NORTHROP

Level 11, 345 George Street, Sydney NSW 2000
T (02) 9241 4188 F (02) 9241 4324
E sydney@northrop.com.au ABN 81 094 433 100

INNER SYDNEY HIGH SCHOOL

CIVIL SSDA REPORT

NSW DEPARTMENT OF EDUCATION

244 Cleveland St, Surry Hills NSW 2010

PREPARED BY
Northrop Consulting Engineers
Level 11, 345 George Street
SYDNEY NSW 2000

Tel: 02 9241 4188
Fax: 02 9241 4324

Ref: 166175

PREPARED FOR
Root Project Australia
Level 4, 35 Bridge Street
Sydney NSW 2000

Activity schedule

Date	Revision	Issue	Initial
04.05.2017	A	Draft Issue	DG
08.05.2017	B	Final Issue	DG
08.06.2017	C	Final Issue	DG

Contents

1 PROJECT OVERVIEW

1.1 Introduction

The NSW Department of Education (DoE) are preparing a State Significant Development Application (SSD 16_7610) for the development of 'inner Sydney high school' located at the corner of Cleveland and Chalmers Streets, Surry Hills (the 'site').

The inner Sydney high school is proposed to accommodate up to 1200 students to take enrolment pressure off surrounding high schools exceeding student capacity, and accommodate future population growth within City of Sydney Local Government Area (LGA). The high school will contain high quality classrooms, collaborative learning spaces and associated facilities.

Specifically, this proposal seeks development consent for the following works at the site:

- Internal reconfiguration and refurbishment of the existing heritage listed buildings on the site to create:
  - General and specialist learning areas;
  - Amenities; and
  - Staff workplaces for teachers and administrative staff.
- Construction of a thirteen (13) storey plus roof level and basement (approximately 56.5m from park level), multi-purpose school building, containing:
  - Collaborative general and specialist learning hubs with a combination of enclosed and open spaces;
  - Library and Resource Hubs;
  - Staff workplaces;
  - Student canteen;
  - Indoor Movement Complex and other indoor recreation and performance spaces;
  - Outdoor learning and recreational areas.
- Associated site landscaping and public domain improvements; and
- Augmentation and construction of ancillary infrastructure and utilities as required.

1.2 Background

The population of Sydney is forecast to grow by over one million people in the next 10 years and a significant number will reside in or close to the Sydney CBD in new residential developments in areas such as Green Square, Central to Eveleigh precinct, Barangaroo, Central Square, the Bays Precinct and Ultimo. This growth in inner Sydney suburbs is occurring rapidly, putting significant pressure on public infrastructure, including transport, health services and education.

The DoE has a legislative responsibility to provide teaching spaces to meet demand in all areas across NSW. A new inner Sydney high school is to be built on Cleveland Street, Surry Hills to meet this demand. Cleveland Street Intensive English High School currently occupies the site. A new facility is being constructed for Cleveland Street Intensive English High School on a site already owned by the DoE at Alexandria.

The Cleveland Street school site will be redeveloped to create a new future focused high-rise school with a mix of new and refurbished buildings. The heritage of the site is a major consideration for the design of the new school. A design excellence competition has been completed with the winning architects, Francis Jones Morehen Thorp (FJMT) continuing to progress the design for the school. The new inner Sydney high school is expected to open in 2020. The new inner Sydney high school will offer:

- Facilities that are readily accessible and flexible to meet the demands of an evolving curriculum in line with future-focused learning principles.
- Flexible and well connected teaching and learning spaces that enable a variety of teaching and learning practices.
- Spaces that are engaging and supportive for students and teachers.
- Technology-rich settings with an emphasis on mobility and flexibility.
- A healthy and environmentally sustainable environment.
- Innovative, connected outdoor spaces that enable play and collaborative learning.
- Connected open space, creating a welcoming and accessible school with indoor and outdoor teaching and learning opportunities. No historic buildings are proposed to be demolished as part of the redevelopment.

The new teaching spaces will incorporate principles of energy efficiency and ecologically sustainable development (ESD). This includes:

- Passive design principles
- Thermal performance and comfort.
- Natural lighting.
- Water recycling management.

Works are as illustrated in detail in the Architectural Design Statement as prepared by FJMT.

1.3 Site Description

The inner Sydney high school is located at 244 Cleveland Street. The proposed development will involve the demolition of an existing building, retention of heritage buildings, construction of a new 13 storey building plus roof level and basement, walkways and associated services and infrastructure.

