



Robert **Bird** Group

Stormwater Management Report

Biological Sciences Project University of New South Wales

Prepared For: Brookfield Multiplex Constructions Pty Ltd

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Appendices

- Appendix A Robert Bird Group Civil Design Drawings
Appendix B Campus 2020 Stormwater Management Masterplan

References

1. Australian Rainfall and Runoff – A Guide to Flood Estimation, Volumes 1 and 2 (1987) – The Institution of Engineers, Australia.
2. Randwick City Council's Private Stormwater Code
3. UNSW Kensington Campus – Campus 2020 Masterplan - Stormwater Strategy

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1.0 Introduction

This report has been prepared by Robert Bird Group (RBG) to outline the Stormwater Management Plan (SWMP) for the Biological Sciences Project at the University of New South Wales Kensington Campus, (the Site).

The project is being completed across 3 stages, which include the Enabling Works (not part of this approval process), Stage 1 and Stage 2 works. The Civil works involved on the project generally form part of the Enabling Works and Stage 1 works. Robert Bird Group has been engaged to provide civil engineering consultancy services for the Stage 1 works, with the Enabling Works design provided by others under separate contracts and development approval.

RBG have co-ordinated the Enabling Works design within our Stage 1 Stormwater Management Plan to give an overall perspective of the works where possible.

This report provides a summary of the design principles and relevant SEARS requirements for stormwater management on the site. Civil design drawings have been prepared by RBG for Stage 1, which include the proposed sediment and erosion control strategy and the extent of the stormwater management principals. These drawings are included in Appendix A.

2.0 Site Description

The Site is located in the suburb of Kensington, within the Randwick City Council local government area. Located within the Kensington campus at the University of New South Wales, the site is approximately 0.4ha in size and is bounded by Botany St to the east, Samuels Ave and the Samuels Building to the south, Biolink Building and Chancellery Walk to the west, and the Michael Birt Lawn and Wallace Wurth Building to the North. Refer Figure 2.1 for a Site locality plan.

The Site is the current location of the Biomedical Theatres Building which is being demolished under a separate approval, and Building D26 (to be retained, with a new façade). The main access point for the new development services is a large loading dock area for waste and other deliveries, which can be accessed from Samuels Avenue.

Currently, there is an existing second pedestrian access which is located in the south west corner of Site between the Samuels building and the existing biosciences building. This links though to Chancellery Walk.



Figure 2.1 –Site locality plan – Stage 1 (refer Section 2.1.2)

2.1 Proposed Works

The proposed development will replace the Biomedical Theatres Building with a new building and loading dock area. An indicative site layout is provided in Figure 2.2.



Figure 2.2 – Indicative Site Layout – Ground Floor

As noted in the Introduction, the Biological Sciences Project will be completed in multiple stages. These include Enabling Works, Stage 1 and Stage 2 works.

Below is a summary of the different stages and their perspective scopes for reference.

2.1.1 Enabling Works (Civil design by others/approved under separate approval)

The Enabling Works stage will generally consist of the following:

- demolition of the Biomedical Theatres building and general structures on the proposed site;
- re-alignment of High Voltage (HV) power supply to a number of Upper Campus buildings, including the creation of two new substations to replace an existing Substation;
- relocation of general underground services;
- replacement of the sewer and stormwater lines parallel to Botany Road;
- re-alignment of Library Walk as it meets Gate 11 on Botany Street; and
- demolition, relocation and new construction of general stormwater drainage services throughout the site, including:
 - o general removal of existing drainage within or close to the proposed new structure footprint.
 - o general drainage to replace removed alignments for existing surface inlets and downpipes.
 - o new connections to a 600mm diameter main line running parallel to Botany Street.
 - o a main line through the accessway between the new building and existing Samuels building.
 - o construction of a new On Site Detention (OSD) Tank to reduce flows leaving the precinct.

2.1.2 Stage 1 Works (Civil design by RBG)

The Stage 1 works generally includes the following:

- construction of a new building (identified as E26);
- relocation of existing operations from D26 into E26;
- refurbishment of Biolink (D26) lower ground floor;
- removal of temporary facilities (including some provided as part of the Enabling Works);
- reconstruction of a new loading dock and accessway; and
- additional stormwater drainage associated with specific elements of the Stage 1 works including:
 - o surface inlet pits and a grated drain through the loading dock accessway, required to ensure that falls to minor drainage structures and overland flow provisions are achieved; and
 - o subsoil drainage, a swale drain and a surface inlet pit for Botany Street frontage works.

2.1.3 Stage 2 Works (Generally no civil design expected)

The Stage 2 works are expected to include the following:

- façade upgrade of the D26 Biosciences building North wing;
- new plantroom enclosure on the roof of D26 North;
- build connections between north wing and new building;
- additional landscaping;
- ground floor of D26 refurbishment;
- construction of Ground floor linkage through to Chancellery Walk; and
- subsoil drainage for a Western landscaped region adjacent to Chancellery Walk. This area may be constructed as part of Stage 2 works.

3.0 Existing Stormwater Drainage System

3.1 Existing Site Catchment Analysis

The site is generally located at the high point within the University and surrounding locality.

To the east, the site naturally falls to the UNSW boundary at Botany Street. Botany Street appears to be an existing overland flow path with a catchment starting approximately 110m north of the site at the High Street intersection. Botany Street continues to fall from this intersection, past the Biological Sciences Project and to the south.

Within UNSW, the region to the north of the Site may be slightly higher or approximately level with the project site. The existing D26 Biological Sciences building is located along the full northern boundary of the project site. There are existing natural falls from the project site to the east and south within the UNSW campus.

In general, the site's heightened location minimises the impacts from external flows, however an initial assessment of the stormwater runoff along Botany Street has been examined and noted in the following section.

3.1.1 Existing External Catchment – Botany Street

As noted above, an existing external catchment exists to the east of the Site with an overland flow path through Botany Street, flowing to the south.

The proposed structures on the project site are significantly higher than the Botany Street road reserve, however RBG has performed an initial assessment of the flood levels in relation to the proposed floor levels to satisfy that the site is indeed clear of external stormwater ingress and that the proposed works also are in accordance with the freeboard requirements of Randwick City Council.

The Site and the upstream extent of this catchment are located approximately at a localised crest in the region. The grades and natural terrain are relatively flat at this crest and thus the exact catchment extents are difficult to estimate. GIS data has been partially included to assess the external catchment, however for parts of this catchment to the north of the site the GIS data is noted as conflicting with the witnessed area details. Where this has occurred witnessed high points have governed over GIS data.

Figure 3.1 below denotes the assumed external Botany Street catchment in relation to the Site.



