PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2016/776

Date: 17/08/2018

Queensland Government

calibre CONSULTING

PREPARED FOR COLES GROUP PROPERTY DEVELOPMENT
MAY 2018
15-003394.SMP01C
ORIGINAL
WATER & ENVIRONMENT

Coles Flagstone
Site-Based Stormwater Management Plan

COMMERCIAL IN CONFIDENCE

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DOCUMENT CONTROL
15-003394.SMP01

Issue	Date	Issue Details	Author	Checked	Approved
A	27/04/2016	Original submission	IP	MS (RPEQ 9485)	MS (RPEQ 9485)
B	18/05/2016	Minor changes for updates to layout	MS (RPEQ 9485)		
C	09/05/2018	Layout amendment	RH	MS	~~AV (RPEQ 19033)~~

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FIGURES

APPENDICES

1 INTRODUCTION

Calibre Consulting (Qld) Pty Ltd has been commissioned to undertake a Site-Based Stormwater Management Plan to support the proposed Coles Flagstone Development Application (DA).

The proposed development comprises a building for retail, as well as open space areas, car parking facilities and internal roads. The proposed site layout is shown on the Powe Architects Masterplan drawing (248-17 DA-1-001 Revision G) included in **Appendix A**.

This report investigates and addresses the stormwater quality, quantity and waterway stability management requirements for the development in accordance with relevant Local and State Government Standards. The report is to address the Economic Development Queensland (EDQ) Development Condition No.13 (EDQ Approval No. DEV2014/637 dated 8 July 2015). Furthermore, the report provides a flood hazard assessment presenting flood constraints and minimum flood immunity levels for the new buildings. For clarity and consistency the development site that consists of three adjoining lots will herein be referred to as "the site". Scope of the report is provided in **Section 1.1**.

The purpose of this report (**Issue C**) is to provide an update to the stormwater quality modelling for the new layout (presented in **Appendix A**) and confirm the stormwater quality management strategy will achieve the required pollutant load reductions.

1.1 SCOPE OF THIS REPORT

The scope of this report incorporates the following:

- Stormwater quantity assessment to demonstrate no increase in peak flows will result from the development and therefore no adverse impact to neighbouring or downstream properties;
- Management of Waterway Stability required under the *State Planning Policy* (SPP);
- Stormwater quality analysis using MUSIC software to determine the adequacy of the proposed SQIDs to meet the Water Quality Objectives (WQO's) required under *SPP*; and
- Addresses EDQ Development Condition No.13 outlined in **Section 1.2** below.

1.2 EDQ CONDITIONS

Details for EDQ's Conditions for Stage 7 of Greater Flagstone in which the Coles Flagstone is to be located and Calibre Consulting's responses are presented in **Table 1-1**.

Table 1-1: EDQ Approval DEV2014/637 dated 8 July 2015

Item	EDQ Development Conditions	Addressed in Section
Engineering		
13.	Submit Management (Quantity & Quality) a) Submit to EDQ Development Assessment, DILGP detailed design and hydraulic calculations certified by RPEQ for the proposed stormwater drainage reticulation system including detention basins and stormwater treatment devices generally in accordance with the PDA Guideline No. 13 Engineering Standards – Stormwater Quality and the following approved documents: i. Flagstone City – Masterplan Flooding Assessment, Document No. 721743/032/R1V6. Version. Dated 05 September 2014; ii. Flagstone City-Stage 7 Stormwater Management Report, Document No. 7217/43/R11V1, Version 2, dated 14 January 2015.	**Report No. B15-003394.SMP01**

Item	EDQ Development Conditions	Addressed in Section
	The drainage network adopted must demonstrate 'no worsening' or create actionable nuisance to upstream or downstream properties, including the adjoining rail network for storm flows up to a 1% AEP. *The report provides a Site-Based Stormwater Management Plan addresses the requirements of this Development Condition for the Greater Flagstone Development Stage 7.*	

2 SITE CHARACTERISTICS

2.1 LOCATION

The site is located at the corner of the roundabout on Homestead Drive Jimboomba, on the property identified as Lot 25000 on SP286481. While located within the Logan City Council (LCC) local government area it is understood that this report will be lodged as part of the DA package to Economic Development Queensland (EDQ). The total development occupies 1.86ha.

Figure 2-1 below indicates the approximate location of Coles Flagstone.

Figure 2-1: Approximate Location of Coles Flagstone (source: QLD Globe 2018)

2.2 EXISTING TOPOGRAPHY AND DRAINAGE

Following subdivision works (to create Lot 25000) the site had its highest point at its northern corner adjacent to Homestead Drive. From this high point, the site fell towards the farm dam (that is now a waterbody / pond) to the west of Gates Road. It is understood that the site (while now regarded) still falls west towards Gates Road and to waterbody / pond.

