Civil

TaylorThomsonWhitting

LOWER CAMPUS DEVELOPMENT ENABLING WORKS

STORMWATER MANAGEMENT PLAN

for UNSW

10 October 2012

111144P - SMP

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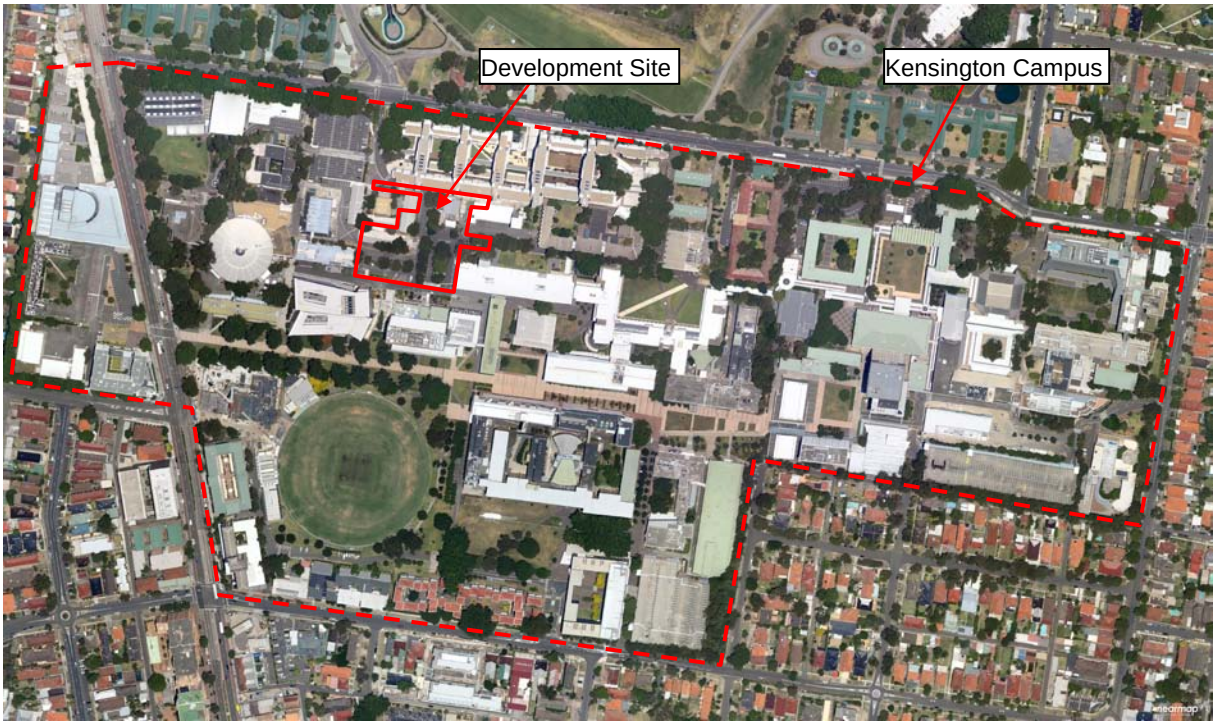
1.0 INTRODUCTION

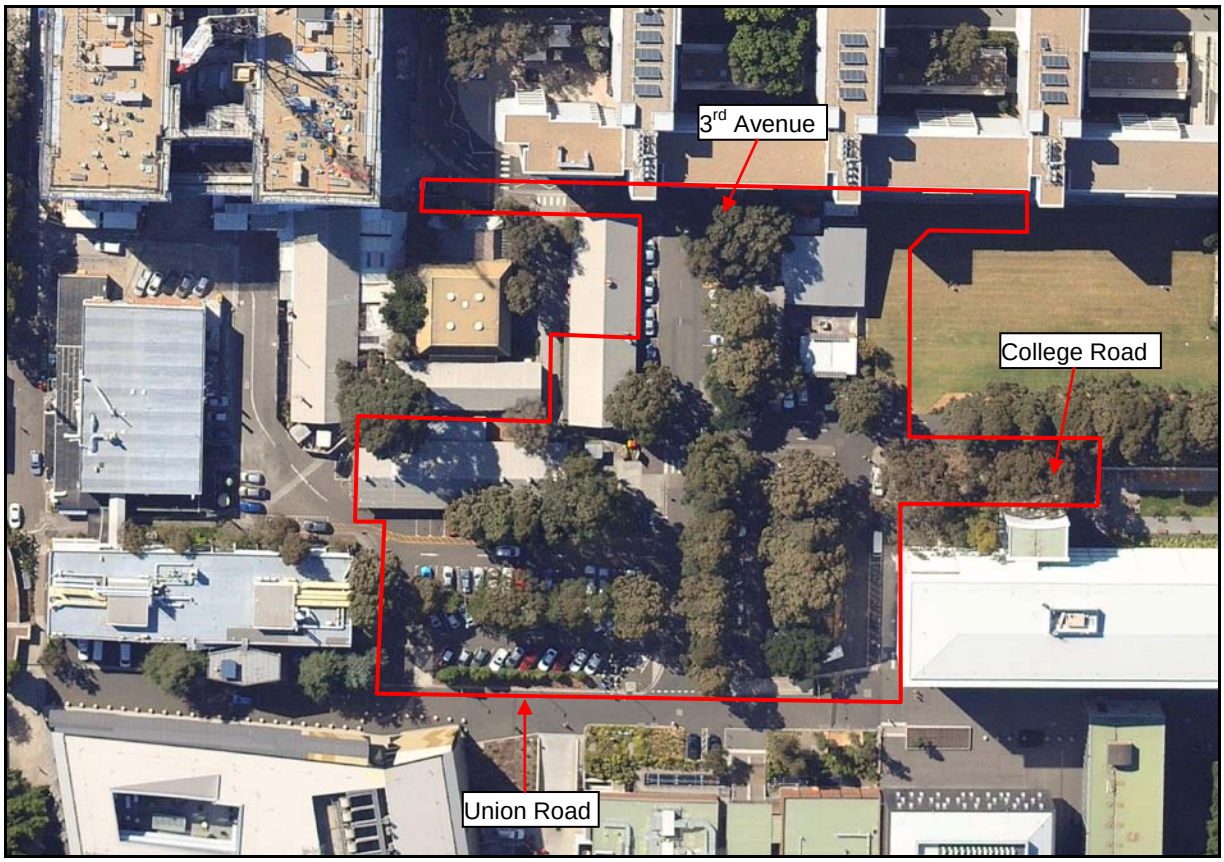
As part of the Lower Campus Development Enabling Works, Taylor Thomson Whitting (TTW) have been engaged by the University of New South Wales (UNSW) to investigate and report on civil engineering aspects of the project. This report relates to the proposed stormwater works related to this development.

1.1 EXISTING SITE

The development site is located on the existing UNSW Kensington Campus, within Randwick Council LGA. The majority of the existing site consists of two on-grade car parks primarily used for the existing Materials Science (E8) and Australian School of Business (E12) buildings. Also within the site are existing university buildings, pedestrian areas, landscaping, roads and other smaller car parking areas. The existing shared access roads within the vicinity of the site are Union Road to the south, 3rd Avenue to the north and College Road to the east.



