Upgrades to Chatswood Public School and Chatswood High School

Appendix 15 - Stormwater Management Report

SSD 9483
Prepared by Wood & Grieve Engineers
For School Infrastructure NSW, Department of Education

Artists impression of upgrades to Chatswood Public School

Upgrades to Chatswood Public School and Chatswood High School

Stormwater Management Plan

Prepared for: Schools Infrastructure New South Wales

Date: 16 Mar 2020

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Ref: 40623

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Revision

Site Address:	**Pacific Highway Site**
	Lot 1, DP812207
	Lot C, DP346499
	Centennial Avenue Site
	Lot 1, DP725204
	Lot 21-23, DP2273
Proposed Development:	Primary School and High School
Client:	Schools Infrastructure New South Wales
Local Authority	Willoughby Council
Authority Reference #:	SSD 9483
Wood & Grieve Reference:	40623-CI-SMP

R. Tracy

Renata Tracey CPEng NER

For and on behalf of

Wood & Grieve Engineers now part of Stantec

Revision	Date	Comment	Prepared By	Approved By
01	20.03.19	Draft Issue	RT	IH
02	27.03.19	Draft Issue	RT	IH
03	29.04.19	Draft Issue	RT	RT
04	11.12.19	Draft Issue	RT	RT
05	18.02.20	Draft Issue	RT	RT
06	27.02.20	Draft Issue	RT	RT
07	11.03.20	SSDA Issue	RT	RT
08	16.03.20	SSDA Issue	RT	RT

Contents

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1. Introduction

Wood & Grieve Engineers have been commissioned by Schools Infrastructure New South Wales to prepare this Stormwater Management Plan (SMP) in support of the State Significant Development application for the proposed development at the existing Primary and High School sites along Centennial Avenue, Chatswood, NSW

This SMP outlines the conceptual water management design for the proposed redevelopment of the site including new permanent school buildings on the sites.

This SMP demonstrates the application of Water Sensitive Urban Design (WSUD) principles and illustrates that the proposed development complies with the Willoughby Council Standards and Guidelines for Stormwater, Australian Rainfall and Runoff, Australian Standards and best engineering practise.

The purpose of this SMP is to evaluate the stormwater management methodology associated with the proposed development plan so as to demonstrate that the appropriate strategies have been adopted.

The SMP specifically addresses the following items for both the construction and operational phases of the development:

- Flood Impacts
- Stormwater runoff volumes and detention (Stormwater Quantity)
- Stormwater quality treatment measures (Stormwater Quality)
- Erosion and Sedimentation Control

Groundwater matters are dealt with in the associated Surface and Ground Water Assessment prepared by PSM which has also been submitted as part of this application.

The following will be achieved with the correct application of this SMP report:

- Appropriate standards to be maintained on all aspects of stormwater management within the site
- Pollution control to be maintained
- Establishment of a unified, clear and concise stormwater management strategy

For further information refer the Civil Drawings in App**endix A.**

2. SEAR's Requirements

This report has been prepared in response to the Secretary's Environmental Assessment Requirements – Application Number SSD 9483. The table below identifies the requirements met by this report and indicates the location within the report.

SEARs Reference	SEARs Description	Report Section
14. Utilities	• Prepare an Infrastructure management Plan in consultation with relevant agencies, detailing information on the existing capacity and any augmentation and easement requirements of the development for the provision of utilities including staging of infrastructure. • Prepare an Integrated Water Management Plan detailing any proposed alternative water supplies, proposed end uses of potable and non-potable water, and water sensitive urban design	Section 9 – Stormwater Quality Treatment
16. Drainage	• Detail measures to minimize operational water quality impacts on surface waters and groundwater. • Stormwater plans detailing the proposed methods of drainage without impacting on the downstream properties and environmentally sensitive areas.	Section 8 – Stormwater Attenuation Section 9 – Stormwater Quality Treatment
17. Flooding	• Identify flood risk on-site (detailing the most recent flood studies for the project areas) and consideration of any relevant provisions of the NSW Floodplain Development Manual (2004), including the potential effects of climate change, sea level rise and an increase in rainfall intensity. If there is a material flood risk, include design solutions for mitigation.	Section 6 – Flood Impact Assessment
19. Sediment, Erosion and Dust Controls	• Detail measures and procedures to minimize and manage the generation and off-site transmission of sediment, dust and fine particles.	Section 10 – Erosion and Sedimentation Control

3. Relevant Policies, Standards and Guidelines

The following listed policies, standards and guidelines were referred to in the preparation of this report:

- Willoughby Council Development Control Plan
- Willoughby Local Environment Plan 2012
- AS3500
- Australian Rainfall & Runoff 2016;
- AS3500 parts 0-5: 2013 Plumbing and Drainage
- AS2890 parts 1-6: 2009 Parking Facilities
- AS1428 parts 1-5: 2010 Design for Access and Mobility
- Landcom Managing Urban Stormwater: Soils and Construction Volume 1 2004
- NSW Floodplain Development Manual 2005
- Guidelines for development adjoining land and water managed by DECCW (OEH, 2013)

4. Existing Site Characteristics

4.1 Property Detail

Address:

Pacific Highway Site

Lot 1, DP812207

Lot C, DP346499

Centennial Avenue Site

Lot 1, DP725204

Lot 21-23, DP2273

Total Site Area: 7.31Ha

Centennial Avenue Site: 5.97Ha

Pacific Highway Site: 1.34Ha

The proposed development can be seen on the concept design drawings in Appendix A of this report.

The proposed development of the Centennial Avenue site will consist of three multistorey high school buildings and various passive and active landscaped areas.

The proposed development of the Pacific Highway site will consist of three new multistorey primary school buildings, multistorey carpark/games court and provision of various active and passive landscaped areas.

As can be seen in the site location aerial photo below (Figure 1), the Centennial Avenue site is bounded by Centennial Avenue to the North and Eddy Road to the South. The sites to the east and west are low density residential use. The Pacific Highway Site is bounded by Pacific Highway to the East, Centennial Avenue to the south and Jenkins Street to the West.

Figure 1 – Site Location Plan

4.2 Topography

The Centennial Avenue site currently falls to the southwest and the Pacific Highway site currently falls to the northwest. The image below (Figure 2) shows the contours on the site spaced at 2m centers.

Figure 2 – Site Topography

4.3 Stormwater Catchments

4.3.1 External Catchments

The Pacific Highway development site does not have any contributing upstream catchment. The entire Pacific Highway site drains to the northwest, ultimately discharging to the road reserves. The southwestern catchment contributes to the Jenkins Street stormwater network, and the northeast catchment drains to the James Street stormwater network.

The existing residential area to the east of the Centennial Avenue site discharges stormwater runoff onto the development site along the eastern boundary which then drains southwest to a low point on Eddy Road. The remaining area of the site is divided into two western catchments which all drain to the west and discharge into the road reserve. The northwest catchment drains to the Dardanelles Road stormwater network, the western catchment drains to the De Villiers Avenue stormwater network.

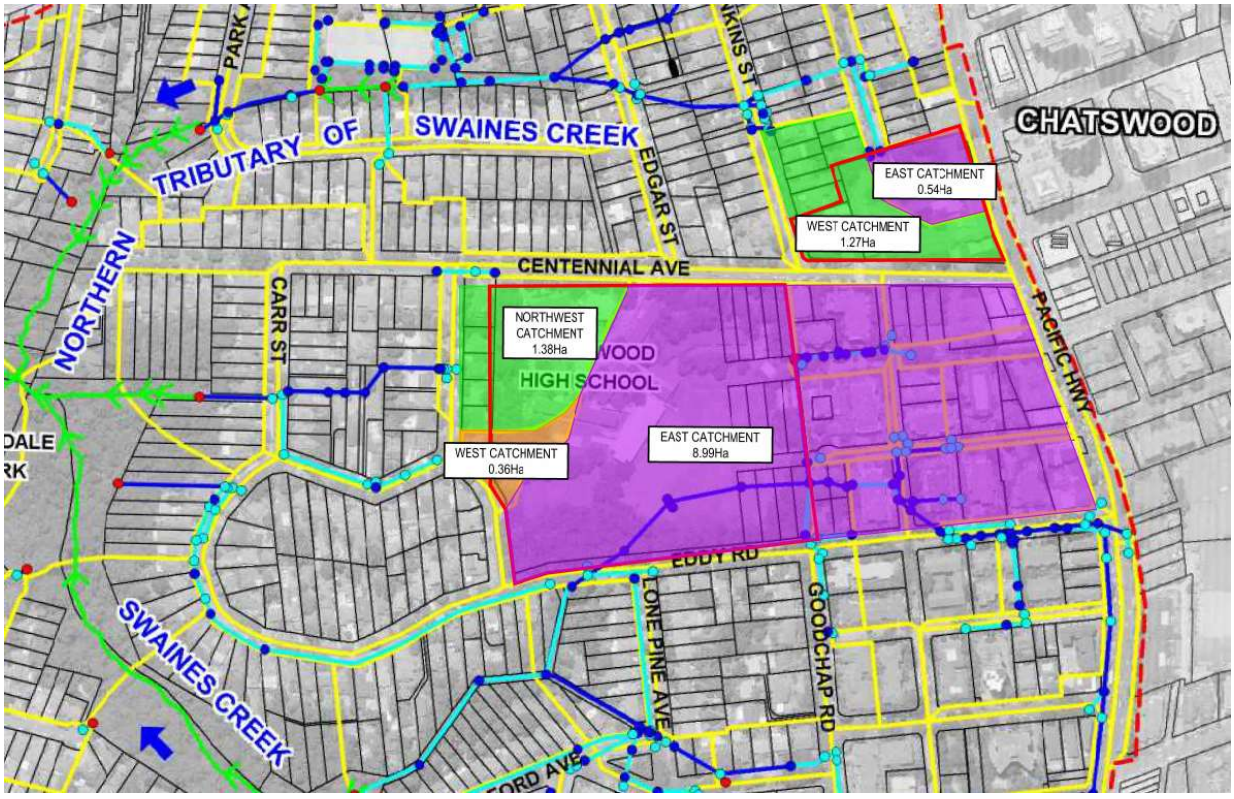


Figure 3 – External Catchments

4.3.2 Internal Catchments

The entire Pacific Highway site drains to the northwest with the catchment areas determined by the stormwater network each catchment contributes to.

The Centennial Avenue site is divided into three existing catchments each of which drain towards the southwest.

The catchment split is shown on Figure 4.

Figure 4 – Internal Site Catchment

4.4 Existing Drainage line

Both sites contain existing in-ground drainage lines. The Pacific Highway site appears to contain stormwater pipes to accommodate the minor storm event which outlet directly to the kerbs on Pacific Highway, Centennial Avenue and Jenkins Street.

On the Centennial Avenue site, the site contains existing stormwater infrastructure consisting of pits and pipes to capture the minor storm event, and an existing On-Site Detention tank, all of which appear to connect into the Willoughby Council stormwater network running through the sports field on-site and outletting to Eddy Avenue. See below which shows the DBYD information received from Council.

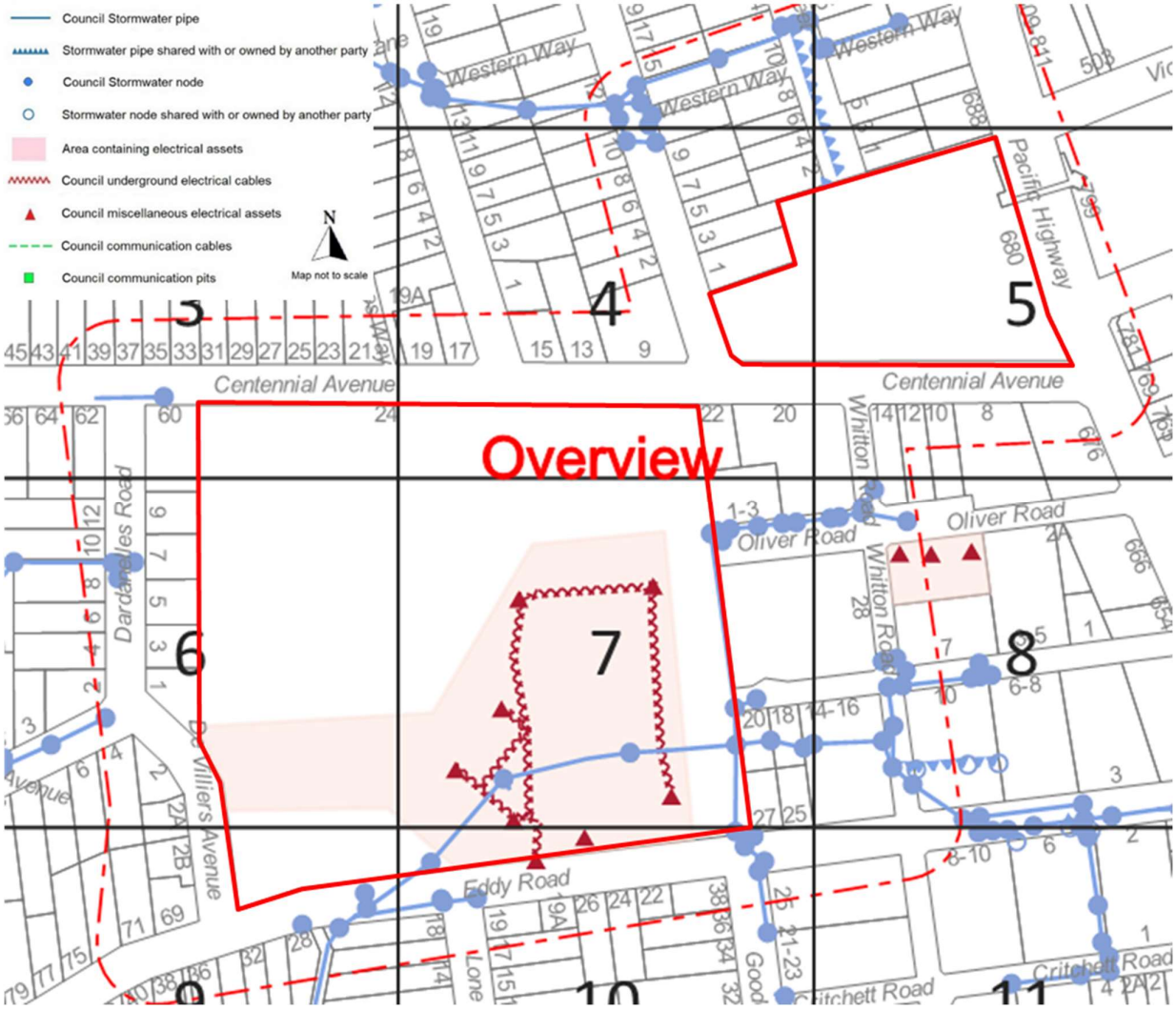


Figure 5 - Internal Site Catchment

The Swaines Creek Flood Study Report dated March 2014 by Lyall & Associates illustrates all underground stormwater networks associated with the site draining to the west, and ultimately discharging to the Swaines Creek.

4.5 Existing Stormwater Discharge

The eastern side of the site on the Pacific Highway site drains via in-ground stormwater pipes outletting directly at kerb on Pacific Highway and Centennial Avenue. The lower western portion of the site also drains via outlets directly at kerb on Jenkins Street.

The majority of the Centennial Avenue site drains to the in-ground storm network which eventually outlets to the existing Council stormwater culvert. There is a minor area to the west of the site that by-passes any inground drainage and discharges to the adjacent residential properties, ultimately outletting to the Dardanelles Street and De Villiers Avenue stormwater network.

5. Authority Requirements

5.1 Local Council

Design requirements for water management on the site has been set in the Willoughby Council Development Control Plan. These requirements are summarised in the sections below.

5.1.1 Stormwater Conveyance Requirements

The Willoughby Council Development Control Plan and associated attachments state the minimum requirements for the design of stormwater conveyance infrastructure.

The table below summarises the requirements for the stormwater conveyance infrastructure.

Table 1 – Stormwater Drainage Serviceability

Infrastructure	Design Parameter	Design Requirement	Conveyance Method
Formalised Drainage	Minor Drainage System	5 Year ARI	In Ground (Piped)
Open Channels	Major Drainage System	20 Year ARI	In Ground (Piped)
	Freeboard	300mm to top of channel	Overland
Swales	Depth x Velocity	< 0.4	Overland

5.1.2 On Site Detention Requirements

The Willoughby Council Development Control Plan state the minimum requirements for the design of stormwater detention infrastructure. The proposed site falls under “Zone 1” as specified in the DCP.

The Site Storage Requirements and Permissible Site Discharge rates are applied per hectare of impervious area, and are summarised in the table below:

- An overland flow route is to be provided in the event that a storm higher than the design storm occurs, or the OSD device malfunctions. The flow route must be capable of carrying the flows for 1 in 100 year ARI design storm, assumed that the outlet to the OSD device is fully blocked.
- All habitable floor levels adjacent to the OSD storage, or the overland flow path from the OSD storage are to be a minimum of 300mm above the maximum design storage water surface level.
- Maximum above ground storage ponding depths are as follows:
  - 200mm deep in areas such as driveways and car parking areas
  - 500mm deep in other storage areas such as landscaping or gardens. Floatable landscaping material are not permitted in above ground storage ponding areas.
- All storage outlets must have inverts above the 1 in 100 year floodway level of any nearby creeks or overland flow routes, or be designed with hydraulic grade line analysis in the case of connection to Council’s underground system.

5.1.3 Stormwater Quality and Pollution Control

The Willoughby Council Development Control Plan and Manual of Engineering Standards state the minimum requirements for the reduction of stormwater runoff pollutants. The guidelines state the following reduction targets:

Pollutant	Average annual pollutant load reduction (%)
Gross Pollutants	90%
Total Suspended Solids (TSS)	85%
Total Phosphorus (TP)	60%
Total Nitrogen (TN)	45%
Hydrocarbons	See below

Figure 6 – Water Quality Targets (Source: Willoughby Council – DCP Attachment 24)

Developments with more than 5 parking spaces and commercial and industrial development are to provide a treatment device that specifically targets hydrocarbons or incorporates a raingarden / bio-retention basin. Runoff from all parking areas, driveways or access roads is required to drain to the treatment device or raingarden / bio-retention basin.

5.2 Office of Environment & Heritage

The OEH set requirements for the management of stormwater runoff in their document "Guidelines for development adjoining land and water managed by DECCW (OEH, 2013)". The document states "Nutrient levels are minimised, and stormwater flow regimes and patterns mimic natural levels before it reaches OEH land."

The recommended approaches in the guidelines state:

- Development proposals for areas adjacent to OEH land should incorporate stormwater detention and water quality systems (with appropriately managed buffer areas) within the development site.
- Stormwater should be diverted to council stormwater systems or to infiltration and subsurface discharge systems within the development site.
- The discharge of stormwater to OEH land, where the quantity and quality of stormwater differs from natural levels, must be avoided.

6. Flood Impact Assessment

When considering a new development, it is important to assess the impact of existing flooding on the proposed development and also the impact of the proposed development on existing or potential flooding both upstream and downstream of the development.

6.1 Flooding

A flood study was undertaken for the Swaines Creek catchment by Lyall & Associates on behalf of Willoughby Council in March 2014. The proposed development site is located within this catchment.

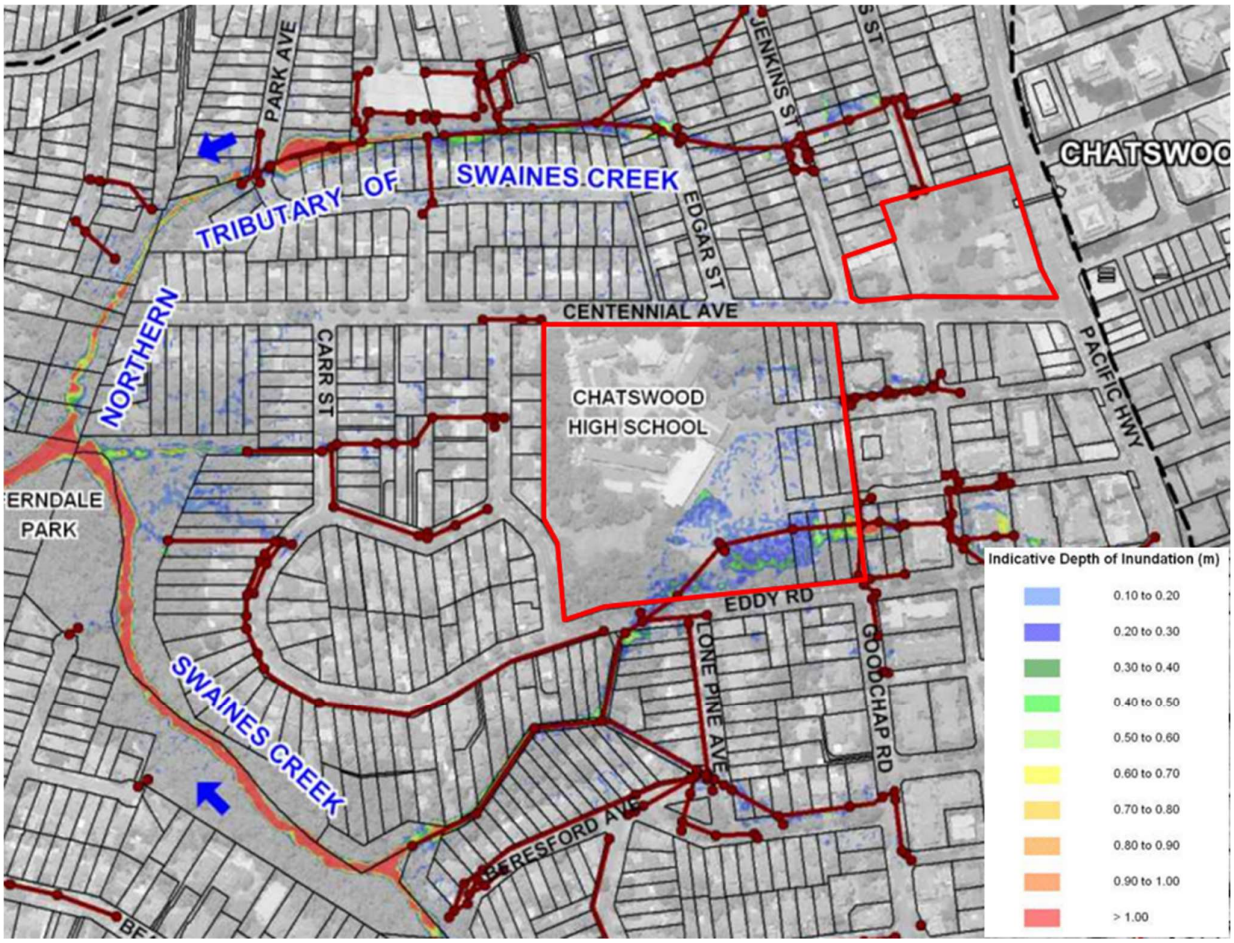


Figure 7 – TUFLOW Model Results 100YEAR ARI (Source: Swaines Creek Flood Study, March 2014)

The flood mapping shows that the Pacific Highway site has no flood impacts, and the Centennial Avenue site has minor flooding impacts to the southeast of the site. Further advice has been sought from Council on the flood impacts at the Centennial Avenue site, results of which are shown below.

