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File reference

Subject Flood Risk Assessment for Inclusion of St Georges Terrace Building into Powerhouse at Parramatta Site

1 Introduction

This technical note is in response to further clarification raised by the Department of Planning, Industry and Environment regarding the retention of St George's Terrace and its impact in terms of flooding for the Powerhouse Parramatta project.

2 Flood Behaviour Surrounding St George's Terrace Building

The flooding behaviour in the vicinity of the St George's Terrace Building is shown in Appendix J of the Response to Submissions report (Appendix A of that document).

For all floods up to the 1% AEP with climate change, there is no inundation of the St George's Terrace Building predicted by the flood modelling. The previous design included landscaping with levels above the 1% AEP with climate change flood levels.

Hence, the flood behaviour is the same as that shown in the addendum report for all floods up to the 1% AEP with climate change.

For the PMF, the predicted flood behaviour with the building retained is shown in the figures contained within Appendix A of this technical note. Figure P1.7-PMFD-MOF (Issue 3) shows the predicted peak flood levels and depths. Figure P1.7-PMFH-MOF (Issue 3) shows the predicted flood hazards.

3 Flood Risk Assessment for St George's Terrace Building

3.1 Flood Impacts of Retaining St George's Terrace Building

As there is no inundation of the St George's Terrace Building predicted by the flood modelling for all floods up to the 1% AEP with climate change, the retention of these buildings would not change the predicted flood impacts.

Technical Note

3.2 Flood risks for occupants of St George's Terrace Building

The flood risks for occupants and contents of the retained St George's Terrace Building are similar to those for Eastern Building of the Powerhouse Museum. The floor levels are similar with the St George's Terrace Building floor level slightly higher at 7.6mAHD.

The flood elements of the emergency management plan would include provisions for people inside the St George's Terrace Building to be directed to the East Building during a flood evacuation. From here, the occupants would have access to Level 1 of museum building which is above the PMF level (i.e. the same access as for those people in the East Building).

The access from the back of the St George's Terrace Building to the East Building would be across ground that is at or above 7.5mAHD which is the same level as the ground floor of the East Building. In a 1:800 AEP (0.13% AEP) overland flow flood event, there would still be 0.3m of freeboard to this level (i.e. the ground floor would remain 300mm above flood waters in this event).

4 General Design Updates

To reflect the revised site layout, the stormwater plan and erosion and sediment control plans appended to previous report have been updated. These are provided in Appendix B and C respectively of this technical note.