Figure 3.1 – Botany Street Catchment

RBG has assumed the following catchment extents:

- High Street to the north of the site is assumed to have a localised crest with flows to the east and west. We have assumed the location of this crest based on GIS data and have also assumed that overland flows from High Street will drain to Botany Street. This may be a conservative assumption as High Street appears to fall more at the intersection towards the west, than Botany Street does to the south and towards the project site.
- Botany Street continues to the north of the High Street intersection and a flow path is also assumed to exist down this section of the road reserve. From the shape of the intersection, RBG has assumed that this catchment will flow on to High Street and to the west and thus has not been included in our catchment assessment.
- For the section of Botany Street that is in between the Site and the High Street intersection, RBG have simply assumed that approximately half the area of the Botany Street properties flow towards the roadway.
- Within the UNSW campus, RBG have conservatively assumed that approximately half of the area north of the site will flow to Botany Street and that the project site falls to Botany Street.
- Along the Botany Street road reserve, there appears to be a localised crest at the High Street intersection, an approximate 1% fall towards the project site, followed by an increase on longitudinal grade just north of the site to approximately 5%. The road crossfall along the frontage of the site is quite steep with the road centre crest significantly higher than top of kerb levels. This would generally result in flows along either side of the road and into the footpaths before surface water flow along the full road width.



Figure 3.2 – View north along Botany Street towards High Street intersection



Figure 3.3 – View south along Botany Street towards Barker Street (south)

Catchment flow paths have been estimated from assessing the site characteristics, GIS levels and survey data. Peak flows for various Average Recurrence Intervals (ARIs) were determined by the rational method based on sub-catchment area and surface type (roof, pavement, landscaping).

The existing conditions indicate that the Botany Street catchment will bypass the site as it is significantly lower than the proposed development with the lower ground floor of the site ranging approximately from 1.3m to 1.6m above the road.

From the catchment assessment, during a 100 year ARI event, a water level of approximately 220mm above the Botany Street gutter invert level will exist at a section along the lower side of the new building.

It has been noted that 500 mm freeboard is to be provided for overland flow paths. From RBG's initial assessment noted above, the Site is indeed clear of surface water with an adequate level of freeboard provided.

3.1.2 Existing Catchment – UNSW Site

The stormwater drainage within the UNSW Kensington Campus is governed by the Campus 2020 Masterplan Stormwater Strategy (CMSS) prepared by Roger Andrews of ANA Technical Services Pty Ltd (refer Appendix B). The UNSW site is made up of 6 main catchment zones with individual under-ground stormwater drainage systems and overland flow paths that discharge to various locations in the UNSW campus and Randwick City Council catchments.

The Site is located in sub-area "E" shown in the UNSW CMSS. The total sub-area "E" has the following characteristics/constraints:

- the catchment area is approximately 2.37ha and all areas are to drain to Botany Street Catchment, via a combination of the campus under-ground piped drainage network and overland flow paths;
- all developments require detention to Council Standards; and
- overland flow is directed towards the Botany Street catchment at the south east corner of the site.

An overland flow path from the Lowy Cancer Research Centre and surrounding buildings (refer sub-area "A") is directed towards detention at the village green. This flow path is shown to run along the western boundary of the Biosciences precinct, but is shown to be directed away from the Site.

3.2 Existing Site Stormwater Drainage Network

3.2.1 Existing Stormwater Drainage Network

The existing drainage network through the Site is shown below and also denoted on the RBG stormwater management plan. It can be seen, that roof and surface water are generally collected and transported to connect to a main 600mm diameter line that runs parallel to Botany Street. This line continues through the campus adjacent to the Australian School of Graduate Management with further connections and discharges through a 750mm diameter line to the Council drainage network in Botany Street above the intersection with Oval Lane.

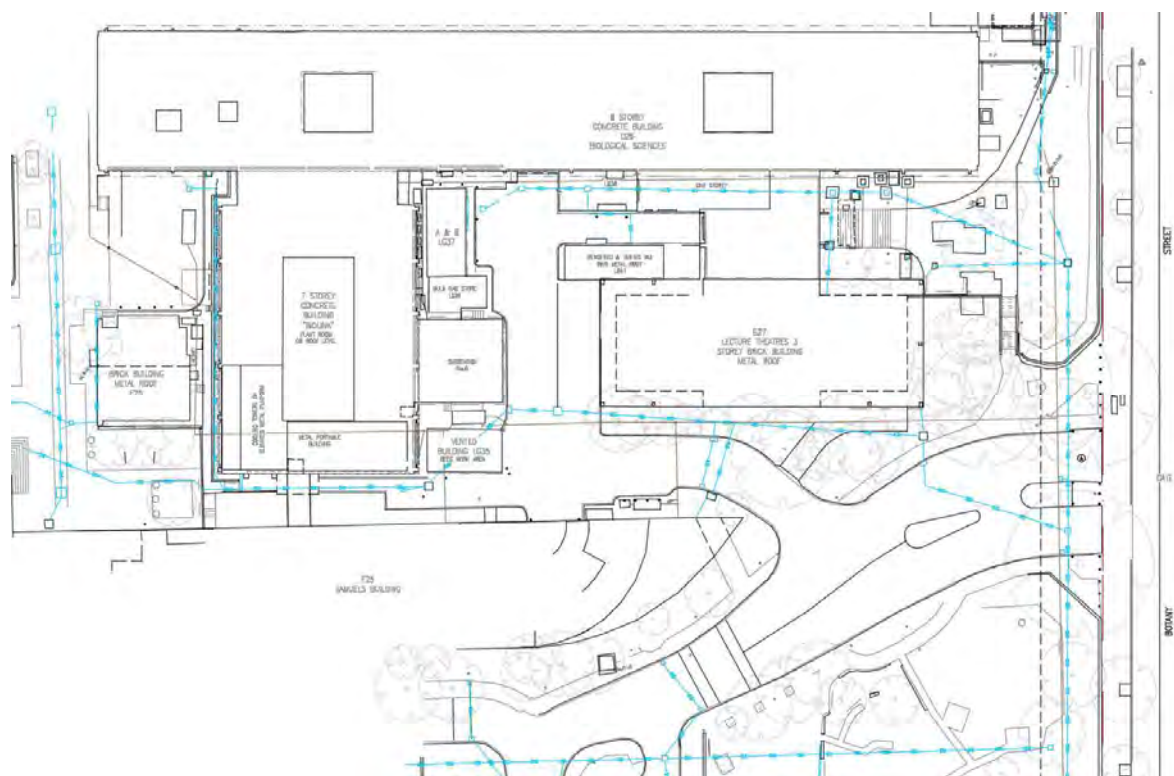


Figure 3.4 – Existing Site stormwater drainage infrastructure

4.0 Proposed Stormwater Management Strategy

4.1 Outline

The proposed site stormwater drainage system has been designed to adhere to the Campus 2020 Masterplan. Generally, additions to the Enabling Works stormwater design have been minimised and the existing catchment areas maintained.