Northrop Consulting Engineers has been engaged by FJMT to undertake Civil Engineering design and documentation for the development.

Figure 1 –General Site Plan

2 SCOPE OF WORK

The civil works component of the project cover the following:

- Internal roads pavement and hardstands
- All earthworks including excavation, removal of unsuitable or surplus material
- New in-ground stormwater including On Site Detention
- Water quality design and documentation

3 SITE CONDITIONS

3.1 Survey

Topographical survey information of the site under current conditions has been prepared by Hill & Blume Consulting Surveyors Pty Ltd (dated 22nd June 2015).

The “Hill & Blume” survey information has provided spot levels across the site, plotted the footprint of existing buildings and other features located across the school.

The survey information does not show or identify any services or infrastructure within the site. This information has been supplemented with additional survey and electromagnetic investigations (**Section 3.2**).

The “Hill & Blume” survey plan is attached in **Appendix A**.

3.2 Electromagnetic Services Investigation

To assist with our assessment, SureSearch Pty Ltd were engaged to undertake Electromagnetic Services investigation to identify the size, depth and location of all existing services located within the site.

The services search was undertaken between the 1st and 9th February 2016.

SureSearch have prepared a detailed survey drawing illustrating all of the identified underground and above ground services. Refer to **Appendix B**.

3.3 Dial Before You Dig

A Dial Before you Dig (DBYD) request was submitted on the 7th November 2015.

The search identified the following services and asset owners within the vicinity of the site.

- Ausgrid
- City of Sydney (IMS)
- Jemena Gas South
- NBN Co
- Nextgen
- Optus and/or Uecomm,
- PIPE Networks,
- Roads and Maritime Services
- Sydney Water
- Telstra
- Vocus Fibre Pty Ltd

It should be noted that the information from the DBYD only identifies the location of underground services in public space and does not show private mains or conduits or above ground services. This information has been supplemented with additional survey and electromagnetic investigations (**Section 3.2**)

Plans and correspondences with the services providers as part of the DBYD inquiry are attached in **Appendix C**.

3.4 CCTV

To ascertain the condition of existing stormwater or sewer services across the site, SureSearch Pty Ltd has been engaged to undertake a CCTV investigations of the existing sewer and stormwater infrastructure within the site.

Video footage of the CCTV investigation can be provided upon request.

4 FLOODING

4.1 Existing Flood CHARACTERISTICS

The site is located within the Blackwattle Bay stormwater catchment area. Northrop has reviewed the Blackwater Bay Catchment Flood Study (2014) prepared by WMAwater on behalf of City of Sydney Council.

Based on the site specific flood certificate provided by WMA water on 4th May 2017 (enclosed as appendix F), the subject site is located within flood hazard area. The study has assessed the flood impacts across the catchment for the 100 year and PMF storm events. Based on the above reports the site will be partially inundated by overland flows from each of the above storm events.

Predicted flood levels in the vicinity of the site has been presented in figure 2 below and summarized in table 1 below.

Table1 – Flood levels and depths across the subject site

Entry Point	Label		1% AEP	PMF
Chalmers Street	**A**	Depth (m)	0.10	0.15
		Level (mAHD)	**30.5**	**30.6**
Chalmers Street	**B**	Depth (m)	1.90	2.30
		Level (mAHD)	**30.2**	**30.4**
Chalmers Street	**C**	Depth (m)	0.32	0.54
		Level (mAHD)	**30.2**	**30.4**
Prince Alfred Park	**D**	Depth (m)	0.23	0.29
		Level (mAHD)	**27.0**	**27.1**
Prince Alfred Park	**E**	Depth (m)	0.20	0.29
		Level (mAHD)	**29.0**	**29.1**
Cleveland Street	**F**	Depth (m)	0.18	0.22
		Level (mAHD)	**31.1**	**31.2**

