Civil Engineering Design Report

Jordan Springs Public School

Lot 22, DP1194338

Cullen Avenue, Jordan Springs NSW

REPORT

PREPARED FOR

Richard Crooks Constructions
Level 3
4 Broadcast Way
Artarmon NSW 2064

PREPARED BY

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Tel: 02 9241 4188

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CIVIL ENGINEERING DESIGN REPORT

Activity Schedule

Date	Revision	Issue	Prepared By	Approved By
14.02.2019	A	Development Application	J. Grinsell	J. Gilligan

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1. EXECUTIVE SUMMARY

The development is the construction of a Primary School for the Department of Education.

Site grading and site stormwater systems was prepared in accordance with Penrith City Council guidelines.

1.1 Site Grading

Site grading was undertaken to minimise earthworks and comply with the relevant guidelines as outlined above.

1.2 Site Stormwater Infrastructure, including Water Sensitive Urban Design

Site stormwater design was undertaken to comply with the relevant guidelines as outlined above.

2. DESIGN REPORT

2.1 General

This Civil Engineering Design Report has been prepared by Northrop Consulting Engineers Pty Ltd (Northrop). Civil Engineering design and documentation of the works will include, site grading, site stormwater infrastructure, stormwater quantity and stormwater quality facilities to be completed for the proposed development.

This Design Report is intended to clarify the Civil Engineering design aspects for this development.

2.2 Project Description

This development is proposed on Lot 2, DP1194338, 14-28 Cullen Avenue, Jordan Springs NSW, which consists of a new public school to cater for approximately 1,000 students and 70 full-time staff. The development includes in the construction 5 building blocks, a drop-off and pick-up bay located on Cullen Avenue, pedestrian access points along Cullen Avenue and Lakeside Parade and 2 carparks facilitating access from both Cullen Avenue and Lakeside Parade.

2.3 Referenced Documents

This Design Report has been prepared with reference to the following documentation:

- Architectural Plans provided by Group GSA
- Survey Plans prepared by LTS Lockley

2.4 Civil Engineering Drawings

The drawings which accompany this report are as follows:

Document Number	Document Title	Revision
182535 – DAC01.01	Cover Sheet, Drawing Schedule and Locality Plan	3
182535 – DAC01.11	Specification Notes – Sheet 01	3
182535 – DAC01.21	General Arrangement Plan	3
182535 – DAC02.01	Sediment and Erosion Control Plan	3
182535 – DAC02.11	Sediment and Erosion Control Details	3
182535 – DAC03.01	Bulk Earthworks Cut and Fill Plan	3
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182535 – DAC04.02	Siteworks and Stormwater Management Plan – Sheet 02	3
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182535 – DAC04.21	Stormwater Longitudinal Sections – Sheet 01	3
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182535 – DAC04.23	Stormwater Longitudinal Sections – Sheet 03	3
182535 – DAC04.31	Bioretention Basin Details – Sheet 01	3
182535 – DAC09.01	Detail Sheet 01	3

2.5 Regulatory

2.5.1 National Construction Code

Northrop's engineering designs for this project will be prepared in accordance with the requirements and regulations of all Statutory Authorities and Codes relevant to the works, including:

- The National Construction Code (Building Code of Australia) Standards Australia;
- Standards Australia
- Penrith City Council's Development Control Plan;

3. SITE GRADING

3.1 Existing Conditions

The development area is currently an undeveloped greenfield lot. The site falls to the east towards an existing creek. The site is owned by the Department of Education which is bounded by Cullen Avenue to the south, Lakeside Parade to the west, existing residential properties to the north and undeveloped land to the east. Refer to Figure 1 below for site location.

Figure 1: Site Location

3.2 Proposed Grading

There are two (2) vehicular crossings proposed for this development – one on Cullen Avenue and one on Lakeside Parade. The proposed site grading generally falls as existing to minimise earthworks. All pavement and landscaping around the building falls away from the building to ensure nuisance stormwater runoff is avoided. There are no upstream catchments that are directed through the site.