4.2 Proposed Stormwater Catchment Analysis

A catchment analysis was undertaken for the proposed site within the Enabling Works stage to determine discharging flows for various ARIs and on-site detention (OSD) requirements in accordance with the UNSW Campus 2020 Masterplan and Randwick City Council requirements.

OSD was deemed to be required and a 166m³ tank has been proposed as part of the Enabling Works package. RBG understands that the volume provided for this tank is slightly larger than Council requirements and was coordinated through UNSW FM and the Enabling Works project team, and reviewed with Council.

4.3 Proposed Stage 1 Stormwater Drainage Design

The proposed stormwater drainage system is generally designed to discharge the 1 in 100 year ARI flows within the pipe network and into the enabling works system and into the OSD tank. Parts of the site for larger storm events will discharge by a combination of the stormwater pipes and overland flow.

The majority of the existing stormwater drainage will be demolished to allow for the new building footprint. The Enabling Works includes a newly aligned stormwater line through the site and provision for OSD.

The additional stormwater infrastructure proposed for the Stage 1 works will connect to the Enabling Works drainage network.

The loading dock accessway will be regraded to form a "V-shape" cross section to fall towards a grated drain in the roadway. Crests and sags have been designed along this access way to allow for surface water collection in minor events as well as overland flow. Connection into the Enabling Works stormwater will be through pits located in front of the proposed loading dock.

Subsoil drainage, a swale drain and a surface inlet pit for Botany Street frontage works are also proposed for Stage 1 as well as subsoil drainage for a western landscaped region adjacent to Chancellery Walk (Stage 2).

Given the significant staging of the works, RBG's Stormwater Management Plan, drawing C6-01 (refer Appendix A) shows existing infrastructure to remain and to be demolished, proposed Enabling Works drainage as well as the proposed Stage 1 drainage works.

A hydraulic DRAINS model was created to assess the Stage 1 connections into the Enabling Works stormwater drainage network (refer Figure 4.1). DRAINS is widely used for designing and analysing urban stormwater drainage systems, using design rainfall data derived from *Australian Rainfall and Runoff (AR&R)*.

It is understood that the Site Enabling Works stormwater drainage network has been designed such that general local drainage up to the 1 in 100 year ARI flows are transported to the OSD tank with an overland flow path provided to cater for larger events or in the circumstance where blockages greater than 50% inlet capacity occur.

4.3.1 Modelling Parameters

The DRAINS model for the Site adopted a Rational Method hydrological model with the following minor (20 year ARI) and major (100 year ARI) Intensity-Frequency-Duration (IFD) information:

Duration	Minor Storm Intensity (20 year ARI) (mm/hr)	Major Storm Intensity (100 year ARI) (mm/hr)
6 minutes	200	255
1 hour	73	96.2
12 hours	13.9	18.3
72 hours	4.28	5.59

Table 4.1 – IFD Data

Whilst the majority of the site is impervious, the pervious areas of grassed landscaping within some sub-catchments have also been considered in the model.

Results of the proposed Stage 1 stormwater works assessment through DRAINS have shown general compliance with the Enabling Works concept and the University Campus 2020 masterplan.

4.3.2 DRAINS Network Diagram

The DRAINS model is shown below for reference.

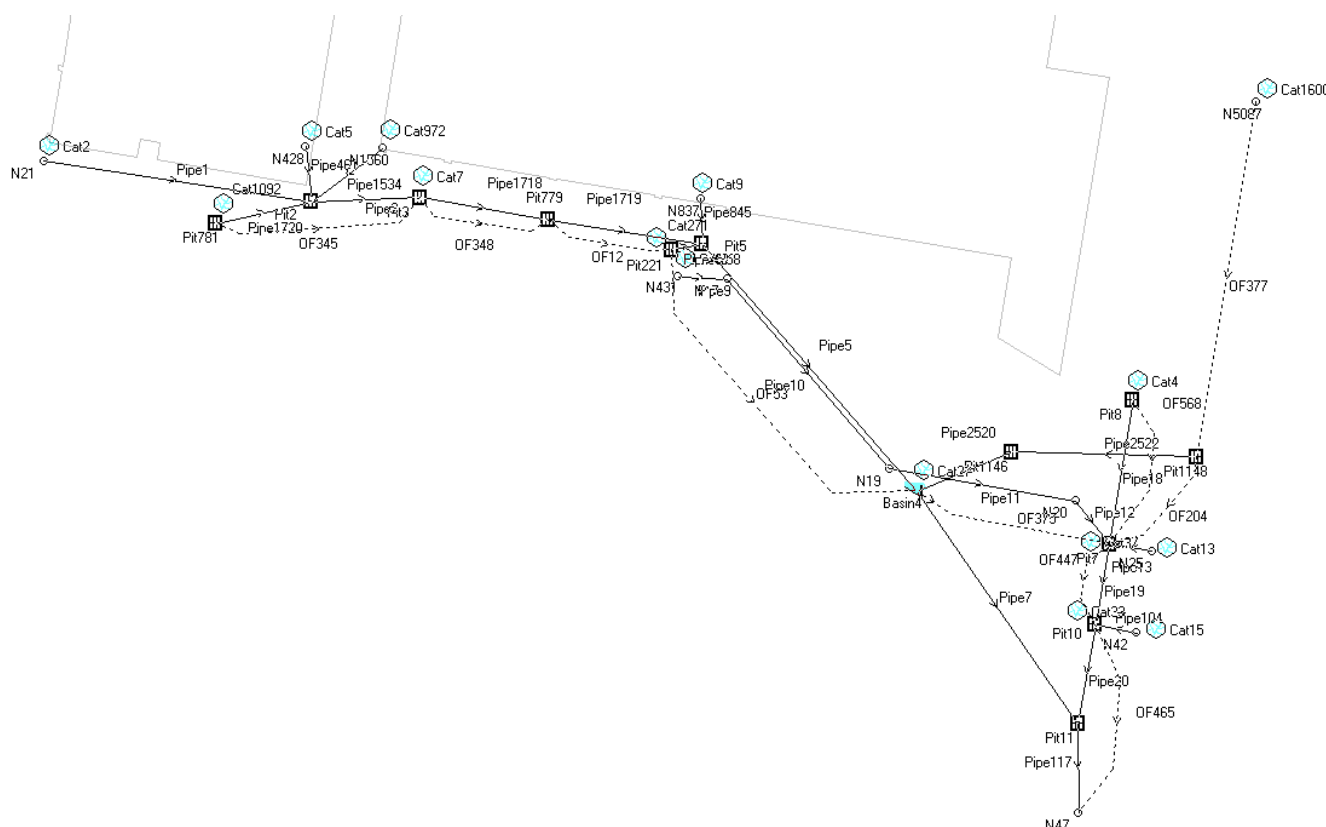


Figure 4.1 – DRAINS network diagram

4.4 On-Site Detention

In accordance with the relevant section of the UNSW campus 2020 masterplan (refer Stormwater Management Catchment Plan Appendix B), 'All developments require full detention to Council standard requirements'.