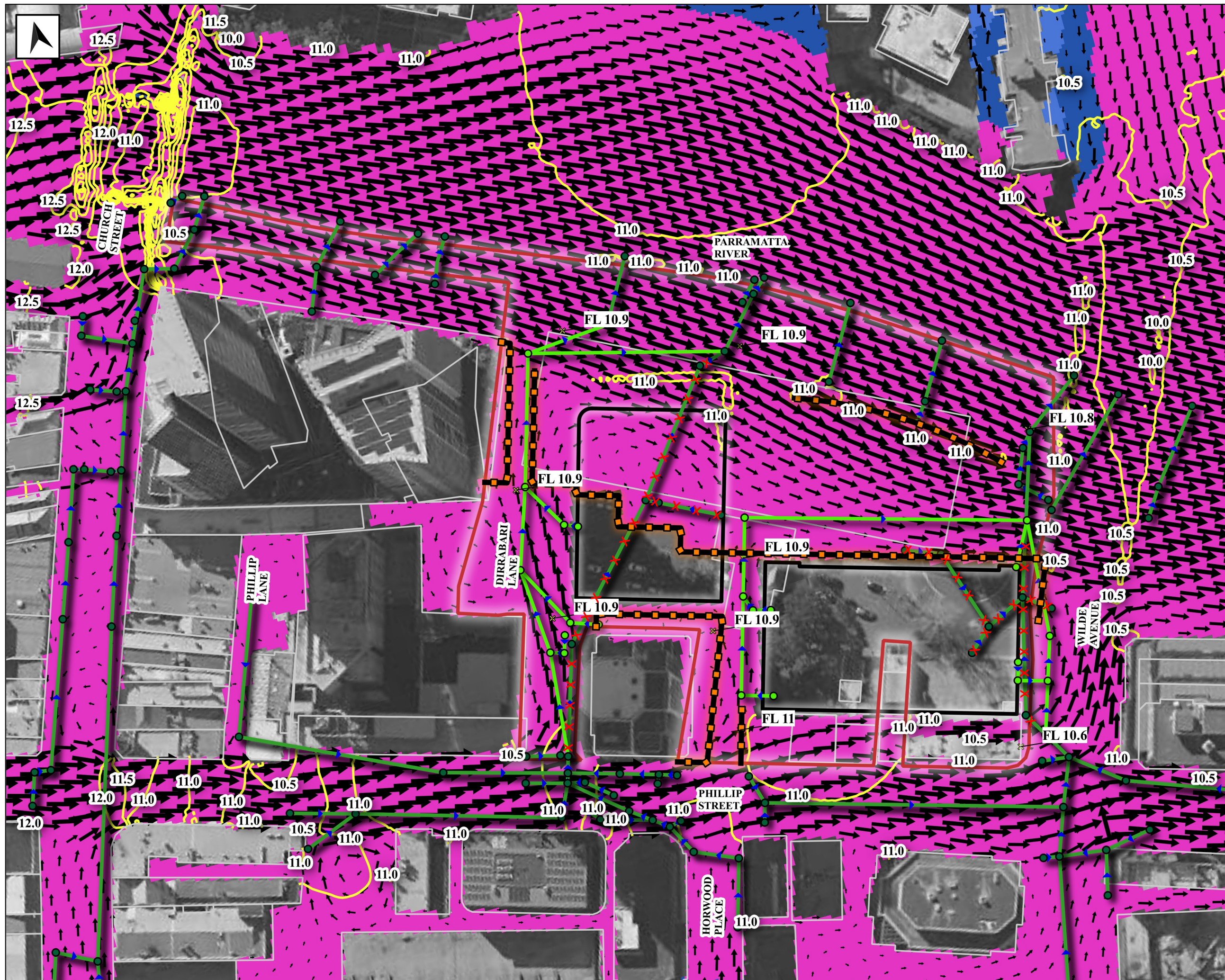
5 Conclusions

The following conclusions are drawn due to the change to the design to include retaining the St Georges Terrace Building:

- There would be no change to the predicted flood impact
- The flood risks for occupants and contents of the retained St George's Terrace Building are similar to those for Eastern Building of the Powerhouse Museum.
- There would need to be minor changes to the flood elements of the emergency management plan to facilitate safe movement of occupants from St George's Terrace to the East Building of Powerhouse Parramatta.

Technical Note

Appendix A – Updated PMF Flood Maps



Legend

- Development Site Boundary
- Powerhouse Building Outline
- Existing Building Outlines
- Post-development Retaining Wall
- Pre-development Pits
- Pre-development Pipes
- Redundant Pits
- Redundant Pipes
- Post-development Pits
- Post-development Pipes
- Flow Direction
- Flood Level (mAHD)
- Peak Flood Level (mAHD)

Peak Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- > 2.00

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3	23/10/2020	AA	NC	EM
2	14/09/2020	AA	NC	EM
Issue	Date	By	Chkd	Appd

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Powerhouse Parramatta
Post-development - River & Overland Flood
Peak Depths and Levels
PMF (4 Hours)

Scale at A3
1:1000
0 25 50 m

Job No 273467	Figure Status Final	Issue 3
Figure No P1.7-PMFD-MOF		



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2	14/09/2020	AA	NC	EM
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Issue	Date	By	Chkd	Appd
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Powerhouse Parramatta
Post-development - River & Overland Flood
Hazard
PMF (4 Hours)

