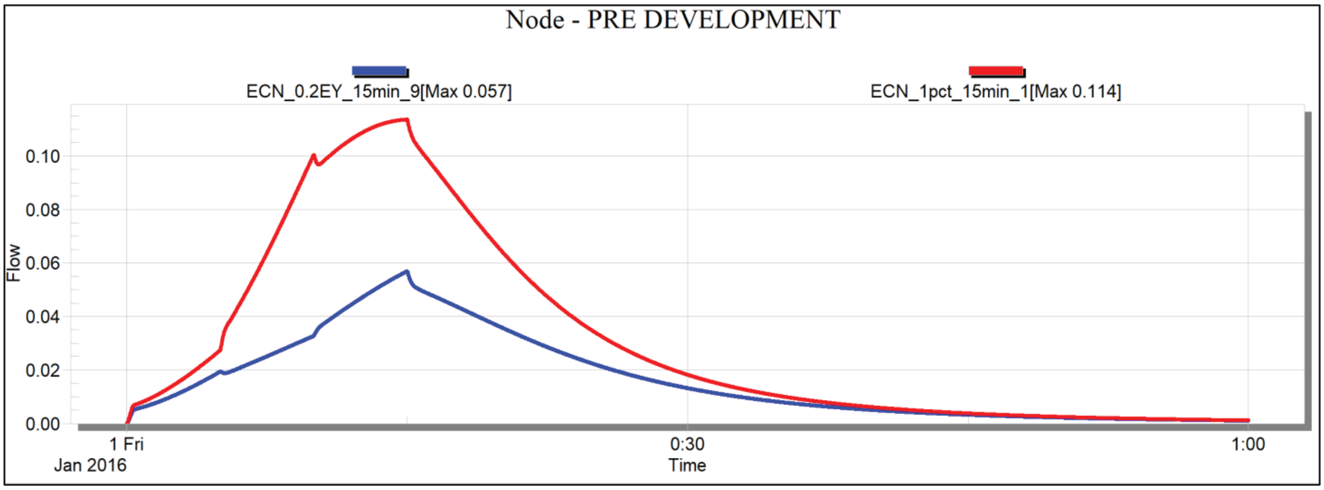


Figure 5: Pre-Development Peak Discharge Rate at LPOD

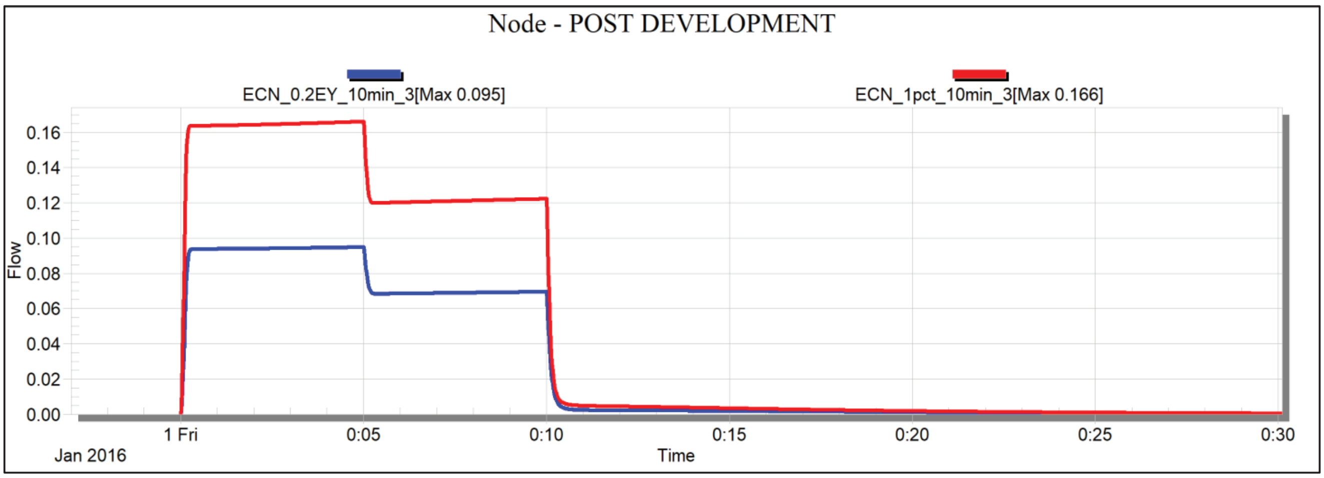


Figure 6: Post-Development Peak Discharge Rate at LPOD

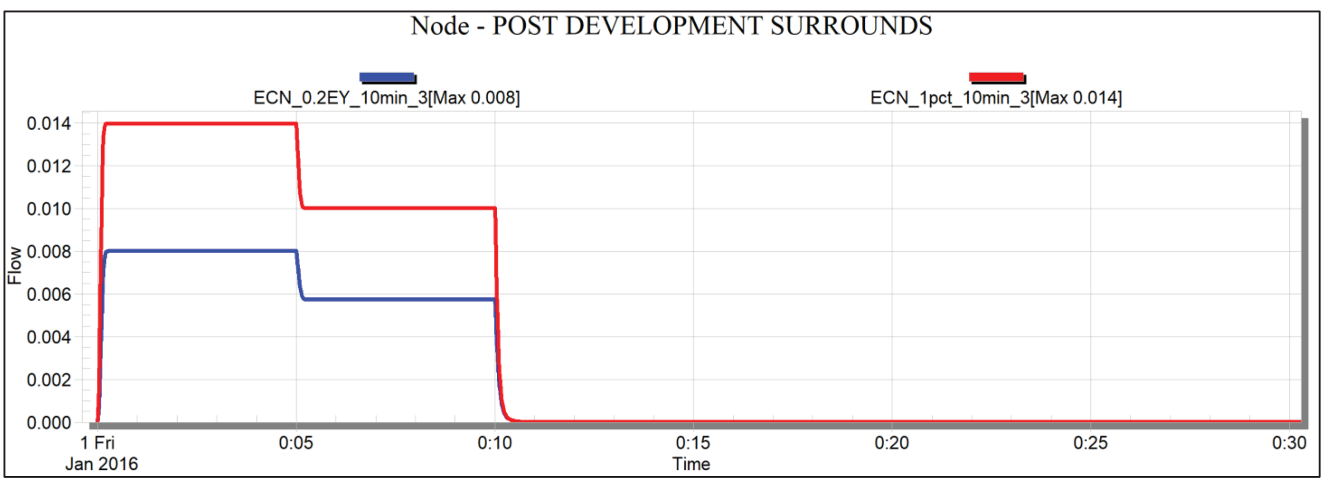