We have proposed a series of landscaped swales around the site to ensure the following;

(a) Upstream stormwater runoff from the existing adjoining properties is captured and diverted back into the existing stormwater system.
(b) Site stormwater runoff is captured and discharged into the existing creek east of the development and Cullen Avenue to mimic the existing scenario.

3.3 Sediment and Erosion Control

Sediment and erosion control is required during excavation and construction to ensure only clean water enters the existing and proposed stormwater system in rain storm events. These measures are to be installed in accordance with 'The Blue Book' (Managing Urban Stormwater Soils and Construction). Refer the Sediment and Erosion Control Plan for details.

4. SITE STORMWATER INFRASTRUTURE

4.1 Stormwater Quantity - Hydraulic Modelling

4.1.1 Performance Criteria

The objectives of this investigation include:

- Management of 'minor' flows using piped systems near buildings and general playground areas, and swales to manage surface water in landscaped areas for at least the 5% AEP;
- Management of 'major' flows using dedicated overland flow paths for the 1% AEP for all areas;
- Ensure stormwater quality measures are provided to comply with Penrith City Council's WSUD policy.

4.1.2 Proposed Stormwater System

The new development is proposed to discharge into the existing creek using a network of pits and pipes and overland flow paths. The majority of the site area discharges into swale which is located on the eastern boundary which directs flows to a bio-retention basin before discharging to the existing creek. This swale has a piped system to capture nuisance flows. All areas which cannot drain to the bio-retention basin are collected via a piped system and discharge to the existing stormwater network in Cullen Avenue.

4.1.3 Modelling of Stormwater Quantity

The piped system and overland flow paths were designed using 12d Model ILSAX Drainage Design Software. Refer Northrop's Development Application drawings for details.

The 12d Model Layout is shown below. The model can be obtained upon request.