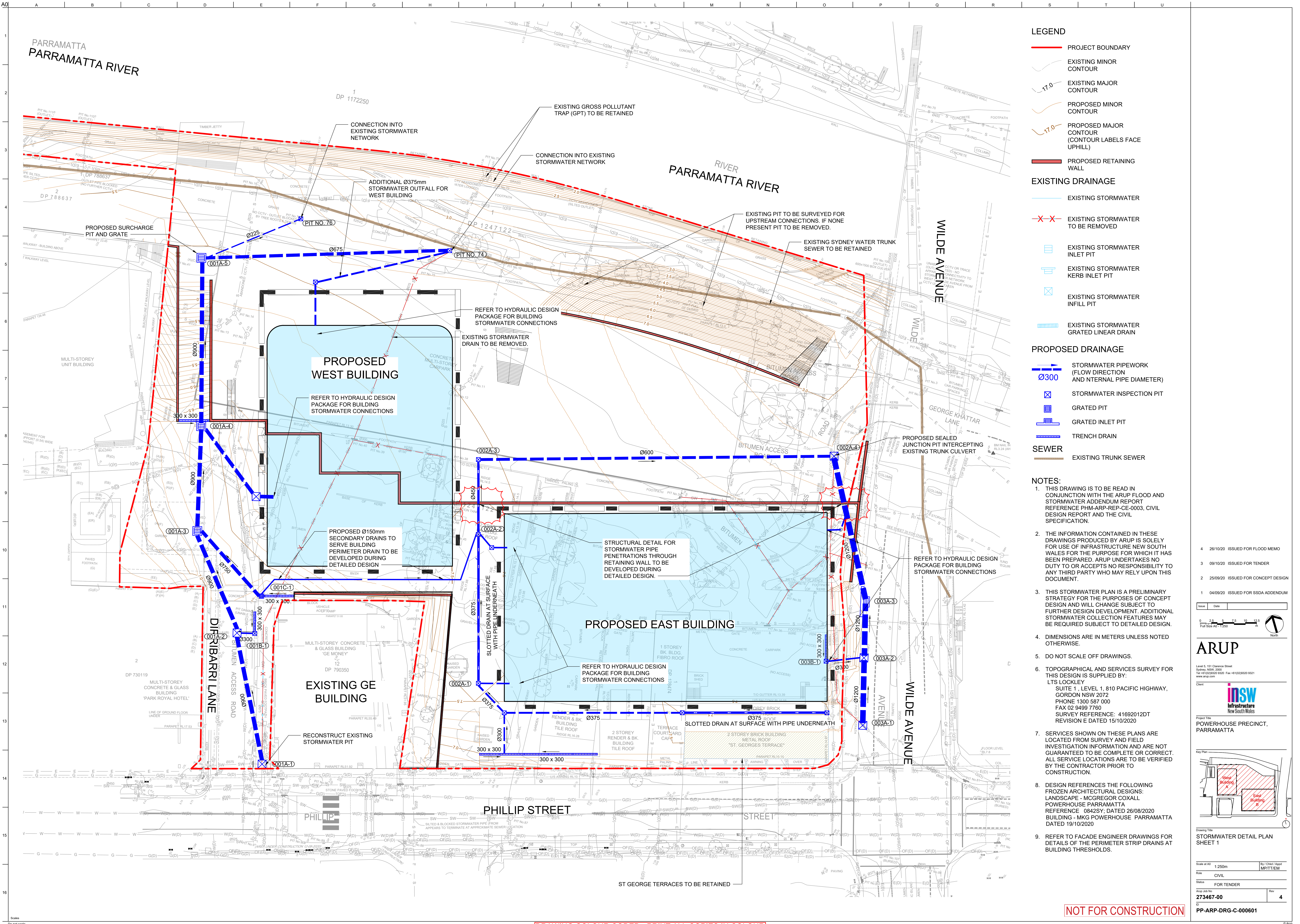


Job No 273467	Figure Status Final
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Figure No P1.7-PMFH-MOF	Issue 3
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Technical Note

Appendix B – Updated Stormwater Management Plan



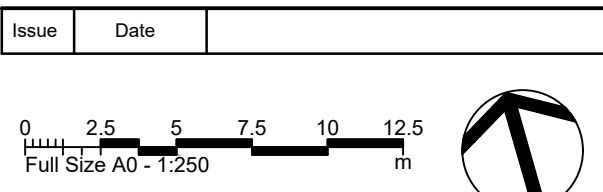
LEGEND

- PROJECT BOUNDARY
- EXISTING MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED MAJOR CONTOUR (CONTOUR LABELS FACE UPHILL)
- PROPOSED RETAINING WALL
- EXISTING DRAINAGE
 - EXISTING STORMWATER
 - EXISTING STORMWATER TO BE REMOVED
 - EXISTING STORMWATER INLET PIT
 - EXISTING STORMWATER KERB INLET PIT
 - EXISTING STORMWATER INFILL PIT
 - EXISTING STORMWATER GRATED LINEAR DRAIN
- PROPOSED DRAINAGE
 - STORMWATER PIPEWORK (FLOW DIRECTION AND INTERNAL PIPE DIAMETER)
 - STORMWATER INSPECTION PIT
 - GRATED PIT
 - GRATED INLET PIT
 - TRENCH DRAIN
- SEWER
 - EXISTING TRUNK SEWER

NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ARUP FLOOD AND STORMWATER ADDENDUM REPORT REFERENCE PHM-ARP-REP-CE-0003, CIVIL DESIGN REPORT AND THE CIVIL SPECIFICATION.