3 STORMWATER INVESTIGATION

The management of the stormwater quantity and site flooding is to be consistent with the EDQ approved stormwater reports as outlined in **Section 1.2**:

i. *Flagstone City – Masterplan Flooding Assessment*, Cardno Document No. 721743/032/R1V6. Version. Dated 05 September 2014; and
ii. *Flagstone City-Stage 7 Stormwater Management Report*, Cardno Document No. 7217/43/R11V1, Version 2, dated 14 January 2015.

Both documents have been approved as part of the PDA Development Approval (DEV2014/637 dated 8 December 2015).

The section below demonstrates the propose development is consistent with the approved documents.

3.1 STORMWATER QUANTITY

The stormwater management strategy for Stage 7 of the Flagstone City development is presented within the Cardno document *Flagstone City-Stage 7 Stormwater Management Report* (2015). This report identified that with the adoption of the local 1 Year ARI (63% AEP) basins the Stage 7 development will not have any adverse flood impact external to the site. The Coles Flagstone site is to discharge runoff to the Waterway Stability and Bioretention Basin on the western side of the site, adjacent to Road No.6 (now Gates Road). This basin is designated as EC2 in the *Stormwater Management Report* (2015) and is to be constructed as part of the Stage 7 subdivision works. Refer to Drawing No. **15-003394-SK001** in **Appendix C** for the location of this basin.

An assessment has been undertaken to determine if the proposed Coles development layout is consistent with the hydrological analysis previously undertaken and documented in the *Stormwater Management Report* (2015).

Fraction impervious values for the proposed Coles development have been compared to the values adopted within the Cardno Stormwater Management Plan to ensure that the proposed development is consistent with previous analysis.

Table 3-1: Stormwater Quantity Parameter Comparison

Parameter	Approved Report No. 7217/43/R11V1 (January 2015)	This Report No. 15-03394.SMP01 (2018)
Fraction Impervious (%)	90%	88%

The fraction impervious for the proposed Coles Flagstone development is consistent with value adopted within the approved Stage 7 *Stormwater Management Plan* (2015).

3.2 INTERNAL DRAINAGE STRATEGY

Pipe drainage is proposed for conveying minor flows from the Coles Flagstone development to the Waterway Stability and Bioretention Basin (EC2) on the western side of the site. This basin is to provide peak flow mitigation for the 1 Year ARI (63% AEP) and stormwater quality treatment before discharging downstream. An internal stormwater drainage strategy is required to ensure that runoff is managed effectively through the site during minor and major storm events.

The site stormwater network is to convey the major and minor storm events through the site to Basin EC2. Typically, underground piped drainage is designed to convey the minor storm only. Major flows will discharge overland similar to existing conditions.

3.3 FLOOD INVESTIGATION

A Flood Investigation was undertaken as part of the master planning for the overall Flagstone City development and for Stage 7. The flood investigations are documented within the approved Cardno documents *Flagstone City – Masterplan Flooding Assessment* (2014) and *Flagstone City-Stage 7 Stormwater Management Report* (2015).

The results of the flood investigations demonstrated that the cumulative development of Stage 7 and Stage 1 will not cause any significant adverse flooding impacts external to the overall Flagstone City development extent.

The Coles Flagstone development is consistent with the land use proposed by the development on Lot 25000 as documented within the *Masterplan Flooding Assessment* (2014) and *Stormwater Management Report* (2015).

3.4 WATERWAY STABILITY ASSESSMENT

As part of the design objectives of the previous *SPP* (2014) for urban stormwater management, developments are required to achieve the waterway stability management criteria. The aim of the waterway stability management is to reduce the impacts of urban development on channel bed and bank erosion by limiting changes in flow rate and duration within receiving waters.

The Coles Flagstone site is to discharge runoff to the Waterway Stability and Bioretention Basin on the western side of the site. This basin is designated as EC2 in the *Stormwater Management Report* (2015) and is to be constructed as part of the Stage 7 subdivision works. Refer to Drawing No. **15-003394-SK001** in **Appendix C** for the location of this basin.

4 STORMWATER QUALITY

The proposed development has the potential to increase the export of pollutants in runoff and cause adverse impacts to downstream waterways. Measures therefore need to be implemented to mitigate the pollutant export increase and meet the water quality objectives (WQOs) identified for the site.

This section discusses:

- Key stormwater pollutants associated with the development;
- WQOs identified for the catchment;
- Proposed measures to mitigate the increase in pollutant concentrations; and
- Modelling of the proposed measures and comparison to the identified WQOs.

This section has been updated for this issue (C) of the report to address changes to the layout of the development.