Figure 7: Post-Development proposed unmitigated runoff

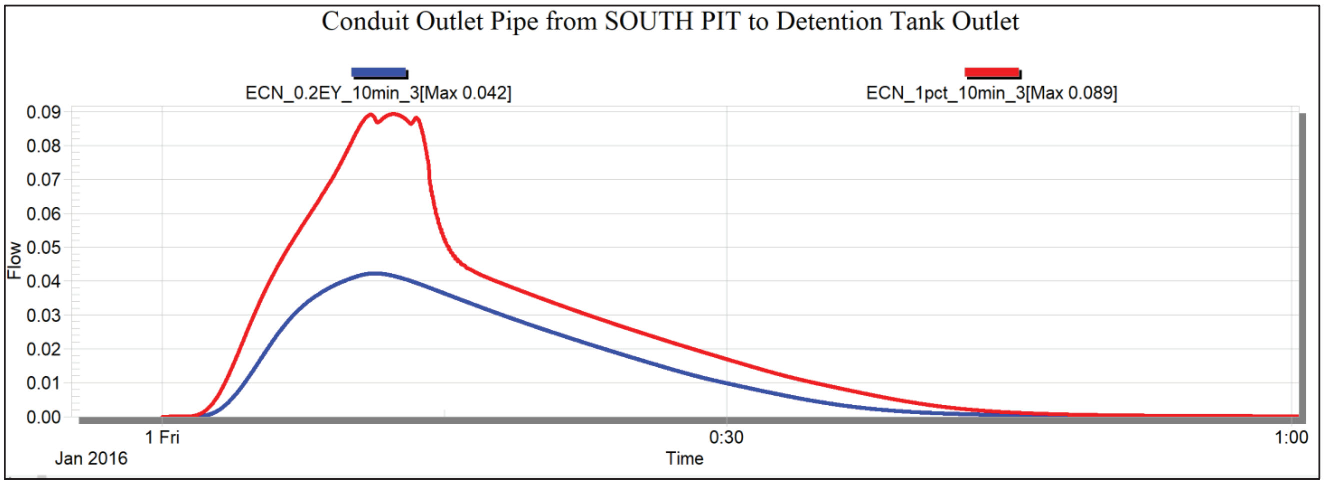


Figure 8: Post-Development mitigated runoff through 300mm outlet pipe at LPOD

Table 6 summarises detention parameters to achieve the target mitigated pre-development flow rates.