- THE INFORMATION CONTAINED IN THESE DRAWINGS PRODUCED BY ARUP IS SOLELY FOR USE OF INFRASTRUCTURE NEW SOUTH WALES FOR THE PURPOSE FOR WHICH IT HAS BEEN PREPARED. ARUP UNDERTAKES NO DUTY TO OR ACCEPTS NO RESPONSIBILITY TO ANY THIRD PARTY WHO MAY RELY UPON THIS DOCUMENT.
- THIS STORMWATER PLAN IS A PRELIMINARY STRATEGY FOR THE PURPOSES OF CONCEPT DESIGN AND WILL CHANGE SUBJECT TO FURTHER DESIGN DEVELOPMENT. ADDITIONAL STORMWATER COLLECTION FEATURES MAY BE REQUIRED SUBJECT TO DETAILED DESIGN.
- DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
- DO NOT SCALE OFF DRAWINGS.
- TOPOGRAPHICAL AND SERVICES SURVEY FOR THIS DESIGN IS SUPPLIED BY: LITS LOCKLEY
SUITE 1, LEVEL 1, 810 PACIFIC HIGHWAY, CORDON NSW 2072
PHONE 1300 587 000
FAX 02 9499 7760
SURVEY REFERENCE: 41692012DT
REVISION E DATED 15/10/2020
- SERVICES SHOWN ON THESE PLANS ARE LOCATED FROM SURVEY AND FIELD INVESTIGATION INFORMATION AND ARE NOT GUARANTEED TO BE COMPLETE OR CORRECT. ALL SERVICE LOCATIONS ARE TO BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
- DESIGN REFERENCES THE FOLLOWING FROZEN ARCHITECTURAL DESIGNS: LANDSCAPE - MCGREGOR COXALL POWERHOUSE PARRAMATTA REFERENCE 0842SY, DATED 26/08/2020 BUILDING - MKG POWERHOUSE PARRAMATTA DATED 19/10/2020
- REFER TO FACADE ENGINEER DRAWINGS FOR DETAILS OF THE PERIMETER STRIP DRAINS AT BUILDING THRESHOLDS.