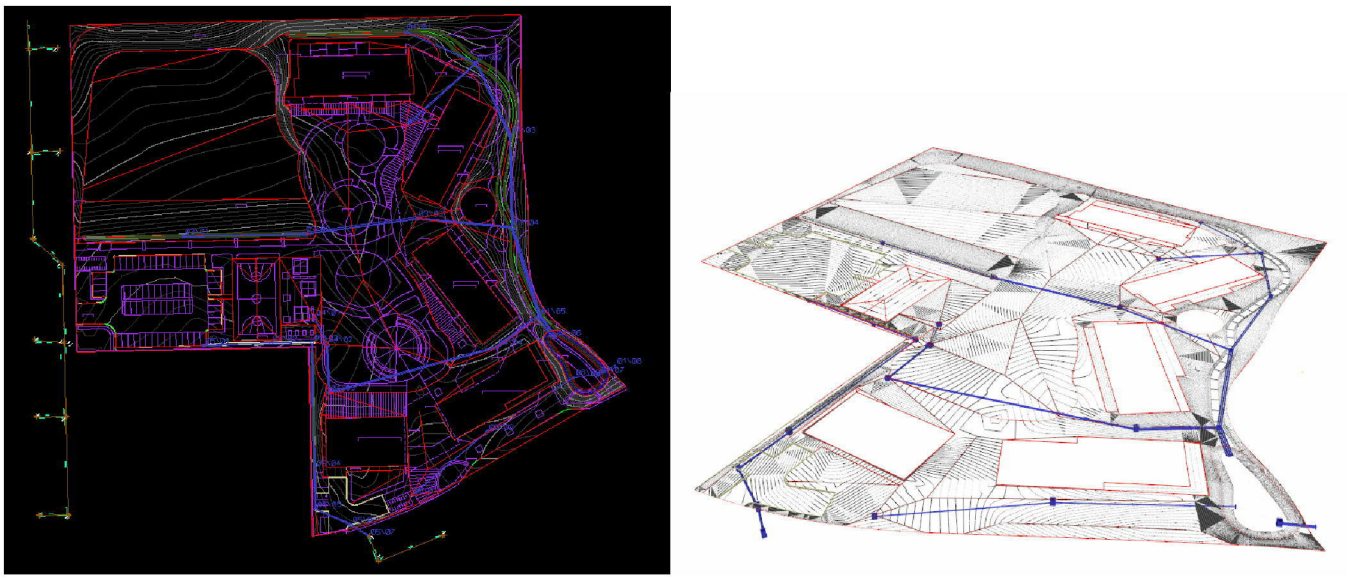

Figure 2: 12d model layout

4.2 Stormwater Quality

4.2.1 Performance Criteria

Stormwater quality treatment targets are to comply with Penrith City Council's WSUD strategy. These targets are relative to a developed scenario:

- 85% reduction in the post development average annual Total Suspended Solids (TSS) load.
- 60% reduction in the post development average annual Total Phosphorus (TP) load.
- 45% reduction in the post development average annual Total Nitrogen (TN) load.

4.2.2 Proposed Stormwater System

The first step to preventing stormwater pollution is to reduce the risk of pollutants being entrained in stormwater runoff. Good site design is important in reducing the risk profile of runoff from all developments. Roofs have a low risk profile for stormwater pollutants, and the simplest way to protect water quality at the ground level is to direct hardstand areas (paving and paths, etc.) to landscaped areas to provide passive irrigation.

The stormwater pollutant load reduction objectives will be met by the use of a rainwater tank and also consolidating stormwater treatment devices.

BUILDING ROOF CATCHMENT

- The roof drainage system connects to an in-ground rainwater re-use tank (RWT).
- The overflow from the RWT connects to the stormwater system within the hardstand area and then is further treated through the bio-retention basin before discharging to the creek.

HARDSTAND AND LANDSCAPE CATCHMENT DIRECTED TO THE BIO-RETENTION BASIN

- A stormwater system is designed for the majority of hardstand, carpark and landscape areas to convey the 5% AEP storm event to a bio-retention basin in the south eastern corner of the lot.
- The bio-retention basin has been sized to reduce pollutant loads to a suitable level before discharging into the existing creek. The bio-retention basin has a filter area of 200m^2, filter depth of 600mm and an extended detention depth of 300mm. Refer Northrop's Development Application drawings for further details.

HARDSTAND AND LANDSCAPE CATCHMENT BYPASSING THE BIO-RETENTION BASIN

- Due to site grading constraints, small areas of hardstand, carpark and landscape bypass the bio-retention basin. These areas are collected via piped network which connects to an existing stormwater pit in Cullen Avenue.
- All grated stormwater pits within the bypass area are to be installed with Stormwater 360 Enviropod inserts.
- The most downstream pit is to be installed with Stormwater 360 690 Psorb Stormfilter to reduce pollutant loads to a suitable level before discharging into the existing stormwater network on Cullen Avenue.

4.2.3 Modelling of Stormwater Quantity

Stormwater treatment was modelled using Modelling Urban Stormwater Improvement Conceptualisation (MUSIC) software v 6.2.1. The MUSIC model's design parameters were set using the Penrith City Council MUSIC-LINK in accordance with Penrith City Council's WSUD policy.

SOURCE NODE / POLLUTANT GENERATION PARAMETERS

Source node parameters for the proposed development were sourced from the Penrith City Council's default nodes. The catchments were modelled using the following source nodes:

- Roof areas – 100% impervious
- Mixed Use (hardstand areas) – 100% impervious
- Mixed Use (landscaping areas) – 0% impervious

STORMWATER TREATMENT PARAMETERS

- Enviropod Pit Inserts
- Rainwater Tank
- Bio-retention Basin
- Swales
- Storm Filters

MODEL SCHEMATIC

MUSIC Model Layout and pollutant removal performance is shown below.