Table 6: Detention Tank Parameters

	Northern Roofwater detention	Southern Roofwater detention
Detention area	5 X 2.381 = 11.905m²	5 X 2.381 = 11.905m²
Detention Depth allowable	2.10m	2.10m
Detention Volume	25m³	25m³
Outlet Structure	70mm Low flow pipe @ RL 13.3 150mm Major outlet @ RL 14.5	70mm Low flow pipe @ RL 13.3 150mm Major outlet @ RL 14.5

Refer Appendix A for proposed detention tank location and details.

5.0 QUALITY ASSESSMENT

5.1. BACKGROUND

The development of the land has the potential to increase the pollutant loads within stormwater runoff and downstream watercourses. During the construction phase of the development, disturbances to the existing ground have the potential to significantly increase sediment loads entering downstream drainage systems and watercourses. The operational phase of the development will potentially increase the amount of sediments and nutrients washing from the site.

The following sections describe construction and operational phase controls and water quality modelling of the proposed treatment train in compliance with Council guidelines.

5.2. CONSTRUCTION PHASE

5.2.1. KEY POLLUTANTS

During the construction phase a number of key pollutants have been identified for this development. Table 7 illustrates the key pollutants that have been identified.

Pollutant	Sources
Litter	Paper, construction packaging, food packaging, cement bags, material off cuts.
Sediment	Exposed soils and stockpiles during earthworks and building works.
Hydrocarbons	Fuel and oil spills, leaks from construction equipment and temporary car park areas.

Table 7: Key Pollutants – Construction Phase

5.2.2. EROSION AND SEDIMENT CONTROLS

Erosion and sediment control devices employed on the site shall be designed and constructed in accordance with CMDG.

PRE-CONSTRUCTION

- Stabilised site access/exit on Hollingsworth Street.
- Sediment fences to be located along the contour lines downstream of disturbed areas.
- Diversion drains to divert clean runoff around the construction site.
- Educate site personnel to the requirements of the Sediment and Erosion Control Plan.

CONSTRUCTION

- Maintain construction access/exit, sediment fencing, catch drains and all other existing controls as required.
- Progressively surface and revegetate finished areas as appropriate.

During construction, all areas of exposed soils allowing dust generation are to be suitably treated. Treatments will include mulching the soil and watering. Road access is to be regularly cleaned to prevent the transmission of soil on vehicle wheels and eliminate any build-up of typical road dirt and tyre dusts from delivery vehicles.

Adequate waste disposal facilities are to be provided and maintained on the site to cater for all waste materials such as litter hydrocarbons, toxic materials, acids or alkaline substances.

5.3. OPERATIONAL PHASE

The following section describes the design of the Stormwater Quality Improvement Devices (SQID's) that form a treatment train for the operational phase of the development that complies with State Planning Policy 2017 water quality objectives as follows:

- 85% reduction in Total Suspended Sediment (TSS)
- 60% reduction in Total Phosphorus (TP)
- 45% reduction in Total Nitrogen (TN)
- 90% reduction in litter (sized 5 mm or greater)

The development proposes roughly 92% of the total site to be sealed (3,714m^2 impervious area for a 4,046m^2 lot) and thus the site requires water quality management during the operational phase. The proposed treatment train is based on the use of a bioretention basin. In order to achieve the water quality objectives for the proposed development area, including the half of the existing roof area, the surface area of the bioretention basin is to be 170m^2.

The current site generally falls, to the LPOD. The impervious area is adjacent to the legal point of discharge and almost all stormwater that falls onto the impervious area cannot be practically treated without major alterations to the existing surface. Given that the site is allowed to function in its current capacity it is reasonable to solely treat all of the proposed new impervious areas and existing impervious areas that can be conveyed to the bio retention basin. The only existing impervious area that can practically be conveyed to the bio retention basin is the northern roofwater from the existing low impact industrial shed.