SITE LOCATION



DEVELOPMENT SITE

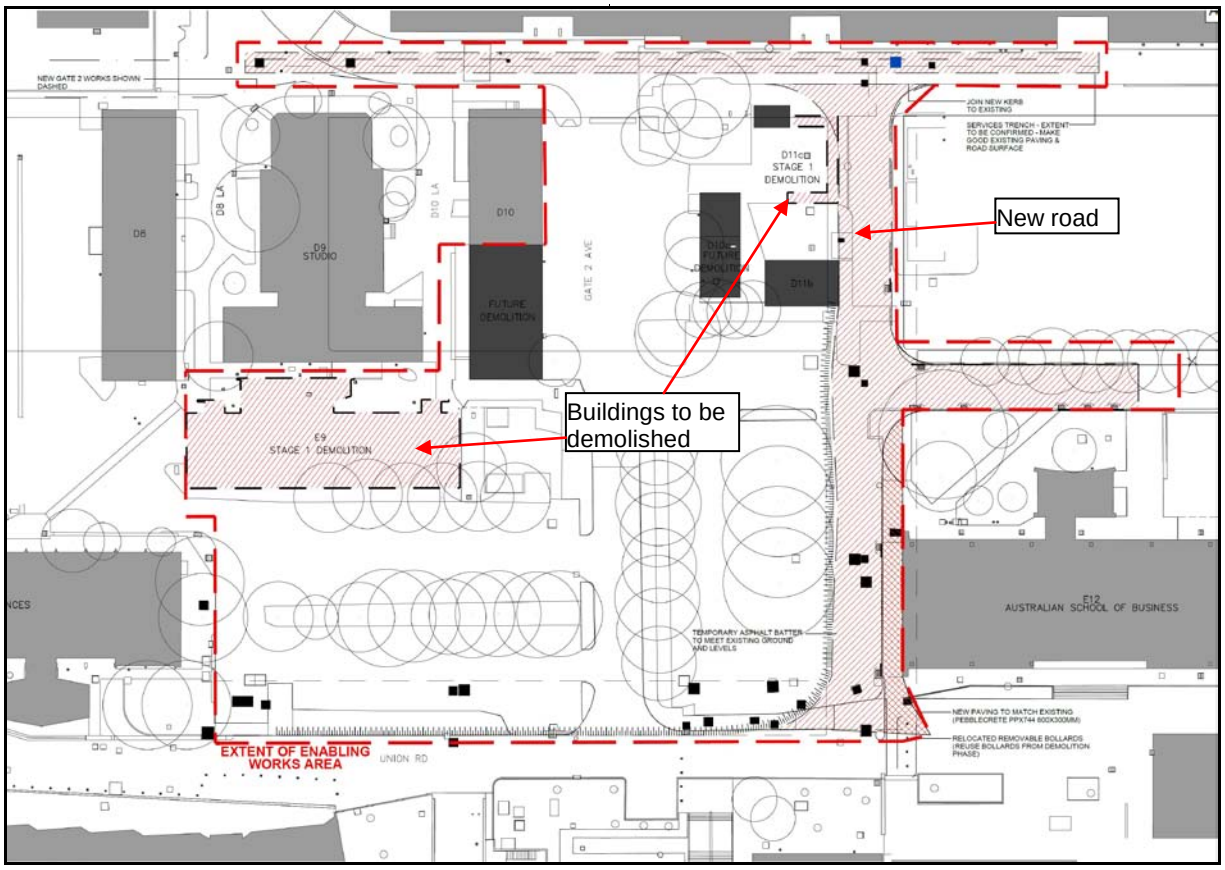
1.2 PROPOSED DEVELOPMENT

The proposed enabling works will allow future development of the Lower Campus. At this stage the full scope of the Lower Campus Development is not confirmed as UNSW are still looking into the feasibility of different options.

A summary of the enabling works includes the following:

- Demolition of existing buildings.
- Construction and diversion of new stormwater and other services.
- Construction of a new road between 3rd Avenue and Union Road.
- Removal of trees and planting associated with the above.

Extracts of Grimshaw drawings A02-2002 and A02-2003, showing the demolition works and proposed works are included in Appendix A. A more detailed description of the development works and context is included in the Preliminary Construction Management Plan.



PROPOSED WORKS

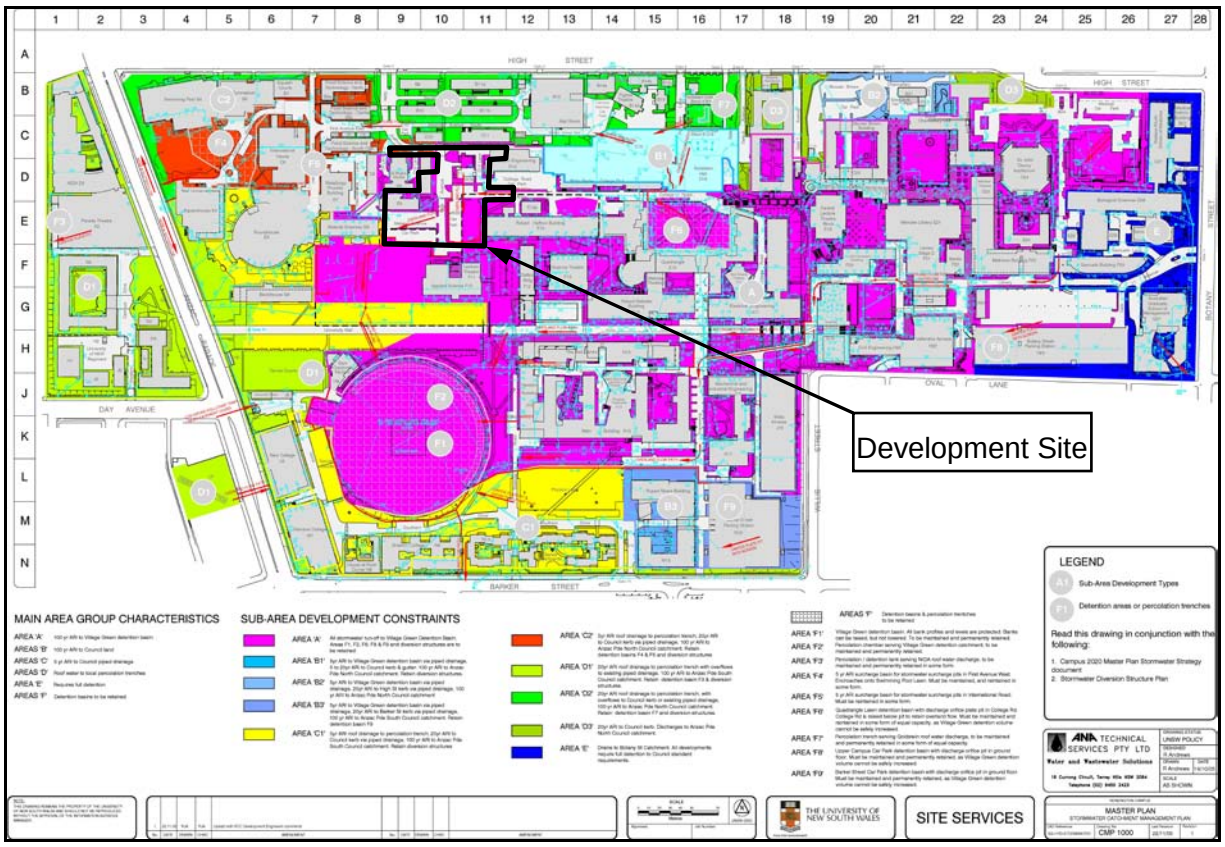
2.0 STORMWATER

2.1 EXISTING STORMWATER

The existing stormwater across Kensington Campus includes five major catchments, which have various discharge conditions, sub-catchments, flow controls, overland flow paths and diversion structures. Randwick Council and UNSW have adopted a stormwater strategy for the whole campus entitled '*UNSW Kensington Campus, Campus 2020 Master Plan, Stormwater Strategy (November 2005)'.* This strategy outlines the various catchments and provides details of the constraints to be applied for future development.