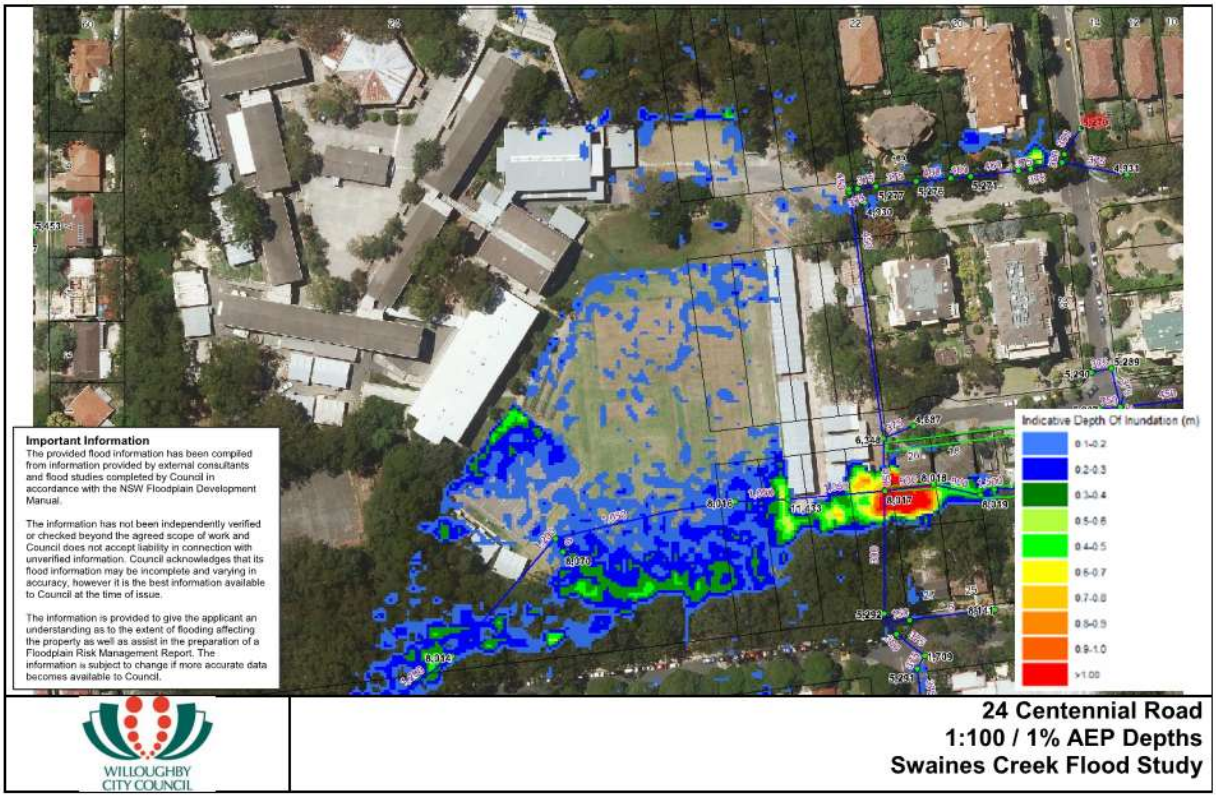


Figure 8 – TUFLOW Model Results 1% AEP (Source: Willougby Council)

As shown above, the site specific flood data indicates that 100 year flood impacts are located outside of the limit of works.

6.2 Development Flood Impacts

The proposed development of Centennial Avenue will maintain existing overland flow paths and convey all overland flow away from habitable floor areas. Access to both sites is not impeded by flooding.

Given that it can be confirmed that the development will not impact on any existing floodplain nor will flooding impact on the development there has been no further development specific flood modelling undertaken at this time.

7. Stormwater Conveyance

This section of the report discusses the systems proposed to allow for stormwater to be conveyed across the site to the legal point of discharge.

As discussed in section 3.1 of this report The Willoughby Council Development Control Plan and associated attachments set the minimum design parameters for the design of stormwater conveyance infrastructure through the site.

7.1 Upstream Catchment Runoff

The runoff from the catchment to the east of Centennial Avenue will not be impacted by the proposed development. The proposed access and drop off area off Oliver Road will be constructed in the existing overland flow path used to convey the runoff from the Eastern Catchment to the sports field. If this conveyance route was to be blocked the runoff would discharge directly into the adjacent residential properties along Oliver Road and increase the risk of nuisance flooding on that road.

To maintain the conveyance across the site the proposed levels will not be raised from existing, and the path of overland flow will be maintained towards the sports fields to allow flows to be directed as per the existing condition.

7.2 Building Drainage

All roof areas will be drained through either a conventional downpipe system or a syphonic system. The drainage system will be designed in accordance with AS3500.3:2003 to convey the minor design storm runoff from the roof to the in ground drainage system. Flows in excess of the design flows will surcharge the roof drainage system and discharge onto the surrounding ground where it will then be conveyed overland to the surrounding ground floor drainage network within.

The flow chart in figure below summarises the sites proposed building drainage system.

7.3 Road and Carpark Drainage

The road and car parking areas will be drained through conventional pit and pipe gravity drainage in accordance with AS3500.3:2003 and council's stormwater drainage guidelines. Stormwater runoff will be conveyed overland to drainage inlet structures where it will then be conveyed to in ground piped drainage networks.

7.4 Legal Point of Discharge

There will be three legal points of discharge for the development as discussed below. By detaining stormwater runoff in detention tanks the discharge flows and velocities will be restricted.

7.4.1 Pacific Highway Catchments

The Eastern Catchment will discharge to Centennial Avenue via a proposed kerb inlet pit installed on Centennial Avenue which ultimately outlets to Jenkins Street. The Western Catchment will drain via the existing network within James Street.

7.4.2 Centennial Avenue Catchments

The Eastern catchment will discharge via a proposed in-ground stormwater network composed of pits, pipes and on-site detention tanks to the existing Council drainage culvert running through the sports field and ultimately outletting to Eddy Avenue. As per the existing condition, a small portion of the site will by-pass the stormwater network and discharge to the adjacent residential properties and ultimately outlet to the existing networks in Dardanelles Road and De Villiers Avenue.

8. Stormwater Attenuation

As discussed in section 5.1 Willoughby Council's Development Control Plan requires that the post development stormwater discharge from the site be limited to the rates specified per zone. The method of controlling the post development release rate to the pre development release rate has been adopted. As such, the discharge flows of the development will be controlled to be less than the predevelopment runoff condition.

8.1.1 Pacific Highway Site

The Pacific Highway site has been calculated as having an area of 1.336Ha. Hydraulic modelling of the catchment was undertaken using DRAINS stormwater modelling software.

East Catchment

The east catchment outlets via a connection to the proposed kerb inlet pit on Centennial Avenue. This catchment has an area of 0.93Ha.

	PERVIOUS	IMPERVIOUS
EXISTING	17%	83%
PROPOSED	31%	69%

The table below summarises the pre and post development discharge flows for the critical 5 year, 20 year and 100 year ARI stormwater events.

Table 2 – Pacific Highway Pre and Post Development Discharge Flows

STORM EVENT	PREDEVELOPMENT FLOW (L/s)	POST DEVELOPMENT FLOW (L/s)
5YR	318	295
20YR	446	420
100YR	594	539

As can be seen in the table above the post development flows are lesser than the pre development release rate due to the decrease of impervious area. As such, it is assumed to be reasonable that on site attenuation is not provided given that the development will not increase flows into the surrounding stormwater infrastructure from the existing condition.

West Catchment

The west catchment outlets via a connection to the proposed kerb inlet pit on Jenkins Street. This catchment has an area of 0.25Ha.

	PERVIOUS	IMPERVIOUS
EXISTING	19%	81%
PROPOSED	29%	71%

The table below summarises the pre and post development discharge flows for the critical 5 year, 20 year and 100 year ARI stormwater events.

Table 3 – Pacific Highway Pre and Post Development Discharge Flows

STORM EVENT	PREDEVELOPMENT FLOW (L/s)	POST DEVELOPMENT FLOW (L/s)
5YR	85	78
20YR	119	114
100YR	157	147

As can be seen in the table above the post development flows are lesser than the pre development release rate due to the decrease of impervious area. As such, it is assumed to be reasonable that on site attenuation is not provided given that the development will not increase flows into the surrounding stormwater infrastructure from the existing condition.

North Catchment

The north catchment sheet flows to the north directly to James Street. This catchment has an area of 0.16Ha.

	EXISTING	PROPOSED
PERVIOUS AREA	100%	55%
IMPERVIOUS AREA	0%	45%

The table below summarises the pre and post development discharge flows for the critical 5 year, 20 year and 100 year ARI stormwater events.

Table 4 – Pacific Highway Pre and Post Development Discharge Flows

STORM EVENT	PREDEVELOPMENT FLOW (L/s)	POST DEVELOPMENT FLOW (L/s) UNATTENUATED	POST DEVELOPMENT FLOW (L/s) ATTENUATED
5YR	52	53	49
20YR	73	74	66
100YR	99	100	87

As can be seen in the table above the post development flows are greater than the pre development release rate due to the increase of impervious area. As such, on site attenuation has been proposed. Based on hydraulic modelling, an on-site detention tank of 5kL is required to attenuate flows back to that of the predeveloped condition.

8.1.2 Centennial Avenue Site

The Centennial Avenue site has been calculated as having an area within the limit of works of 2.17Ha. Hydraulic modelling of the catchment was undertaken using DRAINS stormwater modelling software.

	PERVIOUS	IMPERVIOUS
EXISTING	26%	74%
PROPOSED	30%	70%

The table below summarises the pre and post development discharge flows for the critical 5 year, 20 year and 100 year ARI stormwater events.

Table 5 – Centennial Avenue Pre and Post Development Discharge Flows

STORM EVENT	PREDEVELOPMENT FLOW (L/s)	POST DEVELOPMENT FLOW (L/s)
5YR	688	607
20YR	983	864
100YR	1,270	1,170

As can be seen in the table above the post development flows are lesser than the pre development release rate due to the decrease of impervious area. As such, it is assumed to be reasonable that on site attenuation is not provided given that the development will not increase flows into the surrounding stormwater infrastructure from the existing condition.

9. Stormwater Quality Treatment

As discussed in section 3.3 Willoughby Council's Development Control Plan and Manual of Engineering Standards set targets for the reduction of water borne pollution being conveyed from the site through the stormwater drainage system.

This section of the report demonstrates the Stormwater Quality Improvement Devices (SQID's) to be implemented and the Pollutant Export Modelling undertaken to demonstrate the effectiveness of the treatment system in achieving the reduction targets set by council.

9.1 Potential Pollutants

There are a wide range of potential stormwater pollutant sources which occur from urbanised catchments, many which can be managed through appropriate stormwater quality treatment. Typical urban pollutants may include:

- Atmospheric deposition
- Erosion (including that from subdivision and building activities)
- Litter and debris
- Traffic emissions and vehicle wear
- Animal droppings
- Pesticides and fertilisers
- Application, storage and wash-off of car oil, detergents and other household and commercial solvents and chemicals
- Solids accumulation and growth in stormwater systems
- Weathering of buildings

These pollutants in urban stormwater can be placed into various categories as follows. The pollutants underlined below are able to be readily modelled:

- Suspended Solids
- Litter
- Nutrients such as Nitrogen and Phosphorous
- Biological oxygen demand (BOD) and chemical oxygen demand (COD) materials
- Micro-organisms
- Toxic organics
- Trace metals
- Oils and surfactants

While only the key pollutants underlined above will be examined within the modelling, the stormwater Quality Improvement Devices implemented are expected to assist in reducing a wide range of pollutants. For example, heavy metals are commonly associated with, and bound to fine sediments. Thus reducing the discharge of fine sediment during the construction and operational phases will also reduce the discharge of heavy metals to existing stormwater systems.

9.2 Pollutant Reduction System

In order to achieve the pollutant reduction targets specified in section 3.3 of this report a series of treatment devices are proposed which together form a treatment train.

The pollution reduction system for each site has been diagrammatically shown in the figure below. The treatment train varies for each discharge point.

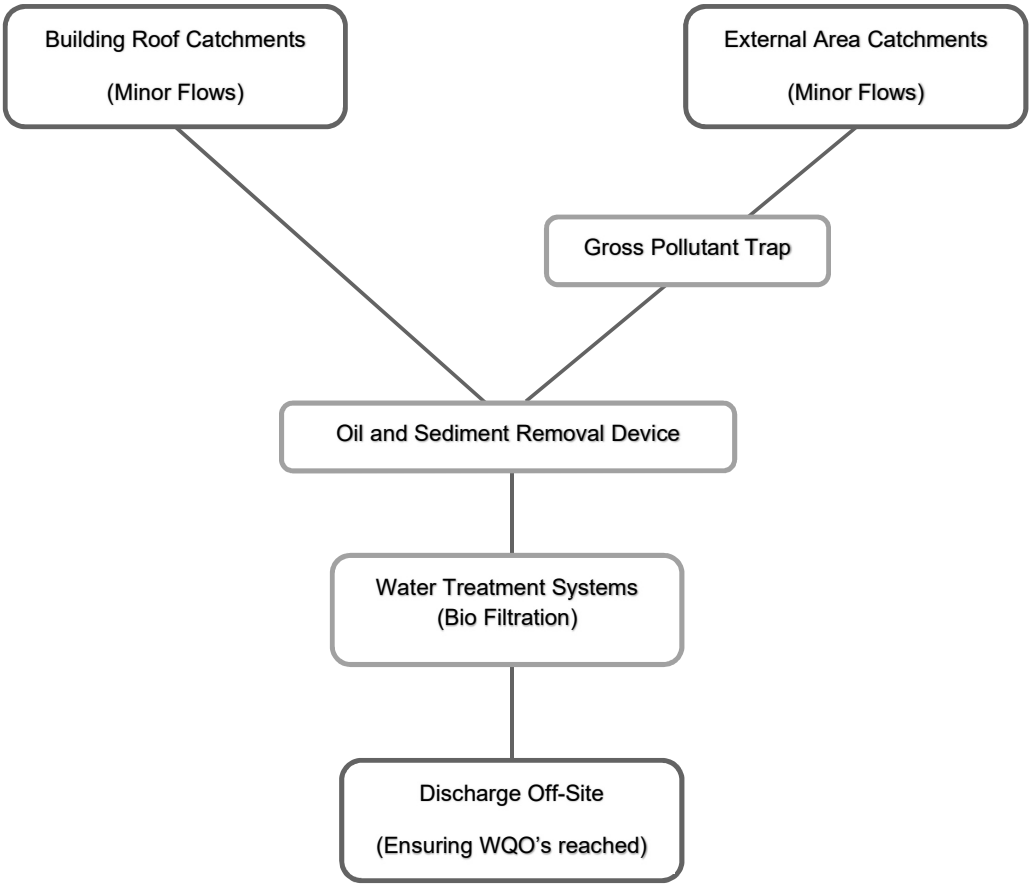


Figure 9 – Proposed Water Quality Treatment Train

Further discussion on each element of this treatment train is provided below.

9.2.1 SPEL Hydrosystem

The SPEL Hydrosystem filter unit used filtration cartridges to remove high levels of stormwater pollutants including:

- Total Suspended Solids (TSS), median removal efficiency of 84%,
- Total Nitrogen (TN), median removal efficiency of 47%
- Total Phosphorous (TP), median removal efficiency of 81%

Three SPEL Hydrosystems are proposed on the Pacific Highway site, and one SPEL hydrosystem is proposed on the Centennial Avenue site.

The MUSIC modelling parameters for this device are set by the manufacturer, SPEL Stormwater.

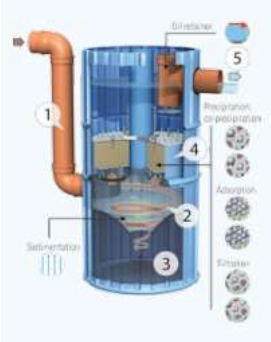


Figure 10 – SPEL Hydrosystem infiltration Unit (Source: SPEL Stormwater)

9.2.2 Stormsack Pit Inlet Trap (or approved equivalent)

Stormsacks (or other similar approved equivalents) provide effective removal of TSS and gross pollutants. Stormsacks are a filter cage system which are inserted into roadway gully pits to filter and remove pollutants before the water enters the piped drainage system. It is proposed to place Stormsacks filters within every proposed stormwater inlet pit.

The SPEL Stormwater sack remove high levels of stormwater pollutants including:

- Total Suspended Solids (TSS), median removal efficiency of 61%, including particles down to two microns
- Total Nitrogen (TN), median removal efficiency of 45%
- Total Phosphorous (TP), median removal efficiency of 28%

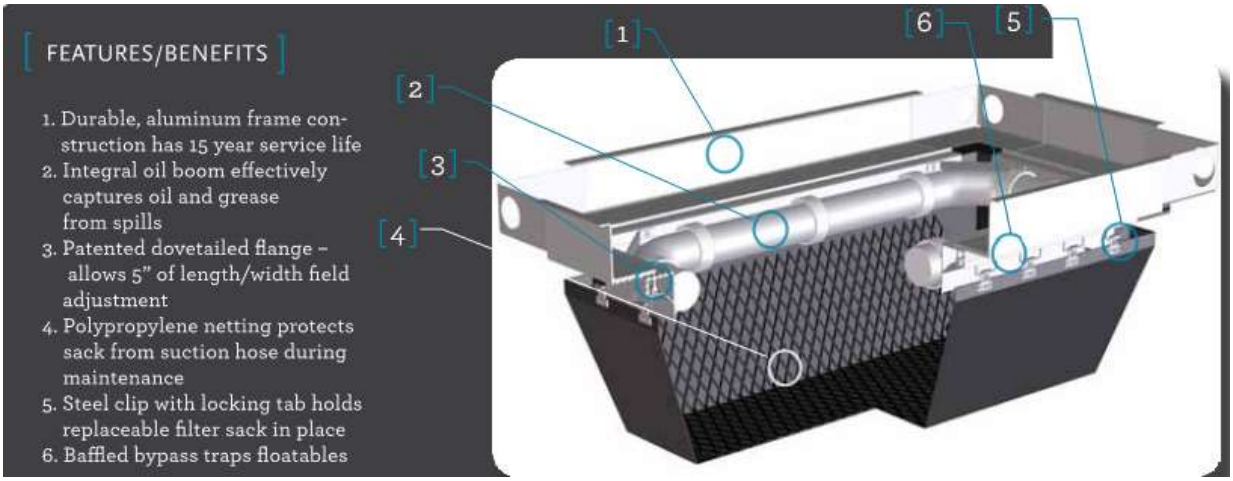


Figure 11 – Stormsack Pit Inlet Trap (Source: SPEL Stormwater)

The MUSIC modelling parameters for this device are set by the manufacturer, SPEL Stormwater.

9.2.3 SPEL Stormceptor

The SPEL Stormceptor unit used filtration cartridges to remove high levels of stormwater pollutants including:

- Total Suspended Solids (TSS), median removal efficiency of 87%,
- Total Nitrogen (TN), median removal efficiency of 23%
- Total Phosphorous (TP), median removal efficiency of 11%

The Stormceptor is an effective solution for medium to low risk hydrocarbon zones.

Compliant Standards:

- **BS EN 858.1:2002 – Separator System for Light Liquids (e.g. oil & petrol);**
  - **Stormwater discharge concentration of less than 5mg of oil per liter (5mg/L).**
- BS 4994:1987 FRP – Specification for the Design and Construction of Vessels and Storage Tanks in Reinforced Plastics;
- AS 2634:1983 – Chemical Plant Equipment made from Glass-Fibre Reinforced Plastics (GRP) Based on Thermosetting Resins and;
- Airports (Environmental Protection) Regulations 1997, Schedule 2 – Water pollution, Cl 1.03.

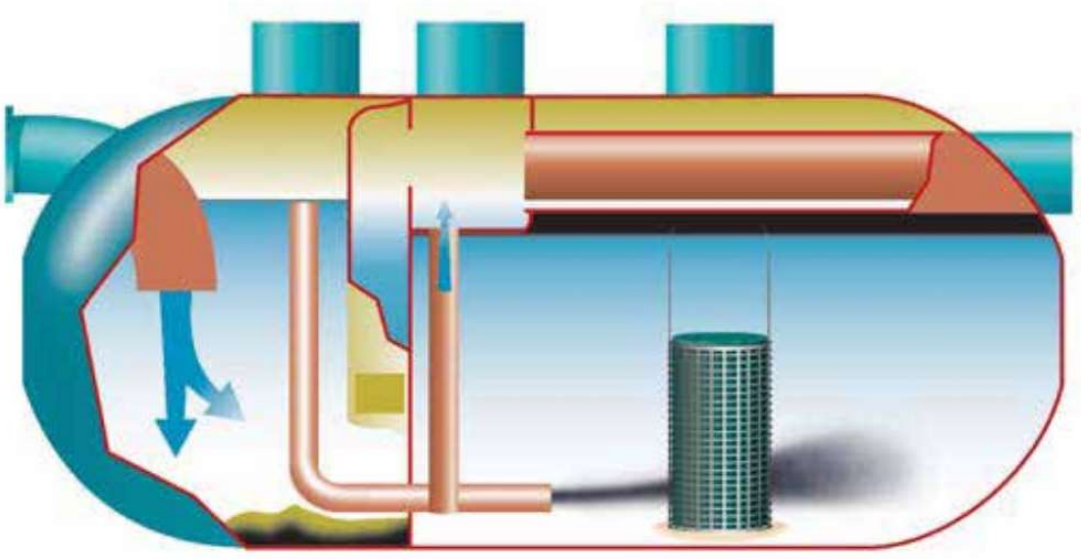


Figure 12 – Stormceptor Unit (Source: SPEL Stormwater)

One stormceptor unit has been proposed on the Centennial Avenue site. The MUSIC modelling parameters for this device are set by the manufacturer, SPEL Stormwater.

9.2.4 SPEL Puraceptor

The SPEL Puraceptor unit used filtration cartridges to remove high levels of stormwater pollutants including:

- Total Suspended Solids (TSS), median removal efficiency of 87%,
- Total Nitrogen (TN), median removal efficiency of 23%

- Total Phosphorous (TP), median removal efficiency of 11%

The Puraceptor is an effective solution for High risk hydrocarbon zones as it is a full retention separator.

Compliant Standards:

- **BS EN 858.1:2002 – Separator System for Light Liquids (e.g. oil & petrol);**
  - **Stormwater discharge concentration of less than 5mg of oil per liter (5mg/L).**
- BS 4994:1987 FRP – Specification for the Design and Construction of Vessels and Storage Tanks in Reinforced Plastics;
- AS 2634:1983 – Chemical Plant Equipment made from Glass-Fibre Reinforced Plastics (GRP) Based on Thermosetting Resins and;
- Airports (Environmental Protection) Regulations 1997, Schedule 2 – Water pollution, Cl 1.03.

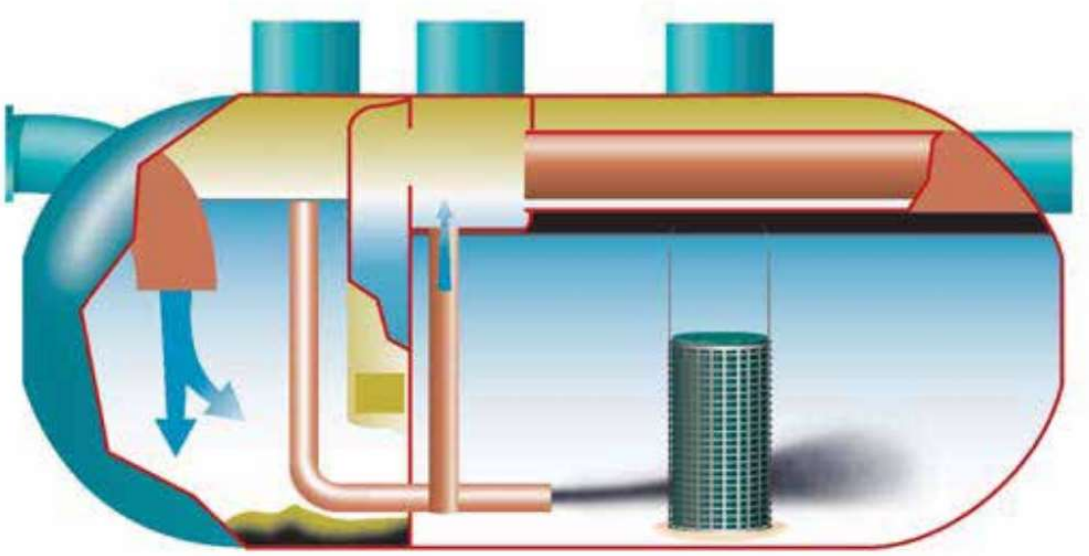


Figure 13 – Puraceptor Unit (Source: SPEL Stormwater)

One puraceptor unit has been proposed on the Pacific Highway site to treat hydrocarbons from the proposed multi-storey carpark. The MUSIC modelling parameters for this device are set by the manufacturer, SPEL Stormwater.