A below-ground detention system will be installed as part of the Enabling Works and will discharge to council drainage at the south east corner of the University site. As discussed in Section 4.2, an OSD tank has been proposed as part of the Enabling Works. Details of the OSD system is documented by LHO Group, which does not form part of this submission

4.5 Overland Flow

The Site has one minor internal overland flow path. In the event of a major storm event, blockage, or other failure of the stormwater system, stormwater will be directed along this flow path.

This overland flow path runs in an easterly direction along the loading dock access way, which is designed to fall towards the Samuels Avenue and the Botany Street vehicle crossing and is indicated on the Stormwater Management Plan drawing C6-01 (refer Appendix A).

A minimum freeboard of 500mm has been noted as a condition of development for overland flow paths or trapped low points the 1 in 100 ARI storm event (Major). RBG notes that this site is very constrained with existing buildings in close proximity. Existing ground levels generally slope away from the proposed development, and as such, mitigate the overall risk of flooding.

RBG has modelled the catchment leading to this flow path and assessed the critical water levels. Currently the proposed dock has been designed to be free from surface water ingress in the major storm event and has a general RL of 53.00. No freeboard to the loading dock has been provided in the design. The critical scenario for the internal overland flow path model shows a water level just below the loading dock level at 52.98 (refer Figure 4.2). It must be noted that our current assessment is through a HecRas 1D model, conservatively assuming that all in-ground drainage is 100% blocked during the major stormwater event. This assessment method has been used for a previous UNSW development with existing constraints of long structures either side of a narrow roadway preventing standard levels of freeboard from being achieved.

The lower ground finished floor level is generally proposed at an RL of 53.47. This matches the surrounding structures and provides 490mm freeboard from the highest surface water level along the overland flow path. Waste and Storage areas adjacent to the Loading Dock have been designed with an RL of 53.00 and are therefore with less than the 490mm freeboard in the major event.

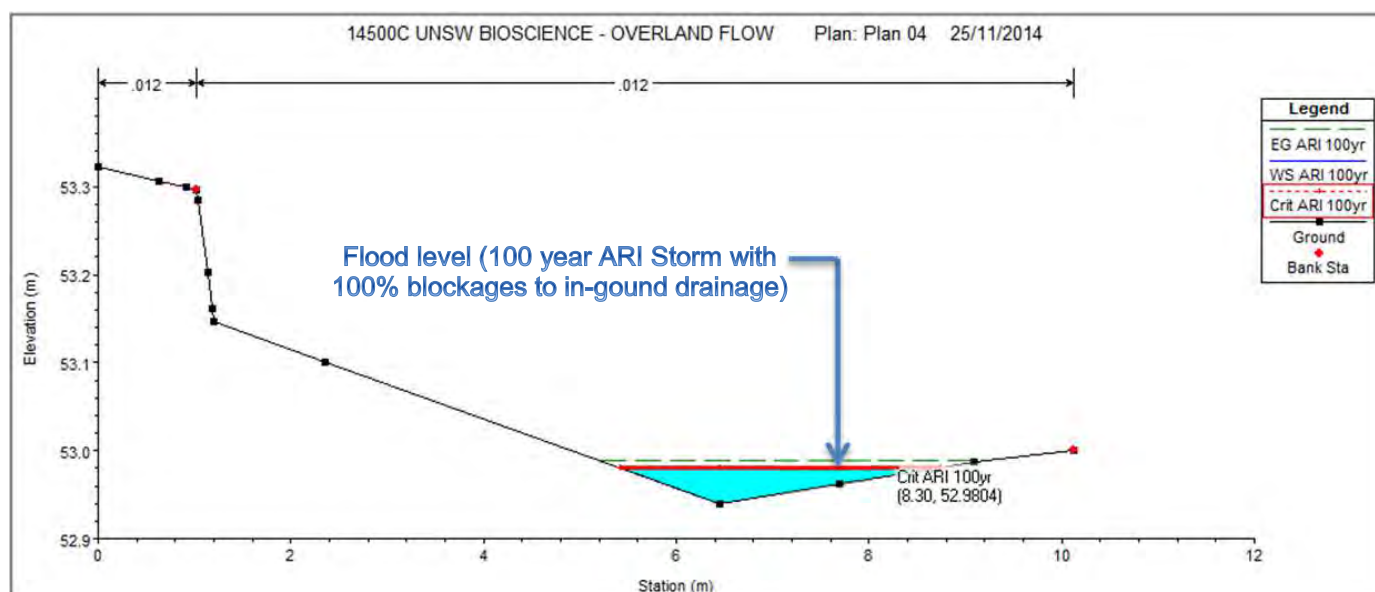


Figure 4.2 – HEC-RAS overland flow path modelling

4.6 Water Quality

Water quality management and Water Sensitive Urban Design (WSUD) have become common practice in the urban development industry. WSUD is a design approach that considers and attempts to mitigate the impact of development stormwater discharges in a manner which is sensitive to the water cycle and the receiving environment. This includes managing potable (drinking) water, surface water, wastewater (sewage and grey water), as well as natural watercourses. Refer Figure 4.3 below which provides an example schematic of a WSUD water balance.

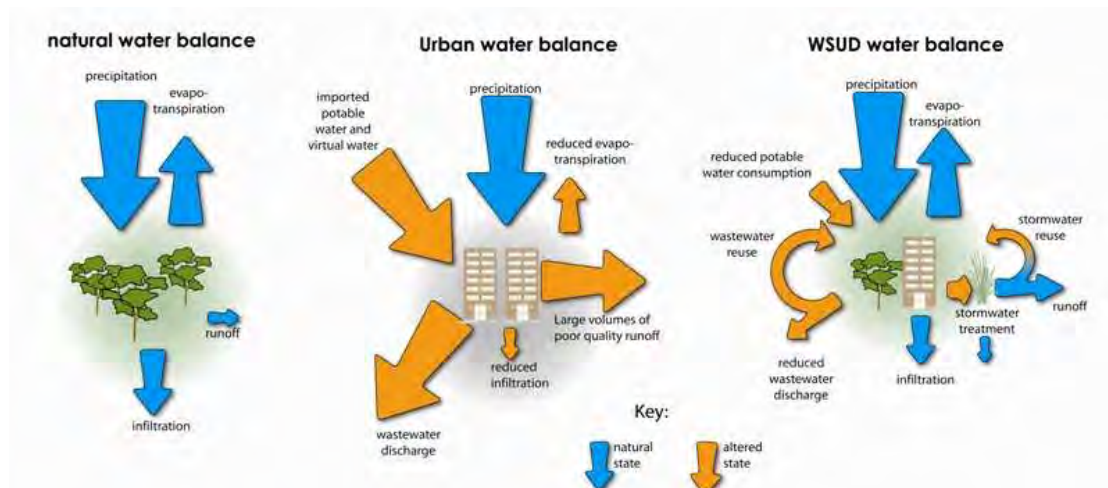


Figure 4.3 – WSUD water balance schematic (Hoban & Wong 2006)

It has been noted that an Integrated Water Management Plan has been requested for the development as part of the SEARs. To date, RBG is assuming that this management plan predominately relates to potable water, sewerage and water sensitive landscaping measures and thus a MUSIC model has not been produced for this submission and water quality targets have not been assessed.