4.1 POLLUTANTS OF CONCERN

Typical key pollutants expected to be generated during the operational (post-construction) phase of the planned development are listed as follows, with those presented in capitals being the key pollutants to be targeted for treatment:

- LITTER
- SEDIMENT
- Oxygen demanding substances (possibly present)
- NUTRIENTS (N & P)
- Pathogens / Faecal coliforms
- Hydrocarbons
- HEAVY METALS (associated with fine sediments)
- Surfactants
- Organochlorines & organophosphates
- Thermal pollution
- pH altering substances

Only the key pollutants will be further addressed in this report; however, the treatment train developed will adequately mitigate the other pollutant loads. As heavy metals will predominately be associated with fine sediment, controls proposed to reduce total suspended solids will also adequately reduce loads of heavy metals.

4.2 WATER QUALITY OBJECTIVES

The proposed development triggers compliance with the *SPP* with respect to stormwater quality. The appropriate load reduction WQO's are presented in **Table 4-1**.

Table 4-1: Water Quality Objectives

Pollutant	Total Suspended Solids (TSS)	Total Phosphorus (TP)	Total Nitrogen (TN)	Gross Pollutants (GP)
Load Reduction Target	80%	60%	45%	90%

It is noted that the initial issue of this report identified WQO's required from the 2014 version of the *SPP*. For this report (Issue C) the *State Planning Policy 2017* is current, however the above WQO's are consistent across in both policies.

4.3 WATER QUALITY MANAGEMENT STRATEGY

To mitigate the increase in pollutants generated by the proposed development a treatment train of SQIDs are proposed. Details are shown in Drawing No. **15-003394-SK001** in **Appendix C**.

The treatment train will involve the end-of-line Waterway Stability and Bioretention Basin to the western side of the site. This basin is designated as EC2 in the *Stormwater Management Report* (2015) and is to be constructed as part of the Stage 7 subdivision works. Refer to Drawing No. **15-003394-SK001** in **Appendix C** for the location of this basin.

4.4 MUSIC MODELLING

Water quality modelling of the proposed development has been undertaken using the Model for Urban Stormwater quality modelling of the proposed development has been undertaken using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Version 6, developed by the Cooperative Research Centre for Catchment Hydrology (CRCCH). MUSIC enables the user to conceptualise the transfer of pollutants through a stormwater drainage system and provides an aid in quantifying the effectiveness of the proposed stormwater quality management strategy. MUSIC only provides quantitative modelling for Total Suspended Solids (TSS), Total Phosphorous (TP), Total Nitrogen (TN) and Gross Pollutants (GP).

The MUSIC model was setup generally in accordance with Water by Design *MUSIC Modelling Guidelines* (2010), with stormwater quality catchment boundaries defined as the development area as part of the Coles Flagstone Development. The development is part of a larger catchment of the Stage 7 proposal for the Greater Flagstone area, as specified in the Cardno *Stormwater Management Report* (2015).

The subsequent sections discuss the model configurations adopted for the analysis. Detailed MUSIC inputs are presented in **Appendix B**. MUSIC modelling parameters are consistent with previously approved reporting.

- **Site:** Coles Flagstone
- **Model:** 15-003394-Mitigated_160422.sqz

4.4.1 METEOROLOGICAL DATA

Six minute pluviographic data was sourced from the Bureau of Meteorology (BOM) for the Greenbank Thompson Road Station No. 40659, which is typically used for development proposals within the LCC Local Government Area. The duration of the simulation was from 1st January 1980 to 1st January 1989.

4.4.2 SOURCE NODES

Source nodes representing sub-catchments were defined for MUSIC modelling purposes. Catchments are presented in Drawing No. **15-03394-SK001** in **Appendix C**. These sub-catchments were then split into three types of source nodes: roof, road, and ground. **Table 4-2** below outlines the source model adopted.

Table 4-2: Source Node Data

Sub Catchment	Source Node	Surface Type	Area (ha)	% Impervious
B	B_com - Roof	Roof	0.527	100
	B_com - Car Park	Road (Car Park)	1.044	100
	B_com - Ground	Ground	0.164	80
C	C_com – Roof	Roof	0.030	100
	C_com – Car Park	Road (Car Park)	0.060	100
	C_com – Ground	Ground	0.040	80
EXT D	EXT D_com – Roof	Roof	0.199	100
	EXT D_com – Car Park	Road (Car Park)	0.119	100
	EXT D_com – Ground	Ground	0.079	80
EXT COM	EXT COM_com - Roof	Roof	0.030	100
	EXT COM_com - Car Park	Road (Car Park)	0.060	100
	EXT COM_com - Ground	Ground	0.100	80
EXT ROAD	EXT ROAD_res - Road	Road	1.670	60

It should be noted that all catchments that discharge runoff to the Waterway Stability and Bioretention Basin (EC2) have been included in the model, as shown in Drawing No. **15-03394-SK001** in **Appendix C**. Modelling confirmed that basin EC2 will meet the required WQO's for its intended treatment. All source nodes were configured in accordance with *Table 3.7* and *3.8* of the *MUSIC Modelling Guidelines* (2010) respectively.

