Prepared for: Baldasso Cortese

St Bernadette Primary School, The Basin - Stormwater Management Strategy

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Job No: 200275
Reference No: 200275-002-SWMS-CL-APS
Revision: A
Date: 18 February 2021

Contents

Appendices

1 Introduction

CREO Consultants (CREO) has been engaged by Baldasso Cortese Architects to produce a Stormwater Management Strategy (SWMS) for the proposed redevelopment of an existing classroom building at the St Bernadette's Primary School located at 1264 Mountain Highway, The Basin.

This document will outline the proposed drainage strategy to ensure that 'best practice' guidelines for qualitative and quantitative treatment are met, in accordance with relevant authority requirements.

2 Existing Conditions

2.1 Site Characteristics and Catchments

The proposed redevelopment of the classroom building at St Bernadette's Primary School will involve the demolition of an existing building and the construction of a new classroom building on the site. The stormwater system for the new building will be connected to the existing underground site stormwater system. Due to the existing development on the site and the age of this development, the fraction impervious of 44% has been adopted for the predeveloped condition while the proposed development has a site fraction impervious of 100%. Overland flow for larger storm events will be directed around the building via the paved and landscaped areas to the LPOD.

The proposed layout can be found in Appendix A.

2.2 Existing Catchment

The existing site of the proposed new building is approximately 750 m2 which is the footprint of the new building.

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As indicated above the existing site contains an existing building that will be demolished to enable the construction of a new classroom building. The site was analysed in its current developed state in order to ascertain the amount of flow that will be generated in its current condition using the AR&R Rational Method. This will set the benchmark in which an increase in flow from the developed scenario will result in a requirement to attenuate back to its pre-developed state. Table 1 below outlines the estimated flows for the 10-year predevelopment floor and the 10-year post-development flow for the site.

Table 1 Estimated Peak Flows for the Pre-Developed Site

Parameter	10-year ARI	
	Pre-Development	Post Development
Peak Flows	10.0 l/s	19.0 l/s

3 Stormwater Management Strategy

The stormwater management strategy proposed for the development at St Bernadette's Primary School, The Basin has been developed to integrate the management of catchment run-off and the quality of the run-off in accordance with Section 53.18 of the City of Knox Planning Scheme Provisions. The primary objectives of this section relevant to this development focus on:

- Provide flood protection treatments for public safety and to protect downstream environments by retarding peak developed flows back to existing conditions.
- Implementation of Water Sensitive Urban Design (WSUD) elements to treat post-developed pollutant-laden run-off to best practice guidelines.

The stormwater drainage systems will be designed to maximise benefits to the community based upon the adequacy of design, the economy of construction and a high level of safety and amenity, including the provision to:

- Ensure hazardous situations do not arise on the streets and footpaths.
- Ensure that all buildings in urban areas are protected against floodwaters to a similar standard to that applying in other areas of Northcote and the municipality of Darebin.
- Limit rubbish and pollutants entering the stormwater drainage system.
- Prevent erosion and sedimentation in estate development.
- Integrate drainage works into urban planning of estate development.
- Provide for multiple uses of land for drainage, recreation and transportation.

3.1 Requirements Of Clause 53.18-04 Of The Panning Scheme

Clause 53.18-05 of the Planning Scheme requires urban runoff from new residential developments to meet best practice water quality and flow requirements. The objectives of Clause 53.18-05 are:

1. To minimise damage to properties and inconvenience to residents from urban run-off.
2. To ensure that the street operates adequately during major storm events and provides for public safety.
3. To minimise increases in stormwater run-off and protect the environmental values and physical characteristics of receiving waters from degradation by urban run-off.

Standard W1 requires that urban stormwater management systems must be:

1. Designed and managed to the requirements of the relevant drainage authority.

2. Designed and managed to the requirements of the water authority where reuse of stormwater is proposed.

3. Designed to meet current best practice performance objectives for stormwater quality, as outlined in *Urban Stormwater – Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee 1999), as amended. The current water quality objectives are:

    a. 80 per cent retention of typical urban annual suspended solids load;

    b. 45 per cent retention of typical urban annual total phosphorus load; and

    c. 45 per cent retention of typical urban annual total nitrogen load.

4. Designed to ensure that flows downstream of the subdivision site are restricted to pre-development levels unless increased flows are approved by the relevant drainage authority and there are no detrimental downstream impacts.

3.2 Requirements Of Clause 53.18-05 Of The Panning Scheme

Clause 53.18-05 of the Planning Scheme requires urban runoff from new residential developments to meet best practice water quality and flow requirements. The objectives of Clause 53.18-05 are:

1. To encourage development that reduces the impact of stormwater on the drainage system and filters sediment and waste from stormwater prior to discharge from the site.
2. To encourage stormwater management that contributes to cooling, local habitat improvements and provision of attractive and enjoyable spaces.
3. To ensure that industrial and commercial chemical pollutants and other toxicants do not enter the stormwater system.