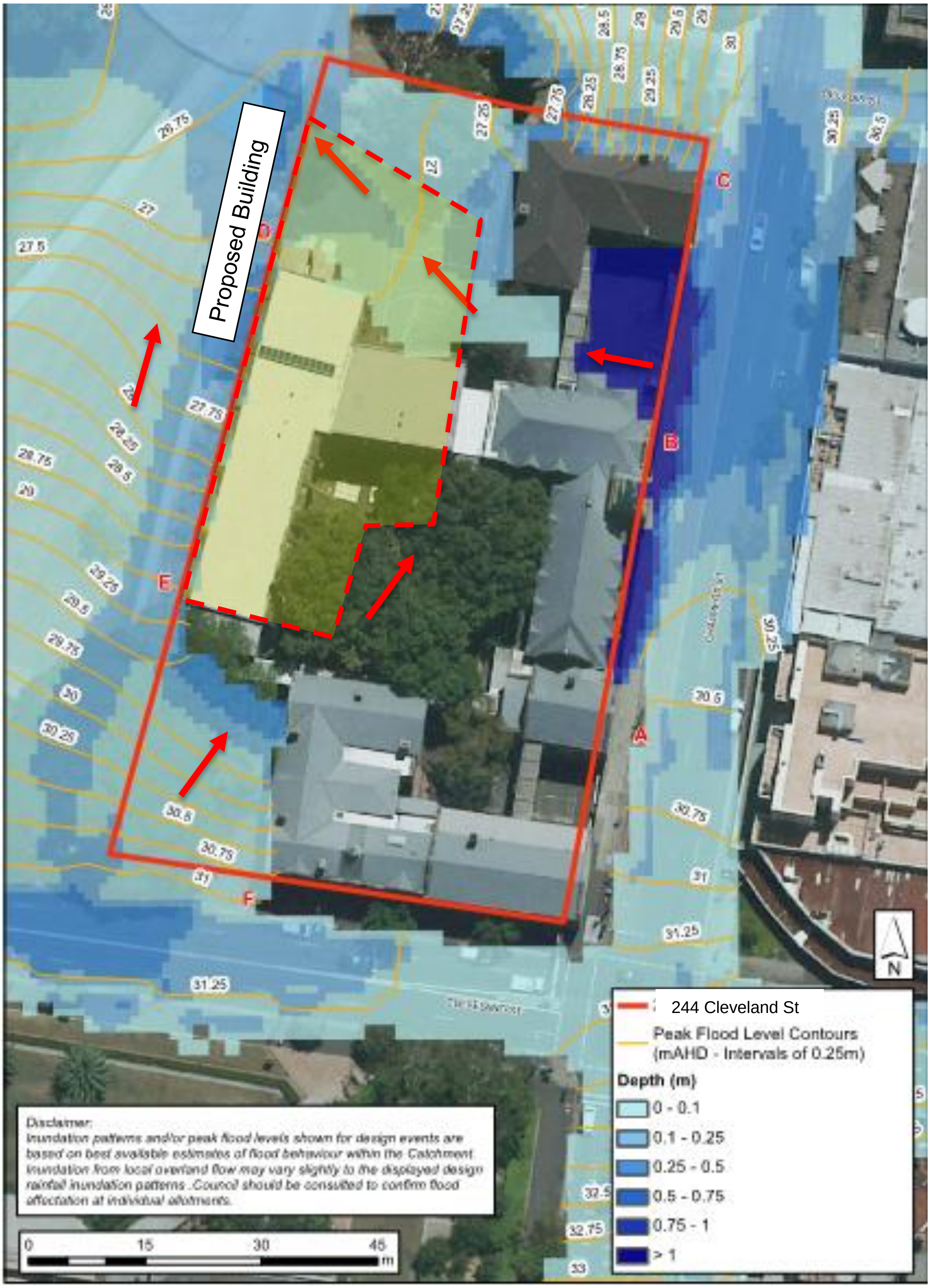

Figure 2 –Flood depth and level contours for 1% AEP flooding event

4.2 Overland Flow Behavior and Levels

The subject site is surrounded by Chalmers Street from west and Prince Alfred Park from north and west which are in favor of City of Sydney council and Cleveland Street from south which is an state road.

As it is presented in figure 2, there are two possible overland flow paths across the subject site. The main overland flow is from Chalmers street frontage where the runoff from the upstream catchment drains towards the low point of the street which is located in front of school's main entrance. According to the 1% AEP flood map, stormwater ponds over Chalmers street low point and overflows to the school court yard through the open portion of the boundary which is not obstructed by any solid wall. Overland flow crosses the site towards the park land.

The second overland flow path enters the site from Cleveland Street and through the car parking entrance. This flow path crosses the internal yard and joints the main flow from the Chalmers Street.