Stochastic generation estimation and serial autocorrelation set to zero has been adopted for all source nodes. Refer to **Appendix B** for MUSIC model layout and additional details regarding MUSIC model set up.

4.4.3 DRAINAGE LINKS

No routing has been adopted for all drainage links within each model.

4.4.4 TREATMENT NODES

Bioretention treatment nodes have been utilised in the MUSIC model.

4.4.4.1 BIORETENTION TREATMENT NODE

A Bioretention treatment node was used to model the proposed Waterway Stability and Bioretention Basin. Default K and C* values were adopted for this treatment node. These treatment node was set up in accordance with the *MUSIC Modelling Guidelines* (2010) and *Interim MUSIC Bioretention Treatment Node* (2013). Refer to **Table 4-3** below.

The bioretention treatment node was configured based on the proposed Waterway Stability and Bioretention Basin as documented within the Cardno *Stormwater Management Report* (2015). The basin will be designed and constructed as part of the Stage 7 works. Refer to Drawing No. **15-03394-SK001** for the basin location.

Table 4-3: Bioretention Basin Modelled Parameters

Parameter	Basin EC2
Surface Area (m2)	480
Filter Area (m2)	480
Ponding Depth (m)	0.3
Filter Depth (m)	0.5
Filter Media Type	Sandy Loam
Filter Median Particle Diameter (mm)	0.45
Saturated Hydraulic Conductivity of Filter Media (mm/hr)	200
TN Content of Filter Media (mg/kg)	400
Orthophosphate Content of Filter Media (mg/kg)	50
Overflow Weir Width Modelled (m)*	2

4.4.5 MUSIC MODELLING RESULTS

Results for the proposed stormwater quality management strategy is presented in **Table 4-4** below. The results indicate that the proposed strategy is effective in treating pollutant loads from the proposed development to achieve the WQO's as required under the *State Planning Policy*.

Table 4-4: MUSIC Model Results

Description	TSS	TP	TN	GP
WQO (% Reduction)	80	60	45	90
Source Loads (kg/yr)	6,820	12.6	66.4	628
Residual Loads (kg/yr)	766	3.59	25.8	0
Pollutant Reduction Achieved (% Reduction)	88.8	71.5	61.2	100
WQO Achieved	Yes	Yes	Yes	Yes

5 CONCLUSIONS

This Site-Based Stormwater Management Plan Report has been prepared to support the DA for Coles Flagstone. The outcomes of the investigations are listed below:

- The stormwater quantity strategy is consistent with previous reporting for Stage 7 of the Flagstone development.
- Management of Waterway Stability required under the *State Planning Policy (SPP)* will be addressed through the provision of the Waterway Stability and Bioretention Basin to be located west of the Coles Flagstone site;
- Stormwater quality management will be provided by the Waterway Stability and Bioretention Basin. MUSIC modelling demonstrates that the bioretention basin will reduce pollutants exported in runoff from the site to meet Water Quality Objectives required under the *SPP*.
- The development is consistent with EDQ development conditions.

This Site-Based Stormwater Management Plan Report has been updated (**Issue C**) to address changes to the layout of the development and confirm the stormwater quality management strategy will achieve the required pollutant load reductions.

6 RECOMMENDATIONS

It is recommended that this Concept Site-Based Stormwater Management Plan Report be approved on the basis that acceptable outcomes will be provided for stormwater and flood management. The design strategies presented in this report are to be incorporated into future detailed design. Detailed design may result in changes to the proposed management strategies but the design objectives are to be maintained.

7 REFERENCES

- Australian Government (2006), *Healthy Waterways. Water Sensitive Urban Design. Technical Design Guidelines for South East Queensland*. Version 1 June 2006.
- Queensland Urban Drainage Manual (2013)
- *Flagstone City – Masterplan Flooding Assessment*, Document No. 721743/032/R1V6. Version. Dated 05 September 2014;
- *Flagstone City-Stage 7 Stormwater Management Report,* Document No. 7217/43/R11V1, Version 2, dated 14 January 2015.
- Department of Energy and Water Supply (2013), *Queensland Urban Drainage Manual*;
- Department of State Development, Infrastructure and Planning (2014), *State Planning Policy 2014*;
- Department of Environment and Resource Management (2010), *Urban Stormwater Quality Planning Guidelines*; and
- Department of State Development, Infrastructure and Planning (2017), *State Planning Policy 2017.*