9.2.5 Raingardens

Bio-Detention systems are vegetated areas where stormwater is passed through densely planted filter media (loamy sand) allowing the plants to absorb the collected and stored nutrients. Bio-retention basins utilise temporary ponding above the vegetated surface to increase the volume of stored water for treatment. Bio-Detention systems can take a number of forms but all have common features including the extended detention depth above the media surface, the filter media and a low level drainage media and subsoil system. These are shown in the figure below.

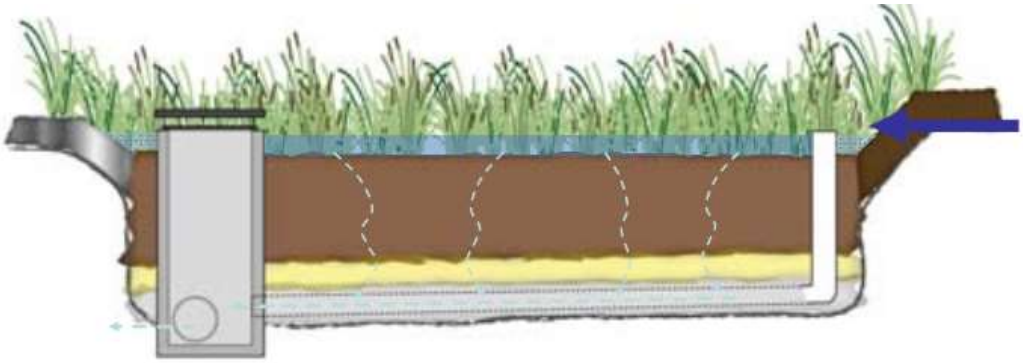


Figure 14: Typical Section of a generic Bio-Detention system (Source: Water by Design)

One raingarden with a surface area of 20m^2 and a filter area of 20m^2 has been proposed on the Centennial Avenue site to treat hydrocarbons from the proposed carpark extension as per Council's requirement to provide a treatment device that specifically targets hydrocarbons or incorporates a raingarden / bio-retention basin to treat runoff from parking areas.

It is recommended that the extended detention depth be no greater than 0.1m to mitigate risk of drowning.

9.3 Pollutant Reduction Modelling

In order to demonstrate that the proposed treatment train meets the required reduction targets, pollutant reduction modelling is proposed using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Software program Version 6.3 by eWater CRC. Pollutant export rates are currently only available for Total Suspended Solids (TSS), Total Nitrogen (TN), Total Phosphorous (TP) and Gross Pollutants (GP). Therefore only quantitative modelling for TSS, TN, TP & GP has been undertaken using MUSIC.

Modelling has only been undertaken on the post-development proposal with SQID's installed so as to demonstrate the percentage reduction for each pollutant type.

9.3.1 MUSIC Program Setup

This section explains the setup of the MUSIC model with the detailed pollutant reduction calculations being included in the MUSIC results in Appendix C.

For Music Modelling (using MUSIC 6.3.0) the following parameters have been used:

Table 6 – MUSIC modelling parameters

Model Parameters	
Meteorological Data:	Sydney 1959
Evaporation Data:	Sydney 1959
Time Step:	6 minute

Table 7 – West Catchment modelling parameters – Pacific Highway Site

Pacific Highway Site modelling Parameters			
Node Description	Area (Ha)	% Impervious	Land Use Rainfall and Pollutant Parameters
Roof Catchment	0.0815	100	Urban Roof
External Areas	0.172	57	Urban Mixed

Table 8 – East Catchment modelling parameters – Pacific Highway Site

Pacific Highway Site modelling Parameters			
Node Description	Area (Ha)	% Impervious	Land Use Rainfall and Pollutant Parameters
Roof Catchment	0.25	100	Urban Roof
External Areas	0.683	57	Urban Mixed

Table 9 – North Catchment modelling parameters – Pacific Highway Site

Pacific Highway Site modelling Parameters			
Node Description	Area (Ha)	% Impervious	Land Use Rainfall and Pollutant Parameters
Roof Catchment	0.071	100	Urban Roof
External Areas	0	-	Urban Mixed
External Areas Bypass	0.085	100	Urban Mixed

Table 10 – Catchment modelling parameters – Centennial Avenue Site

Centennial Ave Site modelling Parameters			
Node Description	Area (Ha)	% Impervious	Land Use Rainfall and Pollutant Parameters
Roof Catchment	0.7633	100	Urban Roof
External Areas	1.305	53	Urban Mixed
External Areas Bypass	0.10	30	Urban Mixed

Note that the Building R catchment has been excluded as this area will be captured into the water quantity and quality system proposed as part of these works.

9.3.2 MUSIC Results & Parameters

MUSIC Runoff Generation Parameters

The following properties have been used in the MUSIC Modelling based on the Land Use Rainfall and Pollutant Parameters.

Table 11 – Recommended MUSIC Runoff Generation Parameters

Parameter	Urban Residential
Rainfall Threshold (mm)	1 (general)
	0.3 (roof)
	1.5 (sealed roads)
Soil Capacity (mm)	54
Initial Storage (%)	10
Field Capacity	51
Infiltration Capacity Coefficient a	135
Infiltration Capacity Coefficient b	4
Initial Depth (mm)	50
Daily Recharge Rate (%)	10
Daily Drainage Rate (%)	10
Daily Deep Seepage Rate (%)	0

Music Concentration Parameters

Table 12 –MUSIC Concentration Parameters for Sydney Catchments

Land-use Type	Parameters	TSS Log10 mg/L		TP Log10 mg/L		TN Log10 mg/L	
		Base Flow	Storm Flow	Base Flow	Storm Flow	Base Flow	Storm Flow
Urban Residential	Mean	1.20	2.15	-0.85	-0.60	0.11	0.30
	STD Dev	0.17	0.32	0.19	0.25	0.12	0.19
Urban Roof	Mean	N/A	1.30	N/A	-0.89	N/A	0.30
	STD Dev	N/A	0.32	N/A	0.25	N/A	0.19
Sealed Roads	Mean	1.2	2.43	-0.85	-0.30	0.11	0.34
	STD Dev	0.17	0.32	0.19	0.25	0.12	0.19

MUSIC Model

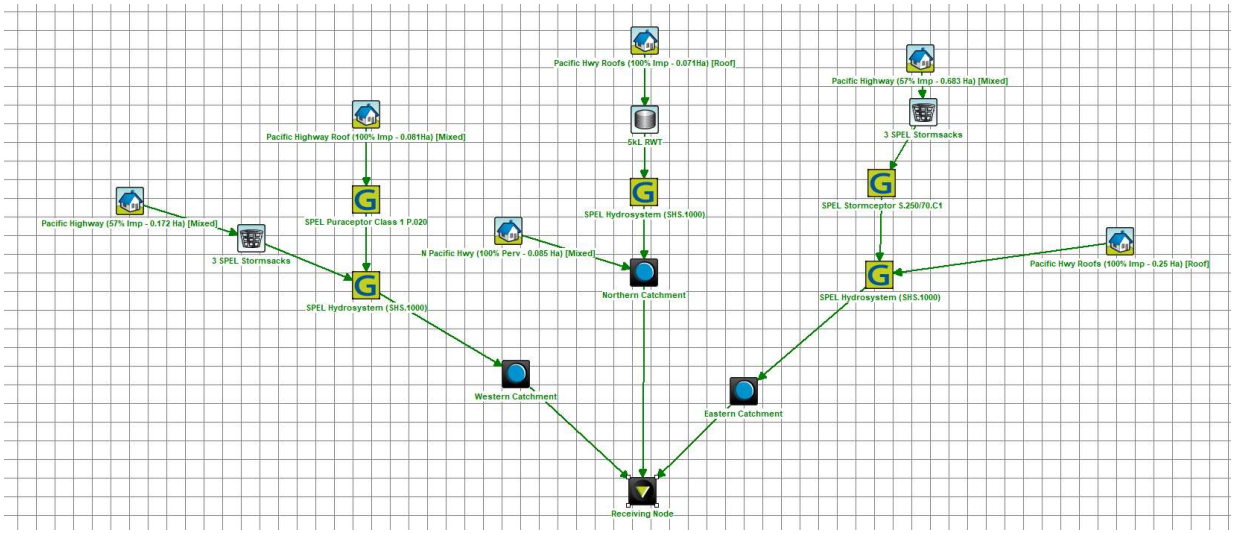


Figure 15 – MUSIC Model Pacific Highway Site

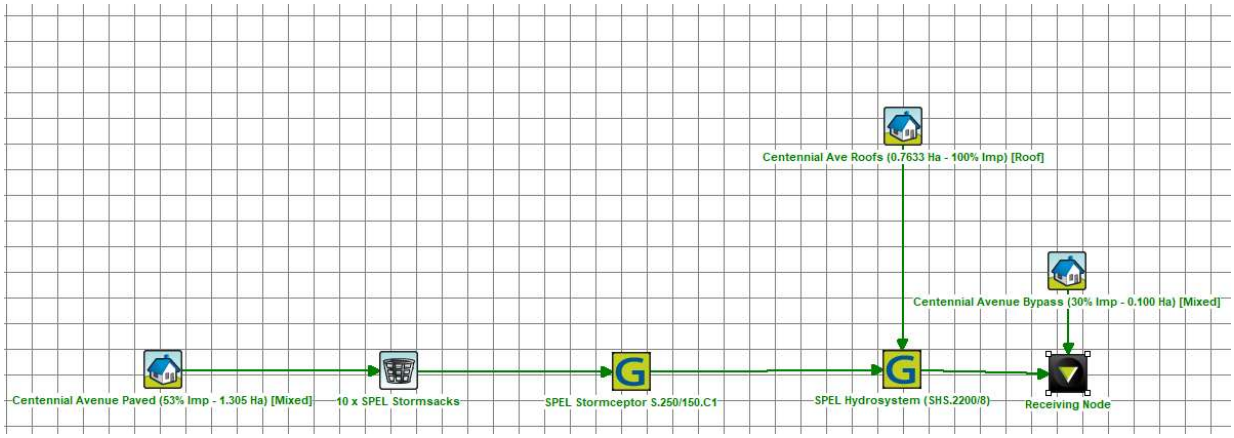
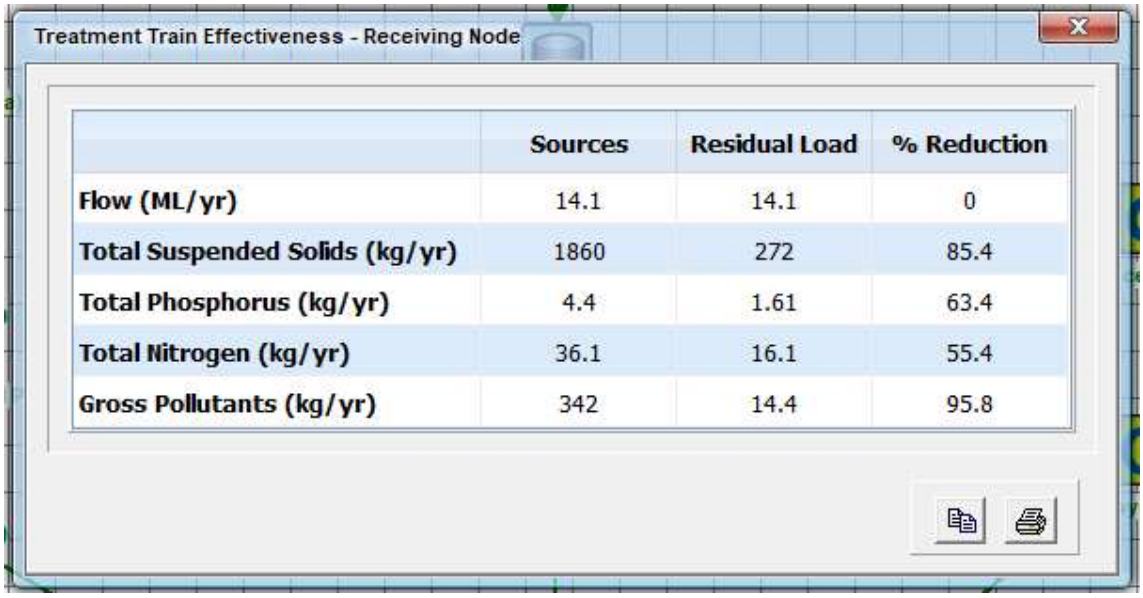


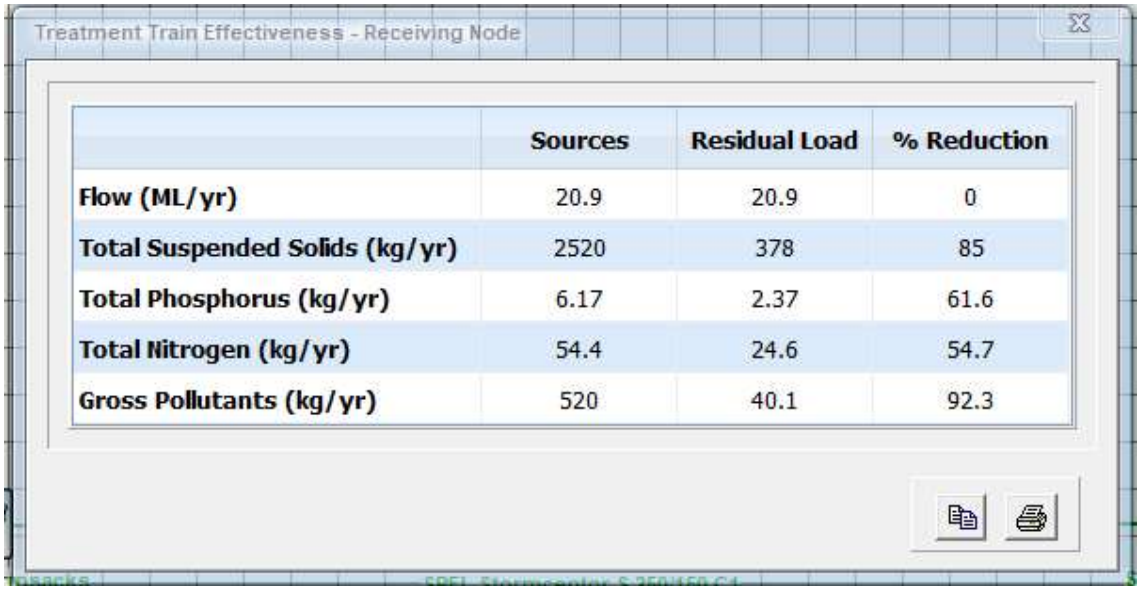
Figure 16 – MUSIC Model Centennial Avenue Site

MUSIC Output



	Sources	Residual Load	% Reduction
Flow (ML/yr)	14.1	14.1	0
Total Suspended Solids (kg/yr)	1860	272	85.4
Total Phosphorus (kg/yr)	4.4	1.61	63.4
Total Nitrogen (kg/yr)	36.1	16.1	55.4
Gross Pollutants (kg/yr)	342	14.4	95.8

Figure 17 – MUSIC Results – Pacific Highway Site



	Sources	Residual Load	% Reduction
Flow (ML/yr)	20.9	20.9	0
Total Suspended Solids (kg/yr)	2520	378	85
Total Phosphorus (kg/yr)	6.17	2.37	61.6
Total Nitrogen (kg/yr)	54.4	24.6	54.7
Gross Pollutants (kg/yr)	520	40.1	92.3

Figure 18 – MUSIC Results - Centennial Avenue Site

9.3.3 Pollutant Reduction Results

A number of management measures have been considered with a focus on reducing polluted runoff volumes from the site. The WSUD principals proposed for stormwater treatment includes the following SQID's:

Pacific Highway	Centennial Avenue
SPEL Stormsack	SPEL Stormsack
3 x SPEL Hydroceptor SHS 1000	SPEL Hydroceptor SHS 2200/8
SPEL Puraceptor P.020	SPEL Stormceptor S.250/150.C1
SPEL Stormceptor S.250/70.C1	Raingarden (near carpark extension)

The effectiveness of the treatment devices proposed in the above section has been modelled using MUSIC with the overall treatment train efficiency results shown below.

Table 13 – Treatment Train Efficiencies

Pacific Highway Site

Indicator	Total Site Reduction	Site Targets	Target Achieved
Gross Pollutants	96%	90%	Yes
Total Suspended Solids (TSS)	85%	85%	Yes
Total Phosphorus (TP)	63%	60%	Yes
Total Nitrogen (TN)	55%	45%	Yes

One puraceptor has been proposed on the Pacific Highway site to treat hydrocarbons from the proposed multistorey carpark as per Council's requirement to provide a treatment device that specifically targets hydrocarbons or incorporates a raingarden / bio-retention basin to treat runoff from parking areas. The Puraceptor is an effective solution for High risk hydrocarbon zones as it is a full retention separator.

Centennial Avenue Site

Indicator	Total Site Reduction	Site Targets	Target Achieved
Gross Pollutants	92%	90%	Yes
Total Suspended Solids (TSS)	85%	85%	No
Total Phosphorus (TP)	62%	60%	Yes
Total Nitrogen (TN)	55%	45%	Yes

One raingarden has been proposed on the Centennial Avenue site to treat hydrocarbons from the proposed additional carpark extension as per Council's requirement to provide a treatment device that specifically targets hydrocarbons or incorporates a raingarden / bio-retention basin to treat runoff from parking areas.

From the results presented above it can be seen that the proposed SQID's mean that the stormwater quality treatment meets with the Council's reduction targets.

10. Erosion & Sedimentation Control

Landcom have published a design guide entitled “Managing Urban Stormwater - Soils and Construction” which is regarded as the standard to which erosion and sedimentation control should be designed to within NSW. Willoughby Council specifies compliance with the Landcom design guide in Attachment 23 of the DCP.

The control of erosion and sedimentation describes the measures incorporated during and following construction of a new development to prevent the pollution and degradation of the downstream watercourse.

Sediment and Erosion Control Plans have been prepared as part of the application documentation and are included in Appendix A of this report.

Common control measures adopted are:

- Sedimentation fences
- Sedimentation basins
- Stormwater drainage inlet protection
- Overland flow diversion swales
- Shaker Grids and wash downs for vehicles leaving the construction site
- Dust control measures

The maintenance of these control measures throughout their intended lifespan will ensure that the risk of erosion and sedimentation pollution of the downstream watercourse will be minimized.

The erosion and sediment control measures will be established which include:

- Establishment of sediment control fences around the extent of works to prevent sediment discharge into the surrounding water courses;
- Establishment of a shaker grid and vehicle wash down area at the site entrance to prevent the tracking of materials from the site;
- Establishment of the proposed sediment basin on site.

In addition, dust control measures will be established during the earthworks and maintained until such time as exposed earthworks are stabilised.

All stormwater runoff will be conveyed to sedimentation ponds prior to discharge. This will also assist in dealing with the risk of chemical spills and runoff from concrete works on the site as any contaminates will be caught prior to discharge into the surrounding water courses.

Sediment basins have been sized using Managing Urban Stormwater - Soils and Construction. Refer to Civil Drawings in Appendix A for Erosion and Sediment Control Plans and Appendix D for Sediment Basin Sizing calculations.

Appendix A Civil Drawings

CIVIL ENGINEERING WORKS

SHEET LIST TABLE	
Sheet Number	Sheet Title
CI-000-001	COVER SHEET
CI-007-001	GENERAL NOTES
CI-060-001	GENERAL ARRANGEMENT PLAN - CENTENNIAL AVENUE
CI-060-011	GENERAL ARRANGEMENT PLAN - PACIFIC HIGHWAY
CI-070-002	EROSION AND SEDIMENT CONTROL PLAN - CENTENNIAL AVENUE
CI-070-012	EROSION AND SEDIMENT CONTROL PLAN - PACIFIC HIGHWAY
CI-076-001	EROSION AND SEDIMENT CONTROL DETAILS
CI-100-001	BULK EARTHWORKS PLAN - CENTENNIAL AVENUE
CI-100-011	BULK EARTHWORKS PLAN - PACIFIC HIGHWAY
CI-500-001	STORMWATER CATCHMENT PLAN - PRE DEVELOPMENT
CI-500-002	STORMWATER CATCHMENT PLAN - POST DEVELOPMENT
CI-500-003	STORMWATER CATCHMENT PLAN - POST DEVELOPMENT DETAIL
CI-526-001	STORMWATER MANAGEMENT PLAN - CENTENNIAL AVENUE
CI-526-011	STORMWATER MANAGEMENT PLAN - PACIFIC HIGHWAY

NSW DEPARTMENT OF EDUCATION
CLIENT

UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL
PROJECT

WOOD & GRIEVE ENGINEERS

40623	CI-000-001	F
PROJECT No	DRAWING No	REV

GENERAL NOTES

1. THE CONTRACTOR SHALL LOCATE AND LEVEL ALL EXISTING SERVICES PRIOR TO COMMENCING CONSTRUCTION AND SHALL MAKE ALL NECESSARY ARRANGEMENTS WITH THE RELEVANT AUTHORITY TO RELOCATE OR ADJUST AS REQUIRED. ALL COSTS TO BE BORNE BY THE APPLICANT, (NOT AT COUNCIL'S EXPENSE)
2. THE CONTRACTOR SHALL NOT ENTER UPON OR DO ANY WORK WITHIN ADJACENT LANDS WITHOUT PRIOR WRITTEN PERMISSION OF THE LAND OWNER.
3. SURVEY MARKS SHOWN THUS ◘ SHALL BE MAINTAINED AT ALL TIMES. WHERE RETENTION IS NOT POSSIBLE THE PRINCIPAL SHALL BE NOTIFIED AND CONSENT RECEIVED PRIOR TO THEIR REMOVAL OR RELOCATION.
4. ALL NEW WORKS SHALL MAKE SMOOTH JUNCTION WITH EXISTING CONDITIONS.
5. ALL LAND DISTURBED BY EARTHWORKS SHALL BE HYDROMULCHED, OR SIMILARLY TREATED TO ESTABLISH GRASS COVER. SEED MIXTURES ARE TO BE APPROVED BY THE PRINCIPAL PRIOR TO SPRAYING. ALL GRASSED AREAS SHALL BE REGULARLY WATERED AND MAINTAINED UNTIL EXPIRATION OF THE MAINTENANCE PERIOD.
6. THE CONTRACTOR SHALL MAINTAIN DUST CONTROL THROUGHOUT THE DURATION OF THE PROJECT.
7. ALL PITS DEEPER THAN 1.2m SHALL HAVE STEP IRONS PROVIDED IN ACCORDANCE WITH CAMDEN COUNCIL'S STANDARDS.
8. SUBSOIL DRAINS SHALL BE CONSTRUCTED TO THE SATISFACTION OF THE PRINCIPAL AND IN ACCORDANCE WITH THE CIVIL SPECIFICATION.
9. MINIMUM 100mm THICK TOPSOIL SHALL BE SPREAD ON ALL FOOTPATHS, BERMS, BATTERS AND ON ALL LOTS. EXCESS TOPSOIL SHALL BE STOCKPILED FOR FUTURE LANDSCAPING USE AS DIRECTED BY THE PRINCIPAL.
10. THE CONTRACTOR SHALL PROVIDE MINIMUM 48 HOURS NOTICE TO THE PRINCIPAL FOR ALL INSPECTIONS.
11. THE CONTRACTOR SHALL MAINTAIN SERVICES AND ALL WEATHER ACCESS AT ALL TIMES TO THE ADJOINING PROPERTIES.
12. THE CONTRACTOR SHALL UNDERTAKE TRAFFIC CONTROL MEASURES TO THE PRINCIPAL AND THE SATISFACTION OF MAITLAND CITY COUNCIL. APPROPRIATE WARNING SIGNS SHALL BE DISPLAYED THROUGHOUT THE DURATION OF CONSTRUCTION.
13. ALL NATURAL SURFACE DATA HAS BEEN DETERMINED BY TERRAIN MODELLING. ALL CONSTRUCTION SITE WORKS MUST BE CARRIED OUT USING THE BENCH MARKS NOTED ON THIS DRAWING.
14. 100 YEAR FLOW PATHS TO BE FORMED AT TIME OF CONSTRUCTION.