4.6.1 WSUD Approach

The WSUD approach for this project includes the provision of pit inserts within the loading dock accessway. From discussions with the Enabling Works project team, RBG has also been informed that a HumeCeptor exists downstream of the Site and was possibly installed with provisions for future developments in the upstream catchments.

The proposed Stage 1 stormwater quality management option to be implemented has been summarised in Table 4.2 below.

Stormwater Quality Management Options	Discussion
Stormwater360 EnviroPod	The Stormwater360 Enviropod is a cost-effective and easily maintained gully pit insert that is effective at removing litter, debris, and other pollutants from urban runoff. Stormwater360 have specific MUSIC nodes for their proprietary in-ground treatment devices, including the Enviropod, which can be used for simulating these proprietary products in the model. Other proprietary devices may be substituted subject to demonstration they meet the required water quality treatment requirements.

Table 4.2 – Stormwater Quality Measures

Water quality control will therefore be achieved using a *treatment train* approach. The HumeCeptor will treat water of its hydrocarbons and fine suspended solids, while Enviropod pit inserts will be located at appropriate upstream pits to capture gross pollutants and coarse suspended solids.

4.6.2 Maintenance of Water Quality Treatment Devices

Water quality treatment devices require regular maintenance. A detailed maintenance plan is to be developed following final selection of the treatment devices to be installed. An indicative maintenance plan is provided below.

- **Stormwater360 Enviropods**
 - In accordance with the manufacturer's technical manual and owner's manual;
 - Periodic (6 monthly) inspection, cleaning and removal of any gross pollutants and coarse sediment that is deposited in the device.

5.0 Erosion and Sediment Control

Erosion and sediment controls will be provided during the construction phase in accordance with Council guidelines. An Erosion and Sediment Control Plan has been prepared and is included in Appendix A. The plan includes measures such as sediment fences at the downstream edges of all disturbed areas, filters at all existing pits collecting stormwater runoff from disturbed areas, and a truck shaker tray at each point of access to the work area.

6.0 Conclusion

This stormwater management report has outlined the proposed stormwater drainage measures for the Stage 1 works of the proposed Biological Sciences Project. This report is to be read in conjunction with the attached plans noted in the appendices and Enabling Works documentation referenced if further clarification on the Enabling Works stage is required.

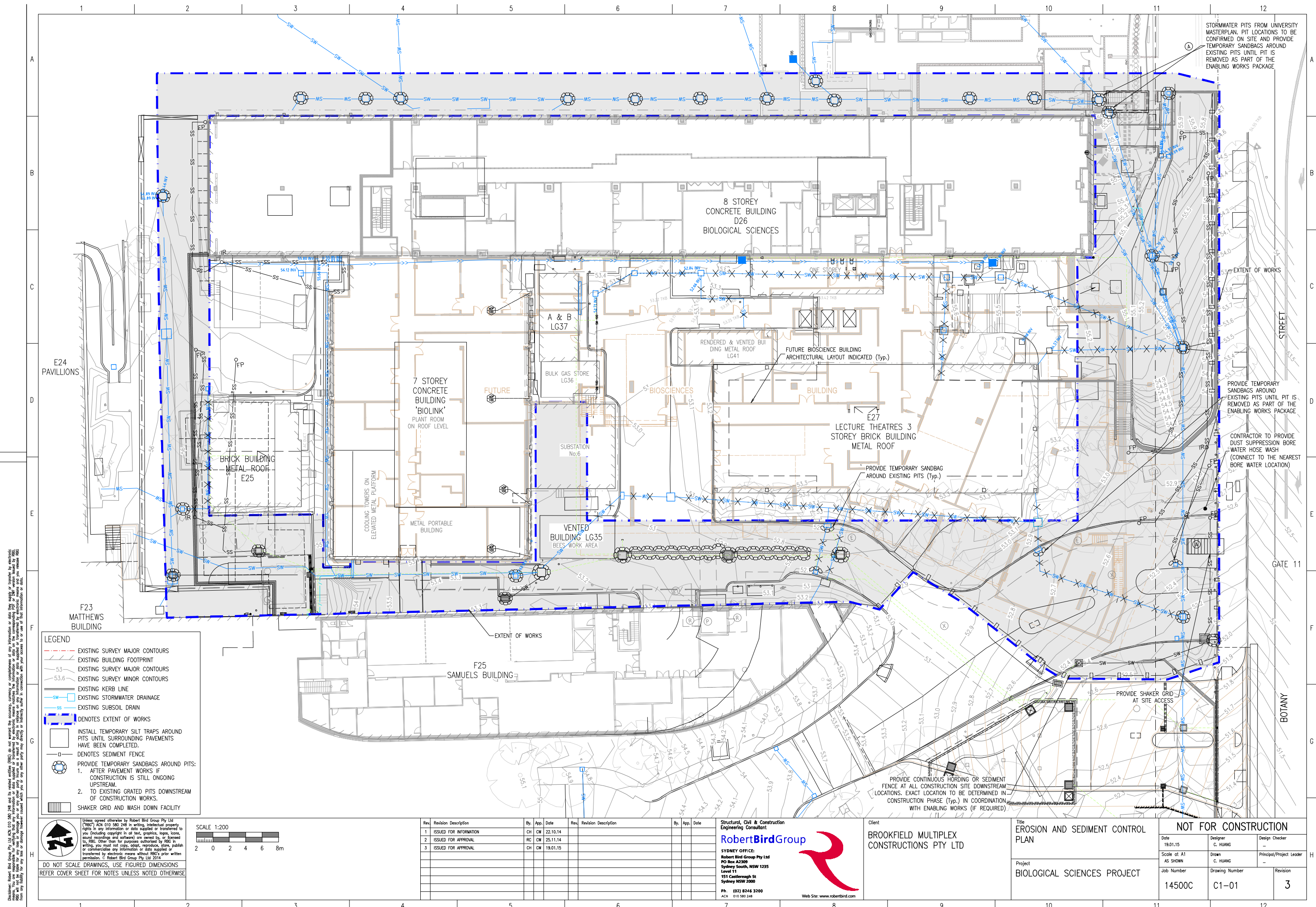
The project is to be constructed in a number of separate stages, with the majority of the stormwater drainage works to be constructed in the Enabling Works stage, which has been designed by others. The Enabling Works stage includes the critical features of the main drainage line, catchment assessment and OSD tank for the site. Drainage infrastructure has also been proposed for the Stage 1 works and RBG have shown an overall arrangement of the staged project works on plan C6-01 in Appendix A to help provide an inclusive picture of the total project works involved.