The whole of the proposed development area is located within catchment 'A', with stormwater run-off, up to the 100yr ARI, discharging to the Village Green detention basin. This basin has an approximate volume of 15,000m^3 and recharges the Botany Sands Aquifer, which in turn is used as a source for borewater supply across the site. No detention is required for this area in accordance with the master plan.

The catchment areas from the Campus 2020 Stormwater Strategy are shown below and are also included in Appendix B.



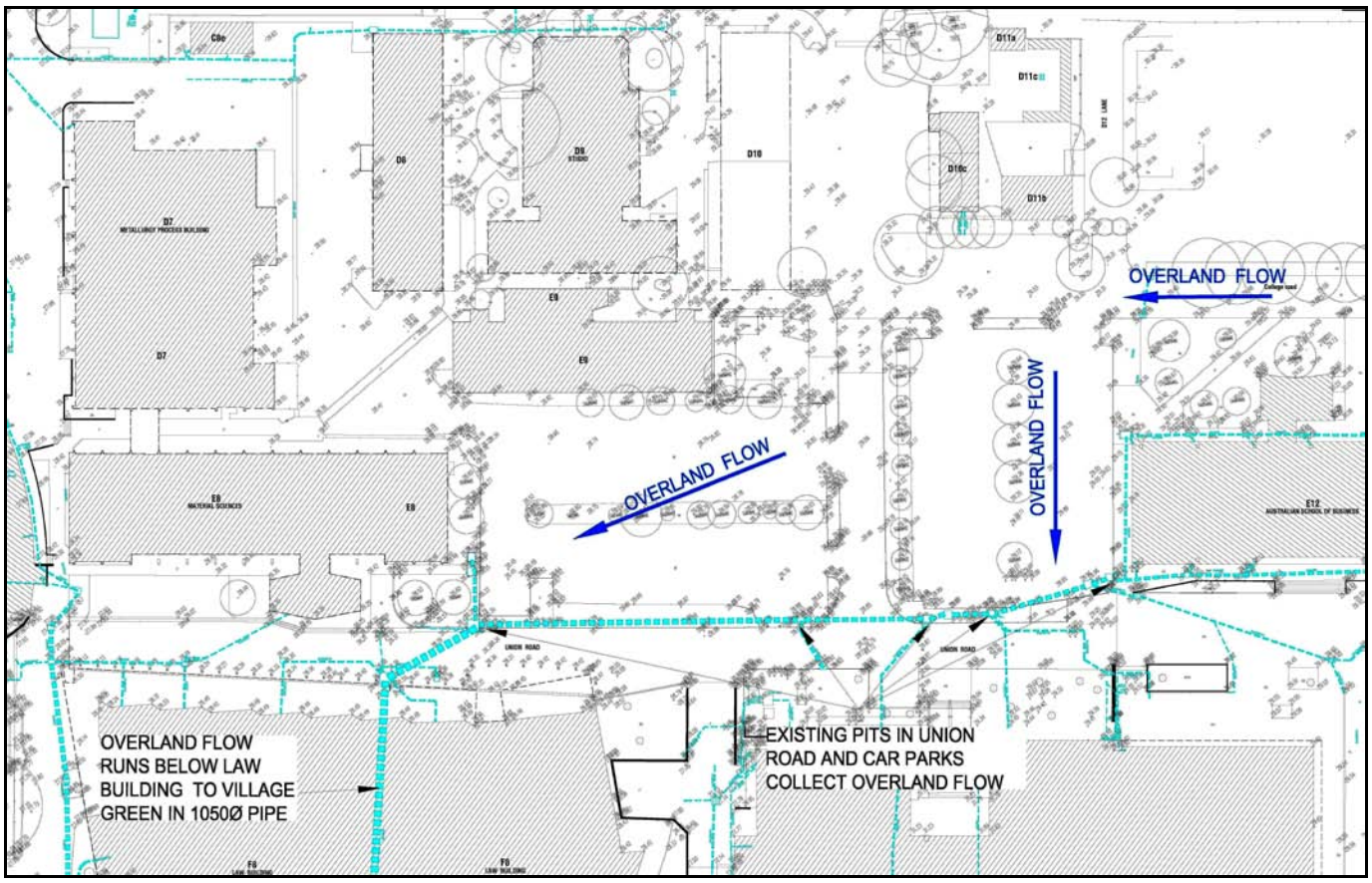
CAMPUS 2020 MASTERPLAN – STORMWATER CATCHMENTS

2.2 OVERLAND FLOW

The Campus 2020 Stormwater Strategy identifies major overland flow paths that cross the proposed site. Overland flow paths run along College Road and cross the two existing car parks. This overland flow is collected by eight large pits located in and around the car parks and along Union Road. These pits transfer the overland flow to a below ground 1050 diameter pipe that runs below the existing law building and discharges to the Village Green detention basin.

This method of conveying overland flow within a below ground pipe has been used for this catchment to ensure that no overland flow up to the 100yr ARI enters the council catchment and stormwater system along Anzac Parade.

The Campus 2020 Stormwater Strategy also identifies a formal diversion structure that exists on Union Road. Levels are raised around the Applied Science loading dock entry to prevent flooding up to the 100yr ARI. Proposed levels around this area will be designed to ensure that the risk of flooding to this loading dock is not increased. A minimum freeboard of 300mm is provided in accordance with Randwick Council guidelines. The HGL for the 100year ARI at this location is RL28.20m and the level of the entrance to the loading dock is at RL28.90m.