STRUCTURAL INSPECTIONS

1. STRUCTURAL INSPECTIONS ARE REQUIRED FOR STRUCTURES WHERE NOTED ON PLANS.
2. 48 HOURS NOTICE IS REQUIRED FOR ALL INSPECTIONS.

SITE COMPOUND

1. CONTRACTOR TO CONFIRM SITE COMPOUND AND FACILITIES LOCATION WITH PRINCIPAL.

SURVEY NOTES

THE EXISTING SITE FEATURES AND LEVELS SHOWN ON THE FOLLOWING DRAWINGS HAVE BEEN PROVIDED BY ADW JOHNSON, BEING REGISTERED SURVEYORS. THE INFORMATION IS SHOWN TO PROVIDE A BASIS FOR DESIGN. WOOD & GRIEVE ENGINEERS DOES NOT GUARANTEE THE ACCURACY OR COMPLETENESS OF THE SURVEY BASE OR ITS SUITABILITY AS A BASIS FOR CONSTRUCTION DRAWINGS.

SHOULD DISCREPANCIES BE ENCOUNTERED DURING CONSTRUCTION BETWEEN THE SURVEY DATA AND ACTUAL FIELD DATA, CONTACT WOOD & GRIEVE ENGINEERS.

THE FOLLOWING NOTES HAVE BEEN TAKEN DIRECTLY FROM THE ORIGINAL SURVEY DOCUMENTS.

PM83605
RL: 8.708
DATUM: A.H.D.

BULK EARTHWORKS NOTES

1. ORIGIN OF LEVELS: REFER SURVEY NOTES.
2. STRIP ALL TOPSOIL/ORGANIC MATERIAL (150mm NOMINAL) FROM CONSTRUCTION AREA AND REMOVE FROM SITE OR STOCK PILE AS DIRECTED BY PRINCIPAL.
3. EXCAVATED MATERIAL TO BE USED AS STRUCTURAL FILL PROVIDED THE PLACEMENT MOISTURE CONTENT OF THE MATERIAL IS +/- 2% OF THE OPTIMUM MOISTURE CONTENT.
4. COMPACT FILL AREAS AND SUBGRADE TO NOT LESS THAN:

LOCATION	MINIMUM DRY DENSITY (AS 1289 E 5.1.1.)
UNDER BUILDING SLABS ON GROUND	95-98% STD
UNDER ROADS, FOOTWAYS AND CARPARKS	100% STD
LANDSCAPED AREAS UNLESS NOTED OTHERWISE	95% STD

5. BEFORE PLACING FILL, PROOF ROLL EXPOSED SUBGRADE WITH A 12 TONNE (MIN) DEADWEIGHT SMOOTH DRUM NON VIBRATORY ROLLER TO DETECT THEN REMOVE SOFT SPOTS (AREAS WITH MORE THAN 2mm MOVEMENT UNDER ROLLER).
6. TESTING SHALL BE "LEVEL 1" TESTING IN ACCORDANCE WITH THE CURRENT VERSION OF AS 3798.
7. FILLING TO BE PLACED AND COMPACTED IN MAXIMUM LAYERS 200mm
8. NO FILLING SHALL TAKE PLACE TO EXPOSED SUBGRADE UNTIL THE AREA HAS BEEN PROOF ROLLED IN THE PRESENCE OF THE GEOTECHNICAL ENGINEER AND APPROVAL GIVEN IN WRITING THAT FILLING CAN PROCEED.
9. WHERE GROUNDWATER DISCHARGE OCCURS IN BULK EXCAVATIONS OR CUT FACES, SUBSOIL DRAINAGE SHALL BE INSTALLED IN ACCORDANCE WITH THE PRINCIPAL / GEOTECH INSTRUCTIONS TO DIRECT DISCHARGE WATER TO THE NEAREST STORMWATER / SEDIMENTATION CONTROL DEVICE. THE SUBSOIL DRAINAGE MUST BE INSTALLED AS SOON AS PRACTICALLY POSSIBLE AFTER EXCAVATION. SUBSOIL DRAINAGE SHALL ALSO BE INSTALLED AT LOW POINTS IN THE FINISHED EARTHWORK PROFILE IN ACCORDANCE WITH THE PRINCIPAL / GEOTECH'S INSTRUCTIONS.
10. ENSURE TEMPORARY DIVERSION CHANNELS ARE CONSTRUCTED AROUND STOCKPILED MATERIALS AND DISTURBED AREAS GENERALLY AS DETAILED.
11. THE CONTRACTOR SHALL ALLOW FOR AND COORDINATE ALL MONITORING AND MAINTENANCE REQUIREMENTS IN RELATION TO SOIL AND GROUNDWATER CONDITIONS DURING CONSTRUCTION.
12. WORKS TO BE IN ACCORDANCE WITH ALL GEOTECHNICAL REPORTS.

SITEWORKS NOTES

1. ORIGIN OF LEVELS:- REFER SURVEY NOTES.
2. CONTRACTOR MUST VERIFY ALL DIMENSIONS AND EXISTING LEVELS ON SITE PRIOR TO COMMENCEMENT OF WORK. ANY DISCREPANCIES TO BE REPORTED TO THE PRINCIPAL.
3. ALL TRENCH BACKFILL MATERIAL SHALL BE COMPACTED TO THE SAME DENSITY AS THE ADJACENT MATERIAL.
4. SEWER, POTABLE WATER AND RECYCLED WATERMAINS BACKFILL TO BE IN ACCORDANCE WITH THE HYDRAULIC SPECIFICATION, ALL OTHER SERVICE TRENCHES UNDER VEHICULAR PAVEMENTS SHALL BE BACKFILLED WITH SAND TO 300mm ABOVE PIPE. WHERE PIPE IS UNDER PAVEMENTS BACKFILL REMAINDER OF TRENCH TO UNDERSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPACTED IN 150mm LAYERS TO MINIMUM 98% MODIFIED MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 5.2.1. (OR A DENSITY INDEX OF NOT LESS THAN 75)
5. ASPHALTIC CONCRETE SHALL CONFORM TO R.M.S. SPECIFICATION R116.
6. ALL BASECOURSE MATERIAL SHALL BE IGNEOUS ROCK QUARRIED MATERIAL TO COMPLY WITH R.M.S. FORM 3051 (UNBOUND), R.M.S. FORM 3052 (BOUND) COMPACTED TO MINIMUM 98% MODIFIED DENSITY IN ACCORDANCE WITH AS 1289 5.2.1. FREQUENCY OF COMPACTION TESTING SHALL NOT BE LESS THAN 1 TEST PER 50m³ OF BASECOURSE MATERIAL PLACED.
7. ALL SUB-BASE COURSE MATERIAL SHALL BE IGNEOUS ROCK QUARRIED MATERIAL TO COMPLY WITH R.M.S. FORM 3051, 3051.1 AND COMPACTED TO MINIMUM 95% MODIFIED DENSITY IN ACCORDANCE WITH A.S 1289 5.2.1 FREQUENCY OF COMPACTION TESTING SHALL NOT BE LESS THAN 1 TEST PER 50m³ OF SUB-BASE COURSE MATERIAL PLACED.
8. AS AN ALTERNATIVE TO THE USE OF IGNEOUS ROCK AS A SUB-BASE MATERIAL IN (9) A CERTIFIED RECYCLED CONCRETE MATERIAL COMPLYING WITH R.M.S. FORM 3051 WILL BE CONSIDERED. SUBJECT TO MATERIAL SAMPLES AND APPROPRIATE CERTIFICATIONS BEING PROVIDED TO THE SATISFACTION OF THE PRINCIPAL.
9. SHOULD THE CONTRACTOR WISH TO USE A RECYCLED PRODUCT THIS SHALL BE CLEARLY INDICATED IN THEIR TENDER AND THE PRICE DIFFERENCE BETWEEN AN IGNEOUS PRODUCT AND A RECYCLED PRODUCT SHALL BE CLEARLY INDICATED.
10. WHERE NOTED ON THE DRAWINGS THAT WORKS ARE TO BE CARRIED OUT BY OTHERS, (eg. ADJUSTMENT OF SERVICES), THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CO-ORDINATION OF THESE WORKS.

EROSION AND SEDIMENT CONTROL NOTES

GENERAL INSTRUCTIONS

1. THE CONTRACTOR/ENGINEER/MANAGER WILL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS DOCUMENTED.
2. ALL WORK SHALL BE GENERALLY CARRIED OUT IN ACCORDANCE WITH
   a. LOCAL AUTHORITY REQUIREMENTS
   b. EPA REQUIREMENTS
   c. LANDCOM "MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION", 4th EDITION, MARCH 2004.
3. MAINTAIN THE EROSION CONTROL DEVICES TO THE SATISFACTION OF THE PRINCIPAL AND THE LOCAL AUTHORITY.
5. AT ALL TIMES A WATER CART(S) SHALL BE MAINTAINED ON SITE TO:
   (A) WATER THE AREAS OF HYDROMULCH
   (B) CONTROL DUST
   WATERING OF MULCH, DUST OR VEGETATION MUST BE KEPT TO THE MINIMUM REQUIRED TO ACHIEVE SPECIFIED OUTCOMES. IN NO CASE SHALL AREAS BE OVER WATERED TO SATURATION OR TO THE POINT WHERE WATER PONDS ON THE SURFACE.
6. THE WATER IN THE SEDIMENT BASIN(S) SHALL BE LOWERED PERIODICALLY T0 MAINTAIN THE MINIMUM STORAGE VOLUME REQUIRED FOR FINE SOILS AND THE FFOLLOWING:

   (A) STORMWATER IN THE SETTLING ZONE SHALL BE DRAINED OR PUMPED OUT WITHIN 7 DAYS (NO LATER THAN 14 DAYS AS SITE CONDITIONS ALLOW) FOLLOWING A RAINFALL EVENT IF THE NOMINATED WATER QUALITY TARGETS CAN BE MET. THE LOWER LEVEL OF THE SETTLING ZONE SHALL BE IDENTIFIED WITH A PEG THAT SHOWS CLEARLY THE LEVEL WHICH DESIGN CAPACITY IS AVAILABLE.

   (B) STORED SEDIMENT SHALL NOT ENCROACH INTO SETTLING ZONE. SEDIMENT REMOVED FROM SEDIMENT BASIN SHALL BE DISPOSED OF IN PLACES THAT WILL NOT RESULT IN A FUTURE EROSION OR POLLUTION HAZARD.

   (C) TEMPORARY SEDIMENT BASIN OUTLET PIPE SHALL BE CAPPED DURING CONSTRUCTION. AFTER CONSTRUCTION BASIN SHOULD BE CLEARED OF SEDIMENTS BEFORE OUTLET PIPE CAP IS REMOVED.
7. WHEN STORMWATER PITS ARE CONSTRUCTED, PREVENT SITE RUNOFF ENTERING UNLESS SEDIMENT FENCES ARE ERECTED AROUND PITS.
8. CONTRACTOR IS TO ENSURE ALL EROSION & SEDIMENT CONTROL DEVICES ARE MAINTAINED IN GOOD WORKING ORDER AND OPERATE EFFECTIVELY. REPAIRS AND OR MAINTENANCE SHALL BE UNDERTAKEN AS REQUIRED, PARTICULARLY FOLLOWING STORM EVENTS.

LAND DISTURBANCE

8. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE WILL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:

   (A) MAINTAIN EXISTING SECURITY / WIND FENCES INSTALLED AS PART OF THE ENABLING WORKS AND INSTALL NEW SECURITY / WIND FENCES AS SHOWN.

   (B) MAINTAIN EXISTING SEDIMENT FENCES INSTALLED AS PART OF THE ENABLING WORKS AND INSTALL NEW SEDIMENT FENCES AS SHOWN.

   (C) INSTALL SEDIMENT TRAPS AS SHOWN ON PLAN AND AS REQUIRED.

   (D) UNDERTAKE SITE DEVELOPMENT WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS. WHERE POSSIBLE, PHASE DEVELOPMENT SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF WORKABLE SIZE.

   (E) DISTURBED AREAS TO BE GRASSED TO THE FOLLOWING STANDARDS:
   - EMBANKMENTS AND CREEKS - HYDRO MULCHED.
   - VERGES - HYDRO MULCHED.

EROSION CONTROL

9. DURING WINDY WEATHER, LARGE, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL.

SEDIMENT CONTROL

11. STOCKPILES WILL NOT BE LOCATED WITHIN 2 METRES OF HAZARD AREAS, INCLUDING LIKELY AREAS OF CONCENTRATED OR HIGH VELOCITY FLOWS SUCH AS WATERWAYS. WHERE THEY ARE BETWEEN 2 AND 5 METRES FROM SUCH AREAS, SPECIAL SEDIMENT CONTROL MEASURES SHOULD BE TAKEN TO MINIMISE POSSIBLE POLLUTION TO DOWNSLOPE WATERS, E.G. THROUGH INSTALLATION OF SEDIMENT FENCING.
12. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) WILL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.
13. WATER WILL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS IT IS RELATIVELY SEDIMENT FREE, I.E. THE CATCHMENT AREA HAS BEEN PERMANENTLY LANDSCAPED AND/OR ANY LIKELY SEDIMENT HAS BEEN FILTERED THROUGH AN APPROVED STRUCTURE.
14. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES WILL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE REHABILITATED/STABILISED.

OTHER MATTERS

15. ACCEPTABLE RECEPTORS WILL BE PROVIDED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER.
16. THE APZ ZONES FOR ANY EXISTING TREES NOT IDENTIFIED FOR REMOVAL WILL BE PROTECTED FROM CONSTRUCTION ACTIVITIES.

KERBING NOTES

1. ALL CONCRETE TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF 25 MPa U.N.O IN REINFORCED CONCRETE NOTES OR MAITLAND CITY SPECIFICATIONS.
2. ALL KERBS, GUTTERS, DISH DRAINS AND CROSSINGS TO BE CONSTRUCTED ON 100mm GRANULAR BASECOURSE COMPACTED TO MINIMUM 95% MODIFIED DRY DENSITY (AS 1289 5.2.1).
3. EXPANSION JOINTS (E.J) TO BE FORMED FROM 10mm COMPRESSIBLE CORK FILLER BOARD FOR THE FULL DEPTH OF THE SECTION AND CUT TO PROFILE. EXPANSION JOINTS TO BE LOCATED AT DRAINAGE PITS, ON TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX 12m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE EXPANSION JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLABS.
4. WEAKENED PLANE JOINTS TO BE MIN 3mm WIDE AND LOCATED AT 3m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE WEAKENED PLANE JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLABS.
5. BROOMED FINISH TO ALL RAMPED AND VEHICULAR CROSSINGS. ALL OTHER KERBING OR DISH DRAINS TO BE STEEL FLOAT FINISHED.
6. IN THE REPLACEMENT OF KERB AND GUTTER :- EXISTING ROAD PAVEMENT IS TO BE SAWCUT 900mm U.N.O FROM THE LIP OF GUTTER. UPON COMPLETION OF THE NEW KERB AND GUTTER NEW BASECOURSE AND SURFACE TO BE LAID 900mm WIDE U.N.O.
7. ALLOTMENT DRAINAGE PIPES CONNECTED TO THE ROLL/KERB AND GUTTER SHALL CONSIST OF A RECTANGULAR HOLLOW SECTION (GALVANISED STEEL) AT THE LOW SIDE OF THE PROPOSED LOT.
8. PRAM RAMP GRADES SHALL BE MAX 1 IN 14. IN SPECIAL CIRCUMSTANCES GRADES SHALL BE ABSOLUTE MAX 1 IN 8.

CONCRETE NOTES

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600 CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
2. CONCRETE QUALITY ALL REQUIREMENTS OF THE CURRENT ACSE CONCRETE SPECIFICATION DOCUMENT 1 SHALL APPLY TO THE FORMWORK, REINFORCEMENT AND CONCRETE UNLESS NOTED OTHERWISE.

ELEMENT	AS 3600 F'c MPa AT 28 DAYS	SPECIFIED SLUMP	NOMINAL AGG. SIZE
VEHICULAR BASE	32	60	20
KERBS, PATHS,	25	80	20
PITS	32	80	20

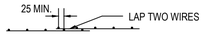
- CEMENT TYPE SHALL BE (ACSE SPECIFICATION) TYPE SL.
- PROJECT CONTROL TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1379.

3. NO ADMIXTURES SHALL BE USED IN CONCRETE UNLESS APPROVED IN WRITING BY THE PRINCIPAL.
4. ALL REINFORCEMENT SHALL BE FIRMLY SUPPORTED ON MILD STEEL PLASTIC TIPPED CHAIRS, PLASTIC CHAIRS OR CONCRETE CHAIRS AT NOT GREATER THAN 1m CENTRES BOTH WAYS. BARS SHALL BE TIED AT ALTERNATE INTERSECTIONS.
5. THE FINISHED CONCRETE SHALL BE A DENSE HOMOGENEOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS. ALL CONCRETE INCLUDING SLABS ON GROUND AND FOOTINGS SHALL BE COMPACTED AND CURED IN ACCORDANCE WITH RMS SPECIFICATION R83.
6. REINFORCEMENT SYMBOLS: N DENOTES GRADE 500 N BARS TO AS 4671, GRADE N R DENOTES 250 R HOT ROLLED PLAIN BARS TO AS 4671, SL DENOTES COLD-DRAWN WIRE REINFORCING FABRIC TO AS 4671

NUMBER OF BARS IN GROUP — BAR GRADE AND TYPE
17 N 20 250
NOMINAL BAR SIZE IN mm — SPACING IN mm

THE FIGURE FOLLOWING THE FABRIC SYMBOL SL IS THE REFERENCE NUMBER FOR FABRIC TO AS 4671.

7. FABRIC SHALL BE LAPPED IN ACCORDANCE WITH THE FOLLOWING DETAIL:



8. EXTERNAL CONCRETE ELEMENTS SHALL MEET THE FOLLOWING REQUIREMENTS: MINIMUM PORTLAND CEMENT CONTENT 300 kg/m3/, MAXIMUM WATER RATIO 0.5, AND CHLORIDE CONTENT RESTRICTED AS PER CLAUSE 4.9 OF AS3600.

PAVEMENT NOTE

1. PAVEMENT IS TO BE SUPPLIED IN ACCORDANCE WITH CIVIL SPECIFICATION.

TRAFFIC CONTROL NOTES

1. A TRAFFIC CONTROL PLAN IS TO BE PREPARED AND LODGED WITH COUNCIL FOR APPROVAL BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF CONSTRUCTION.

REINFORCEMENT STEEL

1. WORKMANSHIP AND MATERIALS
   ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600 AND ANY OTHER APPLICABLE CODES EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTATION.
2. REINFORCEMENT TYPE AND GRADE

REINFORCEMENT NOTATION TYPE	DESCRIPTION AND TYPE	CLASSIFICATION AND DESIGNATION TO AS/NZS 4671
N	HOT ROLLED DEFORMED BAR, MICROALLOY TEMPCORE	D500N

3. BAR NOTATION
   GIVES THE FOLLOWING INFORMATION IN THE FOLLOWING ORDER:
   e.g. 20N16-200T. - NO. OF BARS, TYPE, BAR SIZE (mm), SPACING (mm), LAYER (200 TOP).

   T = TOP — T 1ST LAYER — T 2ND LAYER
   B = BOTTOM — B 1ST LAYER — B 2ND LAYER

4. REINFORCEMENT LAPS
   LAP REINFORCEMENT ONLY AT LOCATIONS SHOWN ON THE DRAWINGS OR AS APPROVED BY THE ENGINEER IN WRITING, U.N.O. LAP ALL BARS AS TABULATED BELOW:

SLAB REINFORCEMENT	
BAR SIZE	MINIMUM LAP LENGTH (mm)
N12	450
N16	650

WALL REINFORCEMENT	
BAR SIZE	MINIMUM LAP LENGTH (mm)
N12	500
N16	650
N20	800
N24	960

STORMWATER DRAINAGE NOTES

1. STORMWATER DESIGN CRITERIA:
   (A) AVERAGE RECURRENCE INTERVAL:
   ROAD DRAINAGE
   5 YEAR ARI — MINOR STORM EVENT
   20 YEAR ARI — MINOR STORM EVENT - MAJOR COLLECTOR ROADS
   100 YEAR ARI — MAJOR STORM EVENT
2. ALL LOTS DISCHARGING TO INTERALLOTMENT DRAINAGE SYSTEMS ARE TO CAPTURE AND CONVEY ALL SITE RUNOFF UP TO THE 5yr ARI INTO THE INTERALLOTMENT DRAIN. - THIS CAPTURE CONDITION APPLIES FOR SUCH LOTS BOTH PRIOR TO AND FOLLOWING BUILDING DEVELOPMENT. - A MINIMUM GAP OF 0.2m BELOW FENCING IS TO BE CONSTRUCTED ACROSS THE FULL WIDTH OF ALL DRAINAGE EASEMENTS TO CONVEY DRAINAGE SURCHARGE FLOWS.
3. PIPES 375 DIA. AND LARGER TO BE REINFORCED CONCRETE CLASS '3' UNLESS NOTED OTHERWISE. APPROVED SPIGOT AND SOCKET WITH RUBBER RING JOINTS. U.N.O.
4. PIPES TO BE INSTALLED TO TYPE HS1 SUPPORT IN ACCORDANCE WITH AS 3725 IN ALL CASES BACKFILL TRENCH WITH SAND TO 300mm ABOVE PIPE. WHERE PIPE IS UNDER PAVEMENTS BACKFILL REMAINDER OF TRENCH TO UNDERSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPACTED IN 150mm LAYERS TO MINIMUM 98% STANDARD MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 5.2.1. (OR A DENSITY INDEX OF NOT LESS THAN 75)
5. ALL INTERNAL WORKS WITHIN PROPERTY BOUNDARIES ARE TO COMPLY WITH THE REQUIREMENTS OF AS 3500 3.1 AND AS/NZS 3500 3.2.
6. WHERE SUBSOIL DRAINS PASS UNDER FLOOR SLABS AND VEHICULAR PAVEMENTS, UNSLOTTED uPVC SEWER GRADE PIPE IS TO BE USED.
7. CARE IS TO BE TAKEN WITH LEVELS OF STORMWATER LINES. GRADES SHOWN ARE NOT TO BE REDUCED WITHOUT APPROVAL.
8. GRATES AND COVERS SHALL CONFORM TO MAITLAND CITY COUNCIL REQUIREMENTS AND AS3996
9. AT ALL TIMES DURING CONSTRUCTION OF STORMWATER PITS, ADEQUATE SAFETY PROCEDURES SHALL BE TAKEN TO ENSURE AGAINST THE POSSIBILITY OF PERSONNEL FALLING DOWN PITS.
10. ALL EXISTING STORMWATER DRAINAGE LINES AND PITS THAT ARE TO REMAIN ARE TO BE INSPECTED AND CLEANED. DURING THIS PROCESS ANY PART OF THE STORMWATER DRAINAGE SYSTEM THAT WARRANTS REPAIR SHALL BE REPORTED TO THE PRINCIPAL/ENGINEER FOR FURTHER DIRECTIONS.
11. CCTV ALL PIPES AFTER CONSTRUCTION AND PRIOR TO COMPLETION.