5.3.1. STORMWATER QUALITY MODELLING

Stormwater Pollutant modelling for the development has been generated using the modelling program 'Model for Urban Stormwater Improvement Conceptualisation' (MUSIC), version 6.3, adhering to the prescribed Water by Design MUSIC modelling guidelines Version 1.0, 2010. A "Split Catchment" approach has been adopted using separate source nodes for the following typical site areas:

- Roof Catchment
- Ground Level (general landscaped areas).

Further assumptions associated with the model involve:

- Default routing (No flow routing or translation between nodes);
- No seepage/exfiltration (0 mm/hr);
- Adopted meteorology data from Rockhampton Aero rainfall station – 039083, 6-minute time step from 2000-2010; and
- All other parameters used within the modelling were based on Water by Design MUSIC Modelling Guidelines Version 1.0, 2010.

The following table summarises the source node catchment areas and their respective impervious fractions.

Table 5: Key Pollutants – Construction Phase

Source Node	Catchment Area (ha)	Fraction Impervious (%)
Proposed Roof	0.182	100
Existing Roof	0.035	100
Proposed Ground Level	0.020	40

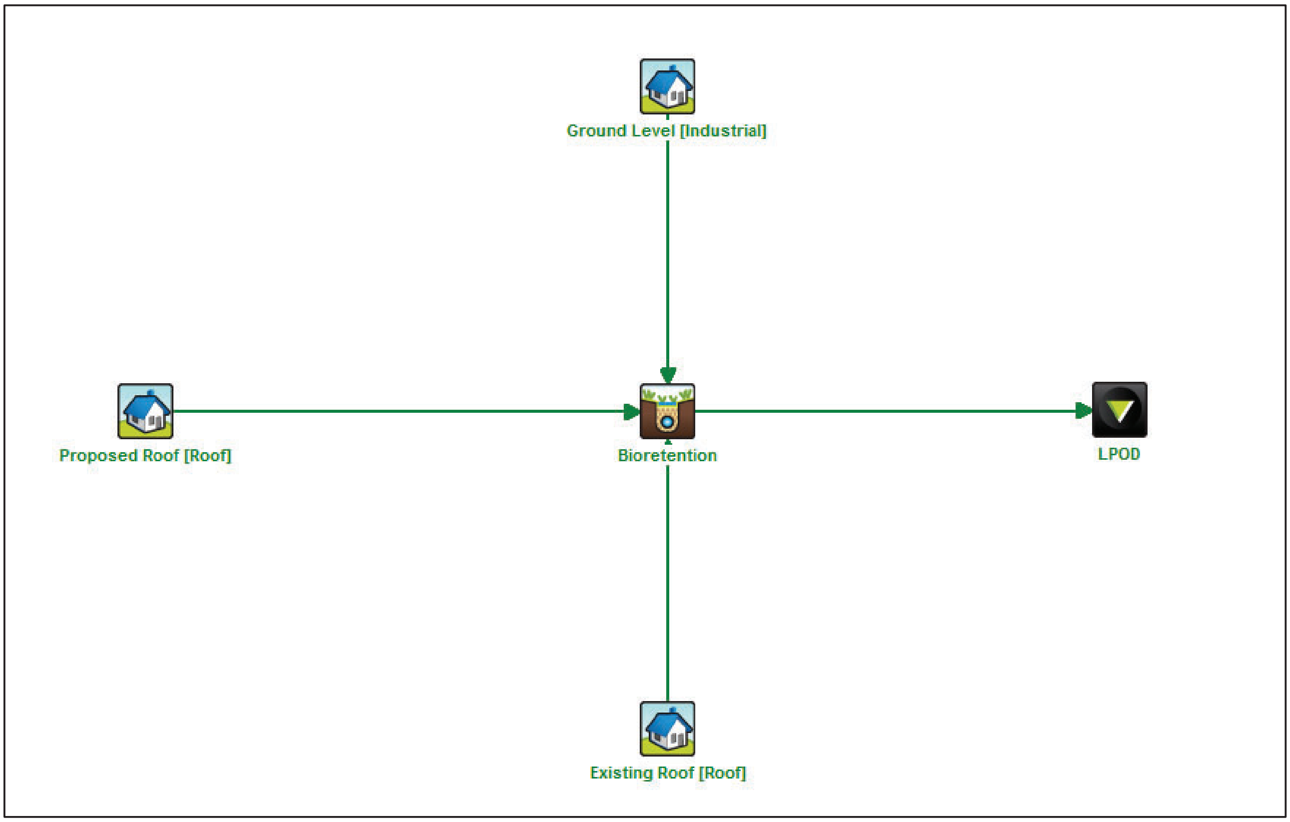


Figure 9: Stormwater Quality Treatment Train

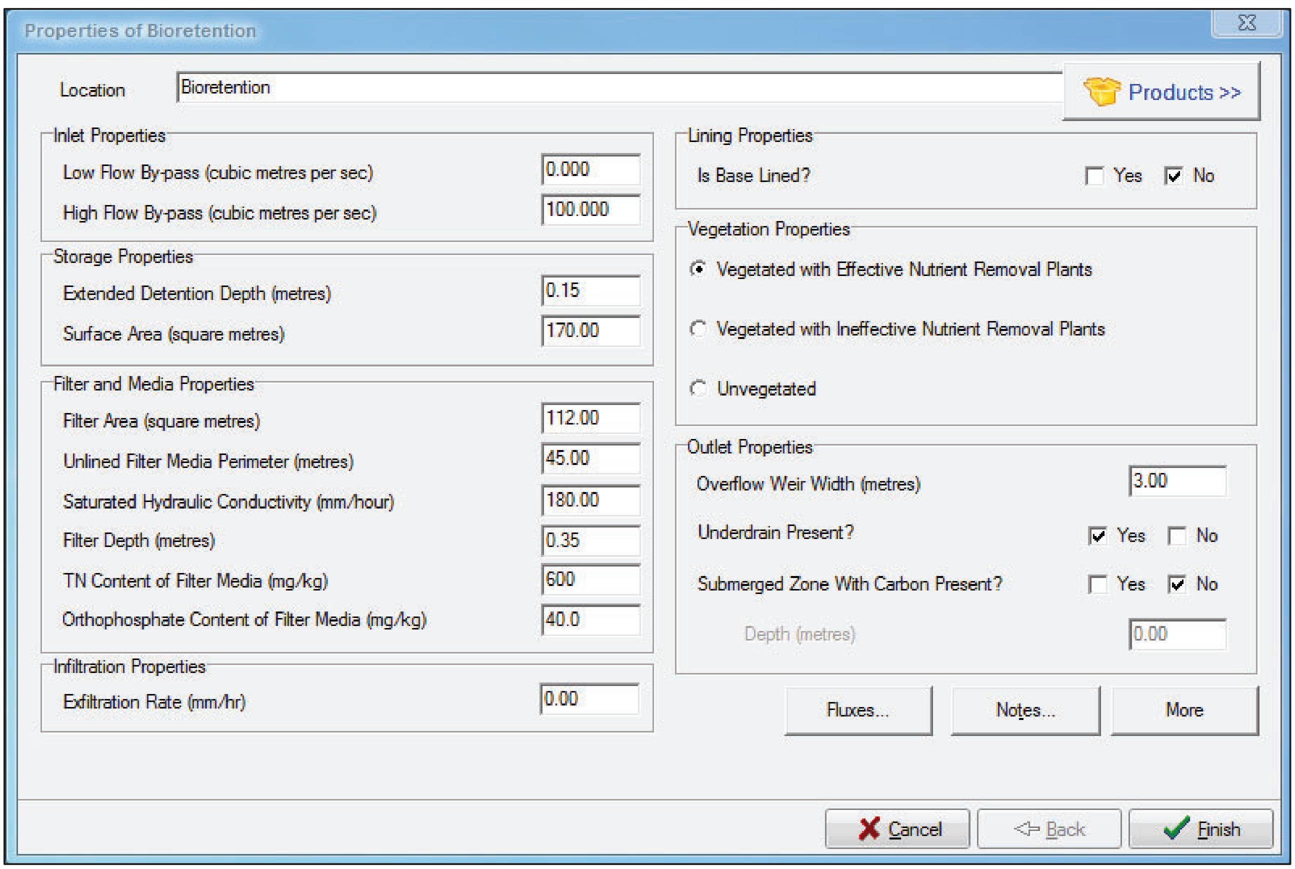


Figure 10: Properties of Bioretention Basin

Treatment Train Effectiveness - LPOD

	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.37	1.23	10.6
Total Suspended Solids (kg/yr)	54.7	6.59	87.9
Total Phosphorus (kg/yr)	0.271	0.0972	64.1
Total Nitrogen (kg/yr)	3.21	1.23	61.6
Gross Pollutants (kg/yr)	34.3	0	100

Figure 11: Stormwater Quality Treatment Train Effectiveness

The above treatment train achieves the State Planning Policy water quality benchmarks.