APPENDICES

Appendix A SITE PLAN

Parking Schedule		
Stage 1		
	Supermarket	192
	Staff car park	32
	Click & Collect	3
	Taxi	1
		228
Stage 2		
	Commercial	15
		15
		243

Car Park Ratio = 4.9 cars/100m² GFA (Stage 2)

GFA Schedule		
Stage 1		
	Amenities & BOH	97
	Liquor	150
	Retail	550
	Supermarket	3,542
		4,339 m²
Stage 2		
	Commercial	300
		300 m²
Stage 3		
	Supermarket	368
		368 m²
		5,007 m²

POWE architects

SURVEY NORTH		DRAWING NORTH	
DRAWN		CHECKED	APPROVED
AD/SR		ME	ME

SCALEBAR, 1:500
@ A1: 0 5m 10m 15m 20m 25m 30m 35m

SCALE	REVISION DATE
1:500 @ A1	180427

REVISION HISTORY

R	DATE	DESCRIPTION	BY
A	160420	ISSUE FOR DA APPROVAL	AD
B	160422	ISSUE FOR DA APPROVAL, SIGNAGE ANNOTATIONS UPDATED & ADDITIONAL SIGNAGE TO ACTIVATE FONTAGE	AD
C	160513	STAGE 4 REMOVED & LOT :25010 BOUNDARY LINES ADDED	AD
D	160520	TEXT AMENDMENT TO THE STAGING NOTE	AD
E	180416	REVISED DA PACKAGE - DRAFT	SR
F	180420	REVISED DA PACKAGE	LZ
G	180427	UPDATED MASTERPLAN AND STAGE ONE PLAN	LZ

FOR APPROVAL
NOT FOR CONSTRUCTION

GFA DEFINTION - LOGAN CITY COUNCIL

GROSS FLOOR AREA (GFA) IS DEFINED AS:
THE TOTAL FLOOR AREA OF ALL STOREYS OF THE BUILDING (MEASURED FROM THE OUTSIDE OF THE EXTERNAL WALLS OR THE CENTRE OF A COMMON WALL), OTHER THAN AREAS USED FOR THE FOLLOWING:
(A) BUILDING SERVICES, PLANT AND EQUIPMENT;
(B) ACCESS BETWEEN LEVELS;
(C) GROUND FLOOR PUBLIC LOBBY;
(D) A MALL;
(E) THE PARKING, LOADING OR MANOEUVRING OF MOTOR VEHICLES;
(F) UNENCLOSED PRIVATE BALCONIES WHETHER ROOFED OR NOT.

SOURCE: LOGAN PLANNING SCHEME 2015 VERSION 3.0

COLES FLAGSTONE - MASTERPLAN

FOR COLES GROUP PROPERTY DEVELOPMENTS AT LOT B Homestead Dr, Undallah QLD 4285 Australia

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FILE REFERENCE NO: 248-17 DA-1-001 [G]

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Appendix B STORMWATER QUALITY ANALYSIS

MUSIC MODEL SUMMARY

Name:	**16-003394**
Date	**8/05/2018**
File:	**H:\15\003394\Stormwater\MUSIC\[15-003394 MUSIC Inputs_180502.xlsx]Mitigated (1604)**
By:	**RH**

E1: Source Node Inputs

Area	B	C	EXT X	EXT COM	EXT ROAD
Road	1.044	0.060	0.119	0.06	1.67
Roof	0.517	0.030	0.199	0.03	
Ground	0.164	0.040	0.079	0.1	