    PROVIDE CCTV FOOTAGE FOR ALL NEW PIPES AND FOR ALL EXISTING PIPES WHICH ARE TO REMAIN COMPLYING WITH THE FOLLOWING REQUIREMENTS:

    (A) THE FILES SHALL BE IN MP4 FORMAT

    (B) FILE RESOLUTION SHALL BE 640 BY 480 PIXELS, 3MBPS AND 25 FRAMES PER SECOND.

    (C) EACH PIPE REACH (I.E. BETWEEN TWO PITS) SHALL BE PROVIDED AS A SEPARATE FILE.

STORMWATER DRAINAGE NOTES

(D) THE CCTV INSPECTION SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE IPWEA CONDITION ASSESSMENT AND ASSET PERFORMANCE GUIDELINES, PRACTICE NOTE 5, STORMWATER DRAINAGE.

(E) THE SPEED AND PANNING OF THE FOOTAGE SHALL BE SUFFICIENT TO DEMONSTRATE THAT THERE ARE NO SIGNIFICANT CRACKS IN THE PIPE AND THAT THE JOINTS HAVE BEEN PROPERLY CONSTRUCTED.

(F) THE FILES SHALL HAVE A NAME CORRESPONDING WITH THE UNIQUE LABEL PROVIDED IN THE ASSOCIATED STAMPED APPROVED DRAWINGS AND

(G) A SUMMARY REPORT (*.PDF) SHALL ACCOMPANY THE DATA

12. PIPES ARE DESIGNED FOR OPERATIONAL TRAFFIC LOADS ONLY. APPROPRIATE MEASURES SHOULD BE TAKEN TO PROTECT PIPES DURING CONSTRUCTION.

EXISTING UNDERGROUND SERVICES NOTES

1. THE LOCATIONS OF UNDERGROUND SERVICES SHOWN IN THIS SET OF DRAWINGS HAVE BEEN PLOTTED FROM SURVEY INFORMATION AND SERVICE AUTHORITY INFORMATION. THE SERVICE INFORMATION HAS BEEN PREPARED ONLY TO SHOW THE APPROXIMATE POSITIONS OF ANY KNOWN SERVICES AND MAY NOT BE AS CONSTRUCTED OR ACCURATE. ARCADIS CAN NOT GUARANTEE THAT THE SERVICES INFORMATION SHOWN ON THESE DRAWINGS ACCURATELY INDICATES THE PRESENCE OR ABSENCE OF SERVICES OR THEIR LOCATION AND WILL ACCEPT NO LIABILITY FOR INACCURACIES IN THE SERVICES INFORMATION SHOWN FROM ANY CAUSE WHATSOEVER.
2. CONTRACTORS SHALL TAKE DUE CARE WHEN EXCAVATING ONSITE INCLUDING HAND EXCAVATION WHERE NECESSARY.
3. CONTRACTORS ARE TO CONTACT THE RELEVANT SERVICE AUTHORITY PRIOR TO COMMENCEMENT OF EXCAVATION WORKS.
4. CONTRACTORS ARE TO UNDERTAKE A SERVICES SEARCH, PRIOR TO COMMENCEMENT OF WORKS ON SITE. SEARCH RESULTS ARE TO BE KEPT ON SITE AT ALL TIMES.

PROPOSED SERVICES NOTES

1. THE CONTRACTOR SHALL ATTEND, MANAGE & SUPERVISE THE PROVISION OF PUBLIC UTILITY SERVICES TO THE WORKS GENERALLY AS INDICATED ON THE SERVICES PLANS, NOTING THAT PRIOR & DURING CONSTRUCTION THE PUBLIC UTILITY AUTHORITIES WILL FINALISE THEIR DOCUMENTATION TO CONSTRUCTION ISSUE STANDARD. THE FOLLOWING GENERAL ARRANGEMENTS SHALL APPLY IN RESPECT OF EACH PUBLIC UTILITY SERVICE.

   CONDUIT ROAD CROSSING
   THE CIVIL CONTRACTOR SHALL ALLOW IN THEIR PRICE FOR CONDUIT CROSSINGS UNDER THE PROPOSED ROADS AS SHOWN ON THE "SERVICES PLAN".
2. THE CIVIL CONTRACTOR (TRENCH PROVIDER) IS TO ARRANGE ON SITE MEETING WITH ALL SERVICE AUTHORITIES PRIOR TO THE INSTALLATION OF CONDUITS.
3. THE CIVIL CONTRACTOR TO CO-ORDINATE INSTALLATION OF ELECTRICITY, GAS AND TELECOMMUNICATION SERVICES.
4. ELECTRICITY, GAS AND TELECOMMUNICATION SERVICES ARE TO BE LAID FOLLOWING THE INSTALLATION OF STORMWATER, SEWER AND WATER SERVICES AND KERB AND GUTTER.
5. ALL UTILITY AUTHORITY REPRESENTATIVES TO INSPECT ROAD CROSSINGS PRIOR TO SEALING.
6. ALL ELECTRICAL ROAD CROSSINGS TO BE CLASS 6 (ORANGE) uPVC CONDUITS.
7. ALL GAS ROAD CROSSINGS TO BE uPVC GREY SEWER GRADE CONDUITS.
8. ALL STREET POLES TO BE POSITIONED 350mm FROM BOUNDARY TO CENTRELINE OF POLE.
9. WHERE FOOTPATHS ARE TO BE CONSTRUCTED, ALL SERVICE PIT COVERS AND MARKERS ARE TO BE LAID WHOLLY WITHIN OR WHOLLY OUTSIDE THE CONCRETE FOOTPATH. CONTACT PRINCIPAL SHOULD DIFFICULTIES ARISE.
10. ELECTRICITY CONDUITS ARE SHOWN FOR CLARITY HOWEVER, CABLES MAY BE DIRECTLY BURIED. APPROVAL BY AUSGRID REQUIRED.
11. SERVICES MARKERS ARE TO BE PLACED ON THE KERB & GUTTER AT ALL ROAD CROSSING POINTS, ON BOTH SIDES OF THE ROAD.
12. ALL SERVICE PIT COVERS TO BE INSTALLED FLUSH WITH PROPOSED VERGE LEVELS AND GRADES.

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APPROVED FOR CONSTRUCTION:	... ../../..

ARCHITECT/CLIENT

UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

PROJECT

GENERAL NOTES

TITLE

40623-CI-007-001.dwg

WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

AS SHOWN	40623	CI-007-001	F
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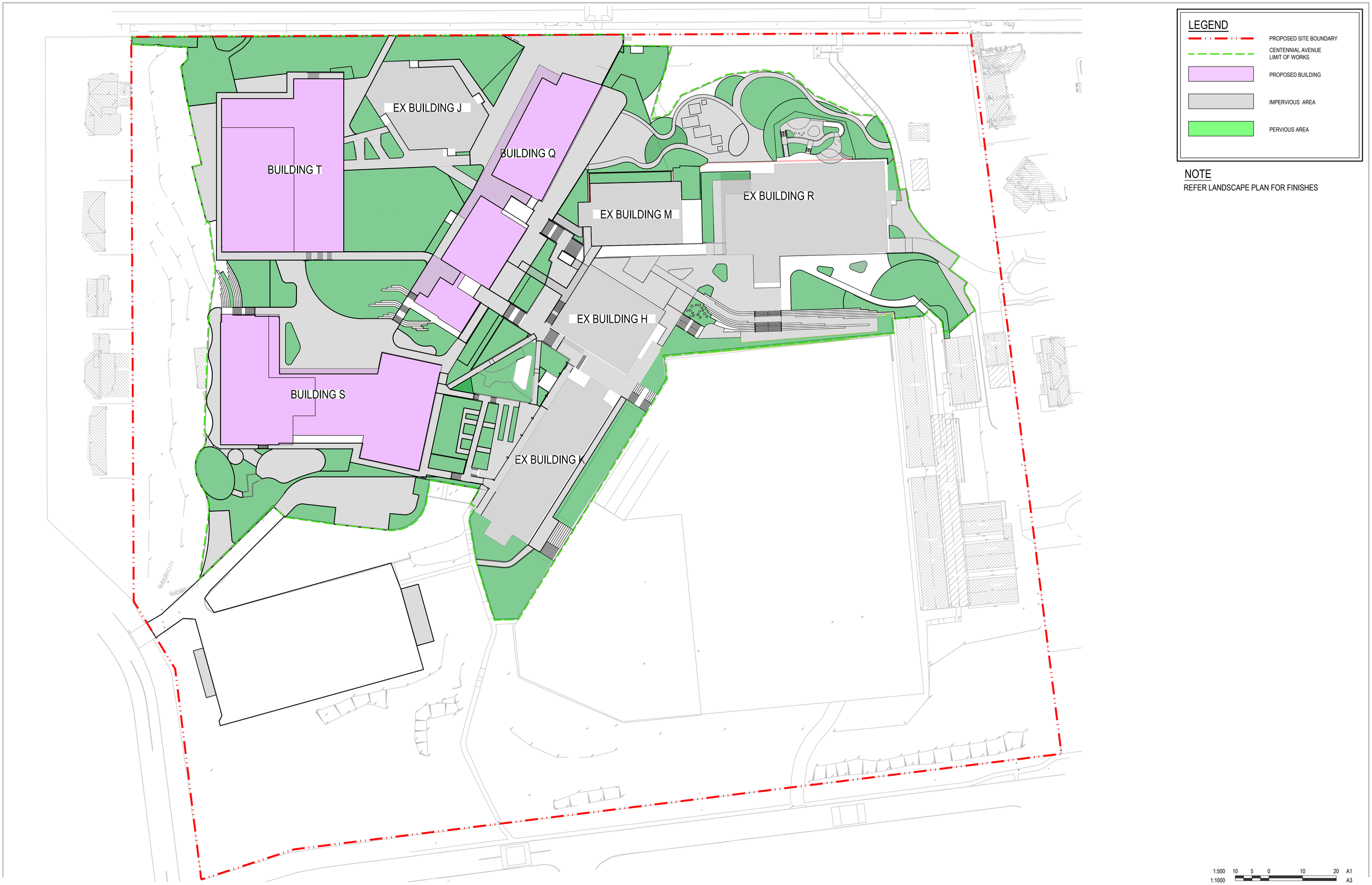

LEGEND

- PROPOSED SITE BOUNDARY
- CENTENNIAL AVENUE LIMIT OF WORKS
- PROPOSED BUILDING
- IMPERVIOUS AREA
- PERVIOUS AREA

NOTE

REFER LANDSCAPE PLAN FOR FINISHES

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ARCHITECT/CLIENT

UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

PROJECT

GENERAL ARRANGEMENT PLAN - CENTENNIAL AVENUE

TITLE

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WOOD & GRIEVE ENGINEERS

FOR APPROVAL

NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
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LEGEND

- PROPOSED SITE BOUNDARY
- CENTENNIAL AVENUE LIMIT OF WORKS
- PROPOSED BUILDING
- IMPERVIOUS AREA
- PERVIOUS AREA

NOTE

REFER LANDSCAPE PLAN FOR FINISHES

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ARCHITECT/CLIENT

UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

PROJECT

GENERAL ARRANGEMENT PLAN - PACIFIC HIGHWAY

TITLE

WOOD & GRIEVE ENGINEERS

FOR APPROVAL

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EX BUILDING J

BUILDING T
FFL 87.510 FFL 90.660

BUILDING Q
FFL 92.00

FFL 91.00

EX BUILDING M

EX BUILDING R
FFL 82.20

EX BUILDING H

BUILDING S
FFL 83.700 FFL 91.300

EX BUILDING K

SHAKER GRID TO BE
LOCATED AT SITE ENTRANCE

PROPOSED SEDIMENT BASIN.
TOTAL VOLUME = 148m^3
SETTLING ZONE = 98m^3
SEDIMENT STORAGE ZONE = 50m^3
DEPTH = 2.1m
DISPERSIBLE SOILS - FLOCCULATION REQUIRED.

PROPOSED SEDIMENT BASIN
TOTAL VOLUME = 124m^3
SETTLING ZONE = 13m^3
SEDIMENT STORAGE ZONE = 9m^3
DEPTH = 1.6m
DISPERSIBLE SOILS - FLOCCULATION REQUIRED.

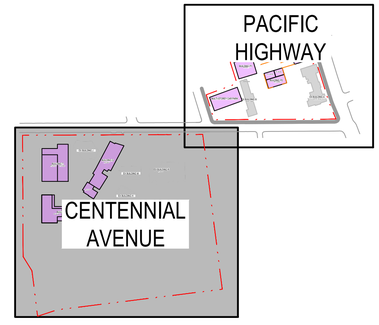
PROPOSED SEDIMENT BASIN
TOTAL VOLUME = 334m^3
SETTLING ZONE = 217m^3
SEDIMENT STORAGE ZONE = 69m^3
DEPTH = 2.2m
DISPERSIBLE SOILS - FLOCCULATION REQUIRED.

LEGEND

- PROPOSED SITE BOUNDARY
- PROPOSED BUILDING
- VEHICLE SHAKEDOWN DEVICE
- PROPOSED SILT FENCE
- PROPOSED SWALE
- EXISTING BUILDING TO BE DEMOLISHED
- SANDBAG PIT PROTECTION
- EXISTING DEMOUNTABLE TO BE REMOVED
- EXISTING JUNCTION PIT
- SITE ENTRY POINT
- PROPOSED GRATED PIT
- EXISTING GRATED PIT
- PROPOSED KERB INLET PIT
- EXISTING KERB INLET PIT

NOTE:
REFER DRAWING CI-076-01 FOR EROSION AND SEDIMENT CONTROL DETAILS

NOTE:
REFER DRAWING CI-076-01 FOR EROSION AND SEDIMENT CONTROL DETAILS



KEY PLAN
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ARCHITECT/CLIENT

UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

PROJECT

EROSION AND SEDIMENT CONTROL PLAN - CENTENNIAL AVENUE

TITLE

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WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
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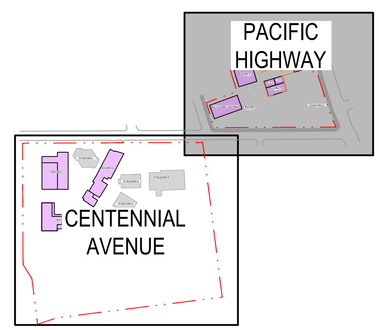
LEGEND

- PROPOSED SITE BOUNDARY
- PROPOSED BUILDING
- VEHICLE SHAKEDOWN DEVICE
- PROPOSED SILT FENCE
- PROPOSED SWALE
- EXISTING BUILDING TO BE DEMOLISHED
- SANDBAG PIT PROTECTION
- EXISTING DEMOUNTABLE TO BE REMOVED
- EXISTING JUNCTION PIT
- SITE ENTRY POINT
- PROPOSED GRATED PIT
- EXISTING GRATED PIT
- PROPOSED KERB INLET PIT
- EXISTING KERB INLET PIT

NOTE:

REFER DRAWING CI-076-01 FOR EROSION AND SEDIMENT CONTROL DETAILS

NOTE:
REFER DRAWING CI-076-01 FOR EROSION AND SEDIMENT CONTROL DETAILS



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ARCHITECT/CLIENT

PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

TITLE: EROSION AND SEDIMENT CONTROL PLAN - PACIFIC HIGHWAY

WOOD & GRIEVE ENGINEERS

FOR APPROVAL
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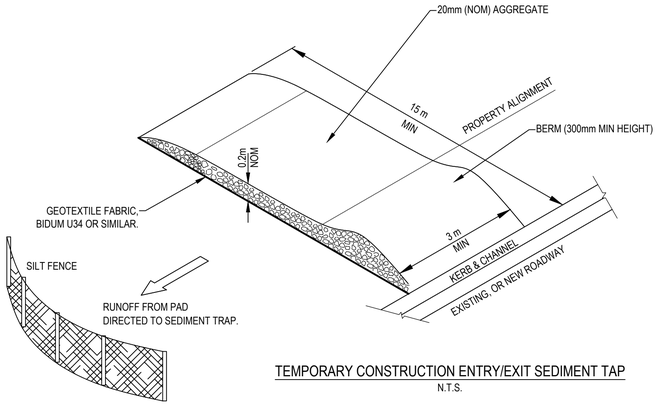

TEMPORARY CONSTRUCTION ENTRY/EXIT SEDIMENT TAP
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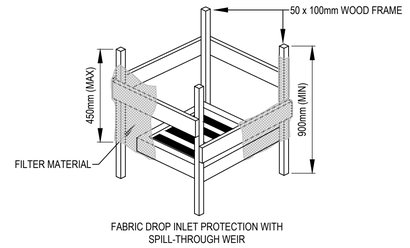
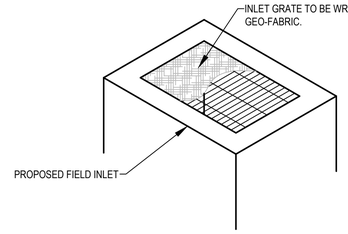


FABRIC DROP INLET PROTECTION WITH SPILL-THROUGH WEIR

FIELD INLET PROTECTION
N.T.S.



FIELD INLET SEDIMENT CONTROL
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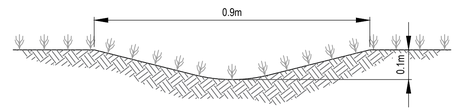
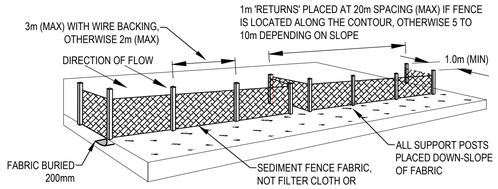


OVERFLOW DIVERSION SWALE DETAIL
(SCALE 1:10)



INSTALLATION OF SEDIMENT FENCE
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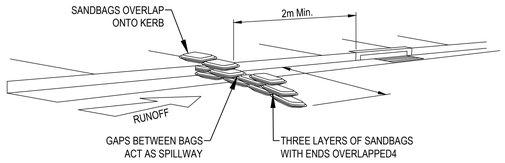

SANDBAG KERB INLET SEDIMENT TRAP
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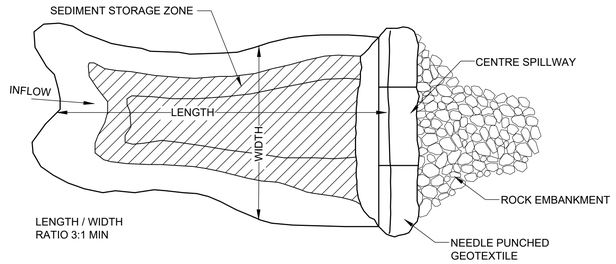
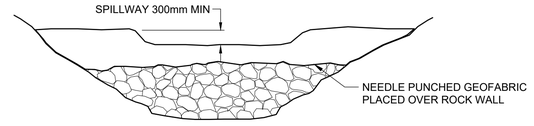


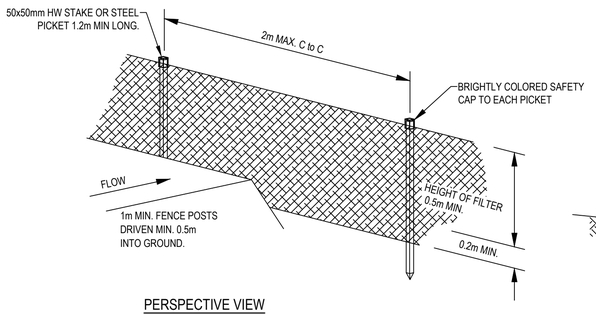
PLAN VIEW



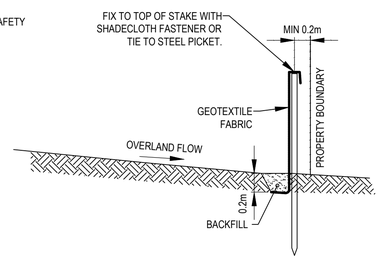
DOWNSTREAM ELEVATION

SEDIMENT BASIN - TYPE C DETAIL
N.T.S.

NOTES:
1. INSTALL MARKER POST SHOWING MAX. STORAGE AND SETTING ZONE DEPTHS.

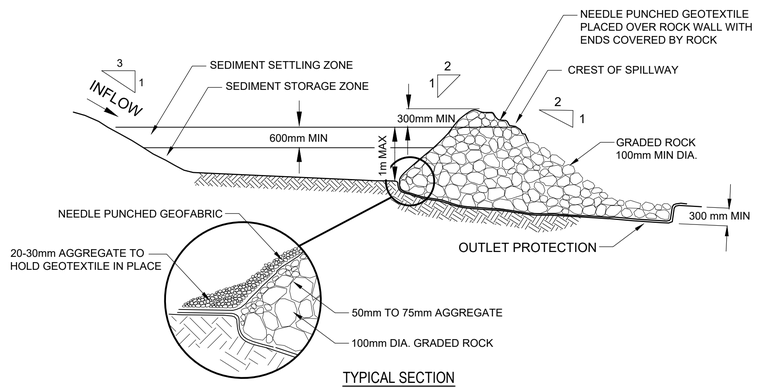


PERSPECTIVE VIEW



TYPICAL SECTION

SEDIMENT FENCE DETAIL
N.T.S.



TYPICAL SECTION

1:100 1 0 1 2 3 4 5 A1
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F	SSDA ISSUE	CPO	RET	11.03.20
E	DRAFT SSDA	CPO	RET	27.02.20
D	DRAFT SSDA	CPO	RET	18.02.20
C	ISSUED FOR SSDA	CPO	RET	11.12.19
B	ISSUED FOR INFORMATION	RET	RET	29.04.19
A	ISSUED FOR INFORMATION	CPO	RET	27.03.19

DRAWN:	CPO
DESIGNED:	RET
VERIFIED:	... ../../..
APPROVED FOR TENDER:	... ../../..
APPROVED FOR CONSTRUCTION:	... ../../..