EXISTING OVERLAND FLOW

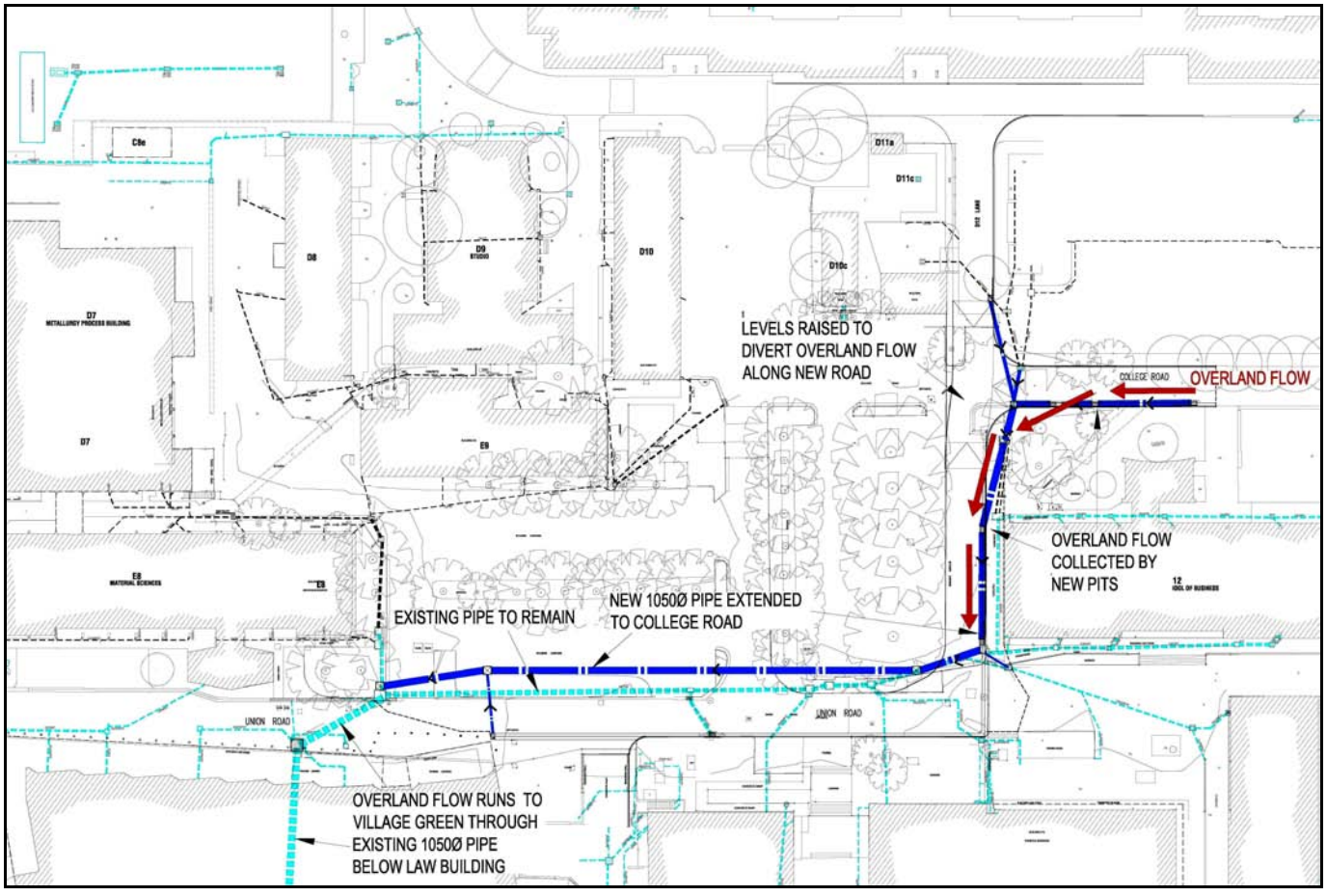
2.3 PROPOSED STORMWATER

The proposed future development of the Lower Campus will potentially block existing overland flow paths and lead to an increased flood risk to future and existing buildings.

However, to ensure that flood risk is not increased, the overland flow in the existing 1050 diameter pipe will be maintained, and it is proposed that the overland flow is captured further upstream. Eight new pits will be installed within College Road and along the new road between 3rd Avenue and Union Road. These pits will be designed to capture all of the overland flow before it reaches the Applied Science loading dock on Union Road. The design of these pits will include a blockage factor of 50%.

The existing stormwater pipe has not been designed to capture this overland flow further upstream, and it is therefore proposed to construct a new 1050 diameter pipe up to College Road. This new pipe will run parallel to the existing stormwater pipe along Union Road, and will provide more than enough capacity to convey the overland flow during a 100 yr ARI storm. Stormwater runoff from the new road and future Lower Campus area will connect to the new 1050 diameter pipe.

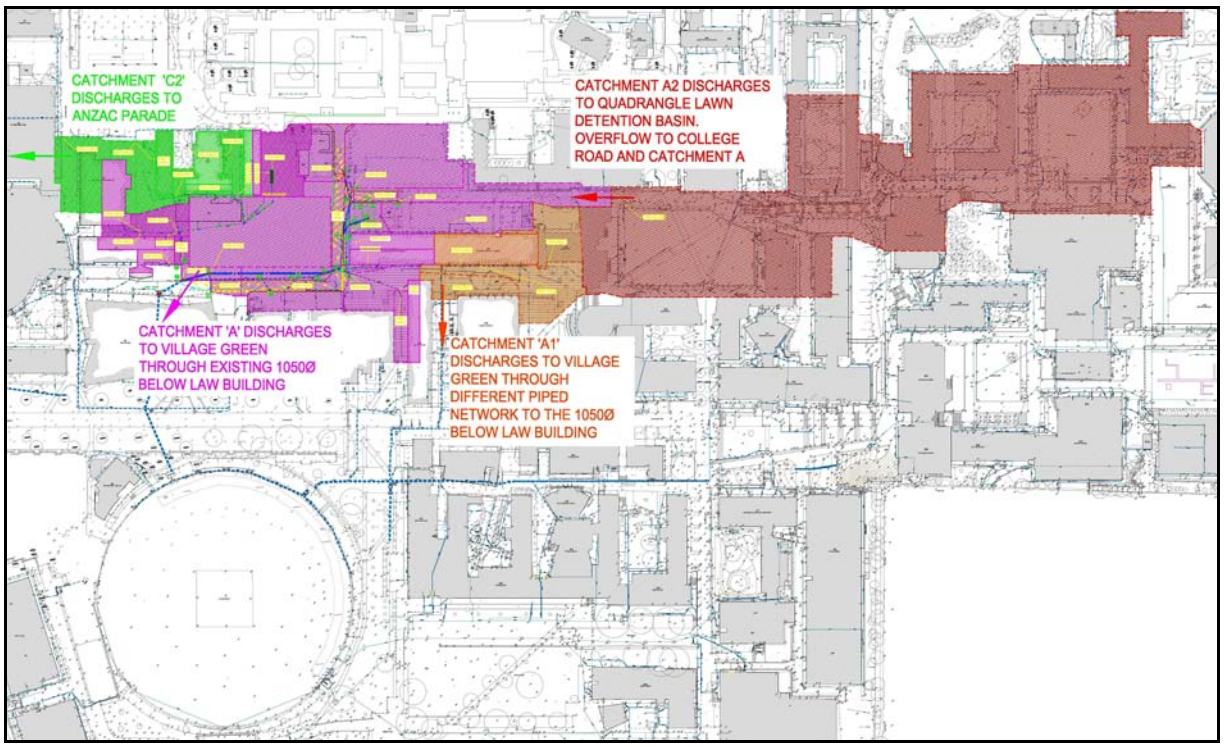
Levels around the new road and along College Road will be designed to ensure that the overland flow ponds around the new pits, and is kept away from existing buildings. Details of the proposed levels and stormwater are included in Appendix C.



PROPOSED OVERLAND FLOW

2.4 STORMWATER ANALYSIS

Stormwater runoff from lower campus area will remain unchanged in principle following the development. The existing catchments are maintained with all areas draining to the 1050 diameter pipe and towards the Village Green Detention Basin.



PROPOSED CATCHMENTS

An initial catchment analysis and DRAINS model have been made to determine pipe flows and overland flows for the proposed works. This analysis will be independently reviewed by UNSW Facilities Management Department, and is included in Appendix D.