LEGEND

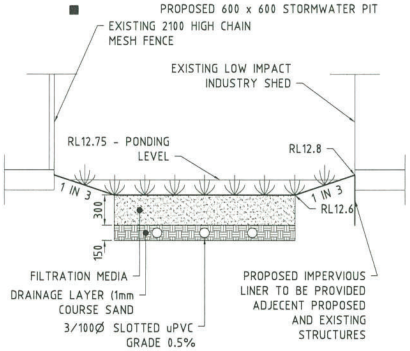
18.0	EXISTING CONTOURS (MAJOR) 0.5m INTERVALS
	EXISTING CONTOURS (MINOR) 0.1m INTERVALS
	EXISTING PROPERTY BOUNDARIES
	DENOTES EXTENT OF DEVELOPMENT
—SW—	PROPOSED STORMWATER RETICULATION ALIGNMENT
—SS—	SUBSOIL DRAINAGE
	PROPOSED IMPERVIOUS LINER
	PROPOSED 5000L SLIMLINE DETENTION TANK (REFER DETAIL)
	PROPOSED 600 x 600 STORMWATER PIT

PRE - DEVELOPMENT

DESCRIPTION	n	AREA(ha)	SLOPE %
GRASS	0.03	0.201	1
CONCRETE	0.015	0.013	2

POST - DEVELOPMENT

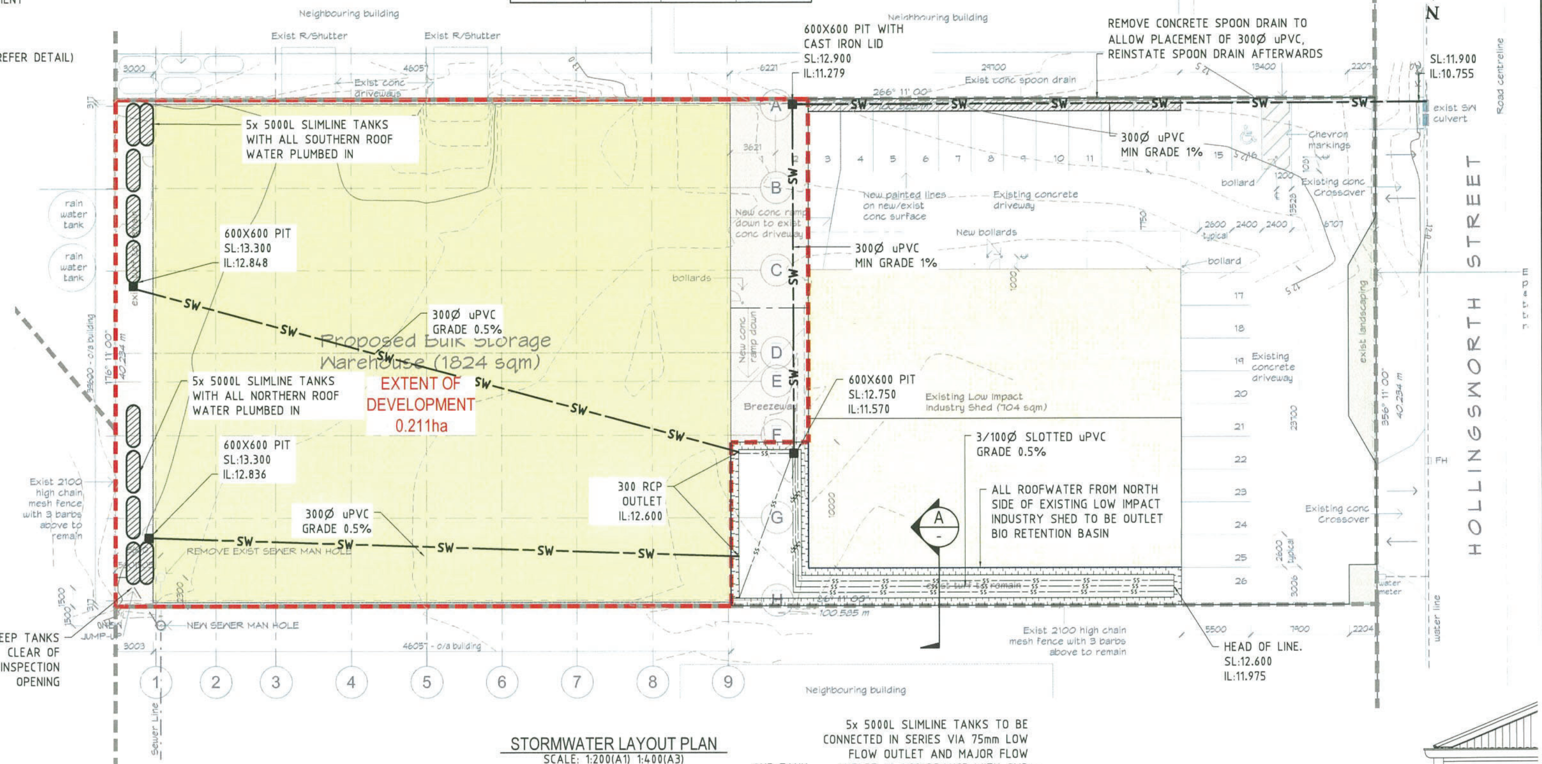
DESCRIPTION	n	AREA(ha)	SLOPE %
GRASS	0.03	0.012	0.5
CONCRETE	0.015	0.017	10
ROOF	0.012	0.182	17.63