ARCHITECT/CLIENT

PROJECT: ----

TITLE: EROSION AND SEDIMENT CONTROL DETAILS

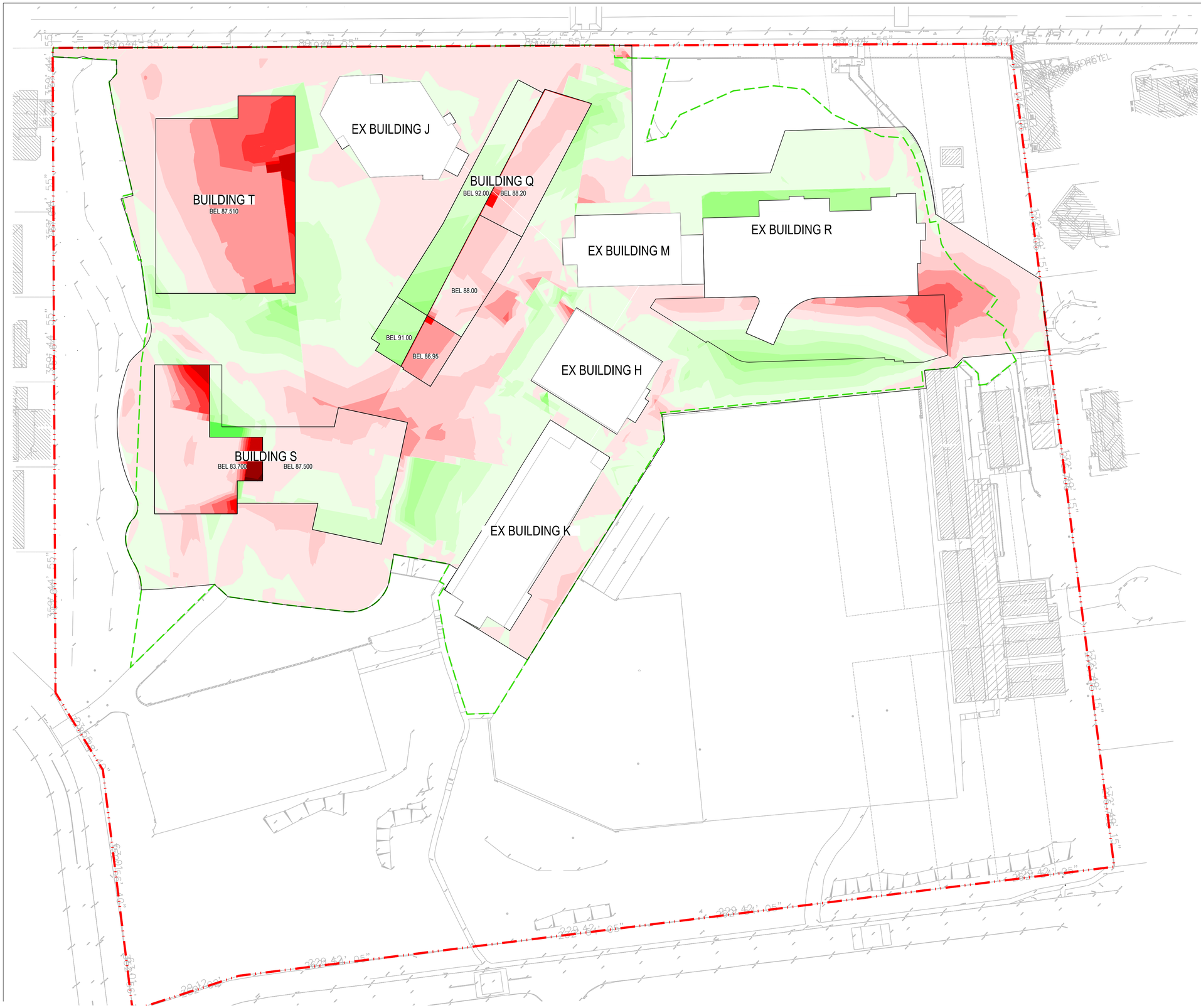
40623-CI-076-001.dwg

WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
AS SHOWN	----	CI-076-001	F

11/03/2020 5:16:14 PM



CUT/FILL DEPTH RANGES

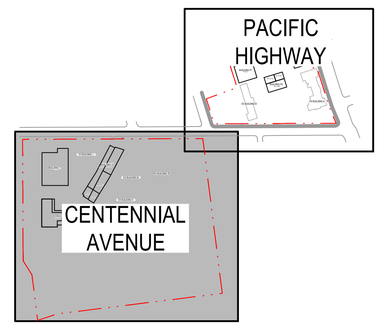
COLOUR	LOWER	UPPER
	-5.0	-4.5
	-4.5	-4.0
	-4.0	-3.5
	-3.5	-3.0
	-3.0	-2.5
	-2.5	-2.0
	-2.0	-1.5
	-1.5	-1.0
	-1.0	-0.5
	-0.5	0.0
	0.0	0.5
	0.5	1.0
	1.0	1.5
	1.5	2.0
	2.0	2.5
	2.5	3.0
	3.0	3.5
	3.5	4.0
	4.0	4.5
	4.5	5.0

CUT AND FILL VOLUME

CUT: 7,050 m^3
FILL: 5,920 m^3
NET: 1,130 m^3 (CUT)

NOTES:

1. VOLUMES ARE BASED ON A COMPARISON BETWEEN THE DESIGN SURFACE AND THE SURVEYED SURFACE.
2. NO STRIPPING OF THE EXISTING SURFACE HAS BEEN APPLIED.
3. NO BULKING FACTORS HAVE BEEN APPLIED.
4. NO ALLOWANCE FOR PAVEMENT BOXING HAS BEEN APPLIED.
5. CUT FILL NUMBERS ARE TAKEN TO THE TOP OF SLAB LEVEL INSIDE BUILDING FOOTPRINTS.
6. CUT FILL EXTERNAL TO BUILDING IS NOT CONSIDERED
7. IT IS NOTED THAT THE MAJORITY, IF NOT ALL, CUT MATERIAL IS NOT SUITABLE FOR FILL PURPOSES.



KEY PLAN
N.T.S

1:500 10 5 0 10 20 A1
1:1000 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
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H	DRAFT SSDA	CPO	RET	27.02.20
G	DRAFT SSDA	CPO	RET	18.02.20
F	ISSUED FOR INFORMATION	CPO	RET	11.02.20
E	ISSUED FOR SSDA	CPO	RET	11.12.19
D	ISSUED FOR INFORMATION	CPO	RET	21.11.19
C	ISSUED FOR INFORMATION	CPO	RET	12.11.19
B	ISSUED FOR INFORMATION	CPO	RET	29.04.19
A	ISSUED FOR INFORMATION	GLE	RET	29.03.19

DRAWN:	CPO
DESIGNED:	RET
VERIFIED:	... ../../..
APPROVED FOR TENDER:	... ../../..
APPROVED FOR CONSTRUCTION:	... ../../..

ARCHITECT/CLIENT

PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

TITLE: BULK EARTHWORKS PLAN - CENTENNIAL AVENUE

40623-C3D-BE-HIGH.dwg

WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
AS SHOWN	40623	CI-100-001	I

11/03/2020 5:17:30 PM

CUT/FILL DEPTH RANGES

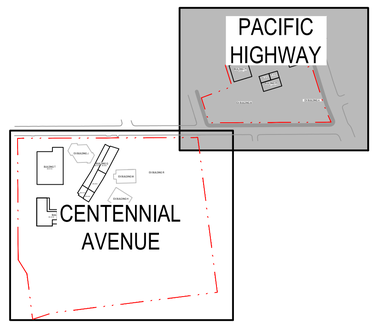
COLOUR	LOWER	UPPER
	-4.0	-3.5
	-3.5	-3.0
	-3.0	-2.5
	-2.5	-2.0
	-2.0	-1.5
	-1.5	-1.0
	-1.0	-0.5
	-0.5	0.0
	0.0	0.5
	0.5	1.0
	1.0	1.5
	1.5	2.0
	2.0	2.5
	2.5	3.0
	3.0	3.5
	3.5	4.0
	4.0	4.5
	4.5	5.0
	5.0	5.5
	5.5	6.0
	6.0	6.5

CUT AND FILL VOLUME

CUT: 4,550 m^3
FILL: 3,620 m^3
NET: 930 m^3 (Cut)

NOTES:

1. VOLUMES ARE BASED ON A COMPARISON BETWEEN THE DESIGN SURFACE AND THE SURVEYED SURFACE.
2. NO STRIPPING OF THE EXISTING SURFACE HAS BEEN APPLIED.
3. NO BULKING FACTORS HAVE BEEN APPLIED.
4. NO ALLOWANCE FOR PAVEMENT BOXING HAS BEEN APPLIED.
5. CUT FILL NUMBERS ARE TAKEN TO THE TOP OF SLAB LEVEL INSIDE BUILDING FOOTPRINTS.
6. CUT FILL EXTERNAL TO BUILDING IS NOT CONSIDERED
7. IT IS NOTED THAT THE MAJORITY, IF NOT ALL, CUT MATERIAL IS NOT SUITABLE FOR FILL PURPOSES.



KEY PLAN
N.T.S

1:500 10 5 0 10 20 A1
1:1000 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
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G	DRAFT SSDA	CPO	RET	10.03.20
F	DRAFT SSDA	CPO	RET	27.02.20
E	DRAFT SSDA	CPO	RET	18.02.20
D	ISSUED FOR SSDA	CPO	RET	11.12.19
C	ISSUED FOR INFORMATION	CPO	RET	12.11.19
B	ISSUED FOR INFORMATION	CPO	RET	29.04.19
A	ISSUED FOR INFORMATION	GLE	RET	29.03.19

DRAWN:	CPO
DESIGNED:	RET
VERIFIED:	... ../../..
APPROVED FOR TENDER:	... ../../..
APPROVED FOR CONSTRUCTION:	... ../../..

ARCHITECT/CLIENT

PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

TITLE: BULK EARTHWORKS PLAN - PACIFIC HIGHWAY

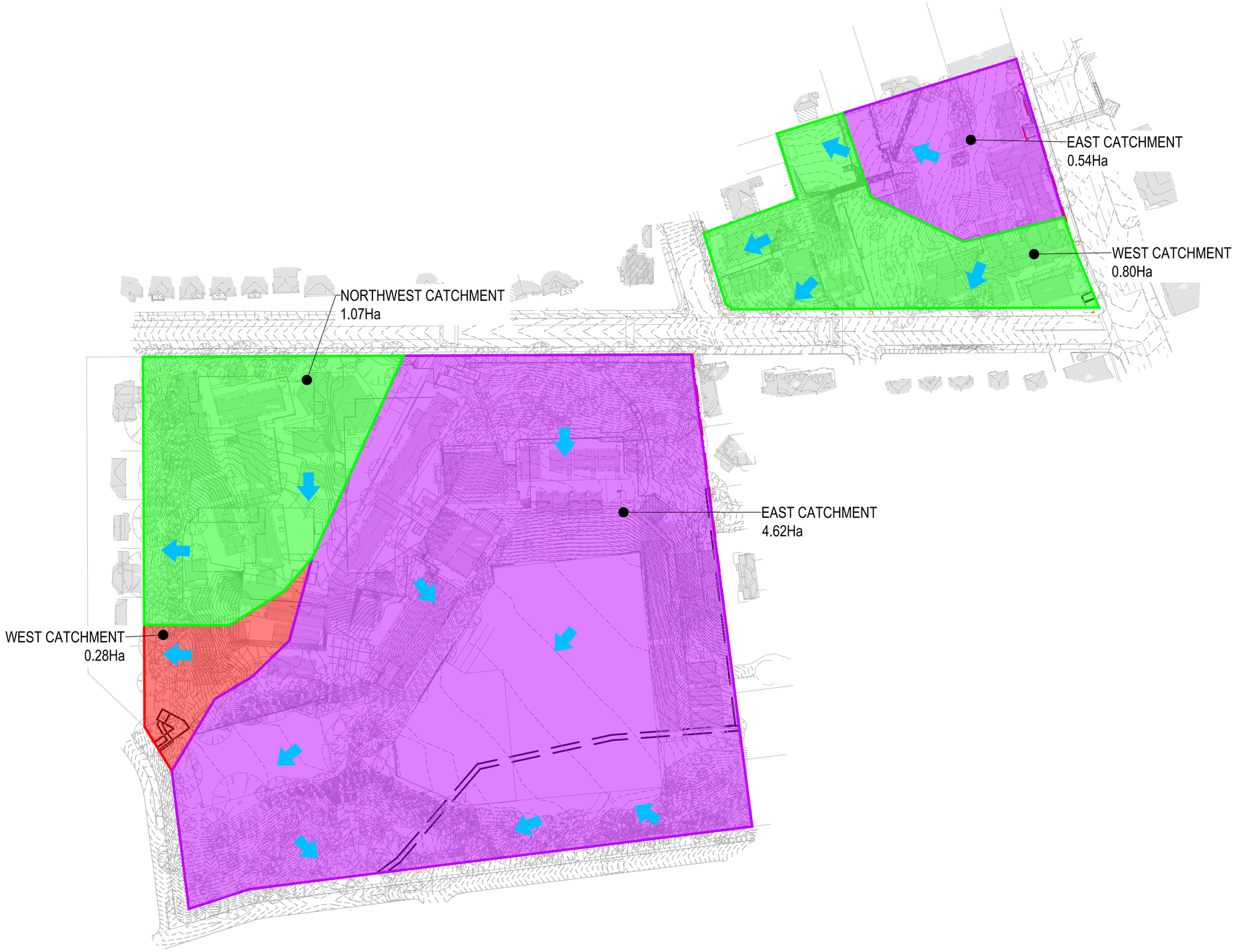
40623-C3D-BE-HIGH.dwg

WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
AS SHOWN	40623	CI-100-011	H

11/03/2020 5:18:24 PM



1:500 10 5 0 10 20 A1
1:1000 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
E	SSDA ISSUE	CPO	RET	11.03.20
D	DRAFT SSDA	CPO	RET	27.02.20
C	DRAFT SSDA	CPO	RET	18.02.20
B	ISSUED FOR SSDA	CPO	RET	11.12.19
A	ISSUED FOR INFORMATION	CPO	RET	29.04.19

DRAWN:	CPO
DESIGNED:	RET
VERIFIED:	... ../../..
APPROVED FOR TENDER:	... ../../..
APPROVED FOR CONSTRUCTION:	... ../../..

ARCHITECT/CLIENT

UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

PROJECT

STORMWATER CATCHMENT PLAN - PRE DEVELOPMENT

TITLE

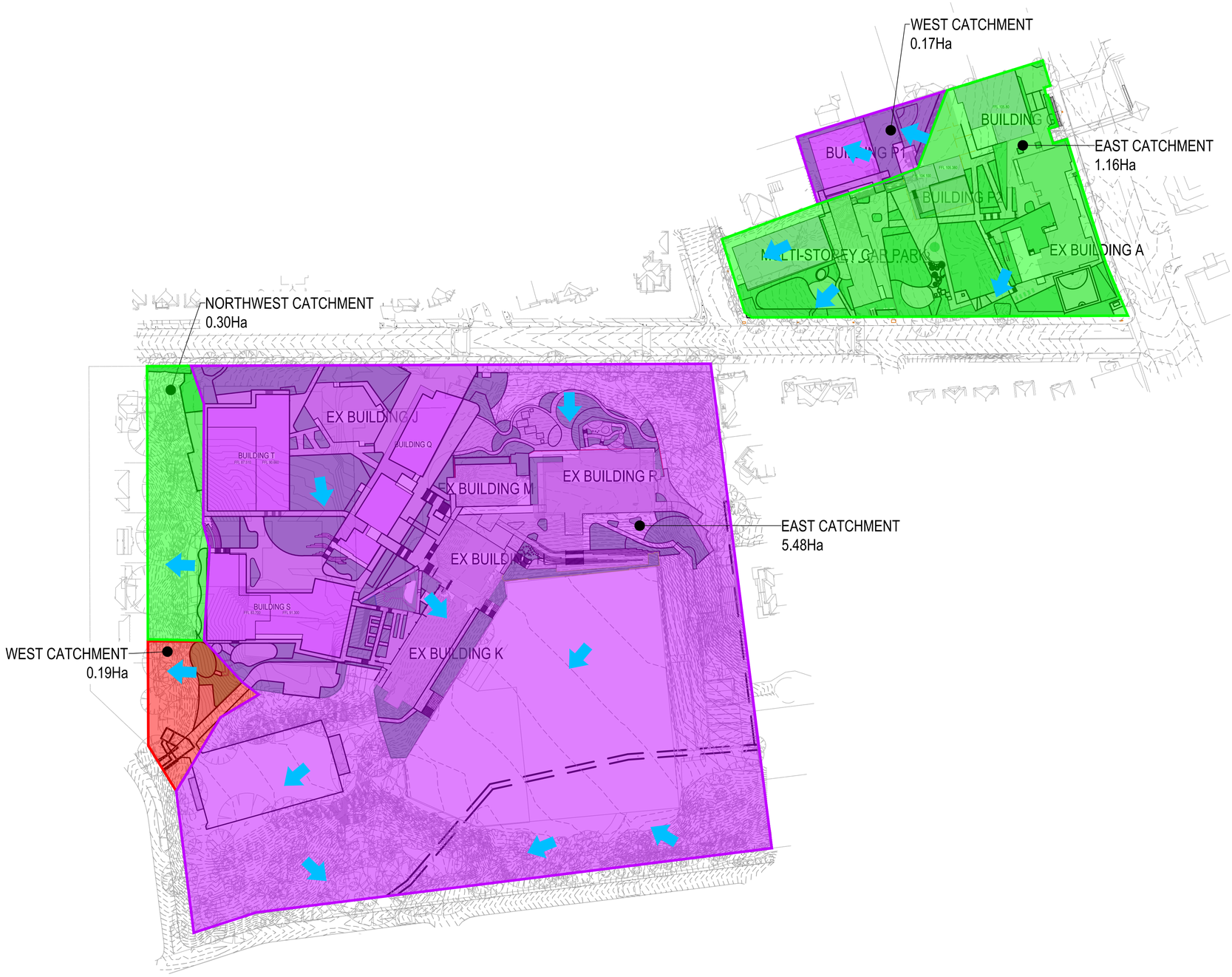
40623-CI-500-001.dwg

11/03/2020 5:19:02 PM

WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
AS SHOWN	40623	CI-500-001	E



LEGEND

- PROPOSED SITE BOUNDARY
- EXTENT OF WORKS
- PROPOSED BUILDING
- PROPOSED ROOF EXTENT
- OVERLAND FLOW

1:500 10 5 0 10 20 A1
1:1000 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
E	SSDA ISSUE	CPO	RET	11.03.20
D	DRAFT SSDA	CPO	RET	27.02.20
C	DRAFT SSDA	CPO	RET	18.02.20
B	ISSUED FOR SSDA	CPO	RET	11.12.19
A	ISSUED FOR INFORMATION	CPO	RET	29.04.19

DRAWN:	CPO
DESIGNED:	RET
VERIFIED:	... ../../..
APPROVED FOR TENDER:	... ../../..
APPROVED FOR CONSTRUCTION:	... ../../..

ARCHITECT/CLIENT

UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

PROJECT

STORMWATER CATCHMENT PLAN - POST DEVELOPMENT

TITLE

40623-CI-500-002.dwg

WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
AS SHOWN	40623	CI-500-002	E

11/03/2020 5:19:43 PM

1:500 10 5 0 10 20 A1
1:1000 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
D	SSDA ISSUE	CPO	RET	11.03.20
C	DRAFT SSDA	CPO	RET	27.02.20
B	DRAFT SSDA	CPO	RET	18.02.20
A	ISSUED FOR SSDA	CPO	RET	11.12.19

DRAWN:	CPO
DESIGNED:	RET
VERIFIED:	... ../../..
APPROVED FOR TENDER:	... ../../..
APPROVED FOR CONSTRUCTION:	... ../../..

ARCHITECT/CLIENT

PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

TITLE: STORMWATER CATCHMENT PLAN - POST DEVELOPMENT DETAIL

40623-CI-500-003.dwg

WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
AS SHOWN	40623	CI-500-003	D

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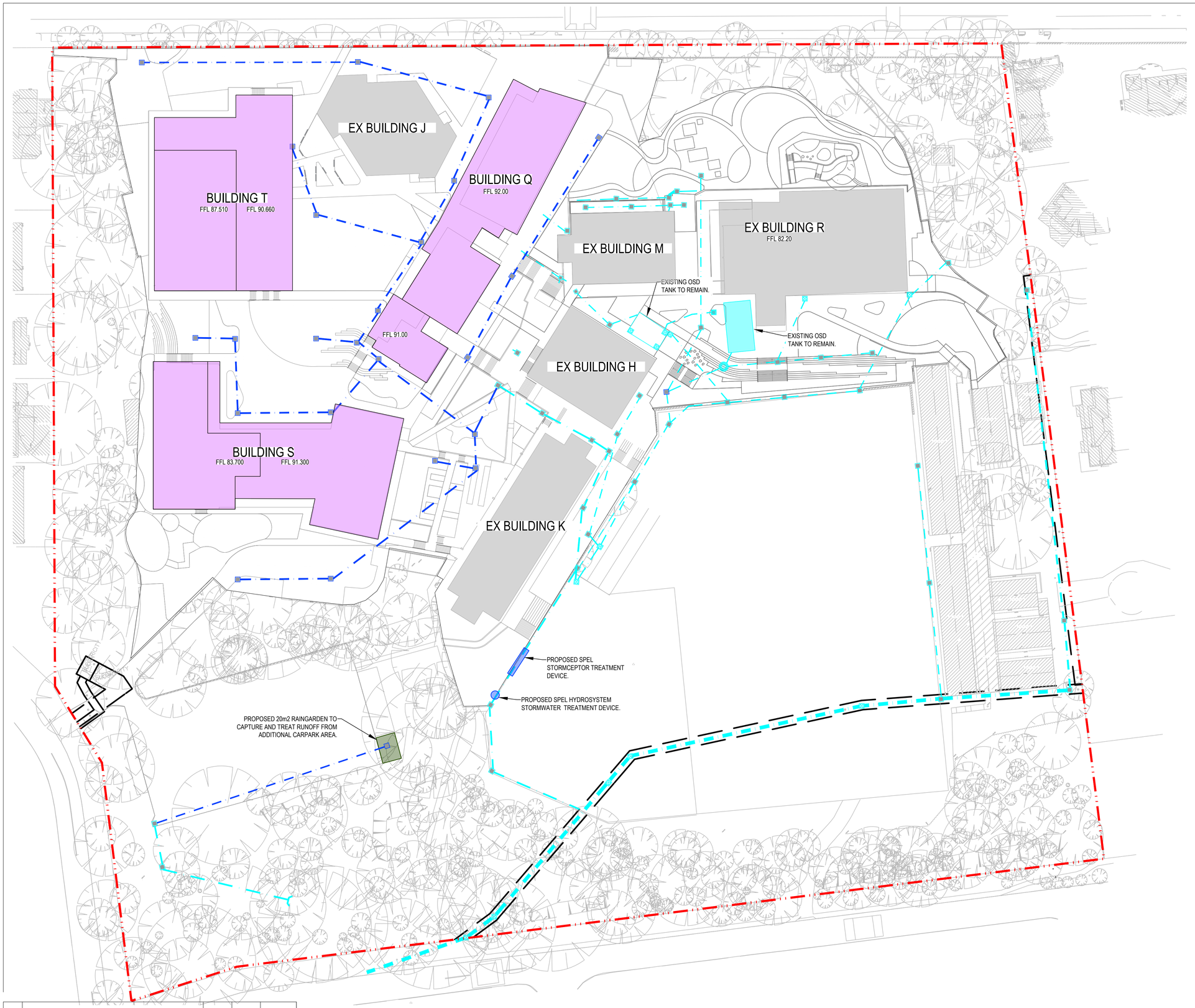
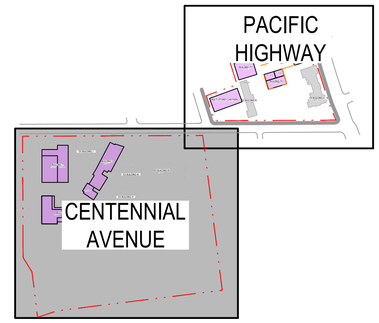


LEGEND

- PROPOSED SITE BOUNDARY
- PROPOSED BUILDING
- PROPOSED STORMWATER PIPE
- EXISTING STORMWATER PIPE
- PROPOSED JUNCTION PIT
- EXISTING JUNCTION PIT
- PROPOSED GRATED PIT
- EXISTING GRATED PIT
- PROPOSED KERB INLET PIT
- EXISTING KERB INLET PIT
- ON SITE DETENTION TANK



KEY PLAN
N.T.S

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1:1000 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
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F	SSDA ISSUE	CPO	RET	11.03.20
E	DRAFT SSDA	CPO	RET	27.02.20
D	DRAFT SSDA	CPO	RET	18.02.20
C	ISSUED FOR SSDA	CPO	RET	11.12.19
B	ISSUED FOR INFORMATION	CPO	RET	29.04.19
A	ISSUED FOR INFORMATION	CPO	RET	27.03.19

DRAWN:	CPO
DESIGNED:	RET
VERIFIED:	... ../../..
APPROVED FOR TENDER:	... ../../..
APPROVED FOR CONSTRUCTION:	... ../../..