Total Area (ha)	4.112
Total Check	4.112

Source Nodes Input	B _com - Roof	B_com - Car park	B_com - Ground	EXT COM _com - Roof	EXT COM_com Car park	EXT COM_com - Ground	EXT ROAD_res - Road	C_com - Roof	C_com_Ground	C_com Car park	EXT D_com - Car park	EXT D _com - Roof	EXT D _com - Ground
Total Area (ha)	0.52	1.04	0.16	0.03	0.06	0.1	1.67	0.03	0.04	0.06	0.12	0.2	0.08
Area Impervious (ha)	100	100	80	100	100	80	60	100	80	100	100	100	80
Area Pervious (ha)	0	0	20	0	0	20	40	0	20	0	0	0	20
Field Capacity (mm)	80	80	80	80	80	80	200	80	80	80	80	80	80
Pervious Area Infiltration Capacity coefficient - a	243	243	243	243	243	243	211	243	243	243	243	243	243
Pervious Area Infiltration Capacity exponent - b	0.6	0.6	0.6	0.6	0.6	0.6	5	0.6	0.6	0.6	0.6	0.6	0.6
Impervious Area Rainfall Threshold (mm/day)	1	1	1	1	1	1	1	1	1	1	1	1	1
Pervious Area Soil Storage Capacity (mm)	18	18	18	18	18	18	500	18	18	18	18	18	18
Pervious Area Soil Initial Storage (% of Capacity)	10	10	10	10	10	10	10	10	10	10	10	10	10
Groundwater Initial Depth (mm)	50	50	50	50	50	50	50	50	50	50	50	50	50
Groundwater Daily Recharge Rate (%)	0	0	0	0	0	0	28	0	0	0	0	0	0
Groundwater Daily Baseflow Rate (%)	31	31	31	31	31	31	27	31	31	31	31	31	31
Groundwater Daily Deep Seepage Rate (%)	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormflow TSS Mean (log mg/L)	1.3	2.43	2.16	1.3	2.43	2.16	2.43	1.3	2.16	2.43	2.43	1.3	2.16
Stormflow TSS Standard Deviation (log mg/L)	0.38	0.38	0.38	0.38	0.38	0.38	0.39	0.38	0.38	0.38	0.38	0.38	0.38
Stormflow TSS Estimation Method	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic
Stormflow TSS Serial Correlation	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormflow TP Mean (log mg/L)	-0.89	-0.3	-0.39	-0.89	-0.3	-0.39	-0.3	-0.89	-0.39	-0.3	-0.3	-0.89	-0.39
Stormflow TP Standard Deviation (log mg/L)	0.34	0.34	0.34	0.34	0.34	0.34	0.31	0.34	0.34	0.34	0.34	0.34	0.34
Stormflow TP Estimation Method	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic
Stormflow TP Serial Correlation	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormflow TN Mean (log mg/L)	0.37	0.37	0.37	0.37	0.37	0.37	0.26	0.37	0.37	0.37	0.37	0.37	0.37
Stormflow TN Standard Deviation (log mg/L)	0.34	0.34	0.34	0.34	0.34	0.34	0.23	0.34	0.34	0.34	0.34	0.34	0.34
Stormflow TN Estimation Method	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic
Stormflow TN Serial Correlation	0	0	0	0	0	0	0	0	0	0	0	0	0
Baseflow TSS Mean (log mg/L)	0	0.78	0.78	0	0.78	0.78	1	0	0.78	0.78	0.78	0	0.78
Baseflow TSS Standard Deviation (log mg/L)	0	0.39	0.39	0	0.39	0.39	0.34	0	0.39	0.39	0.39	0	0.39
Baseflow TSS Estimation Method	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic
Baseflow TSS Serial Correlation	0	0	0	0	0	0	0	0	0	0	0	0	0
Baseflow TP Mean (log mg/L)	0	-0.6	-0.6	0	-0.6	-0.6	-0.97	0	-0.6	-0.6	-0.6	0	-0.6
Baseflow TP Standard Deviation (log mg/L)	0	0.5	0.5	0	0.5	0.5	0.31	0	0.5	0.5	0.5	0	0.5
Baseflow TP Estimation Method	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic
Baseflow TP Serial Correlation	0	0	0	0	0	0	0	0	0	0	0	0	0
Baseflow TN Mean (log mg/L)	0	0.32	0.32	0	0.32	0.32	0.2	0	0.32	0.32	0.32	0	0.32
Baseflow TN Standard Deviation (log mg/L)	0	0.3	0.3	0	0.3	0.3	0.2	0	0.3	0.3	0.3	0	0.3
Baseflow TN Estimation Method	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic	Stochastic

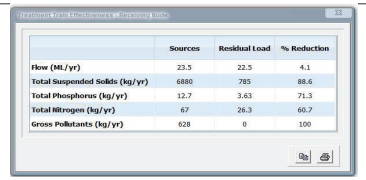
MUSIC Catchment Area	4.110

E2: TREATMENT NODES

Bioretention Treatment Node Parameters					
Bioretention Treatment Node Parameters	Surface Area (m2)	Extended Detention Depth (m)	Filter Media Area (m2)	Filter Depth (m)	Overflow Weir (m)
Bioretention Basin	480	0.3	200	0.5	2