The Site is located generally at a localised high point or crest within the UNSW campus and greater locality. An external catchment flowing through Botany Street has been assessed and found to not impact on the proposed building or compromise freeboard requirements. A minor overland flow path is also present within the project site. It has been found that achieving the noted freeboard requirements is difficult for this internal flow path due to existing constraints.

Water quality and sediment control measures have been proposed for the construction and post developed site conditions, these are also noted in the plans attached in Appendix A.

Appendix A

RBG Civil Design Drawings



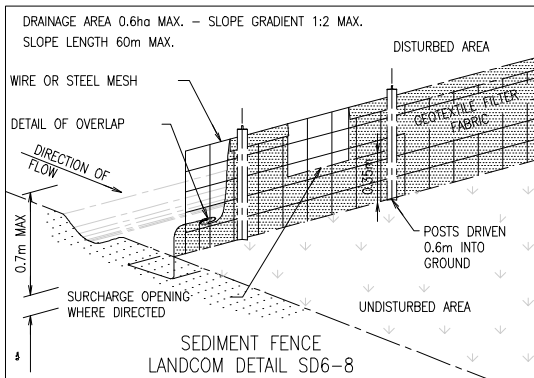
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EROSION AND SEDIMENT CONTROL NOTES

- ALL WORK SHALL BE GENERALLY CARRIED OUT IN ACCORDANCE WITH:
 - LOCAL AUTHORITY REQUIREMENTS,
 - EPA – POLLUTION CONTROL MANUAL FOR URBAN STORMWATER,
 - DEPARTMENT OF ENVIRONMENT AND CONSERVATION NSW – MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION VOLUME 1, 4th EDN "BLUE BOOK".
- EROSION AND SEDIMENT CONTROL DRAWINGS AND NOTES ARE PROVIDED FOR THE WHOLE OF THE WORKS. SHOULD THE CONTRACTOR STAGE THESE WORKS THEN THE DESIGN MAY REQUIRE TO BE MODIFIED. VARIATION TO THESE DETAILS MAY REQUIRE TO BE APPROVED BY THE RELEVANT AUTHORITIES. THE EROSION AND SEDIMENT CONTROL PLAN SHALL BE IMPLEMENTED AND ADOPTED TO MEET THE VARYING SITUATIONS AS WORK ON SITE PROGRESSES.
- MAINTAIN ALL EROSION AND SEDIMENT CONTROL DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT, UNSW AND THE LOCAL AUTHORITY.
- WHEN STORMWATER PITS ARE CONSTRUCTED PREVENT SITE RUNOFF ENTERING THE PITS UNLESS SILT FENCES ARE ERECTED AROUND PITS.
- MINIMIZE THE AREA OF SITE BEING DISTURBED AT ANY ONE TIME.
- PROTECT ALL STOCKPILES OF MATERIALS FROM SCOUR AND EROSION. DO NOT STOCKPILE LOOSE MATERIAL IN ROADWAYS, NEAR DRAINAGE PITS OR IN WATERCOURSES.
- ALL SOIL AND WATER CONTROL MEASURES ARE TO BE PUT BACK IN PLACE AT THE END OF EACH WORKING DAY, AND MODIFIED TO BEST SUIT SITE CONDITIONS.
- CONTROL WATER FROM UPSTREAM OF THE SITE SUCH THAT IT DOES NOT ENTER THE DISTURBED SITE.
- ALL CONSTRUCTION VEHICLES SHALL ENTER AND EXIT THE SITE VIA THE APPROVED CONSTRUCTION ENTRY/EXIT ROUTE.
- ALL VEHICLES LEAVING THE SITE SHALL BE CLEANED AND INSPECTED BEFORE LEAVING.
- MAINTAIN ALL STORMWATER PIPES AND PITS CLEAR OF DEBRIS AND SEDIMENT. INSPECT STORMWATER SYSTEM AND CLEAN OUT AFTER EACH STORM EVENT.
- CLEAN OUT ALL EROSION AND SEDIMENT CONTROL DEVICES AFTER EACH STORM EVENT.
- ALL DISTURBED AREAS SHALL BE REVEGETATED AS SOON AS THE RELEVANT WORKS HAVE BEEN COMPLETED.

SEQUENCE OF WORKS

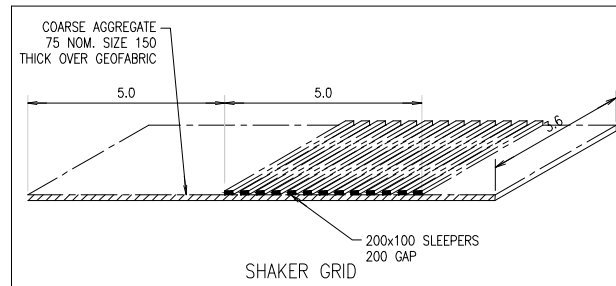
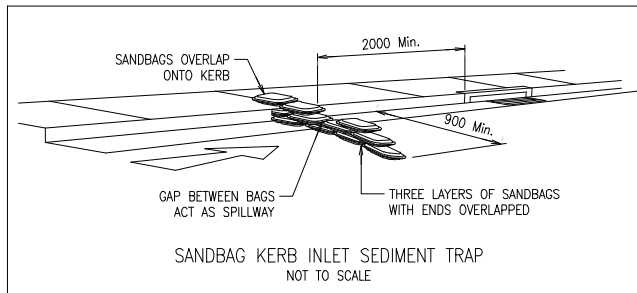
- PRIOR TO COMMENCEMENT OF SITE WORKS, THE FOLLOWING SOIL MANAGEMENT DEVICES MUST BE INSTALLED.
 - AS PART OF THE CONSTRUCTION MANAGEMENT PLAN, SUITABLE LOCATIONS ARE TO BE IDENTIFIED FOR BULK MATERIALS, BUILDING MATERIALS, WASTE BINS AND DELIVERY LOCATIONS.
 - CONSTRUCT SILT CONTROL DEVICES BELOW THE SITE AND ACROSS ALL POTENTIAL RUNOFF SITES. CONTAMINATED WASTEWATER MUST NOT DISCHARGE INTO THE STORMWATER SYSTEM.
 - CO-ORDINATE CONSTRUCTION ENTRY/EXIT ROUTES WITH PROJECT MANAGER. ARRANGE SUITABLE LOCATION FOR THE INSPECTION OF TRUCKS PRIOR TO LEAVING SITE AND DIVERT RUNOFF TO SUITABLE CONTROL SYSTEM.
 - CONSTRUCT MEASURES TO DIVERT UPSTREAM FLOWS INTO EXISTING STORMWATER SYSTEM.
 - PROVIDE SEDIMENT TRAPS UPSTREAM OF EXISTING PITS.
 - INSTALL TEMPORARY BOREWATER TAPS AND PIPES AS REQUIRED. ALL DUST SUPPRESSION, CONSOLIDATION AND WASHING IS TO BE CARRIED OUT USING BOREWATER FROM THE SITE'S RETICULATION NETWORK. LOCATE A 1.8 METRE CHAIN WIRE FENCE AROUND THE BOUNDARIES AND ATTACH HESSIAN CLOTH TO IT ON THE WINDWARD SIDE (TIES AT THE TOP CENTER AND BOTTOM AND AT 1 METRE INTERVALS).
 - PROVIDE SIGNAGE AROUND SITE INDICATING THAT THIS SITE DRAINS TO AN ENVIRONMENTALLY SENSITIVE STRUCTURE.
- DISTURBED AREAS ARE REGULARLY WATERED TO REDUCE DUST POLLUTION.
- CONSTRUCT GEOTEXTILE FILTER PIT SURROUND AROUND ALL PROPOSED PITS AS THEY ARE CONSTRUCTED.
- ON COMPLETION OF PAVEMENT PROVIDE KERB INLET SEDIMENT TRAPS AROUND PITS.