4	26/10/20	ISSUED FOR FLOOD MEMO
3	09/10/20	ISSUED FOR TENDER
2	25/09/20	ISSUED FOR CONCEPT DESIGN
1	04/09/20	ISSUED FOR SSDA ADDENDUM

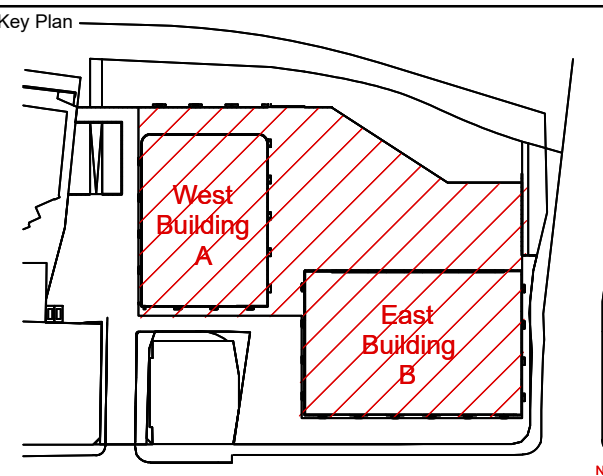


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Project Title
**POWERHOUSE PRECINCT,
PARRAMATTA**



Drawing Title
**STORMWATER DETAIL PLAN
SHEET 1**

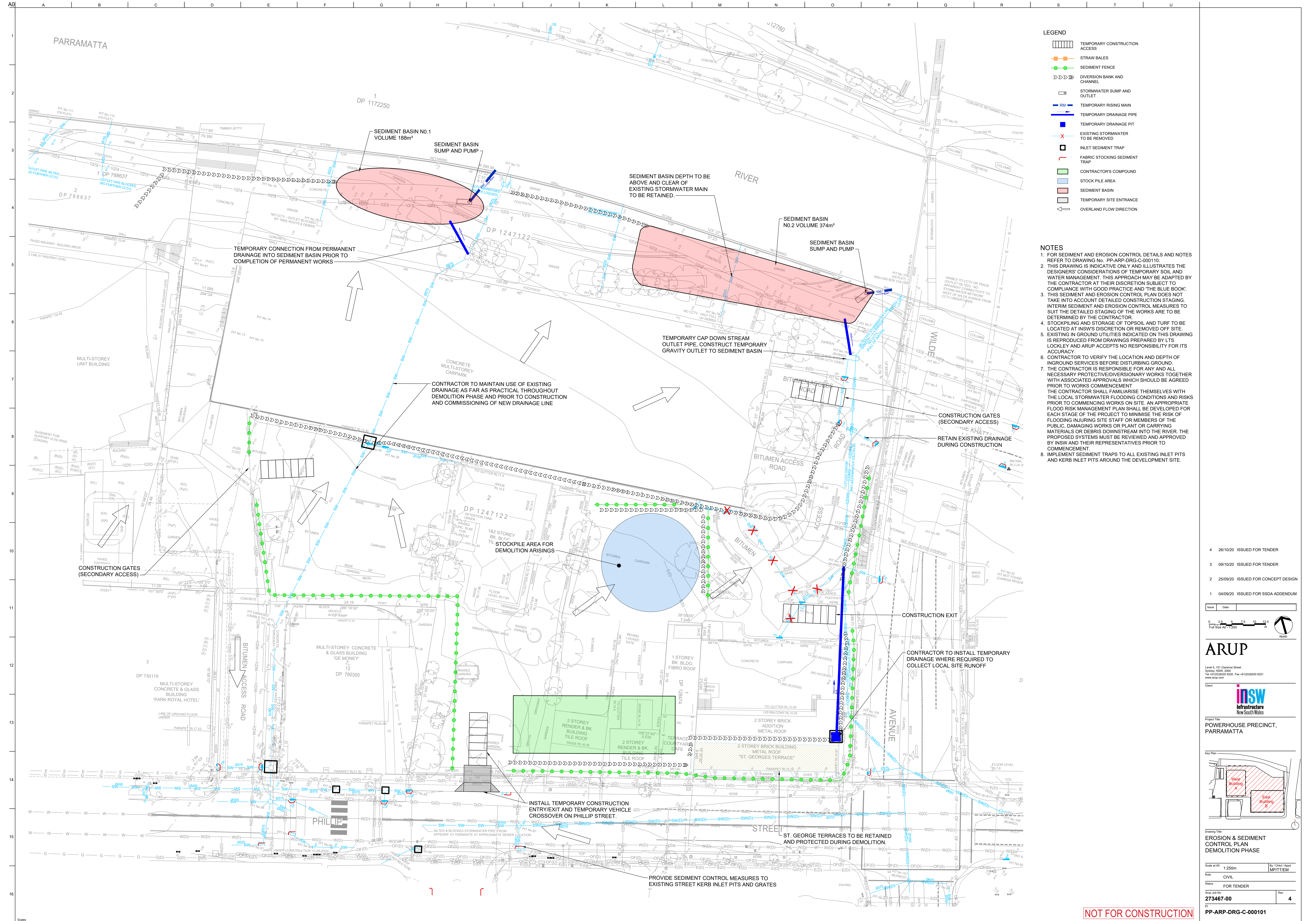
Scale of A0	1:250m	By / Chkd / Appd	MP/T/TEM
Role	CIVIL		
Status	FOR TENDER		
Arup Job No	273467-00		
ID	PP-ARP-DRG-C-000601		4