Standard W2 requires that urban stormwater management systems must be:

5. Designed to meet current best practice performance objectives for stormwater quality, as outlined in *Urban Stormwater – Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee 1999), as amended. The current water quality objectives are:

    d. 80 per cent retention of typical urban annual suspended solids load;

    e. 45 per cent retention of typical urban annual total phosphorus load; and

    f. 45 per cent retention of typical urban annual total nitrogen load.

6. Minimise the impact of chemical pollutants and other toxicants.

7. Contribute to cooling, improving local habitat and providing attractive and enjoyable spaces.

3.3 Requirements Of Clause 53.18-06 Of The Panning Scheme

Clause 53.18-06 of the Planning Scheme requires urban runoff from new residential developments to meet best practice water quality and flow requirements. The objectives of Clause 53.18-06 are:

1. To protect drainage infrastructure and receiving waters from sedimentation and contamination.
2. To protect the site and surrounding areas from environmental degradation prior to and during the construction of subdivision works.

Standard W3 requires that urban stormwater management systems, specifically those implemented during construction must manage:

1. Erosion and sediment.
2. Stormwater.
3. Litter, concrete and other construction wastes.
4. Chemical contamination.

3.4 Proposed Concept

The development will be served by an underground stormwater system that will be designed for the 10% storm event. This system will contain an underground detention system that will manage and limit the flow from the 10% storm event to the pre-development flows. The total detention system volume is to be 5.5m3.

The new underground stormwater system will be connected to the existing underground site stormwater system. The underground stormwater system will be designed to service the planned development on the site. Due to site spatial constraints both the detention and proposed Water treatment system will be inline underground systems. The external pavements will be designed to convey the 1% storm event to the LPOD as overland flow.

4 Stormwater Quality

4.1 Release Criteria

The objectives for on-site treatment relating to urban stormwater quality identify the best practice as the removal of Total Suspended Solids (TSS), Total Phosphorus (TP), Total Nitrogen (TN) and Gross Pollutants (GP). The values are set out in the Victorian Stormwater Committee (1999) *Urban Stormwater Best Practice Environmental Management Guidelines* and have been reproduced in Table 2. These stormwater quality objectives reflect the level of stormwater management necessary to meet the SEPP (Waters of Victoria) (EPA Victoria, 2003) requirements and have been adopted as the design criteria for WSUD treatments.

Table 2 Objectives for Environmental Management of Stormwater

Pollutant	Receiving Water Objective	Current Best Practice Performance Objective
Total Suspended Solids (TSS)	Comply with SEPP (e.g., not to exceed the 90th percentile of 80mg/L)	80% retention of the typical urban annual load
Total Phosphorus (TP)	Comply with SEPP (e.g., base flow concentration not to exceed 0.08mg/L)	45% retention of the typical urban annual load
Total Nitrogen (TN)	Comply with SEPP (e.g., base flow concentration to not exceed 0.09 mg/L)	45% retention of the typical urban annual load
Gross Pollutants (GP)	Comply with SEPP (e.g., no litter in waterways)	70% retention of the typical urban annual load

4.2 Stormwater Quality Strategy

To achieve the best practice objectives shown in the above table, an underground water treatment system will be installed on the outlet discharge pipe from the site.

4.3 Modelling Results

For the proposed design of the underground water treatment system, a MUSIC model has been designed which incorporates the entire catchment.

Table 3 Source, Residual and Removal Loads for Catchment

Pollutant	Source Load (kg/yr.)	Residual Load (kg/yr.)	Load Removed (kg/yr.)	% Reduction
Total Suspended Solids (TSS)	15.2	2.82	12.38	81.5
Total Phosphorus (TP)	0.0863	0.0337	0.0526	61
Total Nitrogen (TN)	1.27	0.694	0.576	45.6
Gross Pollutants (GP)	21.2	0	21.2	100

5 Conclusions and Recommendations

This document provides a holistic approach to managing the stormwater infrastructure to be implemented for the proposed redevelopment of an existing classroom building at the St Bernadette's Primary School.

The report addresses the following key aspects:

- Retardation of 10% AEP storm events exiting the site to match the existing pre-developed conditions.
- Compliance with best practice stormwater quality treatment requirements for discharge to the existing drainage.
- For the catchment, it is recommended that the following infrastructure is implemented:
  - Installation of an underground detention system totalling 5.5m3.
  - Installation of a SPEL Filter 850mm in a Vault.