ARCHITECT/CLIENT

PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

TITLE: STORMWATER MANAGEMENT PLAN - CENTENNIAL AVENUE

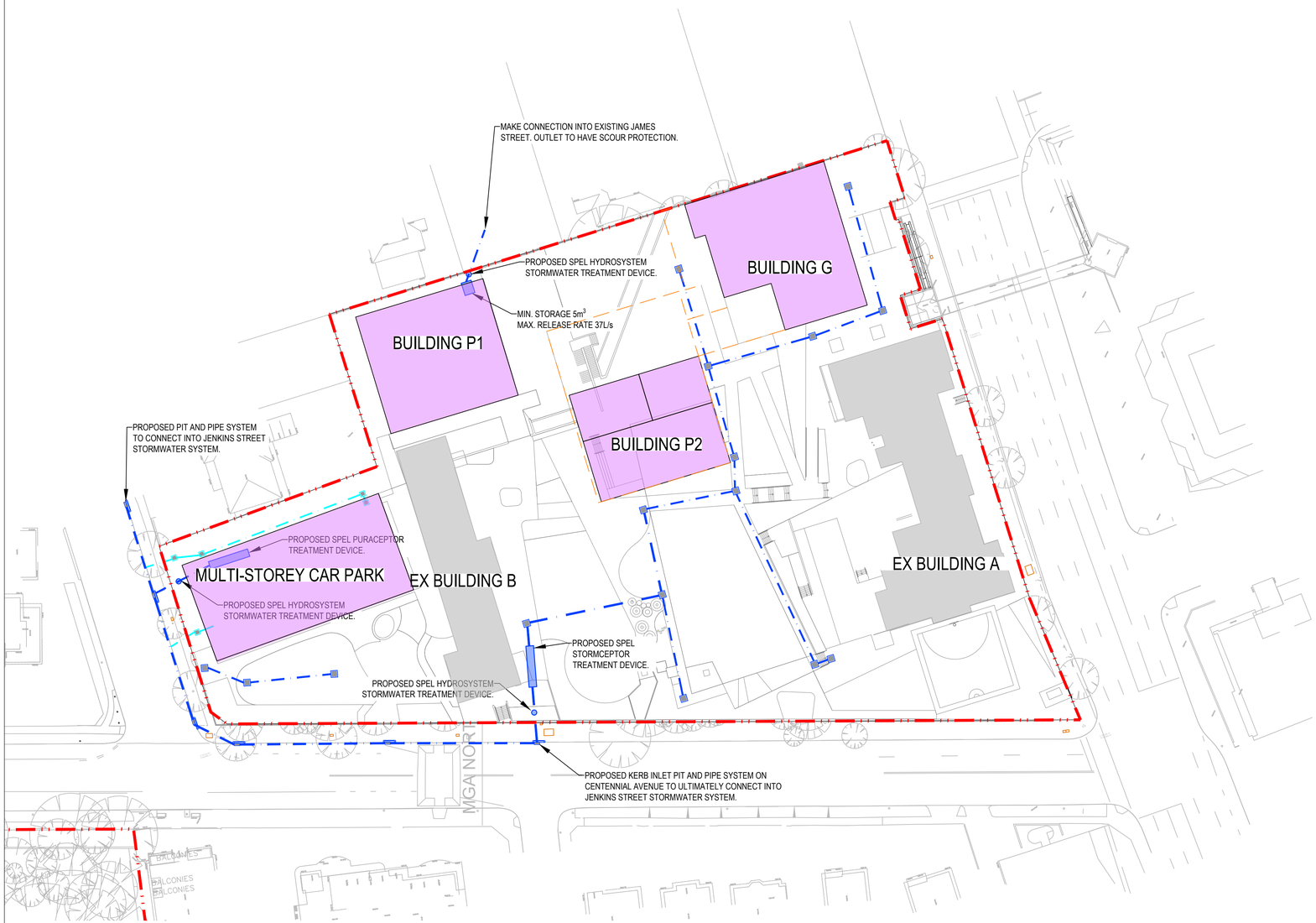
40623-CI-526-001.dwg

11/03/2020 5:20:56 PM

WOOD & GRIEVE ENGINEERS

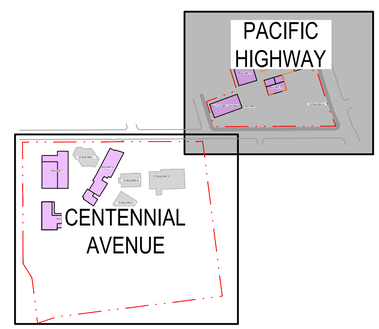
FOR APPROVAL
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
AS SHOWN	40623	CI-526-001	F



LEGEND

- PROPOSED SITE BOUNDARY
- PROPOSED BUILDING
- PROPOSED STORMWATER PIPE
- EXISTING STORMWATER PIPE
- PROPOSED JUNCTION PIT
- EXISTING JUNCTION PIT
- PROPOSED GRATED PIT
- EXISTING GRATED PIT
- PROPOSED KERB INLET PIT
- EXISTING KERB INLET PIT
- ON SITE DETENTION TANK



KEY PLAN
N.T.S

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1:1000 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
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.	.	.	.	.
F	SSDA ISSUE	CPO	RET	11.03.20
E	DRAFT SSDA	CPO	RET	27.02.20
D	DRAFT SSDA	CPO	RET	18.02.20
C	ISSUED FOR SSDA	CPO	RET	11.12.19
B	ISSUED FOR INFORMATION	CPO	RET	29.04.19
A	ISSUED FOR INFORMATION	CPO	RET	27.03.19

DRAWN:	CPO
DESIGNED:	RET
VERIFIED:	... ./../..
APPROVED FOR TENDER:	... ./../..
APPROVED FOR CONSTRUCTION:	... ./../..

ARCHITECT/CLIENT

UPGRADES TO CHATSWOOD PUBLIC SCHOOL AND CHATSWOOD HIGH SCHOOL

PROJECT

STORMWATER MANAGEMENT PLAN - PACIFIC HIGHWAY

TITLE

40623-CI-526-011.dwg

WOOD & GRIEVE ENGINEERS

FOR APPROVAL

NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
AS SHOWN	40623	CI-526-011	F

11/03/2020 5:21:34 PM

Appendix B DRAINS Model Results

100yr ARI Results

DRAINS results prepared from Version 2020.012

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
N OSD N	93.9			0			

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)	
CENTENNIAL POST	1.265	1.077	0.188	5	0	10	1% AEP, 5 min burst, Storm 1	
C PACIFIC N	0.046	0.046	0	3	0	6	1% AEP, 5 min burst, Storm 1	
C PACIFIC PRE N	0.099	0	0.099	3	0	6	1% AEP, 10 min burst, Storm 1	
C PACIFIC BYPASS N	0.054	0	0.054	3	2	6	1% AEP, 10 min burst, Storm 1	
C PACIFIC PRE E	0.594	0.548	0.046	5	0	10	1% AEP, 5 min burst, Storm 1	
C PACIFIC PROPOSED E	0.539	0.456	0.083	5	0	10	1% AEP, 5 min burst, Storm 1	
C CENTENNIAL PRE	1.167	0.341	0.826	5	2	10	1% AEP, 10 min burst, Storm 7	
C PACIFIC PRE W	0.157	0.144	0.014	5	0	10	1% AEP, 5 min burst, Storm 1	
C PACIFIC PROPOSED W	0.147	0.126	0.021	5	0	10	1% AEP, 5 min burst, Storm 1	

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P OSD N	0.033	1.42	94.883	93.896	1% AEP, 10 min burst, Storm 7

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF PACIFIC OSD N	0	0	1.479	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD PACIFIC N	94.97	4.9	0.033	0.033	0

Run Log for 20 run at 17:05:52 on 27/2/2020 using version 2020.012

Flows were safe in all overflow routes.

20yr ARI Results

DRAINS results prepared from Version 2020.012

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
N OSD N	93.89			0			

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)
CENTENNIAL POST	0.983	0.78	0.276	5	0	10	5% AEP, 15 min burst, Storm 4
C PACIFIC N	0.034	0.034	0	3	0	6	5% AEP, 5 min burst, Storm 1
C PACIFIC PRE N	0.073	0	0.073	3	0	6	5% AEP, 15 min burst, Storm 3
C PACIFIC BYPASS N	0.04	0	0.04	3	2	6	5% AEP, 15 min burst, Storm 3
C PACIFIC PRE E	0.446	0.397	0.067	5	0	10	5% AEP, 15 min burst, Storm 4
C PACIFIC PROPOSED E	0.42	0.33	0.123	5	0	10	5% AEP, 15 min burst, Storm 4
C CENTENNIAL PRE	0.864	0.267	0.647	5	2	10	5% AEP, 15 min burst, Storm 6
C PACIFIC PRE W	0.119	0.104	0.02	5	0	10	5% AEP, 15 min burst, Storm 4
C PACIFIC PROPOSED W	0.114	0.091	0.031	5	0	10	5% AEP, 15 min burst, Storm 4

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P OSD N	0.026	1.16	94.516	93.892	5% AEP, 10 min burst, Storm 6

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF PACIFIC OSD N	0	0	0.908	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD PACIFIC N	94.57	2.9	0.026	0.026	0

Run Log for 20 run at 17:11:02 on 27/2/2020 using version 2020.012

Flows were safe in all overflow routes.

5yr ARI Results

DRAINS results prepared from Version 2020.012

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
N OSD N	93.88			0			

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)
CENTENNIAL POST	0.688	0.492	0.197	5	0	10	20% AEP, 20 min burst, Storm 5
C PACIFIC N	0.025	0.025	0	3	0	6	20% AEP, 5 min burst, Storm 1
C PACIFIC PRE N	0.052	0	0.052	3	0	6	20% AEP, 10 min burst, Storm 8
C PACIFIC BYPASS N	0.028	0	0.028	3	2	6	20% AEP, 10 min burst, Storm 8
C PACIFIC PRE E	0.318	0.279	0.039	5	0	10	20% AEP, 10 min burst, Storm 10
C PACIFIC PROPOSED E	0.295	0.208	0.087	5	0	10	20% AEP, 20 min burst, Storm 5
C CENTENNIAL PRE	0.607	0.167	0.44	5	2	10	20% AEP, 15 min burst, Storm 4
C PACIFIC PRE W	0.085	0.079	0.012	5	0	10	20% AEP, 10 min burst, Storm 3
C PACIFIC PROPOSED W	0.078	0.069	0.018	5	0	10	20% AEP, 10 min burst, Storm 3

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P OSD N	0.021	0.97	94.274	93.884	20% AEP, 5 min burst, Storm 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF PACIFIC OSD N	0	0	0.908	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD PACIFIC N	94.31	1.5	0.021	0.021	0

Run Log for 20 run at 17:11:26 on 27/2/2020 using version 2020.012

Flows were safe in all overflow routes.

Appendix C MUSIC Model Results

PACIFIC HIGHWAY SITE MUSIC RESULTS

Source nodes

Location,Pacific Highway (57% Imp - 0.683 Ha),Pacific Hwy Roofs (100% Imp - 0.25 Ha),Pacific Highway (57% Imp - 0.172 Ha),Pacific Hwy Roofs (100% Imp - 0.071Ha),N Pacific Hwy (100% Perv - 0.085 Ha),Pacific Highway Roof (100% Imp - 0.081Ha)

ID,1,3,8,10,13,18

Node Type,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode

Zoning Surface Type,Mixed,Roof,Mixed,Roof,Mixed,Mixed

Total Area (ha),0.683,0.25,0.172,0.071,0.085,0.081

Area Impervious (ha),0.389564850746269,0.25,0.0981041791044776,0.071,0,0.081

Area Pervious (ha),0.293435149253731,0,0.0738958208955224,0,0.085,0

Field Capacity (mm),80,80,80,80,80,80

Pervious Area Infiltration Capacity coefficient - a,200,200,200,200,200,200

Pervious Area Infiltration Capacity exponent - b,1,1,1,1,1,1

Impervious Area Rainfall Threshold (mm/day),1,1,1,1,1,1

Pervious Area Soil Storage Capacity (mm),120,120,120,120,120,120

Pervious Area Soil Initial Storage (% of Capacity),25,25,25,25,25,25

Groundwater Initial Depth (mm),10,10,10,10,10,10

Groundwater Daily Recharge Rate (%),25,25,25,25,25,25

Groundwater Daily Baseflow Rate (%),5,5,5,5,5,5

Groundwater Daily Deep Seepage Rate (%),0,0,0,0,0,0

Stormflow Total Suspended Solids Mean (log mg/L),2.2,1.3,2.2,1.3,2.2,2.2

Stormflow Total Suspended Solids Standard Deviation (log mg/L),0.32,0.32,0.32,0.32,0.32,0.32

Stormflow Total Suspended Solids Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic

Stormflow Total Suspended Solids Serial Correlation,0,0,0,0,0,0

Stormflow Total Phosphorus Mean (log mg/L),-0.45,-0.89,-0.45,-0.89,-0.45,-0.45

Stormflow Total Phosphorus Standard Deviation (log mg/L),0.25,0.25,0.25,0.25,0.25,0.25

Stormflow Total Phosphorus Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic

Stormflow Total Phosphorus Serial Correlation,0,0,0,0,0,0

Stormflow Total Nitrogen Mean (log mg/L),0.42,0.3,0.42,0.3,0.42,0.42

Stormflow Total Nitrogen Standard Deviation (log mg/L),0.19,0.19,0.19,0.19,0.19,0.19

Stormflow Total Nitrogen Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic

Stormflow Total Nitrogen Serial Correlation,0,0,0,0,0,0

Baseflow Total Suspended Solids Mean (log mg/L),1.1,1.1,1.1,1.1,1.1,1.1

Baseflow Total Suspended Solids Standard Deviation (log mg/L),0.17,0.17,0.17,0.17,0.17,0.17

Baseflow Total Suspended Solids Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic

Baseflow Total Suspended Solids Serial Correlation,0,0,0,0,0,0

Baseflow Total Phosphorus Mean (log mg/L),-0.82,-0.82,-0.82,-0.82,-0.82,-0.82

Baseflow Total Phosphorus Standard Deviation (log mg/L),0.19,0.19,0.19,0.19,0.19,0.19

Baseflow Total Phosphorus Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic

Baseflow Total Phosphorus Serial Correlation,0,0,0,0,0,0

Baseflow Total Nitrogen Mean (log mg/L),0.32,0.32,0.32,0.32,0.32,0.32

Baseflow Total Nitrogen Standard Deviation (log mg/L),0.12,0.12,0.12,0.12,0.12,0.12

Baseflow Total Nitrogen Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Baseflow Total Nitrogen Serial Correlation,0,0,0,0,0,0
Flow based constituent generation - enabled,Off,Off,Off,Off,Off,Off
Flow based constituent generation - flow file, , , , , ,
Flow based constituent generation - base flow column, , , , , ,
Flow based constituent generation - pervious flow column, , , , , ,
Flow based constituent generation - impervious flow column, , , , , ,
Flow based constituent generation - unit, , , , , ,
OUT - Mean Annual Flow (ML/yr),0.00,0.00,0.00,0.00,0.00,0.00
OUT - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00
OUT - TP Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00
OUT - TN Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00
Rain In (ML/yr),0,0,0,0,0,0
ET Loss (ML/yr),0,0,0,0,0,0
Deep Seepage Loss (ML/yr),0,0,0,0,0,0
Baseflow Out (ML/yr),0,0,0,0,0,0
Imp. Stormflow Out (ML/yr),0,0,0,0,0,0
Perv. Stormflow Out (ML/yr),0,0,0,0,0,0
Total Stormflow Out (ML/yr),0,0,0,0,0,0
Total Outflow (ML/yr),0,0,0,0,0,0
Change in Soil Storage (ML/yr),0,0,0,0,0,0
TSS Baseflow Out (kg/yr),0,0,0,0,0,0
TSS Total Stormflow Out (kg/yr),0,0,0,0,0,0
TSS Total Outflow (kg/yr),0,0,0,0,0,0
TP Baseflow Out (kg/yr),0,0,0,0,0,0
TP Total Stormflow Out (kg/yr),0,0,0,0,0,0
TP Total Outflow (kg/yr),0,0,0,0,0,0
TN Baseflow Out (kg/yr),0,0,0,0,0,0
TN Total Stormflow Out (kg/yr),0,0,0,0,0,0
TN Total Outflow (kg/yr),0,0,0,0,0,0
GP Total Outflow (kg/yr),0,0,0,0,0,0

No Imported Data Source nodes

USTM treatment nodes
Location,5kL RWT
ID,12
Node Type,RainWaterTankNode
Lo-flow bypass rate (cum/sec),0
Hi-flow bypass rate (cum/sec),100
Inlet pond volume,0
Area (sqm),3
Initial Volume (m^3),0
Extended detention depth (m),0.2
Number of Rainwater tanks,1

Permanent Pool Volume (cubic metres),5
Proportion vegetated,0
Equivalent Pipe Diameter (mm),50
Overflow weir width (m),10
Notional Detention Time (hrs),64.0E-3
Orifice Discharge Coefficient,0.6
Weir Coefficient,1.7
Number of CSTR Cells,2
Total Suspended Solids - k (m/yr),400
Total Suspended Solids - C* (mg/L),12
Total Suspended Solids - C** (mg/L),12
Total Phosphorus - k (m/yr),300
Total Phosphorus - C* (mg/L),0.13
Total Phosphorus - C** (mg/L),0.13
Total Nitrogen - k (m/yr),40
Total Nitrogen - C* (mg/L),1.4
Total Nitrogen - C** (mg/L),1.4
Threshold Hydraulic Loading for C** (m/yr),0
Horizontal Flow Coefficient,
Reuse Enabled,Off
Max drawdown height (m),
Annual Demand Enabled,Off
Annual Demand Value (ML/year),
Annual Demand Distribution,
Annual Demand Monthly Distribution: Jan,
Annual Demand Monthly Distribution: Feb,
Annual Demand Monthly Distribution: Mar,
Annual Demand Monthly Distribution: Apr,
Annual Demand Monthly Distribution: May,
Annual Demand Monthly Distribution: Jun,
Annual Demand Monthly Distribution: Jul,
Annual Demand Monthly Distribution: Aug,
Annual Demand Monthly Distribution: Sep,
Annual Demand Monthly Distribution: Oct,
Annual Demand Monthly Distribution: Nov,
Annual Demand Monthly Distribution: Dec,
Daily Demand Enabled,Off
Daily Demand Value (ML/day),
Custom Demand Enabled,Off
Custom Demand Time Series File,
Custom Demand Time Series Units,
Filter area (sqm),
Filter perimeter (m),
Filter depth (m),
Filter Median Particle Diameter (mm),
Saturated Hydraulic Conductivity (mm/hr),

Infiltration Media Porosity,
Length (m),
Bed slope,
Base Width (m),
Top width (m),
Vegetation height (m),
Vegetation Type,
Total Nitrogen Content in Filter (mg/kg),
Orthophosphate Content in Filter (mg/kg),
Is Base Lined?,
Is Underdrain Present?,
Is Submerged Zone Present?,
Submerged Zone Depth (m),
B for Media Soil Texture,-9999
Proportion of upstream impervious area treated,
Exfiltration Rate (mm/hr),0
Evaporative Loss as % of PET,0
Depth in metres below the drain pipe,
TSS A Coefficient,
TSS B Coefficient,
TP A Coefficient,
TP B Coefficient,
TN A Coefficient,
TN B Coefficient,
Sfc,
S*,
Sw,
Sh,
Emax (m/day),
Ew (m/day),
IN - Mean Annual Flow (ML/yr),0.00
IN - TSS Mean Annual Load (kg/yr),0.00
IN - TP Mean Annual Load (kg/yr),0.00
IN - TN Mean Annual Load (kg/yr),0.00
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00
OUT - Mean Annual Flow (ML/yr),0.00
OUT - TSS Mean Annual Load (kg/yr),0.00
OUT - TP Mean Annual Load (kg/yr),0.00
OUT - TN Mean Annual Load (kg/yr),0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00
Flow In (ML/yr),0
ET Loss (ML/yr),0
Infiltration Loss (ML/yr),0
Low Flow Bypass Out (ML/yr),0
High Flow Bypass Out (ML/yr),0
Orifice / Filter Out (ML/yr),0

Weir Out (ML/yr),0
Transfer Function Out (ML/yr),0
Reuse Supplied (ML/yr),0
Reuse Requested (ML/yr),0
% Reuse Demand Met,0
% Load Reduction,0
TSS Flow In (kg/yr),0
TSS ET Loss (kg/yr),0
TSS Infiltration Loss (kg/yr),0
TSS Low Flow Bypass Out (kg/yr),0
TSS High Flow Bypass Out (kg/yr),0
TSS Orifice / Filter Out (kg/yr),0
TSS Weir Out (kg/yr),0
TSS Transfer Function Out (kg/yr),0
TSS Reuse Supplied (kg/yr),0
TSS Reuse Requested (kg/yr),0
TSS % Reuse Demand Met,0
TSS % Load Reduction,0
TP Flow In (kg/yr),0
TP ET Loss (kg/yr),0
TP Infiltration Loss (kg/yr),0
TP Low Flow Bypass Out (kg/yr),0
TP High Flow Bypass Out (kg/yr),0
TP Orifice / Filter Out (kg/yr),0
TP Weir Out (kg/yr),0
TP Transfer Function Out (kg/yr),0
TP Reuse Supplied (kg/yr),0
TP Reuse Requested (kg/yr),0
TP % Reuse Demand Met,0
TP % Load Reduction,0
TN Flow In (kg/yr),0
TN ET Loss (kg/yr),0
TN Infiltration Loss (kg/yr),0
TN Low Flow Bypass Out (kg/yr),0
TN High Flow Bypass Out (kg/yr),0
TN Orifice / Filter Out (kg/yr),0
TN Weir Out (kg/yr),0
TN Transfer Function Out (kg/yr),0
TN Reuse Supplied (kg/yr),0
TN Reuse Requested (kg/yr),0
TN % Reuse Demand Met,0
TN % Load Reduction,0
GP Flow In (kg/yr),0
GP ET Loss (kg/yr),0
GP Infiltration Loss (kg/yr),0
GP Low Flow Bypass Out (kg/yr),0

GP High Flow Bypass Out (kg/yr),0
GP Orifice / Filter Out (kg/yr),0
GP Weir Out (kg/yr),0
GP Transfer Function Out (kg/yr),0
GP Reuse Supplied (kg/yr),0
GP Reuse Requested (kg/yr),0
GP % Reuse Demand Met,0
GP % Load Reduction,100
PET Scaling Factor,

Generic treatment nodes
Location,SPEL Hydrosystem (SHS.1000),SPEL Hydrosystem (SHS.1000),SPEL Hydrosystem (SHS.1000),3 SPEL Stormsacks,3 SPEL Stormsacks,SPEL Stormceptor S.250/70.C1,SPEL Puraceptor Class 1 P.020
ID,4,9,11,14,15,16,17
Node Type,GenericNode,GenericNode,GenericNode,GPTNode,GPTNode,GenericNode,GenericNode
Lo-flow bypass rate (cum/sec),0,0,0,0,0,0,0
Hi-flow bypass rate (cum/sec),0.012,0.012,0.012,0.045,0.045,0.015,0.02
Flow Transfer Function
Input (cum/sec),0,0,0,0,0,0,0
Output (cum/sec),0,0,0,0,0,0,0
Input (cum/sec),10,10,10,10,10,10,10
Output (cum/sec),10,10,10,10,10,10,10
Input (cum/sec), , , , , , ,
Output (cum/sec), , , , , , ,
Input (cum/sec), , , , , , ,
Output (cum/sec), , , , , , ,
Input (cum/sec), , , , , , ,
Output (cum/sec), , , , , , ,
Input (cum/sec), , , , , , ,
Output (cum/sec), , , , , , ,
Input (cum/sec), , , , , , ,
Output (cum/sec), , , , , , ,
Input (cum/sec), , , , , , ,
Output (cum/sec), , , , , , ,
Input (cum/sec), , , , , , ,
Output (cum/sec), , , , , , ,
Input (cum/sec), , , , , , ,
Output (cum/sec), , , , , , ,
Gross Pollutant Transfer Function
Enabled,True,True,True,True,True,True,True
Input (kg/ML),0,0,0,0,0,0,0
Output (kg/ML),0,0,0,0,0,0,0
Input (kg/ML),15,15,15,15,15,15,15
Output (kg/ML),0,0,0,0,0,0,0
Input (kg/ML), , , , , , ,
Output (kg/ML), , , , , , ,