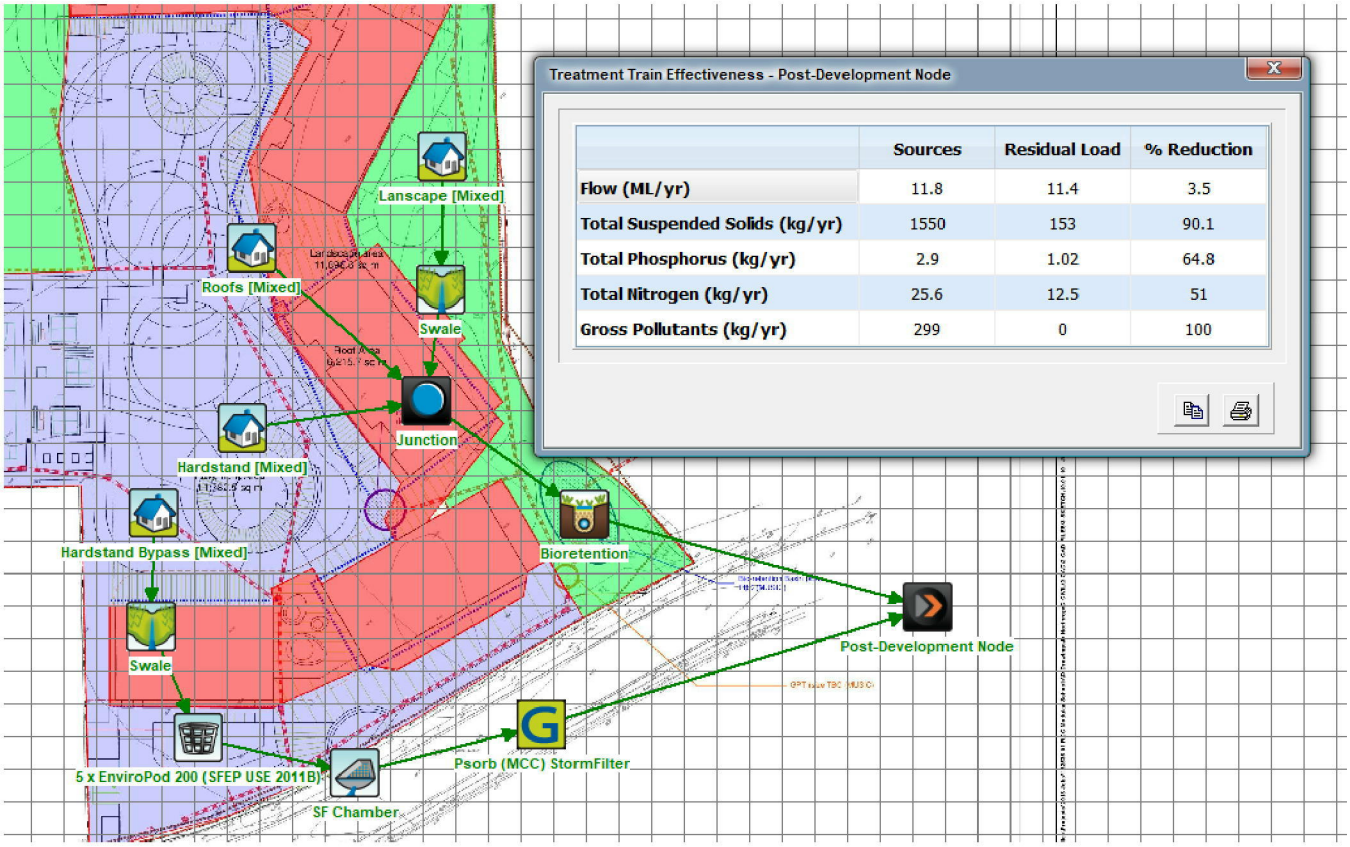

Figure 3: MUSIC model layout

Stormwater Pollutants	% Reduction in average annual load	Pollution Reduction Target (%)
Total Suspended Solids	90.1	85
Total Phosphorus	64.8	60
Total Nitrogen	51.0	45
Gross Pollutants	100	90

As shown above, the stormwater treatment targets appropriate for the site will be met by the treatment measures provided. The pollutant removal performance as predicted by MUSIC modelling exceeded the Penrith City Council targets of 90%/85%/60%/45% for GP, TSS, TP and TN respectively.