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Technical Note

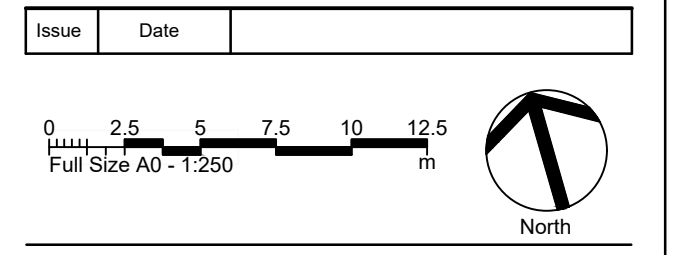
Appendix C – Updated Erosion and Sediment Control Plans



- LEGEND
- TEMPORARY CONSTRUCTION ACCESS
 - STRAW BALES
 - SEDIMENT FENCE
 - DIVERSION BANK AND CHANNEL
 - STORMWATER SUMP AND OUTLET
 - TEMPORARY RISING MAIN
 - TEMPORARY DRAINAGE PIPE
 - TEMPORARY DRAINAGE PIT
 - EXISTING STORMWATER TO BE REMOVED
 - INLET SEDIMENT TRAP
 - FABRIC STOCKING SEDIMENT TRAP
 - CONTRACTOR'S COMPOUND
 - STOCK PILE AREA
 - SEDIMENT BASIN
 - TEMPORARY SITE ENTRANCE
 - OVERLAND FLOW DIRECTION

- NOTES
1. FOR SEDIMENT AND EROSION CONTROL DETAILS AND NOTES REFER TO DRAWING No. PP-ARP-DRG-C-000110.
 2. THIS DRAWING IS INDICATIVE ONLY AND ILLUSTRATES THE DESIGNERS' CONSIDERATIONS OF TEMPORARY SOIL AND WATER MANAGEMENT. THIS APPROACH MAY BE ADAPTED BY THE CONTRACTOR AT THEIR DISCRETION SUBJECT TO COMPLIANCE WITH GOOD PRACTICE AND 'THE BLUE BOOK'.
 3. THIS SEDIMENT AND EROSION CONTROL PLAN DOES NOT TAKE INTO ACCOUNT DETAILED CONSTRUCTION STAGING. INTERIM SEDIMENT AND EROSION CONTROL MEASURES TO SUIT THE DETAILED STAGING OF THE WORKS ARE TO BE DETERMINED BY THE CONTRACTOR.
 4. STOCKPILING AND STORAGE OF TOPSOIL AND TURF TO BE LOCATED AT INSW'S DISCRETION OR REMOVED OFF SITE.
 5. EXISTING IN GROUND UTILITIES INDICATED ON THIS DRAWING IS REPRODUCED FROM DRAWINGS PREPARED BY LTS LOCKLEY AND ARUP ACCEPTS NO RESPONSIBILITY FOR ITS ACCURACY.
 6. CONTRACTOR TO VERIFY THE LOCATION AND DEPTH OF INGROUND SERVICES BEFORE DISTURBING GROUND.
 7. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL NECESSARY PROTECTIVE/DIVERSIONARY WORKS TOGETHER WITH ASSOCIATED APPROVALS WHICH SHOULD BE AGREED PRIOR TO WORKS COMMENCEMENT. THE CONTRACTOR SHALL FAMILIARISE THEMSELVES WITH THE LOCAL STORMWATER FLOODING CONDITIONS AND RISKS PRIOR TO COMMENCING WORKS ON SITE. AN APPROPRIATE FLOOD RISK MANAGEMENT PLAN SHALL BE DEVELOPED FOR EACH STAGE OF THE PROJECT TO MINIMISE THE RISK OF FLOODING INJURING SITE STAFF OR MEMBERS OF THE PUBLIC, DAMAGING WORKS OR PLANT OR CARRYING MATERIALS OR DEBRIS DOWNSTREAM INTO THE RIVER. THE PROPOSED SYSTEMS MUST BE REVIEWED AND APPROVED BY INSW AND THEIR REPRESENTATIVES PRIOR TO COMMENCEMENT.
 8. IMPLEMENT SEDIMENT TRAPS TO ALL EXISTING INLET PITS AND KERB INLET PITS AROUND THE DEVELOPMENT SITE.