In addition to the above overland flows which are crossing the site, the proposed development is affected by flooding from the Prince Alfred park land along the west boundary. The recent earthwork on the park land resulted in change of land fall and increase in flooding impact.

4.3 Development Impact and Flood Management

The proposed building structure which has been indicatively marked on figure 2 above, is affected by overland flow along the western site boundary as well as overland flows entering the site through east (Chalmers Street) and south (Cleveland Street) boundaries. This is a current condition that is undesirable for the school. The following principles are being considered for flood management:

- Proposed floor levels will be generally no lower than the floor levels of existing adjoining buildings. This acknowledges the constraints of integrating new to existing building levels - and aims to provide at least an 'equal' level of flood protection for new and existing works.
- A passage will be provided for overland flow from Cleveland Street. However, it should be noted 500mm freeboard to floor levels will not be achieved for the 100-year ARI flood event, because of the existing building level constraints.
- Flood protection will be provided by constructing landscape walls and ramps along the western side of the site - to protect adjoining entries. A minimum 100mm freeboard will be provided.
- The existing overland flow path from Chalmers Street is not safe to enter the school. To this end, it is proposed to divert the flow path on Chalmers Street to the north-eastern corner of the site and direct the flow through the adjoining parklands. This 'flow path diversion' will be achieved by the levels being established for the new school entry on Chalmers Street. Any concern for displacement of flood waters (due to altering the level for the point of overflow for overland flow from Chalmers Street) could be addressed by reviewing the inlet and pipe capacity of the potential trunk drain pipe diversion (refer to Appendix G for pipe diversion plans)

5 DESIGN STANDARDS

The building will be designed in accordance with accepted engineering principles and Australian Standards. The referenced documents include the following.

- AS 3500.3:2003 Plumbing and Drainage - Part 3: Stormwater Drainage.
- AS 2890.1:2004 Parking Facilities – Part 1 Off-Street Car Parking.

- AS 2890.2:2004 Parking Facilities – Part 2 Off-Street Car Parking for commercial vehicles.
- AS 2890.6:2009 Parking Facilities – Part 1 Off-Street Parking for People with Disabilities.
- ‘Blue Book’ (Managing Urban Stormwater Soils and Construction – prepared by The Department of Housing).
- Austroads (APRG Report No. 21) – A guide to the design of new pavements for light traffic.
- Australian Rainfall & Runoff (AR&R)
- Relevant Council DCP

6 CIVIL DESIGN AND DOCUMENTATION

The designers shall prepare design and documentation to support the following key milestones:

- Concept Design and
- Detailed Design

6.1 Specification

Civil specification will be completed as ‘Specification Notes’ within the detailed design documentation – no allowance for separate written specification.

The civil specification will capture the following key elements of works:

- Site works;
- Complimented council standard;
- Existing Services;
- Earthworks;
- Sediment & Erosion;
- Stormwater Drainage;
- Pavements and;
- Certification.

6.2 Sediment & Erosion Control

Concept Sediment & Erosion Control Plan and associated details will be prepared in accordance with statutory requirements in particular the ‘Blue Book’.

The concept sediment and erosion control measures and details are documented on Northrop Consulting Engineers development application drawings DA-C3.01 and DA-C3.02. Prior to any demolition or earthworks commencing on site, erosion and sediment control measures will be implemented generally in accordance with the design drawings. These measures are intended to be a minimum treatment only, as the contractor will be required to modify the measures to suit the construction program, sequencing and techniques. These measures will include but are not limited to:

- Temporary Construction Access;
- Sediment Fencing;
- Dust Control Hessian;
- Mesh and gravel inlet filters;
- Geotextile inlet filters; and
- Diversion swales;

A sediment basin has been proposed to control the erosion and sedimentation during construction period as demonstrated in drawing C2.01. It is proposed to locate the sediment basin where the future OSD/Retention basin will be located.

Concept Sediment & Erosion Control Plan and associated details will be prepared in accordance with statutory requirements in particular the 'Blue Book'.

6.3 Stormwater

6.3.1 General

Stormwater drainage has been designed generally in accordance with the following statutory requirements.

- AS 3500.3:2003 Plumbing and Drainage - Part 3: Stormwater Drainage.
- Australian Rainfall & Runoff (AR&R)
- Relevant Council DCP

The new stormwater drainage works has been designed based on the following parameters.