6 References

IEAust (2003), Australian Rainfall and Runoff Volume 2. Institute of Engineers Australia.

Melbourne Water Corporation (2010), MUSIC Guidelines: Recommended Input Parameters and modelling approaches for MUSIC Users.

Victorian Stormwater Committee (1999) Urban Stormwater Best Practice Environmental Management Guidelines.

Appendix A Plans

CIVIL LAYOUT PLAN

SCALE 1:100

0 2000 4000 6000 8000 10000

SCALE: 1:100

REVISION	DATE	ISSUE DESCRIPTION	DRAWN	CHECKED	APPROVED
-	-	-	-	-	-

CLIENT

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PROJECT

ST BERNADETTE'S PRIMARY SCHOOL

DRAWING TITLE

CIVIL LAYOUT PLAN

STATUS

PRELIMINARY
NOT FOR CONSTRUCTION

SCALE AT A1	DRAWN	DESIGNED
1:100	H BYRNES	A P SPENCER
PROJECT ENGINEER	PROJECT MANAGER	DATE FIRST ISSUE
A P SPENCER	A P SPENCER	XX
PROJECT No.	DRAWING No.	REVISION
200275	SK-C01	A

Appendix B Detention Calculation

STORMWATER DETENTION CALCULATOR

CREO CONSULTANTS PTY LTD

Client:	Baldasso Cortese
Project:	St Bernadettes

IFD STORM DATA — IFD IMPORTED CORRECTLY
COEFFICIENTS IMPORTED CORRECTLY
https://data.arr-software.org/

Engineer:	T Spencer
Job Number:	200275
Date:	17/02/2021
Revision:	A

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Predeveloped Conditions:

Catchment Area (ha)	0.075
Time of Concentration (min)	6
Fraction Impervious	44%

Fraction Impervious Calculator	
Impervious Area (m²)	320
Pervious Area (m²)	400
Total Area (m²)	720
Fraction Impervious	44%

	Annual Exceedence Probability						
	63.2%	50.0%	20.0%	10.0%	5.0%	2.0%	1.0%
Intensity (mm/hr)	53.39	60.18	83.99	102.56	122.82	153.18	179.42
Coefficient of Runoff	0.382	0.405	0.453	0.477	0.501	0.549	0.572
Q (m3/s)	0.004	0.005	0.008	0.010	0.013	0.018	0.021

Developed Conditions:

Catchment Area (ha)	0.075
Time of Concentration (min)	6
Fraction Impervious	100%

Fraction Impervious Calculator	
Impervious Area (m²)	750
Pervious Area (m²)	0
Total Area (m²)	750
Fraction Impervious	100%

	Annual Exceedence Probability						
	63.2%	50.0%	20.0%	10.0%	5.0%	2.0%	1.0%
Intensity (mm/hr)	53.39	60.18	83.99	102.56	122.82	153.18	179.42
Coefficient of Runoff	0.720	0.765	0.855	0.900	0.945	1.035	1.080
Q (m3/s)	0.008	0.010	0.015	0.019	0.024	0.033	0.040