4	26/10/20	ISSUED FOR TENDER
3	09/10/20	ISSUED FOR TENDER
2	25/09/20	ISSUED FOR CONCEPT DESIGN
1	04/09/20	ISSUED FOR SSDA ADDENDUM

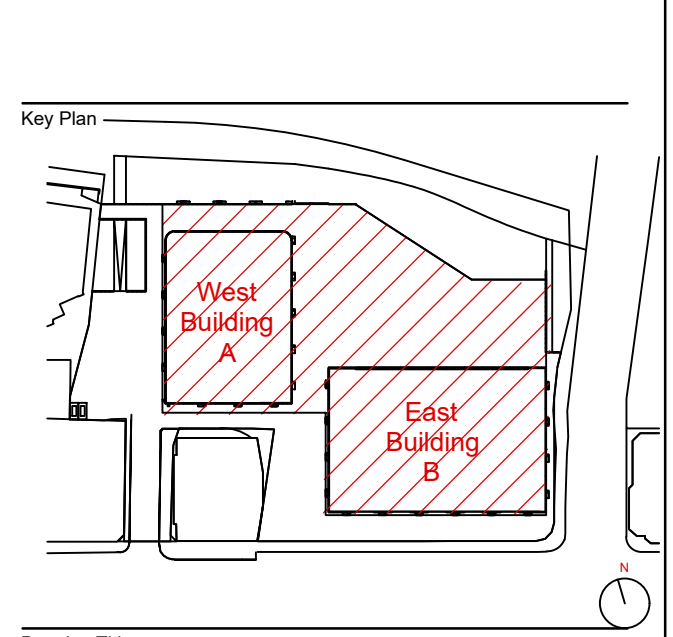


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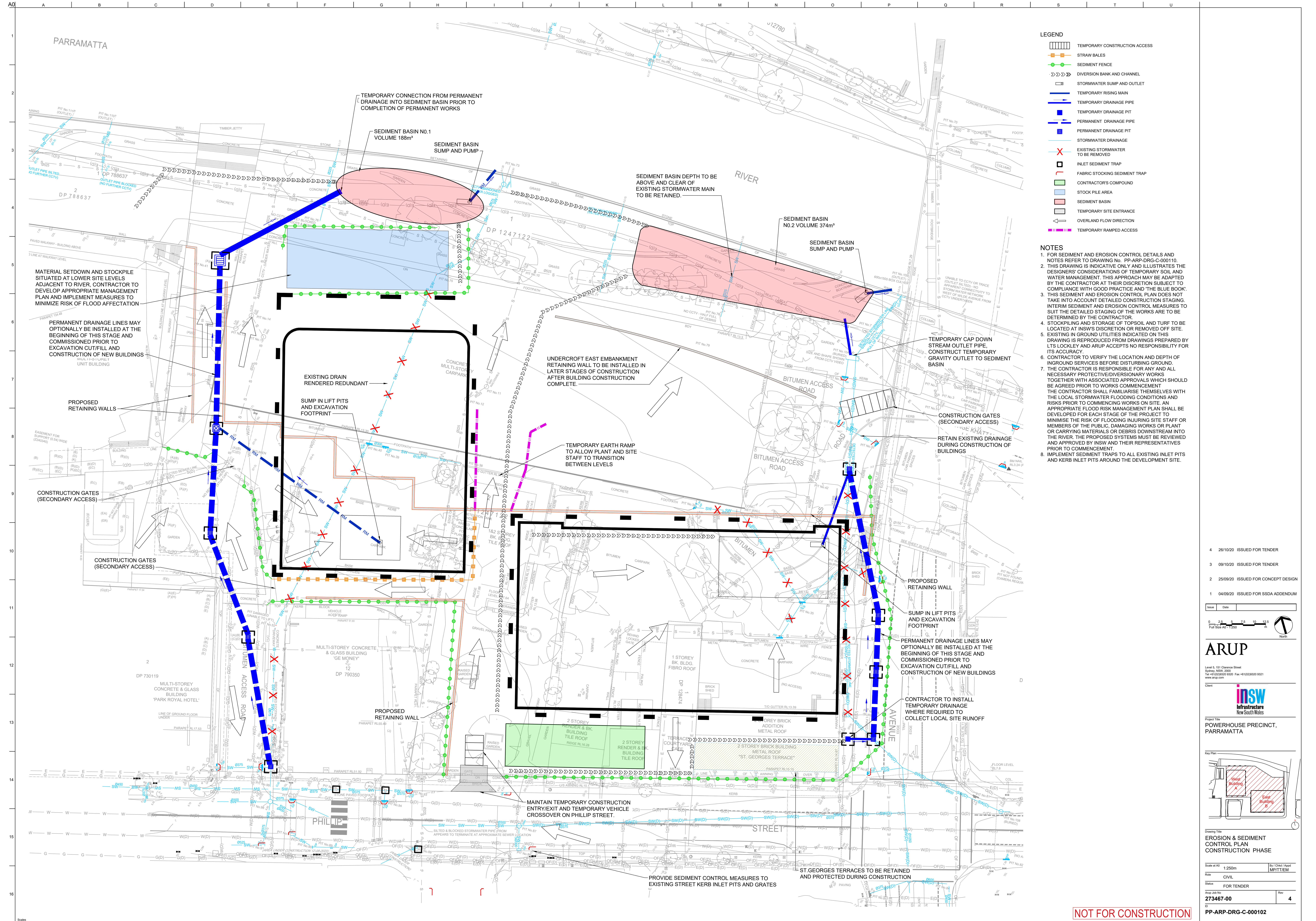
Drawing Title

**EROSION & SEDIMENT
CONTROL PLAN
DEMOLITION PHASE**

Scale of AD	1:250m	By / Chkd / Appd	MP/T/TEM
Date	CIVIL		
Status	FOR TENDER		
Arup Job No	273467-00	Rev	4
ID	PP-ARP-DRG-C-000101		

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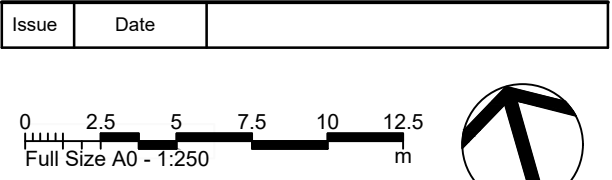
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- LEGEND**
- TEMPORARY CONSTRUCTION ACCESS
 - STRAW BALES
 - SEDIMENT FENCE
 - DIVERSION BANK AND CHANNEL
 - STORMWATER SUMP AND OUTLET
 - TEMPORARY RISING MAIN
 - TEMPORARY DRAINAGE PIPE
 - TEMPORARY DRAINAGE PIT
 - PERMANENT DRAINAGE PIPE
 - PERMANENT DRAINAGE PIT
 - STORMWATER DRAINAGE
 - EXISTING STORMWATER TO BE REMOVED
 - INLET SEDIMENT TRAP
 - FABRIC STOCKING SEDIMENT TRAP
 - CONTRACTOR'S COMPOUND
 - STOCK PILE AREA
 - SEDIMENT BASIN
 - TEMPORARY SITE ENTRANCE
 - OVERLAND FLOW DIRECTION
 - TEMPORARY RAMPED ACCESS