- In-ground drainage designed to capture and convey up to and including the 20 Year ARI Critical Storm Event.
- Provision of overland flow paths for runoff generated by storm events above the 20 Year ARI Critical Storm Event up to and including the 100 Year ARI Storm Event.
- For trapped areas (i.e. sunken loading docks) where overland flow paths cannot be provided alternate drainage methods will be provided. This includes but not limited to design of the in-ground drainage system capacity to capture and convey up to the 100 Year ARI Critical Storm Event.

The final stormwater requirements are subject to the outcomes of the Development Application with respective authorities or in accordance with the relevant Review of Environmental Factors (REF).

6.3.2 Water Quantity

The proposed system will include a roof and surface drainage system, overland flow routes, on-site stormwater detention (OSD) and water quality treatment measures in accordance with Council's and Sydney Water guidelines.

As it is presented in figure 3 the entire roof area of the proposed building and surface runoff will be drained to OSD with the remaining building bypassing the OSD. 28.5% of the site will bypass the OSD and drain directly to Sydney Water stormwater line running through the site. The Sub-

catchment data including areas draining and bypassing the OSD has been summarized in table 3 below.

Table3 – Sub-catchment data including areas draining and bypassing the OSD

Sub-catchment Data	Post- Dev	Pre- Dev	Units
Total Site Area	5694	5694	sqm
Roof area of existing building to be retained (C5)	1641	1641	sqm
Redeveloped area	4046	4046	sqm
Roof Area (C1)	1933	1414	sqm
Paved Area (C3)	1293	1690.8	sqm
Driveway Area (C4)	435	505	sqm
Total Impervious Area	3661	3609.8	sqm
Total Pervious Area (C2)	385	436.2	sqm