INITIAL DRAINS ANALYSIS

Prepared by:
TAYLOR THOMSON WHITTING (NSW) PTY LTD

Eirian Crabbe
Senior Civil Engineer

Authorised by:
TAYLOR THOMSON WHITTING (NSW) PTY LTD

Stephen Brain
Civil Technical Director

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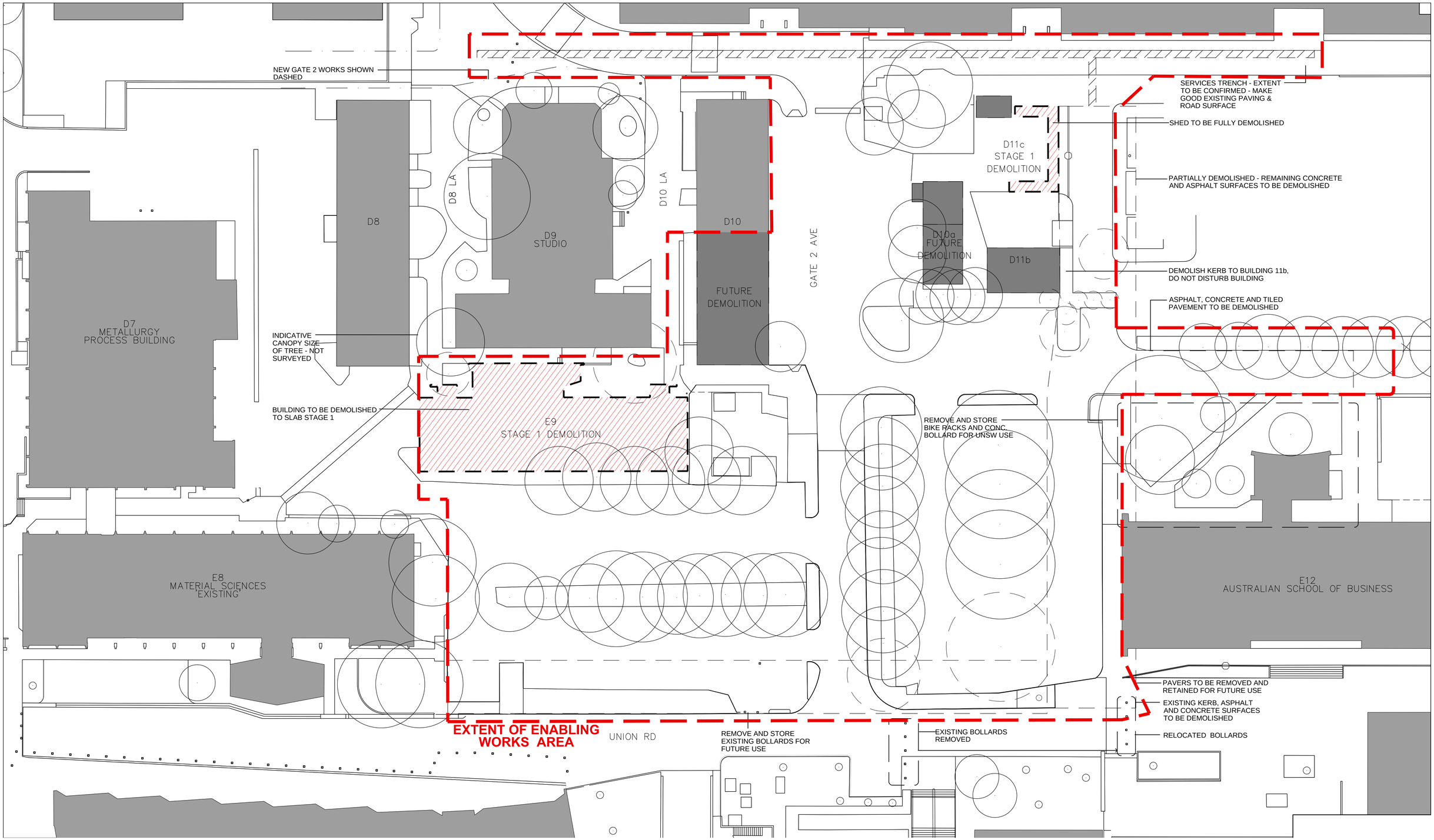
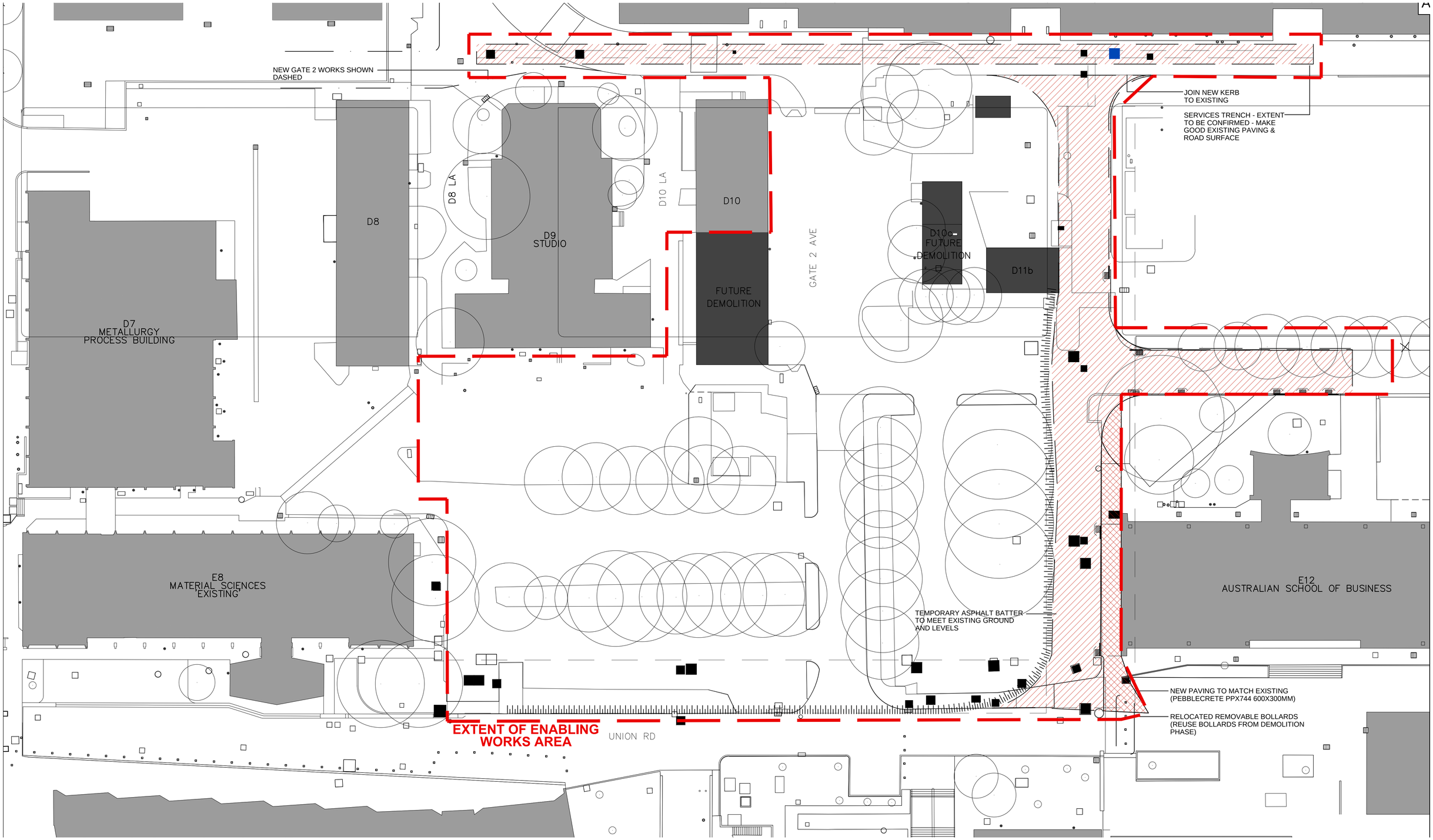
APPENDIX A: EXTRACTS OF DEMOLITION AND PROPOSED WORK PLANS