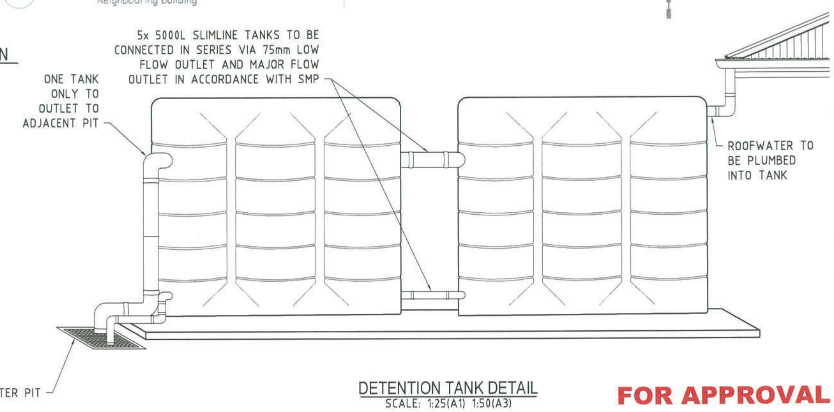
A SECTION
SCALE 1:25(A1) 1:50(A3)

FILTRATION MEDIA PROPERTIES

FILTER	SANDY LOAM
D50	0.45mm
SATURATED HYDRAULIC CONDUCTIVITY	180mm/hr
TN CONTENT OF FILTER MEDIA	600mg/kg
ORTHOPHOSPHATE CONTENT OF FILTER MEDIA	40mg/kg



STORMWATER LAYOUT PLAN
SCALE: 1:200(A1) 1:400(A3)



DETENTION TANK DETAIL
SCALE: 1:25(A1) 1:50(A3)

SCALE 1:25 @ A1 SCALE 1:50 @ A3 SCALE 1:200 @ A1 SCALE 1:400 @ A3

FOR APPROVAL

SURVEYOR	CAPRICORN SURVEY GROUP	ADDRESS: 132 VICTORIA PARADE ROCKHAMPTON, QLD 4700	
CO-ORDINATE DATUM	ARBITRARY		
HEIGHT DATUM	AHD VIDE PM104339 RL:12.484m		

REV	DATE	REVISION DESCRIPTION	DFT	DFT CHK	DES	DES CHK
B	16.10.2018	MOVED TANKS TO BACK	IBB	IBB	IBB	INM
A	05.10.2018	RFI RESPONSE	IBB	IBB	IBB	INM

DRAWING No. | REFERENCE DRAWING TITLE

	BY	DATE
REVIEWED		
RPEQ ENG	[signature]	17/10/18
RPEQ No: 1347		

CLIENT

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SCALE: AS SHOWN

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0121819

CLIENT: RUFUS DESIGN GROUP
PROJECT: NEW STORAGE WAREHOUSE - 68 HOLLINGSWORTH STREET, KAWANA
TITLE: STORMWATER LAYOUT PLAN
SHEET 1 OF 1

A1 | DRAWING NUMBER 0121819-0001 | REVISION B

APPENDIX A

Proposed Stormwater layout