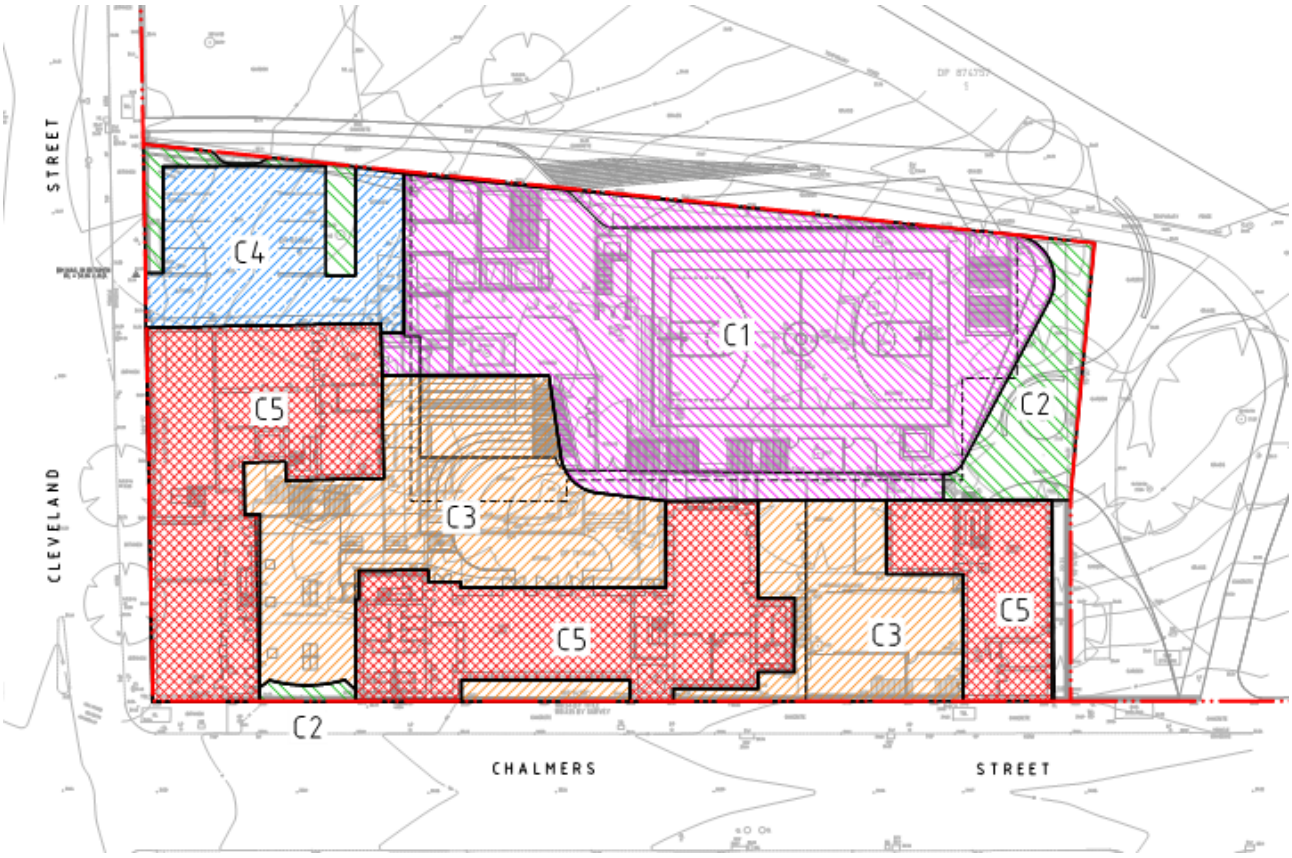

Figure 3 –Sub-Catchment Plan

Based on the information submitted to Sydney Water in table 3, we were provided by Sydney Water that our OSD volume is 65 cubic meter and our PSD rate is 148L/s. refer to appendix E for the correspondence.

6.3.3 Water Quality

The project specific water quality requirements has been aligned with the requirements detailed by Local Authorities.

The water quality modelling software MUSIC was used to analysis the performance of the treatment train in accordance with the MUSIC Modelling Guidelines. MUSIC uses source pollutant loads and treatment removal efficiencies to determine the percentage reduction of pollutants within a catchment as a result of the treatment.

The following water quality measures have being implemented:

- Enviro Pods;
- Grose Pollutant Traps (GPT),
- Trash Screen and silt trap (not included in MUSIC model);

The stormwater from existing heritage building's roof has been excluded from the water quality model. Runoff from existing roofs bypasses the treatment system and discharges directly to the Sydney Water drainage system.

6.3.4 Water Quality Modelling Results

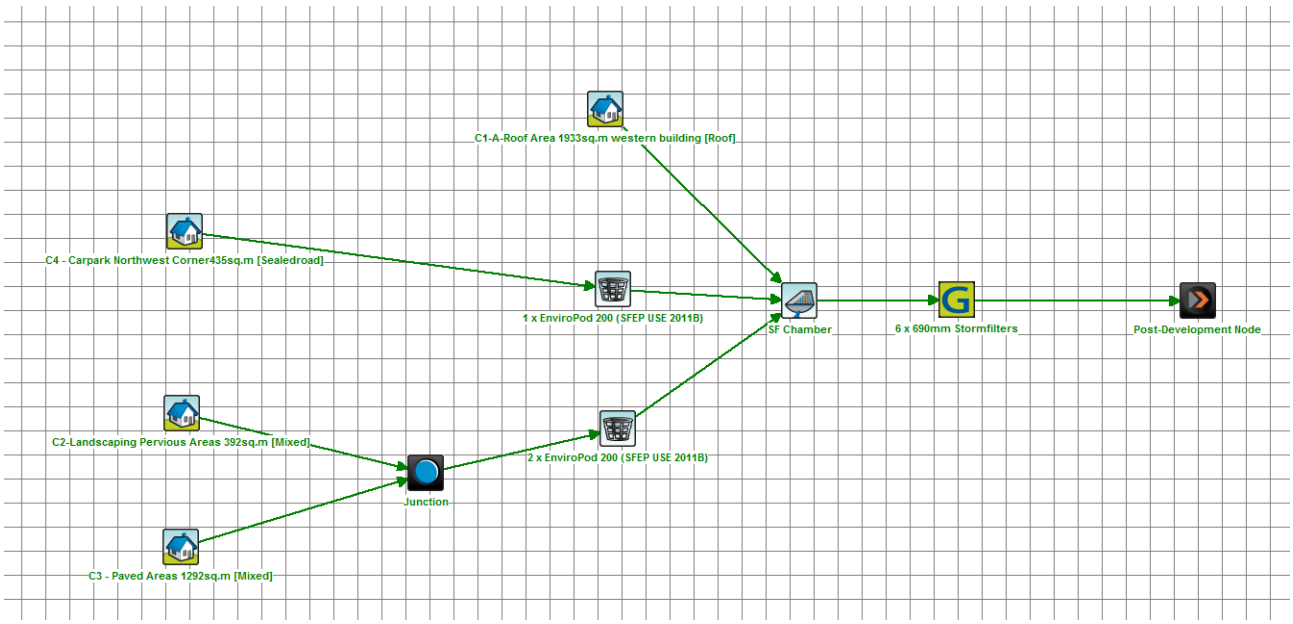

Figure 4 –Music Model Result

The results of the MUSIC simulation is presented in Table 4 below:

Table 4: MUSIC Model Results

	Source Load (kg/yr)	Residual Load (kg/yr)	Reduction (%)	COS Reduction Objective (%)	Compliance
Gross Pollutants	79.4	0	100	90	OK
Total Suspended Solids (TSS)	416	32.3	92.2	85	OK
Total Phosphorus (TP)	0.809	0.18	77.8	65	OK
Total Nitrogen (TN)	8.34	4.01	52	45	OK

The MUSIC modelling indicates that the proposed water quality treatment measures meet Council's water quality objectives.

6.4 Existing Sydney Water Trunk Stormwater Drain

It is anticipated that the footprint of the proposed multi-storey tower will be located over the existing Sydney Water 1860s stormwater brick culvert.

The basement to the building proposed on the western portion of the inner Sydney high school site conflicts with the existing alignment and level of the drain. Northrop has engaged with Sydney Water to determine potential options for treating the drain as part of the proposed works.

These options are based on following Sydney Water initial comments and requirements recommended during the meetings with them:

- At this stage Sydney Water will not support any new structure to be built over the existing brick culvert structure. Any proposed works to a "live" culvert, particular during bad weather conditions, is considered a high risk item to Sydney Water and a potential risk to contractors working on the asset.
- Any new structure need to be offset by at least 1.0 m away from the outside face of the brick culvert. Sydney Water may consider less than a meter, however this would need to be approved by Sydney Water.
- It is understood that the existing culvert has an average longitudinal fall of approximately 4%. As such, there is an opportunity to relocate the existing culvert around the proposed building footprint and maintain a reasonable longitudinal fall across the stormwater culvert.

The principles for the options include:

A. Maintaining the alignment of the existing ovi drain and replace with an integrated stormwater void. Deemed unviable, because the level of the proposed basement will finish lower than any level acceptable to maintain adequate gradient on the drain. Refer drawing CK-A1 & 2 in Attachment G.
B. Constructing an integrated stormwater void in an alignment that does not conflict with the proposed basement. Deemed less viable because a suitable alignment would be more circuitous (i.e. less streamlined and difficult to construct as part of the proposed building works and avoid trees). Refer drawing CK-B1& 2 in Attachment G.

C. Construct a new trunk drainage pipe system around the site, via Chalmers Street and along the northern boundary of the site (within the existing park). Deemed a more viable option - subject to on-going discussions with Sydney Water; and investigating services impacts and effects on traffic and bus lanes in Chalmers Street. Refer drawing CK-C in Attachment G.

6.5 Siteworks & Grading

Siteworks and grading will be designed generally in accordance with the following statutory requirements.

- AS 2890.1:2004 Parking Facilities – Part 1 Off-Street Car Parking.
- AS 2890.6:2009 Parking Facilities – Part 1 Off-Street Parking for People with Disabilities.
- Respective council's DCP
- Site specific geotechnical report

Car parking, loading docks and future building footprint areas will be graded to generally accommodate drainage within the statutory requirements outlined above.

6.6 Set-downs

Set downs around the buildings and plant area will be considered based on following assumptions:

- 100 mm from Plant / Administration / Amenities / Logistics' area to external footpath;
- 150 mm from internal to external landscaping areas considering the disabled access requirement.
- Flush at vehicle sheds at the interface with carpark

Above noted set downs to be review and approved by architect.

6.7 Pavements

The structural slabs will be designed by the project structural engineer. External hardstands pavement will be designed and documented by Civil Engineer.

The designers will design and document the interface pavement conditions for the extent of works.

APPENDIX - A

Hill & Blume Survey

APPENDIX – B

SureSearch underground and above ground services

APPENDIX – C

Dial Before You Dig

APPENDIX – D

Civil Drawing Package

APPENDIX – E

Sydney Water Correspondence

APPENDIX – F

Flood Certificate

APPENDIX – G

Sydney Water Drainage Diversion Options