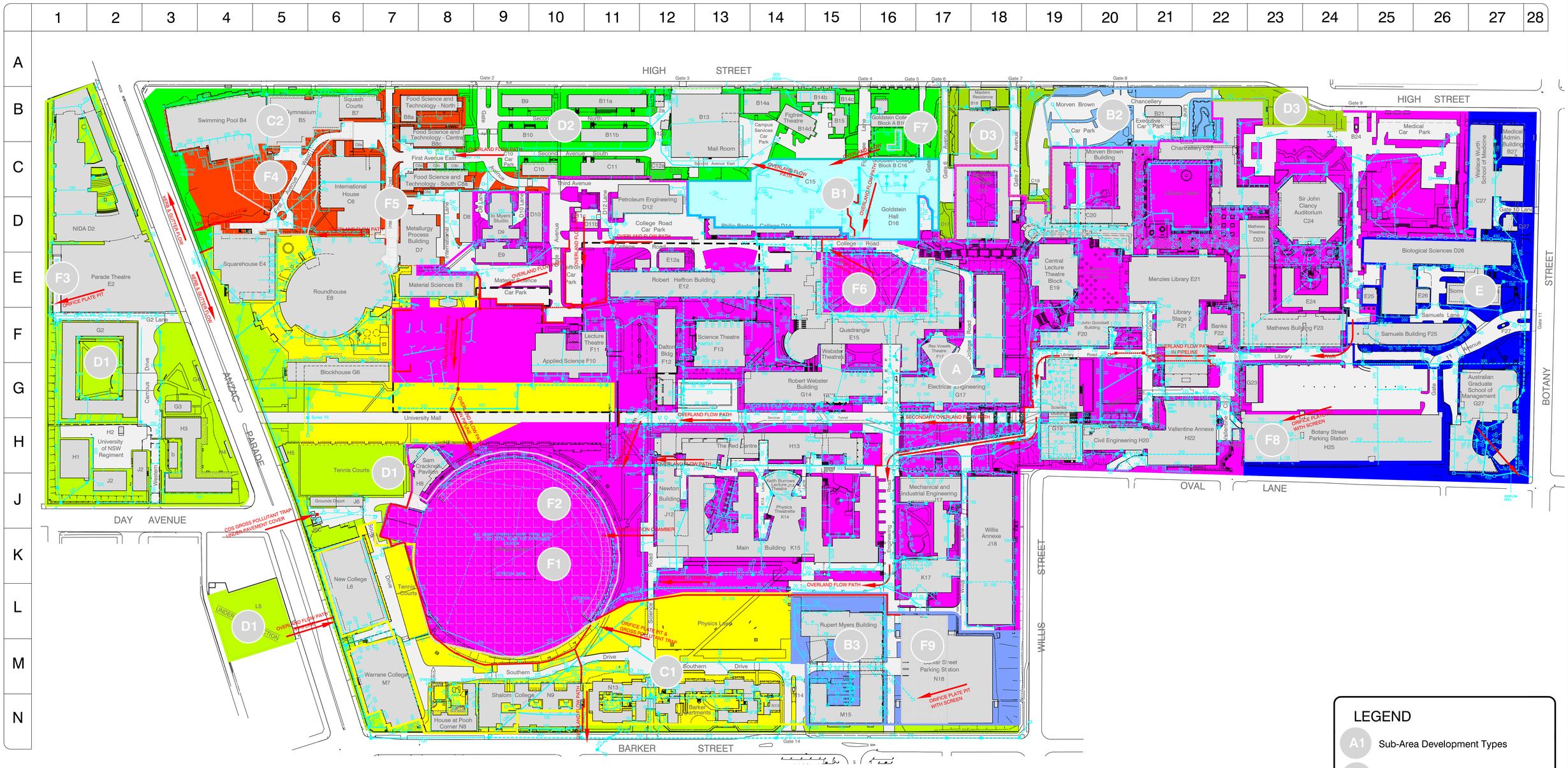
EXTRACT OF GRIMSHAW DEMOLITION PLAN A02-2001



EXTRACT OF GRIMSHAW NEW WORKS PLAN A02-2003

APPENDIX B: CAMPUS 2020 MASTERPLAN –

STORMWATER CATCHMENT PLAN



MAIN AREA GROUP CHARACTERISTICS

AREA 'A'	100 yr ARI to Village Green detention basin.
AREAS 'B'	100 yr ARI to Council land
AREAS 'C'	5 yr ARI to Council piped drainage
AREAS 'D'	Roof water to local percolation trenches
AREA 'E'	Requires full detention
AREAS 'F'	Detention basins 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 & gutter. 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 basin F7 and diversion structures.
AREA 'D3'	20yr ARI to Council kerb. 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 trentches 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.
AREA 'F2'	Percolation chamber serving Village Green detention catchment, to be maintained and permanently retained.
AREA 'F3'	Percolation / detention tank serving NIDA roof water discharge, to be maintained and permanently retained in some form.
AREA 'F4'	5 yr ARI surcharge basin for stormwater surcharge pits in First Avenue West. Encroaches onto Swimming Pool Lawn. Must be maintained, and raintained in some form.
AREA 'F5'	5 yr ARI surcharge basin for stormwater surcharge pits in International Road. Must be raintained 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 raintained 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:

1. Campus 2020 Master Plan Stormwater Strategy document
2. Stormwater Diversion Structure Plan

ANA TECHNICAL SERVICES PTY LTD
Water and Wastewater Solutions
18 Currong Circuit, Terrey Hills NSW 2084
Telephone (02) 9450 2423

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

No.	DATE	DRAWN	CHKD	AMENDMENT
1	22.11.05	RJA	RJA	Updatd with RCC Development Engineer's comments

SCALE 0 10 20 30 40 50 75 Metres — UNSW GRID

Approved — Job Number

THE UNIVERSITY OF NEW SOUTH WALES
FACILITIES MANAGEMENT

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

APPENDIX C: PROPOSED STORMWATER PLANS

UNIVERSITY OF NEW SOUTH WALES

LOWER CAMPUS DEVELOPMENT ENABLING WORKS

GENERAL NOTES

1. Contractor must verify all dimensions and existing levels on site prior to commencement of works. Any discrepancies to be reported to the Engineer
2. Strip all topsoil from the construction area. All stripped topsoil shall be disposed of off-site unless directed otherwise.
3. Make smooth connection with all existing works.
4. Compact subgrade under buildings and pavements to minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1. Compaction under buildings to extend 2m minimum beyond building footprint.
5. All work on public property, property which is to become public property, or any work which is to come under the control of the Statutory Authority is to be carried out in accordance with the requirements of the relevant Authority. The Contractor shall obtain these requirements from the Authority. Where the requirements of the Authority are different to the drawings and specifications, the requirements of the Authority shall be applicable.
6. For all temporary batters refer to geotechnical recommendations.

REFERENCE DRAWINGS

1. These drawings have been based from, and to be read in conjunction with the following Consultants drawings. Any conflict to the drawings must be notified immediately to the Engineer.

Consultant	Dwg Title	Dwg No	Rev	Date
GRIMSHAW	PROPOSED INGROUND SERVICES	A02-2002	4	
GRIMSHAW	PROPOSED HARD SURFACES	A02-2003	4	
GRIMSHAW	DEMOLITION PLAN-STAGE 1	A02-2001	4	
BNMH	PROPOSED FLOOR PLAN	W001	A	25.07.12

STORMWATER DRAINAGE NOTES

1 Stormwater Design Criteria :
- (A) Average recurrence interval –
  - 1:100 years for roof drainage to first external pit
  - 1:20 years for paved and landscaped areas
- (B) Rainfall intensities –
  - Time of concentration: 6 minutes
  - 1:100 years = 255 mm/hr
  - 1:20 years = 200 mm/hr
- (C) Runoff coefficients –
  - Roof areas: C_{100} = 1.00
  - Roads and paved areas: C_{20} = 0.95
  - Landscaped areas: C_{20} = 0.64

2. Pipes 300 dia and larger to be reinforced concrete Class "2" approved spigot and socket with rubber ring joints U.N.O.
3. Pipes up to 300 dia shall be sewer grade uPVC with solvent welded joints.
4. Equivalent strength VCP or FRP pipes may be used subject to approval.
5. Precast pits may be used external to the building subject to approval by UNSW Facilities management
6. Enlargers, connections and junctions to be manufactured fittings where pipes are less than 300 dia.
7. Where subsoil drains pass under floor slabs and vehicular pavements, unslotted uPVC sewer grade pipe is to be used. All subgrades are assumed to be free-draining, where no free-draining subgrade is present, contact Engineer and allow for subsoil drainage.
8. Grates and covers shall conform with AS 3996-2006, and AS 1428.1 for access requirements.
9. Pipes are to be installed in accordance with AS 3725. All bedding to be type H2 U.N.O.
10. Care is to be taken with levels of stormwater lines. Grades shown are not to be reduced without approval.
11. All stormwater pipes to be 150 dia at 1.0% min fall U.N.O.
12. Subsoil drains to be slotted flexible uPVC U.N.O.
13. Adopt invert levels for pipe installation (grades shown are only nominal).