INSTALLATION:

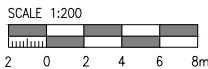
- EXCAVATE A TRENCH 200mm DEEP.
- DRIVE POSTS 500–700mm INTO GROUND AT A MAXIMUM SPACING OF 3.0m CENTRES.
- PLACE AND FIX SUPPORT MESH (F52) TO POST.
- LAY BIDIM GEOFABRIC (SF 2000) AGAINST THE SUPPORT MESH AND FIX BY TIE WIRE, STAPLES OR HOG RINGS.
- PLACE BIDIM IN TRENCH AND BACKFILL WITH SOIL.

NOTE:
POSITION OF SEDIMENT FENCE AS DIRECTED BY MANAGING CONTRACTOR. FENCE TO REMAIN IN PLACE UNTIL EXCAVATION IS BELOW FOOTPATH LEVEL. PROVIDE 2mx2m TURFED AREA ON DOWNSTREAM SIDE OF FENCE AT SURCHARGE OPENINGS.



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Rev	Revision Description	By	App.	Date	Rev	Revision Description	By	App.	Date
1	ISSUED FOR APPROVAL	RC	CW	25.11.14					
1	ISSUED FOR APPROVAL	CH	CW	19.01.15					

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Client

BROOKFIELD MULTIPLEX
CONSTRUCTIONS PTY LTD

Title
EROSION AND SEDIMENT CONTROL
NOTES & DETAILS

Project
BIOLOGICAL SCIENCES PROJECT

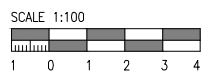
NOT FOR CONSTRUCTION

Date 19.01.15	Designer C. WAITE	Design Checker —
Scale at A1 AS SHOWN	Drawn S. MANVACHAR	Principal/Project Leader —
Job Number 14500C	Drawing Number C1-02	Revision 2

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LEGEND	
	SITE BOUNDARY
	DENOTES FACE OF BUILDING
	EXISTING STORMWATER LINE TO BE RETAINED
	EXISTING STORMWATER LINE TO BE ABANDONED
	PROPOSED STORMWATER LINE UNDER ENABLING WORKS PACKAGE
	PROPOSED SURFACE INLET PIT
	PROPOSED STORMWATER PIPE LINE
	PROPOSED STORMWATER SWALE
	DENOTE PROPOSED SURFACE GRADE
	PROPOSED KERB LINE
	PROPOSED MAJOR CONTOURS WITH HEIGHT
	PROPOSED MINOR CONTOURS WITH HEIGHT
	EXISTING SPOT LEVEL
	PROPOSED SPOT LEVEL
	DENOTES OVERFLOW PATH

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Rev	Revision Description	By	App.	Date	Rev	Revision Description	By	App.	Date
1	PRELIMINARY ISSUE	CH	CW	24.10.14					
2	PRELIMINARY ISSUE	RC	CW	27.10.14					
3	ISSUED FOR APPROVAL	RC	CW	25.11.14					
4	ISSUED FOR APPROVAL	CH	CW	19.01.15					

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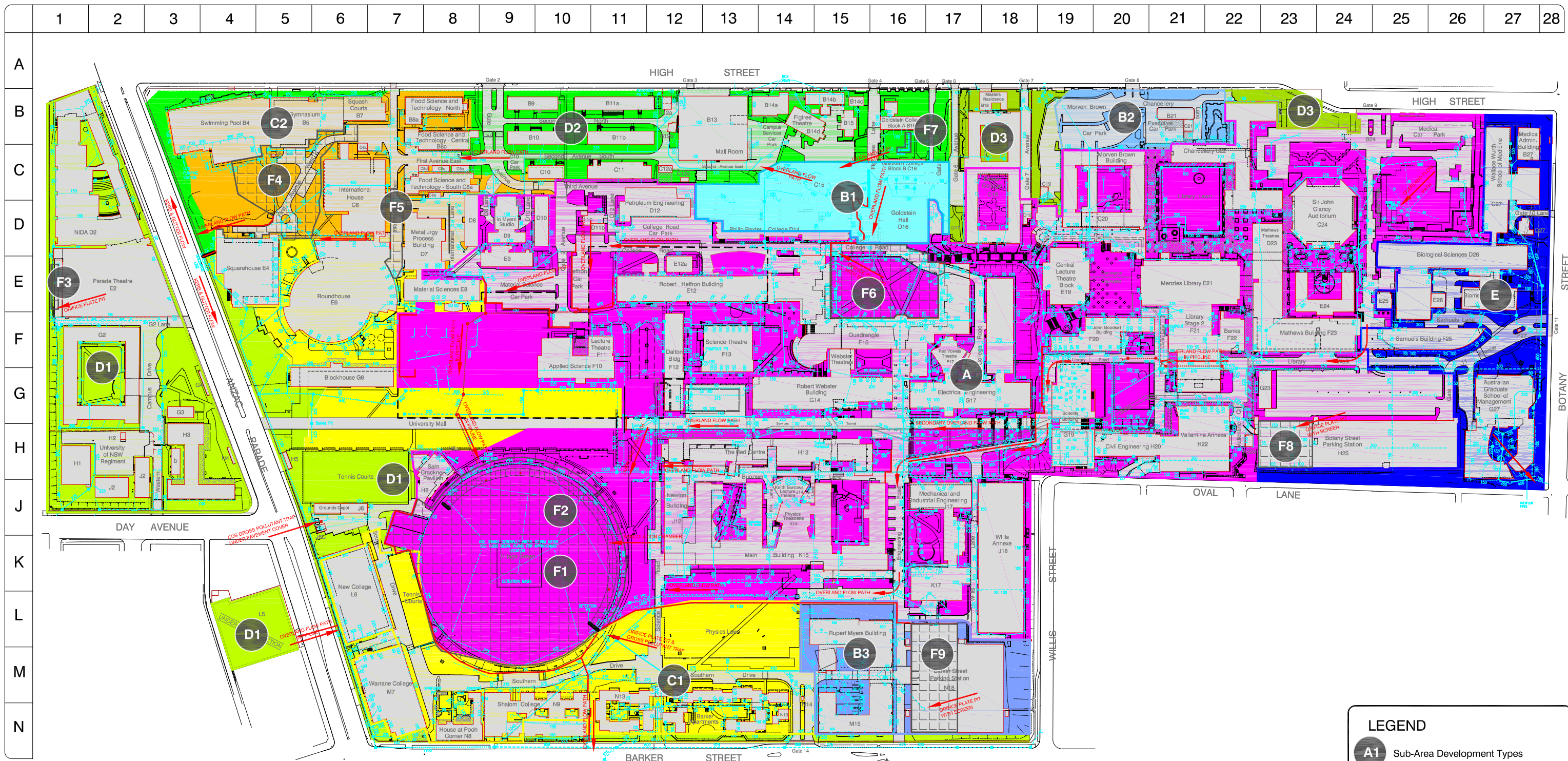
Client
**BROOKFIELD MULTIPLEX
CONSTRUCTIONS PTY LTD**