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MUSIC-*link* Report

Project Details		Company Details	
Project:	Jordan Springs Public School	**Company:**	Northrop Consulting Engineers
Report Export Date:	14-Feb-19	**Contact:**	Jack Grinsell
Catchment Name:	182535 - Jordan Springs - MUSIC v2	**Address:**	Level 2, 3 Horwood Place Parramatta NSW 2150
Catchment Area:	2.993ha	**Phone:**	0424253330
Impervious Area*:	60.24%	**Email:**	jgrinsell@northrop.com.au
Rainfall Station:	67113 PENRITH		
Modelling Time-step:	6 Minutes		
Modelling Period:	1-01-1999 - 31-12-2008 11:54:00 PM		
Mean Annual Rainfall:	691mm		
Evapotranspiration:	1158mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.31		
Study Area:	Penrith		
Scenario:	Penrith Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Post-Development Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	3.51%	Bio Retention Node	1	Urban Source Node	4
TSS	90.1%	Swale Node	2		
TP	64.8%	Sedimentation Basin Node	1		
TN	51%	GPT Node	2		
GP	100%	Generic Node	1		

Comments

Comments on non-compliant parameters:

Swales

- Due the the flat nature of the site, min swale grades of 1% are not feasible. A swale grade of 0.5% has been adopted.

SF Chamber / Psorb (MCC) StormFilter / 5 x EnviroPod 200 (SFEP USE 2011B)

- These are proprietry product node supplied by Stormwater 360. All parameters are according to the design guidelines supplied by Stormwater 360.

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	99	99
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
GPT	5 x EnviroPod 200 (SFEP USE 2011B)	Hi-flow bypass rate (cum/sec)	None	99	0.1
GPT	CDS 0708M	Hi-flow bypass rate (cum/sec)	None	99	0.054
Post	Post-Development Node	% Load Reduction	None	None	3.51
Post	Post-Development Node	GP % Load Reduction	90	None	100
Post	Post-Development Node	TN % Load Reduction	45	None	51
Post	Post-Development Node	TP % Load Reduction	60	None	64.8
Post	Post-Development Node	TSS % Load Reduction	85	None	90.1
Sedimentation	SF Chamber	High Flow Bypass Out (ML/yr)	None	None	0
Urban	Hardstand	Area Impervious (ha)	None	None	0.762
Urban	Hardstand	Area Pervious (ha)	None	None	0
Urban	Hardstand	Total Area (ha)	None	None	0.762
Urban	Hardstand Bypass	Area Impervious (ha)	None	None	0.416
Urban	Hardstand Bypass	Area Pervious (ha)	None	None	0
Urban	Hardstand Bypass	Total Area (ha)	None	None	0.416
Urban	Lanscape	Area Impervious (ha)	None	None	0
Urban	Lanscape	Area Pervious (ha)	None	None	1.19
Urban	Lanscape	Total Area (ha)	None	None	1.19
Urban	Roofs	Area Impervious (ha)	None	None	0.625
Urban	Roofs	Area Pervious (ha)	None	None	0
Urban	Roofs	Total Area (ha)	None	None	0.625

Only certain parameters are reported when they pass validation

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Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Sedimentation	SF Chamber	Notional Detention Time (hrs)	8	12	0.0114
Sedimentation	SF Chamber	Total Nitrogen - k (m/yr)	500	500	1
Sedimentation	SF Chamber	Total Phosphorus - k (m/yr)	6000	6000	1
Sedimentation	SF Chamber	Total Suspended Solids - k (m/yr)	8000	8000	1
Swale	Swale	Bed slope	0.01	0.05	0.005
Swale	Swale	Bed slope	0.01	0.05	0.005

Only certain parameters are reported when they pass validation