PIT SCHEDULE

Note: Grate size does not necessarily reflect pit size, refer pit type details, shown on detail sheets – **C05,C06**
Final internal pit dimensions are to comply with AS3500

Type	Description	Cover (Clear Opening)	Number
A	Kerb inlet pit 3600 lintel	450 x 900 Class D galvanised mild steel grate hinged to frame	10,11
B	Kerb inlet pit 3600 lintel	450 x 900 Class D galvanised mild steel grate hinged to frame	4,5,6,7,8,9
C	Junction pit	600 x 900 Class D cover with paver infill to architect specification	1,2,3
D	Surface inlet pit	600 x 900 Class D galvanised mild steel grate hinged to frame	20,21,22, 23,24

SURVEY AND SERVICES INFORMATION

SURVEY

Origin of levels : PM S1310, RL 30.814(AHD)
Datum of levels : A.H.D. AUSTRALIAN HEIGHT DATUM
Coordinate system : MGA
Survey prepared by : CRUX SURVEYING
Setout Points : CONTACT THE SURVEYOR

Taylor Thomson Whitting does not guarantee that the survey information shown on these drawings is accurate and will accept no liability for any inaccuracies in the survey information provided to us from any cause whatsoever.

UNDERGROUND SERVICES - WARNING

The locations of underground services shown on Taylor Thomson Whittings drawings have been plotted from diagrams provided by service authorities. This information has been prepared solely for the authorities own use and may not necessarily be updated or accurate.

The position of services as recorded by the authority at the time of installation may not reflect changes in the physical environment subsequent to installation.

Taylor Thomson Whitting does not guarantee that the services information shown on these drawings shows more than the presence or absence of services, and will accept no liability for inaccuracies in the services information shown from any cause whatsoever.

The Contractor must confirm the exact location and extent of services prior to construction and notify any conflict with the drawings immediately to the Engineer/Superintendent.

The contractor is to get approval from the relevant state survey department, to remove/adjust any survey mark. This includes but is not limited to; State Survey Marks (SSM), Permanent Marks (PM), cadastral reference marks or any other survey mark which is to be removed or adjusted in any way.
Taylor Thomson Whitting plans do not indicate the presence of any survey mark. The contractor is to undertake their own search.

BOUNDARY AND EASEMENT NOTE

The property boundary and easement locations shown on Taylor Thomson Whitting drawing's have been based from information received from : No boundary information received.
Refer architect for boundary information and locations

Taylor Thomson Whitting makes no guarantees that the boundary or easement information shown is correct.
Taylor Thomson Whitting will accept no liabilities for boundary inaccuracies. The contractor/builder is advised to check/confirm all boundaries in relation to all proposed work prior to the commencement of construction. Boundary inaccuracies found are to be reported to the superintendent prior to construction starting.

KERBING NOTES

Includes all kerbs, gutters, dish drains, crossings and edges.

1. All kerbs, gutters, dish drains and crossings to be constructed on minimum 75mm granular basecourse compacted to minimum 98% modified maximum dry density in accordance with AS 1289 5.2.1.
2. Expansion joints (EJ) 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 12m centres except for integral kerbs where the expansion joints are to match the joint locations in slabs.
3. Weakened plane joints to be min 3mm wide and located at 3m centres except for integral kerbs where weakened plane joints are to match the joint locations in slabs.
4. Broomed finished to all ramped and vehicular crossings, all other kerbing or dish drains to be steel float finished.
5. In the replacement of kerbs –
   Existing road pavement is to be sawcut 900mm from lip of gutter. Upon completion of new kerbs, new basecourse and surface is to be laid 900mm wide to match existing materials and thicknesses.
   Existing allotment drainage pipes are to be built into the new kerb with a 100mm dia hole.
   Existing kerbs are to be completely removed where new kerbs are shown.

SITEWORKS LEGEND

- F22.20 — Finished surface level
- 22.00 — Finished contour
- K&G — Kerb and gutter
- KO — Kerb only
- FK — Flush kerb
- DD — Dish drain
- IL10.00 / 600 ø 'Z' / 1.25% / Q=345 L/s / IL9.65 — Stormwater pit, flow direction and line with; Invert level upstream, Pipe size and class, Pipe grade, Flow (Litres per second), Invert level downstream
- IR — Intermediate riser with subsoil drainage line (100 dia)
- FP — Flushing point with subsoil drainage line (100 dia)
- Overland flow

CONCRETE NOTES

EXPOSURE CLASSIFICATION : External : B1

CONCRETE

Place concrete of the following characteristic compressive strength f'c as defined in AS 1379.

Location	AS 1379 f'c MPa at 28 days	Specified Slump	Nominal Agg. Size
X Footpaths, pits, kerbs	S25	80	20

1. Use Type 'GP' cement, unless otherwise specified.
2. All concrete shall be subject to project assessment and testing to AS 1379.
3. Consolidate by mechanical vibration. Cure all concrete surfaces as directed in the Specification.
4. For all falls in slab, drip grooves, reglets, chamfers etc. refer to Architects drawings and specifications.
5. Unless shown on the drawings, the location of all construction joints shall be submitted to Engineer for review.
6. No holes or chases shall be made in the slab without the approval of the Engineer.
7. Conduits and pipes are to be fixed to the underside of the top reinforcement layer.
8. Slurry used to lubricate concrete pump lines is not to be used in any structural members.
9. All slabs cast on ground require sand blinding with a Concrete Underlay
10. (170) Indicates Slab or Band thickness variation.

FORMWORK

1. The design, certification, construction and performance of the formwork, falsework and backropping shall be the responsibility of the contractor. Proposed method of installation and removal of formwork is to be submitted to the superintendent for comment prior to work being carried out.

SITEWORKS NOTES

1. All basecourse material to comply with RTA specification No 3051 and compacted to minimum 98% modified standard dry density in accordance with AS 1289 5.2.1.
2. All trench backfill material shall be compacted to the same density as the adjacent material.
3. All service trenches under vehicular pavements shall be backfilled with an approved select material and compacted to a minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1

PAVEMENT LEGEND

NOTES

1. Asphaltic concrete shall conform to AS2150 and the specification
2. Pavements based on assumed 5% CBR. To be confirmed with on site testing.

P1
50mm Thickness asphaltic concrete (AC10) on
150mm Compacted thickness fine crushed rock (DGB20) on
200mm Compacted thickness fine crushed rock (DGS40)
(5%) CBR subgrade assumed

Pedestrian

P2
40mm Pavers to Architects specification on
30mm Thick mortar bedding on
100mm Thickness concrete (f'c=32MPa) with SL72 fabric (40 top cover) on
150mm Compacted thickness fine crushed rock (DGB20)

Trafficked

P3
60mm Pavers to Architects specification on
30mm Thick mortar bedding on
160mm Thickness concrete (f'c=32MPa) with SL72 fabric (40 top cover) on
200mm Compacted thickness fine crushed rock (DGB20)

SAFETY IN DESIGN

The Contractor is to refer to the specification for the Civil Risk and Solutions Register.

EXISTING SERVICES
Contractor to be aware existing services are located within the site. Location of all services to be verified by Contractor prior to commencing works. Contractor to confirm with relevant authority regarding measures to be taken to ensure services are protected or procedures are in place to demolish and/or relocate.