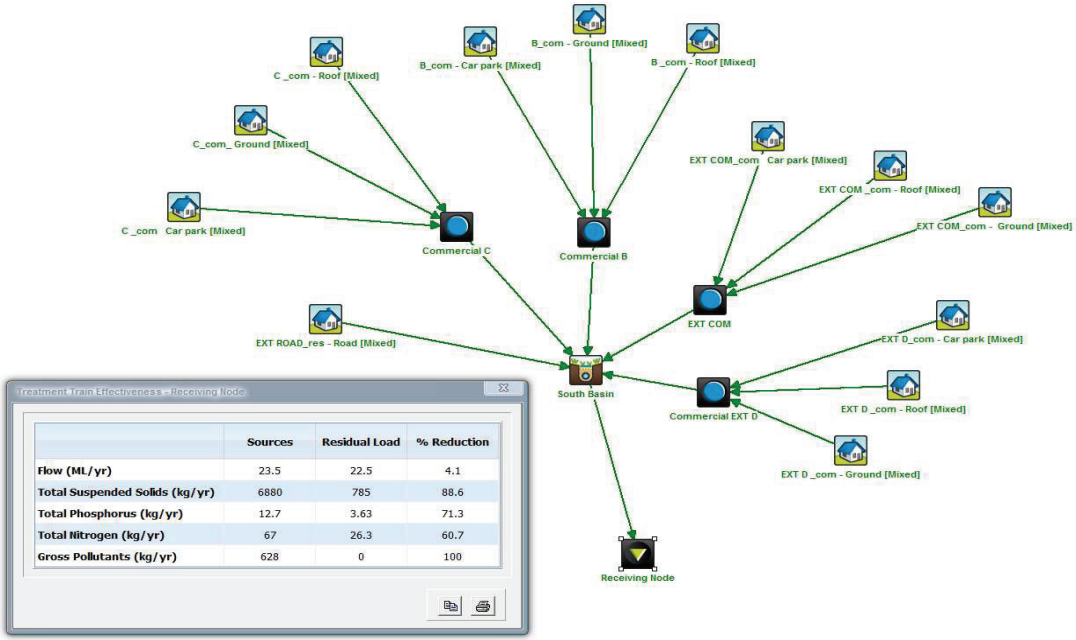
E3: MUSIC MODEL RESULTS

Developed Mitigated 1.sqz -	Sources	Residual Load	% Reduction
TSS (kg/yr)	6880	785	89%
TP (kg/yr)	12.7	3.63	71%
TN (kg/yr)	67.0	26.3	61%
Gross Pollutants (kg/yr)	628	0	100%



	Sources	Residual Load	% Reduction
Flow (ML/yr)	23.5	22.5	4.1
Total Suspended Solids (kg/yr)	6880	785	88.6
Total Phosphorus (kg/yr)	12.7	3.63	71.3
Total Nitrogen (kg/yr)	67	26.3	60.7
Gross Pollutants (kg/yr)	628	0	100