Input (kg/ML), , , , , , ,
Output (kg/ML), , , , , , ,
Input (kg/ML), , , , , , ,
Output (kg/ML), , , , , , ,
Input (kg/ML), , , , , , ,
Output (kg/ML), , , , , , ,
Input (kg/ML), , , , , , ,
Output (kg/ML), , , , , , ,
Input (kg/ML), , , , , , ,
Output (kg/ML), , , , , , ,
Input (kg/ML), , , , , , ,
Output (kg/ML), , , , , , ,
Input (kg/ML), , , , , , ,
Output (kg/ML), , , , , , ,
Total Nitrogen Transfer Function
Enabled,True,True,True,True,True,True,True
Input (mg/L),0,0,0,0,0,0,0
Output (mg/L),0,0,0,0,0,0,0
Input (mg/L),50,50,50,50,50,50,50
Output (mg/L),26.5,26.5,26.5,27.5,27.5,38.5,38.5
Input (mg/L), , , , , , ,
Output (mg/L), , , , , , ,
Input (mg/L), , , , , , ,
Output (mg/L), , , , , , ,
Input (mg/L), , , , , , ,
Output (mg/L), , , , , , ,
Input (mg/L), , , , , , ,
Output (mg/L), , , , , , ,
Input (mg/L), , , , , , ,
Output (mg/L), , , , , , ,
Input (mg/L), , , , , , ,
Output (mg/L), , , , , , ,
Input (mg/L), , , , , , ,
Output (mg/L), , , , , , ,
Input (mg/L), , , , , , ,
Output (mg/L), , , , , , ,
Total Phosphorus Transfer Function
Enabled,True,True,True,True,True,True,True
Input (mg/L),0,0,0,0,0,0,0
Output (mg/L),0,0,0,0,0,0,0
Input (mg/L),5,5,5,5,5,5,5
Output (mg/L),1.3,1.3,1.3,3.6,3.6,4.45,4.45
Input (mg/L), , , , , , ,
Output (mg/L), , , , , , ,
Input (mg/L), , , , , , ,
Output (mg/L), , , , , , ,

Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Total Suspended Solids Transfer Function
Enabled,True,True,True,True,True,True,True
Input (mg/L),0,0,0,0,0,0,0
Output (mg/L),0,0,0,0,0,0,0
Input (mg/L),1000,1000,1000,1000,1000,1000,1000
Output (mg/L),160,160,160,390,390,130,130
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
Input (mg/L), , , , , ,
Output (mg/L), , , , , ,
TSS Flow based Efficiency Enabled,Off,Off,Off,Off,Off,Off,Off
TSS Flow based Efficiency, , , , , ,
TP Flow based Efficiency Enabled,Off,Off,Off,Off,Off,Off,Off
TP Flow based Efficiency, , , , , ,
TN Flow based Efficiency Enabled,Off,Off,Off,Off,Off,Off,Off
TN Flow based Efficiency, , , , , ,
GP Flow based Efficiency Enabled,Off,Off,Off,Off,Off,Off,Off
GP Flow based Efficiency, , , , , ,
IN - Mean Annual Flow (ML/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00
IN - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00
IN - TP Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00
IN - TN Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00

IN - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00
OUT - Mean Annual Flow (ML/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00
OUT - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00
OUT - TP Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00
OUT - TN Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00
Flow In (ML/yr),0,0,0,0,0,0,0
ET Loss (ML/yr),0,0,0,0,0,0,0
Infiltration Loss (ML/yr),0,0,0,0,0,0,0
Low Flow Bypass Out (ML/yr),0,0,0,0,0,0,0
High Flow Bypass Out (ML/yr),0,0,0,0,0,0,0
Orifice / Filter Out (ML/yr),0,0,0,0,0,0,0
Weir Out (ML/yr),0,0,0,0,0,0,0
Transfer Function Out (ML/yr),0,0,0,0,0,0,0
Reuse Supplied (ML/yr),0,0,0,0,0,0,0
Reuse Requested (ML/yr),0,0,0,0,0,0,0
% Reuse Demand Met,0,0,0,0,0,0,0
% Load Reduction,0,0,0,0,0,0,0
TSS Flow In (kg/yr),0,0,0,0,0,0,0
TSS ET Loss (kg/yr),0,0,0,0,0,0,0
TSS Infiltration Loss (kg/yr),0,0,0,0,0,0,0
TSS Low Flow Bypass Out (kg/yr),0,0,0,0,0,0,0
TSS High Flow Bypass Out (kg/yr),0,0,0,0,0,0,0
TSS Orifice / Filter Out (kg/yr),0,0,0,0,0,0,0
TSS Weir Out (kg/yr),0,0,0,0,0,0,0
TSS Transfer Function Out (kg/yr),0,0,0,0,0,0,0
TSS Reuse Supplied (kg/yr),0,0,0,0,0,0,0
TSS Reuse Requested (kg/yr),0,0,0,0,0,0,0
TSS % Reuse Demand Met,0,0,0,0,0,0,0
TSS % Load Reduction,0,0,0,0,0,0,0
TP Flow In (kg/yr),0,0,0,0,0,0,0
TP ET Loss (kg/yr),0,0,0,0,0,0,0
TP Infiltration Loss (kg/yr),0,0,0,0,0,0,0
TP Low Flow Bypass Out (kg/yr),0,0,0,0,0,0,0
TP High Flow Bypass Out (kg/yr),0,0,0,0,0,0,0
TP Orifice / Filter Out (kg/yr),0,0,0,0,0,0,0
TP Weir Out (kg/yr),0,0,0,0,0,0,0
TP Transfer Function Out (kg/yr),0,0,0,0,0,0,0
TP Reuse Supplied (kg/yr),0,0,0,0,0,0,0
TP Reuse Requested (kg/yr),0,0,0,0,0,0,0
TP % Reuse Demand Met,0,0,0,0,0,0,0
TP % Load Reduction,0,0,0,0,0,0,0
TN Flow In (kg/yr),0,0,0,0,0,0,0
TN ET Loss (kg/yr),0,0,0,0,0,0,0
TN Infiltration Loss (kg/yr),0,0,0,0,0,0,0
TN Low Flow Bypass Out (kg/yr),0,0,0,0,0,0,0

TN High Flow Bypass Out (kg/yr),0,0,0,0,0,0,0
TN Orifice / Filter Out (kg/yr),0,0,0,0,0,0,0
TN Weir Out (kg/yr),0,0,0,0,0,0,0
TN Transfer Function Out (kg/yr),0,0,0,0,0,0,0
TN Reuse Supplied (kg/yr),0,0,0,0,0,0,0
TN Reuse Requested (kg/yr),0,0,0,0,0,0,0
TN % Reuse Demand Met,0,0,0,0,0,0,0
TN % Load Reduction,0,0,0,0,0,0,0
GP Flow In (kg/yr),0,0,0,0,0,0,0
GP ET Loss (kg/yr),0,0,0,0,0,0,0
GP Infiltration Loss (kg/yr),0,0,0,0,0,0,0
GP Low Flow Bypass Out (kg/yr),0,0,0,0,0,0,0
GP High Flow Bypass Out (kg/yr),0,0,0,0,0,0,0
GP Orifice / Filter Out (kg/yr),0,0,0,0,0,0,0
GP Weir Out (kg/yr),0,0,0,0,0,0,0
GP Transfer Function Out (kg/yr),0,0,0,0,0,0,0
GP Reuse Supplied (kg/yr),0,0,0,0,0,0,0
GP Reuse Requested (kg/yr),0,0,0,0,0,0,0
GP % Reuse Demand Met,0,0,0,0,0,0,0
GP % Load Reduction,100,100,100,100,100,100,100

Other nodes
Location,Receiving Node,Eastern Catchment,Northern Catchment,Western Catchment
ID,2,5,6,7
Node Type,ReceivingNode,JunctionNode,JunctionNode,JunctionNode
IN - Mean Annual Flow (ML/yr),0.00,0.00,0.00,0.00
IN - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00
IN - TP Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00
IN - TN Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00
OUT - Mean Annual Flow (ML/yr),0.00,0.00,0.00,0.00
OUT - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00
OUT - TP Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00
OUT - TN Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00
% Load Reduction,0.00,0.00,0.00,0.00
TSS % Load Reduction,0.00,0.00,0.00,0.00
TN % Load Reduction,0.00,0.00,0.00,0.00
TP % Load Reduction,0.00,0.00,0.00,0.00
GP % Load Reduction,0.00,0.00,0.00,0.00

Links
Location,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link
Source node ID,4,5,7,6,9,10,12,11,13,8,14,1,3,15,16,18,17
Target node ID,5,2,2,2,7,12,11,6,6,14,9,15,4,16,4,17,9

Muskingum-Cunge Routing,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed

Muskingum K, , , , , , , , , , , , , , , , ,

Muskingum theta, , , , , , , , , , , , , , , , ,

IN - Mean Annual Flow (ML/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00

IN - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00

IN - TP Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00

IN - TN Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00

IN - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00

OUT - Mean Annual Flow (ML/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00

OUT - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00

OUT - TP Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00

OUT - TN Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00

OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00

Catchment Details

Catchment Name,200227 Pacific Highway

Timestep,6 Minutes

Start Date,1/01/1959

End Date,31/12/1959 11:54:00 PM

Rainfall Station, 66062 SYDNEY

ET Station,Monthly User Defined

Mean Annual Rainfall (mm), 1490

Mean Annual ET (mm), 1260

CENTENNIAL AVENUE SITE MUSIC RESULTS

Source nodes
Location,Centennial Ave Roofs (0.7633 Ha - 100% Imp),Centennial Avenue Bypass (30% Imp - 0.100 Ha),Centennial Avenue Paved (53% Imp - 1.305 Ha)
ID,2,6,7
Node Type,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode
Zoning Surface Type,Roof,Mixed,Mixed
Total Area (ha),0.598,0.1,1.305
Area Impervious (ha),0.598,0.0302798507462687,0.690237873134328
Area Pervious (ha),0,0.0697201492537314,0.614762126865672
Field Capacity (mm),80,80,80
Pervious Area Infiltration Capacity coefficient - a,200,200,200
Pervious Area Infiltration Capacity exponent - b,1,1,1
Impervious Area Rainfall Threshold (mm/day),1,1,1
Pervious Area Soil Storage Capacity (mm),120,120,120
Pervious Area Soil Initial Storage (% of Capacity),25,25,25
Groundwater Initial Depth (mm),10,10,10
Groundwater Daily Recharge Rate (%),25,25,25
Groundwater Daily Baseflow Rate (%),5,5,5
Groundwater Daily Deep Seepage Rate (%),0,0,0
Stormflow Total Suspended Solids Mean (log mg/L),1.3,2.2,2.2
Stormflow Total Suspended Solids Standard Deviation (log mg/L),0.32,0.32,0.32
Stormflow Total Suspended Solids Estimation Method,Stochastic,Stochastic,Stochastic
Stormflow Total Suspended Solids Serial Correlation,0,0,0
Stormflow Total Phosphorus Mean (log mg/L),-0.89,-0.45,-0.45
Stormflow Total Phosphorus Standard Deviation (log mg/L),0.25,0.25,0.25
Stormflow Total Phosphorus Estimation Method,Stochastic,Stochastic,Stochastic
Stormflow Total Phosphorus Serial Correlation,0,0,0
Stormflow Total Nitrogen Mean (log mg/L),0.3,0.42,0.42
Stormflow Total Nitrogen Standard Deviation (log mg/L),0.19,0.19,0.19
Stormflow Total Nitrogen Estimation Method,Stochastic,Stochastic,Stochastic
Stormflow Total Nitrogen Serial Correlation,0,0,0
Baseflow Total Suspended Solids Mean (log mg/L),1.1,1.1,1.1
Baseflow Total Suspended Solids Standard Deviation (log mg/L),0.17,0.17,0.17
Baseflow Total Suspended Solids Estimation Method,Stochastic,Stochastic,Stochastic
Baseflow Total Suspended Solids Serial Correlation,0,0,0
Baseflow Total Phosphorus Mean (log mg/L),-0.82,-0.82,-0.82
Baseflow Total Phosphorus Standard Deviation (log mg/L),0.19,0.19,0.19
Baseflow Total Phosphorus Estimation Method,Stochastic,Stochastic,Stochastic
Baseflow Total Phosphorus Serial Correlation,0,0,0
Baseflow Total Nitrogen Mean (log mg/L),0.32,0.32,0.32
Baseflow Total Nitrogen Standard Deviation (log mg/L),0.12,0.12,0.12
Baseflow Total Nitrogen Estimation Method,Stochastic,Stochastic,Stochastic
Baseflow Total Nitrogen Serial Correlation,0,0,0
Flow based constituent generation - enabled,Off,Off,Off
Flow based constituent generation - flow file, , ,
Flow based constituent generation - base flow column, , ,
Flow based constituent generation - pervious flow column, , ,
Flow based constituent generation - impervious flow column, , ,
Flow based constituent generation - unit, , ,
OUT - Mean Annual Flow (ML/yr),0.00,0.00,0.00
OUT - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00
OUT - TP Mean Annual Load (kg/yr),0.00,0.00,0.00
OUT - TN Mean Annual Load (kg/yr),0.00,0.00,0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00

Rain In (ML/yr),0,0,0
ET Loss (ML/yr),0,0,0
Deep Seepage Loss (ML/yr),0,0,0
Baseflow Out (ML/yr),0,0,0
Imp. Stormflow Out (ML/yr),0,0,0
Perv. Stormflow Out (ML/yr),0,0,0
Total Stormflow Out (ML/yr),0,0,0
Total Outflow (ML/yr),0,0,0
Change in Soil Storage (ML/yr),0,0,0
TSS Baseflow Out (kg/yr),0,0,0
TSS Total Stormflow Out (kg/yr),0,0,0
TSS Total Outflow (kg/yr),0,0,0
TP Baseflow Out (kg/yr),0,0,0
TP Total Stormflow Out (kg/yr),0,0,0
TP Total Outflow (kg/yr),0,0,0
TN Baseflow Out (kg/yr),0,0,0
TN Total Stormflow Out (kg/yr),0,0,0
TN Total Outflow (kg/yr),0,0,0
GP Total Outflow (kg/yr),0,0,0

No Imported Data Source nodes

No USTM treatment nodes

Generic treatment nodes
Location,SPEL Hydrosystem (SHS.2200/8),10 x SPEL Stormsacks,SPEL Stormceptor S.250/150.C1
ID,3,4,5
Node Type,GenericNode,GPTNode,GenericNode
Lo-flow bypass rate (cum/sec),0,0,0
Hi-flow bypass rate (cum/sec),0.032,0.15,0.042
Flow Transfer Function
Input (cum/sec),0,0,0
Output (cum/sec),0,0,0
Input (cum/sec),10,10,10
Output (cum/sec),10,10,10
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Gross Pollutant Transfer Function
Enabled,True,True,True
Input (kg/ML),0,0,0
Output (kg/ML),0,0,0

Input (kg/ML),15,15,15
Output (kg/ML),0,0,0
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Total Nitrogen Transfer Function
Enabled,True,True,True
Input (mg/L),0,0,0
Output (mg/L),0,0,0
Input (mg/L),50,50,50
Output (mg/L),26.5,27.5,38.5
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Total Phosphorus Transfer Function
Enabled,True,True,True
Input (mg/L),0,0,0
Output (mg/L),0,0,0
Input (mg/L),5,5,5
Output (mg/L),1.3,3.6,4.45
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,

Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Total Suspended Solids Transfer Function
Enabled,True,True,True
Input (mg/L),0,0,0
Output (mg/L),0,0,0
Input (mg/L),1000,1000,1000
Output (mg/L),160,390,130
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
TSS Flow based Efficiency Enabled,Off,Off,Off
TSS Flow based Efficiency, , ,
TP Flow based Efficiency Enabled,Off,Off,Off
TP Flow based Efficiency, , ,
TN Flow based Efficiency Enabled,Off,Off,Off
TN Flow based Efficiency, , ,
GP Flow based Efficiency Enabled,Off,Off,Off
GP Flow based Efficiency, , ,
IN - Mean Annual Flow (ML/yr),0.00,0.00,0.00
IN - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00
IN - TP Mean Annual Load (kg/yr),0.00,0.00,0.00
IN - TN Mean Annual Load (kg/yr),0.00,0.00,0.00
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00
OUT - Mean Annual Flow (ML/yr),0.00,0.00,0.00
OUT - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00
OUT - TP Mean Annual Load (kg/yr),0.00,0.00,0.00
OUT - TN Mean Annual Load (kg/yr),0.00,0.00,0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00
Flow In (ML/yr),0,0,0
ET Loss (ML/yr),0,0,0
Infiltration Loss (ML/yr),0,0,0
Low Flow Bypass Out (ML/yr),0,0,0
High Flow Bypass Out (ML/yr),0,0,0
Orifice / Filter Out (ML/yr),0,0,0
Weir Out (ML/yr),0,0,0
Transfer Function Out (ML/yr),0,0,0

Reuse Supplied (ML/yr),0,0,0
Reuse Requested (ML/yr),0,0,0
% Reuse Demand Met,0,0,0
% Load Reduction,0,0,0
TSS Flow In (kg/yr),0,0,0
TSS ET Loss (kg/yr),0,0,0
TSS Infiltration Loss (kg/yr),0,0,0
TSS Low Flow Bypass Out (kg/yr),0,0,0
TSS High Flow Bypass Out (kg/yr),0,0,0
TSS Orifice / Filter Out (kg/yr),0,0,0
TSS Weir Out (kg/yr),0,0,0
TSS Transfer Function Out (kg/yr),0,0,0
TSS Reuse Supplied (kg/yr),0,0,0
TSS Reuse Requested (kg/yr),0,0,0
TSS % Reuse Demand Met,0,0,0
TSS % Load Reduction,0,0,0
TP Flow In (kg/yr),0,0,0
TP ET Loss (kg/yr),0,0,0
TP Infiltration Loss (kg/yr),0,0,0
TP Low Flow Bypass Out (kg/yr),0,0,0
TP High Flow Bypass Out (kg/yr),0,0,0
TP Orifice / Filter Out (kg/yr),0,0,0
TP Weir Out (kg/yr),0,0,0
TP Transfer Function Out (kg/yr),0,0,0
TP Reuse Supplied (kg/yr),0,0,0
TP Reuse Requested (kg/yr),0,0,0
TP % Reuse Demand Met,0,0,0
TP % Load Reduction,0,0,0
TN Flow In (kg/yr),0,0,0
TN ET Loss (kg/yr),0,0,0
TN Infiltration Loss (kg/yr),0,0,0
TN Low Flow Bypass Out (kg/yr),0,0,0
TN High Flow Bypass Out (kg/yr),0,0,0
TN Orifice / Filter Out (kg/yr),0,0,0
TN Weir Out (kg/yr),0,0,0
TN Transfer Function Out (kg/yr),0,0,0
TN Reuse Supplied (kg/yr),0,0,0
TN Reuse Requested (kg/yr),0,0,0
TN % Reuse Demand Met,0,0,0
TN % Load Reduction,0,0,0
GP Flow In (kg/yr),0,0,0
GP ET Loss (kg/yr),0,0,0
GP Infiltration Loss (kg/yr),0,0,0
GP Low Flow Bypass Out (kg/yr),0,0,0
GP High Flow Bypass Out (kg/yr),0,0,0
GP Orifice / Filter Out (kg/yr),0,0,0
GP Weir Out (kg/yr),0,0,0
GP Transfer Function Out (kg/yr),0,0,0
GP Reuse Supplied (kg/yr),0,0,0
GP Reuse Requested (kg/yr),0,0,0
GP % Reuse Demand Met,0,0,0
GP % Load Reduction,100,100,100

Other nodes
Location,Receiving Node

ID,1
Node Type,ReceivingNode
IN - Mean Annual Flow (ML/yr),0.00
IN - TSS Mean Annual Load (kg/yr),0.00
IN - TP Mean Annual Load (kg/yr),0.00
IN - TN Mean Annual Load (kg/yr),0.00
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00
OUT - Mean Annual Flow (ML/yr),0.00
OUT - TSS Mean Annual Load (kg/yr),0.00
OUT - TP Mean Annual Load (kg/yr),0.00
OUT - TN Mean Annual Load (kg/yr),0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00
% Load Reduction,0.00
TSS % Load Reduction,0.00
TN % Load Reduction,0.00
TP % Load Reduction,0.00
GP % Load Reduction,0.00

Links
Location,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link
Source node ID,3,2,4,5,6,7
Target node ID,1,3,5,3,1,4
Muskingum-Cunge Routing,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed
Muskingum K, , , , , ,
Muskingum theta, , , , , ,
IN - Mean Annual Flow (ML/yr),0.00,0.00,0.00,0.00,0.00,0.00
IN - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00
IN - TP Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00
IN - TN Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00
OUT - Mean Annual Flow (ML/yr),0.00,0.00,0.00,0.00,0.00,0.00
OUT - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00
OUT - TP Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00
OUT - TN Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00,0.00,0.00,0.00

Catchment Details
Catchment Name,200227 Centennial Ave
Timestep,6 Minutes
Start Date,1/01/1959
End Date,31/12/1959 11:54:00 PM
Rainfall Station, 66062 SYDNEY
ET Station,Monthly User Defined
Mean Annual Rainfall (mm), 1490
Mean Annual ET (mm), 1260

Appendix D Sediment Basin Sizing

J Worksheets

J.1 The Standard Worksheet

Note: These "Standard Calculation" spreadsheets relate only to low erosion hazard lands as identified in figure 4.6 where the designer chooses to not use the RUSLE to size sediment basins. The more "Detailed Calculation" spreadsheets should be used on high erosion hazard lands as identified by figure 4.6 or where the designer chooses to run the RUSLE in calculations.

1. Site Data Sheet

Site name: Upgrades to Chatswood Public School and Chatswood High School

Site location: Centennial Avenue, Chatswood

Precinct:

Description of site: Brownfield Site

Site Area	Site						Remarks
	C1	C2		P1	P2	P3	
Total catchment area (ha)	1.268	0.582		0.388	0.063	0.900	
Disturbed catchment area (ha)	1.268	0.582		0.388	0.063	0.900	

Soil analysis

Soil landscape	Soil Hydrological Group C						DNR mapping (if relevant)
Soil Texture Group	Type D/F						Sections 6.3.3(c), (d) and (e)

Rainfall data

Design rainfall depth (days)	5	5		5	5	5	See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	80	80		80	80	80	See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	32.9	32.9		32.9	32.9	32.9	See Section 6.3.4 (h)
Rainfall intensity: 2-year, 6-hour storm							See IFD chart for the site
Rainfall erosivity (R-factor)							Automatic calculation from above data

Comments

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$$V = 10 \times C_v \times A \times R_{y\text{-}\%ile,\ x\text{-}day} \ (m^3)$$

where:

- 10 = a unit conversion factor
- C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period
- R = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).
- A = total catchment area (ha)

Sediment Storage Zone Volume

In the standard calculation, the sediment storage zone is 50 percent of the setting zone. However, designers can work to capture the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)), in which case the "Detailed Calculation" spreadsheets should be used.

Total Basin Volume

Site	C_v	R x-day y-%ile	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
C1	0.51	32.9	1.268	213	107	320
C2	0.51	32.9	0.582	98	49	147
P1	0.51	32.9	0.388	65	33	98
P2	0.51	32.9	0.063	11	6	17
P3	0.51	32.9	0.900	151	76	227

Design with
community in mind

Level 6, Building B
207 Pacific Highway
St Leonards NSW 2065
Tel +61 +61 2 8484 7000
E sydney@wge.com.au

For more information please visit
www.wge.com.au

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