EXISTING STRUCTURES
Contractor to be aware existing structures exist within the site. To prevent damage to existing structure(s) and/or personnel, site works to be carried out as far as practicably possible from existing structure(s).

EXISTING TREES
Contractor to be aware existing trees exist within the site which need to be protected. To prevent damage to trees and/or personnel, site works to be carried out as far as practicably possible from existing trees.
Advice needs to be sought from Arborist and/or Landscape Architect on measures required to protect trees.

GROUNDWATER
Contractor to be aware ground water is likely in close proximity to existing surface level. Likely temporary de-watering will be required during construction works.

EXCAVATIONS
Deep excavations due to stormwater drainage works are required. Contractor to ensure safe working procedures are in place for works. All excavations to be fenced off and batters adequately supported to approval of Geotechnical Engineer.

GROUND CONDITIONS
Contractor to be aware of the site geotechnical conditions. Refer to report (insert report details) for details.

HAZARDOUS MATERIALS
Contractor to be aware hazardous materials such as cement/concrete and bituminous materials are required to be used during construction. Contractor to ensure all hazardous materials are identified prior to commencing works. Safe working practises as per relevant authority to be adopted and appropriate PPE to be used when handling all hazardous materials.

CONFINED SPACES
Contractor to be aware of potential hazard due to working in confined spaces in stormwater pits, trenches and/or tanks. Contractor to provide safe working methods and use appropriate PPE when entering confined spaces

MANUAL HANDLING
Contractor to be aware manual handling is required during construction. Contractor to take appropriate measures to ensure manual handling procedures and assessments are in place prior to commencing works

WATER POLLUTION
Contractor to ensure all measures taken to prevent pollutants from construction works contaminating surrounding environment.
Site egress /interface with public
Contractor to be aware site works will occur in close proximity to footpaths and roadways. Contractor to erect appropriate barriers and signage to protect site personnel and public.

VEHICLE MOVEMENT
Contractor to supply and comply with traffic management plan and provide adequate site traffic control including trained banksman to supervise vehicle movements where necessary

REINFORCEMENT NOTES

1. Fix reinforcement as shown on drawings. The type and grade is indicated by a symbol as shown below. On the drawings this is followed by a numeral which indicates the size in millimetres of the reinforcement.

N.	Hot rolled ribbed bar	grade D500N
R.	Plain round bar	grade R250N
SL.	Square mesh	grade 500L
RL.	Rectangular mesh	grade 500L

2. Provide bar supports or spacers to give the following concrete cover to all reinforcement unless otherwise noted on drawings.

Footings	40 top, 40 bottom, 40 sides.
Slabs	40 top, 40 bottom, 40 when exposed to weather or ground.
Walls	40 generally 40 when cast in forms but later exposed to weather or ground. 40 when cast directly in contact with ground.

3. Cover to reinforcement ends to be 50 mm u.n.o.
4. Provide N12–450 support bars to top reinforcement as required, Lap 500 U.N.O.
5. Maintain cover to all pipes, conduits, reglets, drip grooves etc
6. All cogs to be standard cogs unless noted otherwise.
7. Fabric end and side laps are to be placed strictly in accordance with the manufacturers requirements to achieve a full tensile lap. Fabric shall be laid so that there is a maximum of 3 layers at any location.

8. Laps in reinforcement shall be made only where shown on the drawings unless otherwise approved. Lap lengths as per table below.

TENSION LAPS

BAR SIZE	TOP BARS IN BANDS AND BEAMS	ALL OTHER BARS
N12	570	480
N16	800	700
N20	1150	950
N24	1500	1250
N28	1850	1500
N32	2250	1800
N36	2700	2100

COMPRESSION LAPS

BAR SIZE	COLUMNS 32 MPa	COLUMNS 40 MPa	COLUMNS 50 MPa
N16	640	640	640
N20	850	800	800
N24	1110	1000	960
N28	1400	1250	1125
N32	1710	1525	1360
N36	2040	1825	1640

ASSUMPTIONS

TOP BARS IN BANDS AND BEAMS
1. More than 300mm of concrete below the bar.
2. Minimum cover of 25mm and minimum stirrup size of N12 giving Cd=37mm; therefore minimum clear spacing between bars = 2 x Cd = 74mm. Minimum cover is based on the new A2 exposure classification for interior, non-residential which requires 25mm cover for 32MPa concrete.
3. f'c = 32MPa minimum.

ALL OTHER BARS
1. Less than 300mm of concrete below the bar.
2. Minimum cover of 25mm giving Cd = 25mm; therefore minimum clear spacing between bars = 2 x Cd = 50mm.
3. f'c = 32MPa

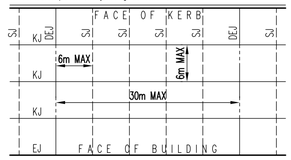
TENDER NOTES

1. These drawings are preliminary drawings issued for tender as an indication of the extent of works only. They are not a complete construction set of drawings.
2. To determine the full extent of work, these drawings shall be read in conjunction with the architectural drawings and other contract documents.
   Allow for all items shown on architectural and other drawings as not all items are shown on the structural/civil works drawings.
3. Should any ambiguity, error, omissions, discrepancy, inconsistency or other fault exist or seem to exist in the documents, immediately notify in writing to the Superintendent.
4. Rates shown on the drawings are for the final structure/civil works in place and do not allow for any wastage, rolling margins, over supply or fabrication requirements. etc.

JOINTING NOTES

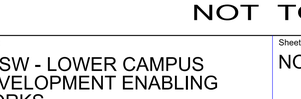
Vehicular Pavement Jointing

1. All vehicular pavements to be jointed as shown on drawings.
2. Keyed construction joints should generally be located at a maximum of 6m centres.
3. Sawn joints should generally be located at a maximum of 6m centres or 1.5 x the spacing of keyed joints, where key joint spacing is less than 4m, with dowelled expansion joints at maximum of 30m centres.
4. Provide 10mm wide full depth expansion joints between buildings and all concrete or unit pavers.
5. The timing of the saw cut is to be confirmed by the contractor on site. Site conditions will determine how many hours after the concrete pour before the saw cuts are commenced. Refer to the specification for weather conditions and temperatures required.
6. Vehicular pavement jointing as follows.



Pedestrian Footpath Jointing

1. Expansion joints are to be located where possible at tangent points of curves and elsewhere at max 6.0m centres.
2. Weakened plane joints are to be located at a max 1.5 x width of the pavement.
3. Where possible joints should be located to match kerbing and / or adjacent pavement joints.
4. All pedestrian footpath jointings as follows (uno).



CIVIL DRAWING LIST

Drawing No	Drawing Title
C01	NOTES AND LEGENDS SHEET
C02	EXISTING STORMWATER AND SURVEY PLAN
C03	EROSION AND SEDIMENT CONTROL PLAN
C04	SITEWORKS AND STORMWATER PLAN
C05	DETAILS SHEET 1
C06	DETAILS SHEET 2
C07	TURNING PATH - 19.0m ARTICULATED

FileName: C01.dwg - USER: wwdyw - Plot File Created: Nov 26, 2012 - 2:01pm

A1 0 1 2 3 4 5 6 7 8 9 10

ISSUE FOR TENDER ONLY
NOT TO BE USED FOR CONSTRUCTION

Rev	Description	Eng	Draft	Date
B	ISSUE FOR TENDER	EC	WW	26.11.12
A	ISSUE FOR TENDER	EC	WW	27.09.12

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Project
UNSW - LOWER CAMPUS DEVELOPMENT ENABLING WORKS

Sheet Subject
NOTES AND LEGENDS SHEET

Scale : A1
NTS
Drawn
WW
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Job No
111144
Drawing No
C01
Revision
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