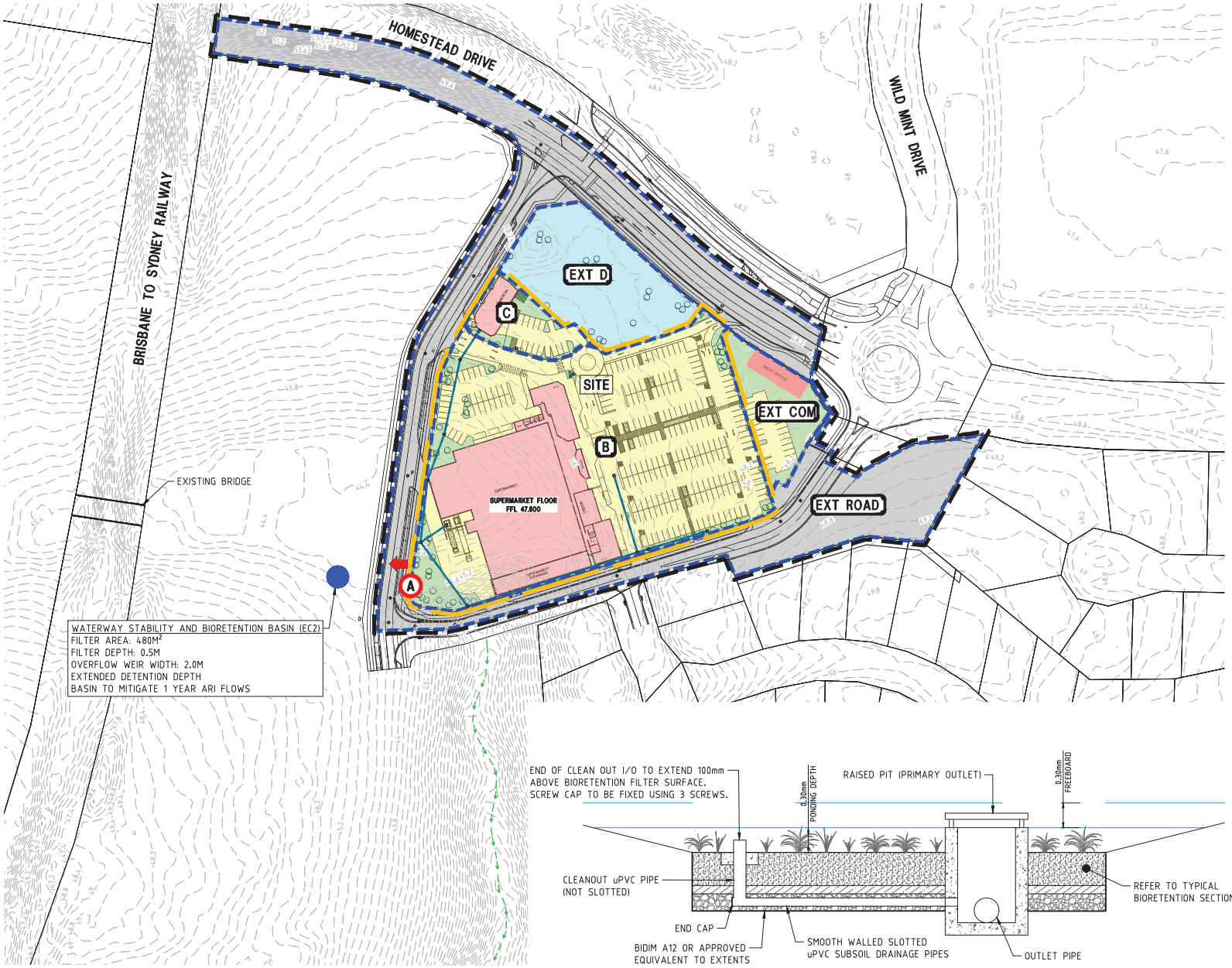
E4: MUSIC MODEL LAYOUT



Treatment Train Effectiveness - Receiving Node

	Sources	Residual Load	% Reduction
Flow (ML/yr)	23.5	22.5	4.1
Total Suspended Solids (kg/yr)	6880	785	88.6
Total Phosphorus (kg/yr)	12.7	3.63	71.3
Total Nitrogen (kg/yr)	67	26.3	60.7
Gross Pollutants (kg/yr)	628	0	100

Appendix C DRAWINGS



PLAN
SCALE 1:1000

TYPICAL BIORETENTION DETAIL
SCALE 1:20 (A1)
SCALE 1:40 (A3)

LEGEND:

- SITE BOUNDARY
- SITE CATCHMENT BOUNDARY
- CATCHMENT TO BASIN SEE NOTE 2
- EXISTING CONTOURS
- INDICATIVE DESIGN CONTOURS
- MUSIC ROAD/CARPARK AREA
- MUSIC ROOF AREA
- MUSIC GROUND
- MUSIC EXT COMMERCIAL
- MUSIC EXT ROAD
- MUSIC CATCHMENT LABEL
- DISCHARGE FLOW ARROW
- DISCHARGE LOCATION
- WATERWAY STABILITY AND BIORETENTION BASIN LOCATION
- EXISTING FLOW PATH
- INTERNAL DRAINAGE

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE LATEST VERSION OF CALIBRE CONSULTING REPORT No. 15-003394-SMP01.
2. THE WATERWAY STABILITY AND BIORETENTION BASIN IS CONSISTENT TO THAT PROVIDED IN THE EDQ REPORT CARDNO FLAGSTONE CITY - STAGE 7 STORMWATER MANAGEMENT REPORT, DOCUMENT No. 7217/43/R11V1 (2015).

CONCEPT PLAN ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

FILE: B15042-SK01.dwg DATE: 22-12-2015 TIME: 11:01
Xref's: X_B15042_TITLE X_B15042_BASE USR: Sam Linde

FIRST ISSUE	CALCS	DRAWN	DATE	AMENDMENT DETAILS
A	IP	SL	27.04.16	
B	MS	MP	18.05.16	CHANGES TO LAYOUT
C	RH	RH	09.05.18	LAYOUT UPDATE
D				
E				
F				

AMENDMENTS

DESIGN CHECK
DRAWN CHECK

SCALE (METRES)
1:1000 10 0 10 20 30 40 50 A1
1:2000 A3

MICROFILM No.
PROJECT No. 15-003394

APPROVED
FOR & ON BEHALF OF CALIBRE CONSULTING (QLD) PTY LTD

CLIENT: COLES GROUP PROPERTY DEVELOPMENT
PROJECT: COLES FLAGSTONE

calibre CONSULTING

CONSULT AUSTRALIA

DRAWING TITLE: CONCEPT STORMWATER MANAGEMENT PLAN COLES FLAGSTONE
DRAWING NUMBER: 15-003394-SK001
ISSUE: B