Title
STORMWATER MANAGEMENT PLAN
Project
BIOLOGICAL SCIENCES PROJECT

NOT FOR CONSTRUCTION			
Date 20.01.15	Designer C. WATE	Design Checker —	
Scale at A1 AS SHOWN	Drawn S. MANANJAR	Principal/Project Leader —	
Job Number 14500C	Drawing Number C6-01	Revision 4	

Appendix B

Campus 2020 Stormwater Catchment Management Plan



MAIN AREA GROUP CHARACTERISTICS

- AREA 'A' 100 yr ARI to Village Green detention basin.
- AREAS 'B' 5yr ARI to Village Green Detention Basin; 100 yr ARI to Council street drainage
- AREAS 'C' 5 yr ARI to percolation trench; 100yr ARI to Council street drainage
- AREAS 'D' 20yr ARI to percolation / piped street drainage; 100yr ARI to Council street drainage.
- AREA 'E' Requires full detention
- AREAS 'F' Detention basins & diversion structures to be retained

SUB-AREA DEVELOPMENT CONSTRAINTS

- AREA 'A' All stormwater run-off to Village Green Detention Basin. Areas F1, F2, F6, F8 & F9 and diversion structures are to be retained
- AREA 'B1' 5yr ARI to Village Green detention basin via piped drainage, 5 to 20yr ARI to Council kerb via piped drainage, 100 yr ARI to Anzac Pde North Council catchment. Retain diversion structures.
- AREA 'B2' 5yr ARI to Village Green detention basin via piped drainage, 20yr ARI to High St kerb via piped drainage, 100 yr ARI to Anzac Pde North Council catchment
- AREA 'B3' 5yr ARI to Village Green detention basin via piped drainage, 20yr ARI to Barker St kerb via piped drainage, 100 yr ARI to Anzac Pde South Council catchment. Retain detention basin F9
- AREA 'C1' 5yr ARI roof drainage to percolation trench, 20yr ARI to Council kerb via piped drainage, 100 yr ARI to Anzac Pde South Council catchment. Retain diversion structures

- AREA 'C2' 5yr ARI roof drainage to percolation trench, 20yr ARI to Council kerb via piped drainage, 100 yr ARI to Anzac Pde North Council catchment. Retain detention basins F4 & F5 and diversion structures
- AREA 'D1' 20yr ARI roof drainage to percolation trench with overflows to existing piped drainage, 100 yr ARI to Anzac Pde South Council catchment. Retain detention basin F3 & diversion structures.
- AREA 'D2' 20yr ARI roof drainage to percolation trench, with overflows to Council kerb or existing piped drainage, 100 yr ARI to Anzac Pde North Council catchment. Retain detention basins F7 and diversion structures.
- AREA 'D3' 20yr ARI to Council kerb via piped drainage. Discharges to Anzac Pde North Council catchment.
- AREA 'E' Drains to Botany St Catchment. All developments require full detention to Council standard requirements.



AREAS 'F' Detention basins & percolation trenches to be retained

- AREA 'F1' Village Green detention basin. All bank profiles and levels are protected. Banks can be raised, but not lowered. To be maintained and permanently retained. Percolation chamber serving Village Green detention catchment, to be maintained and permanently retained.
- AREA 'F2' Percolation / detention tank serving NDA roof water discharge, to be maintained and permanently retained in some form.
- AREA 'F3' 5 yr ARI surcharge basin for stormwater surcharge pits in First Avenue West. Encroaches onto Swimming Pool Lawn. Must be maintained, and maintained in some form.
- AREA 'F5' 5 yr ARI surcharge basin for stormwater surcharge pits in International Road. Must be maintained in some form.
- AREA 'F6' Quadrangle Lawn detention basin with discharge orifice plate pit in College Rd. College Rd is raised below pit to retain overland flow. Must be maintained and maintained in some form of equal capacity, as Village Green detention volume cannot be safely increased.
- AREA 'F7' Percolation trench serving Goldstein roof water discharge, to be maintained and permanently retained in some form of equal capacity.
- AREA 'F8' Upper Campus Car Park detention basin with discharge orifice pit in ground floor. Must be maintained and permanently retained, as Village Green detention volume cannot be safely increased.
- AREA 'F9' Barker Street Car Park detention basin with discharge orifice pit in ground floor. Must be maintained and permanently retained, as Village Green detention volume cannot be safely increased.

LEGEND

- A1 Sub-Area Development Types
- F1 Detention areas or percolation trenches

Read this drawing in conjunction with the following:

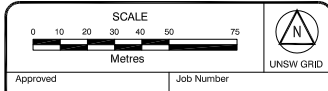
- Campus 2020 Master Plan Stormwater Strategy document
- Stormwater Diversion Structure Plan

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DRAWING STATUS	
UNSW POLICY	
DESIGNED	R Andrews
DRAWN	R Andrews
DATE	14/10/05
SCALE	AS SHOWN

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No.	DATE	DRAWN	CHKD	AMENDMENT	No.	DATE	DRAWN	CHKD	AMENDMENT
1	28.11.05	RJA	RJA	Updated with RCC Development Engineer's comments					



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SITE SERVICES

KENSINGTON CAMPUS			
MASTER PLAN			
STORMWATER CATCHMENT MANAGEMENT PLAN			
CAD Reference	Drawing No.	Last Revision	Revision
SS-HYD-STORMWATER	CMP 1000	22/11/05	1



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