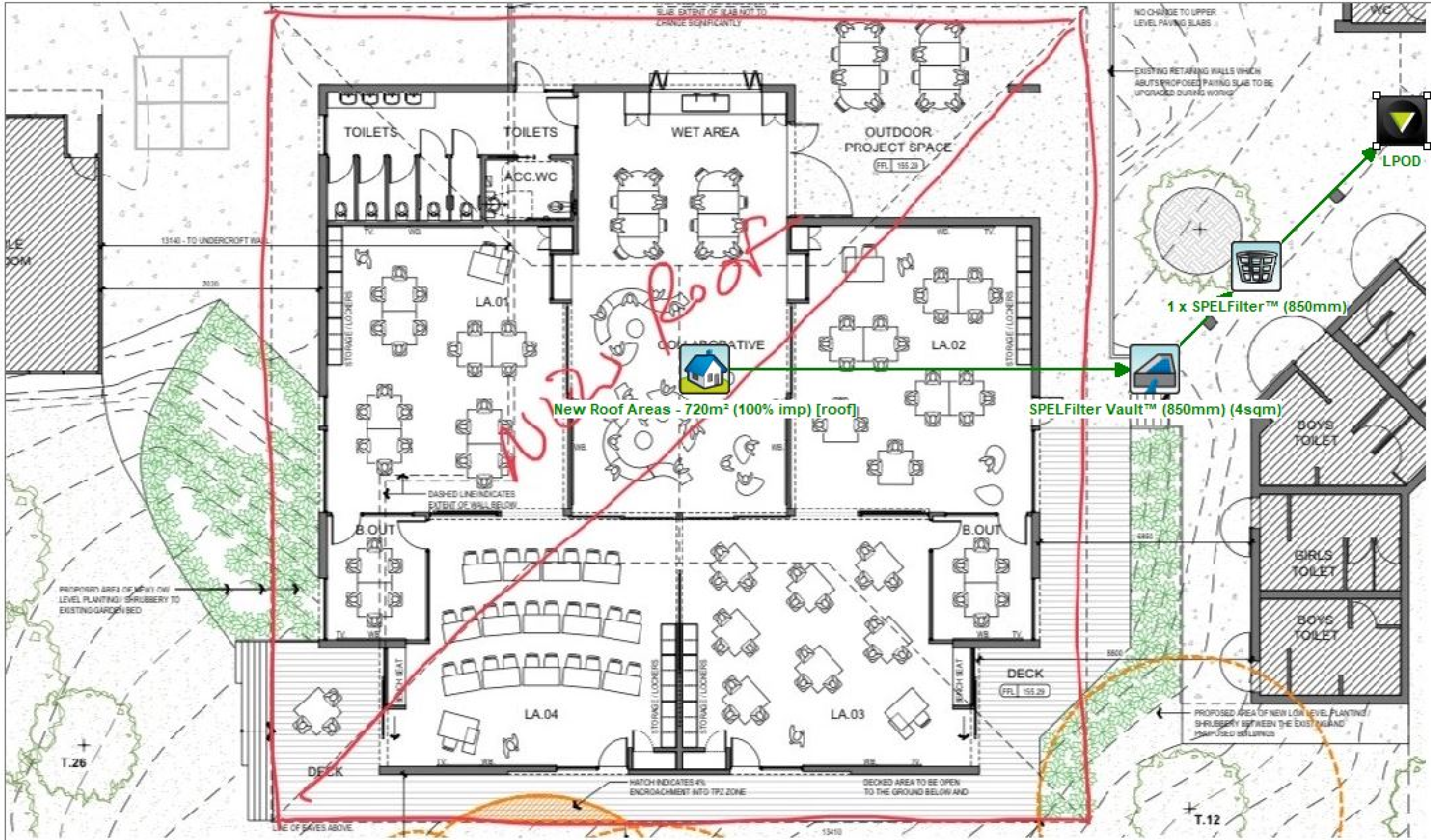
STORAGE CALCULATION

Retard Flows up to:	10%	AEP
Predeveloped Flow:	0.010	m³/s
OR Restrict flows to:		m³/s

FROM TABLE BELOW: **STORAGE REQUIRED (m³): 5.275** *Using the* **Swinburne Institute of Technology 1987 Method**

Storm Duration (min)	Flow Rate In (l/s)	Volume In (m³)	Volume Out (m³)	Storage Required (m³)
1	32.063	1.924	0.612	0.089
2	26.063	3.128	1.223	0.987
3	23.625	4.253	1.835	1.806
4	21.938	5.265	2.446	2.513
5	20.438	6.131	3.058	3.073
10	15.563	9.338	6.116	4.751
15	12.656	11.391	9.173	5.275
20	10.744	12.893	12.231	5.248
25	9.375	14.063	15.289	4.889
30	8.344	15.019	18.347	4.316
45	6.356	17.162	27.520	1.873
60	5.231	18.833	36.694	-1.043
90	3.938	21.263	55.041	-7.787
120	3.244	23.355	73.388	-14.868
180	2.456	26.528	110.082	-30.042
270	1.894	30.679	165.123	-53.412
360	1.571	33.939	220.164	-77.672
540	1.219	39.488	330.246	-127.164
720	1.020	44.064	440.327	-177.629
1080	0.791	51.273	660.491	-280.501
1440	0.658	56.862	880.655	-384.994
1800	0.568	61.358	1100.819	-490.581
2160	0.501	64.881	1320.982	-597.139
2880	0.407	70.308	1761.310	-811.876
4320	0.298	77.274	2641.965	-1245.237
5760	0.234	81.000	3522.619	-1681.839
7200	0.193	83.430	4403.274	-2119.736
8640	0.163	84.661	5283.929	-2558.832
10080	0.141	85.504	6164.584	-2998.317

Appendix C MUSIC Model



spelstormwater
joy in water

creo
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Treatment Train Effectiveness - LPOD

	Sources	Residual Load	% Reduction
Flow (ML/yr)	0.571	0.571	0
Total Suspended Solids (kg/yr)	15.2	2.82	81.5
Total Phosphorus (kg/yr)	0.0863	0.0337	61
Total Nitrogen (kg/yr)	1.27	0.694	45.6
Gross Pollutants (kg/yr)	21.2	0	100