- NOTES**
- FOR SEDIMENT AND EROSION CONTROL DETAILS AND NOTES REFER TO DRAWING No. PP-ARP-DRG-C-000110.
 - THIS DRAWING IS INDICATIVE ONLY AND ILLUSTRATES THE DESIGNERS' CONSIDERATIONS OF TEMPORARY SOIL AND WATER MANAGEMENT. THIS APPROACH MAY BE ADAPTED BY THE CONTRACTOR AT THEIR DISCRETION SUBJECT TO COMPLIANCE WITH GOOD PRACTICE AND 'THE BLUE BOOK'.
 - THIS SEDIMENT AND EROSION CONTROL PLAN DOES NOT TAKE INTO ACCOUNT DETAILED CONSTRUCTION STAGING. INTERIM SEDIMENT AND EROSION CONTROL MEASURES TO SUIT THE DETAILED STAGING OF THE WORKS ARE TO BE DETERMINED BY THE CONTRACTOR.
 - STOCKPILING AND STORAGE OF TOPSOIL AND TURF TO BE LOCATED AT INSW'S DISCRETION OR REMOVED OFF SITE.
 - EXISTING IN GROUND UTILITIES INDICATED ON THIS DRAWING IS REPRODUCED FROM DRAWINGS PREPARED BY LTS LOCKLEY AND ARUP ACCEPTS NO RESPONSIBILITY FOR ITS ACCURACY.
 - CONTRACTOR TO VERIFY THE LOCATION AND DEPTH OF INGROUND SERVICES BEFORE DISTURBING GROUND.
 - THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL NECESSARY PROTECTIVE/DIVERSIONARY WORKS TOGETHER WITH ASSOCIATED APPROVALS WHICH SHOULD BE AGREED PRIOR TO WORKS COMMENCEMENT. THE CONTRACTOR SHALL FAMILIARISE THEMSELVES WITH THE LOCAL STORMWATER FLOODING CONDITIONS AND RISKS PRIOR TO COMMENCING WORKS ON SITE. AN APPROPRIATE FLOOD RISK MANAGEMENT PLAN SHALL BE DEVELOPED FOR EACH STAGE OF THE PROJECT TO MINIMISE THE RISK OF FLOODING INJURING SITE STAFF OR MEMBERS OF THE PUBLIC, DAMAGING WORKS OR PLANT OR CARRYING MATERIALS OR DEBRIS DOWNSTREAM INTO THE RIVER. THE PROPOSED SYSTEMS MUST BE REVIEWED AND APPROVED BY INSW AND THEIR REPRESENTATIVES PRIOR TO COMMENCEMENT.
 - IMPLEMENT SEDIMENT TRAPS TO ALL EXISTING INLET PITS AND KERB INLET PITS AROUND THE DEVELOPMENT SITE.

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3	09/10/20	ISSUED FOR TENDER
2	25/09/20	ISSUED FOR CONCEPT DESIGN
1	04/09/20	ISSUED FOR SSDA ADDENDUM

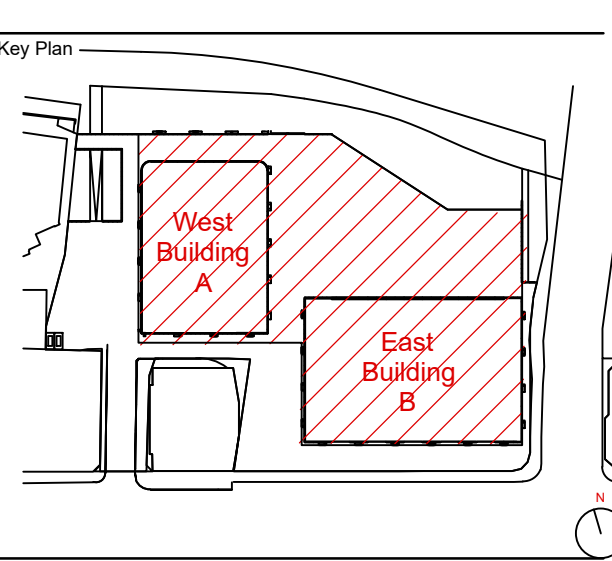


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Project Title
**POWERHOUSE PRECINCT,
PARRAMATTA**



Drawing Title
**EROSION & SEDIMENT
CONTROL PLAN
CONSTRUCTION PHASE**

Scale of A3: 1:250m By: CHN / Appd: MPJ/TJEM

Role: CIVIL

Status: FOR TENDER

App: Job No: 273467-00 Rev: 4

ID: PP-ARP-DRG-C-000102

EROSION AND SEDIMENT

- ES1
- ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE IN ACCORDANCE WITH LANDCOM "SOILS AND CONSTRUCTION MANUAL VOLUME 1, MARCH 2004"
- ES2
- WORKS SHALL BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:
- (A)
- INSTALL AIR MONITORING EQUIPMENT, COMMENCE WITH PITS TO BE RETAINED.
- (B)
- INSTALL EROSION AND SEDIMENT CONTROLS.
- (C)
- STRIP AND STOCKPILE TOPSOIL AND CARRY OUT ALL BULK EARTHWORKS.
- (D)
- UNDERTAKE REMAINING SITE WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS.
- (E)
- REMOVE SOIL AND WATER MANAGEMENT WORKS NOT REQUIRED FOR OTHER STAGES OF CONSTRUCTION ONCE UPSTREAM SURFACES ARE STABILISED TO THE SATISFACTION OF THE PROJECT MANAGER.

EROSION CONTROL MEASURES

- EC1
- CONTROLS AFFECTED BY WORKS ARE TO BE RE-ESTABLISHED PRIOR TO THE COMPLETION OF EACH DAYS WORK.
- EC2
- DUST CONTROL MEASURES SHALL BE IMPLEMENTED CONTINUOUSLY DURING CONSTRUCTION WORKS TO THE SATISFACTION OF THE PROJECT MANAGER.

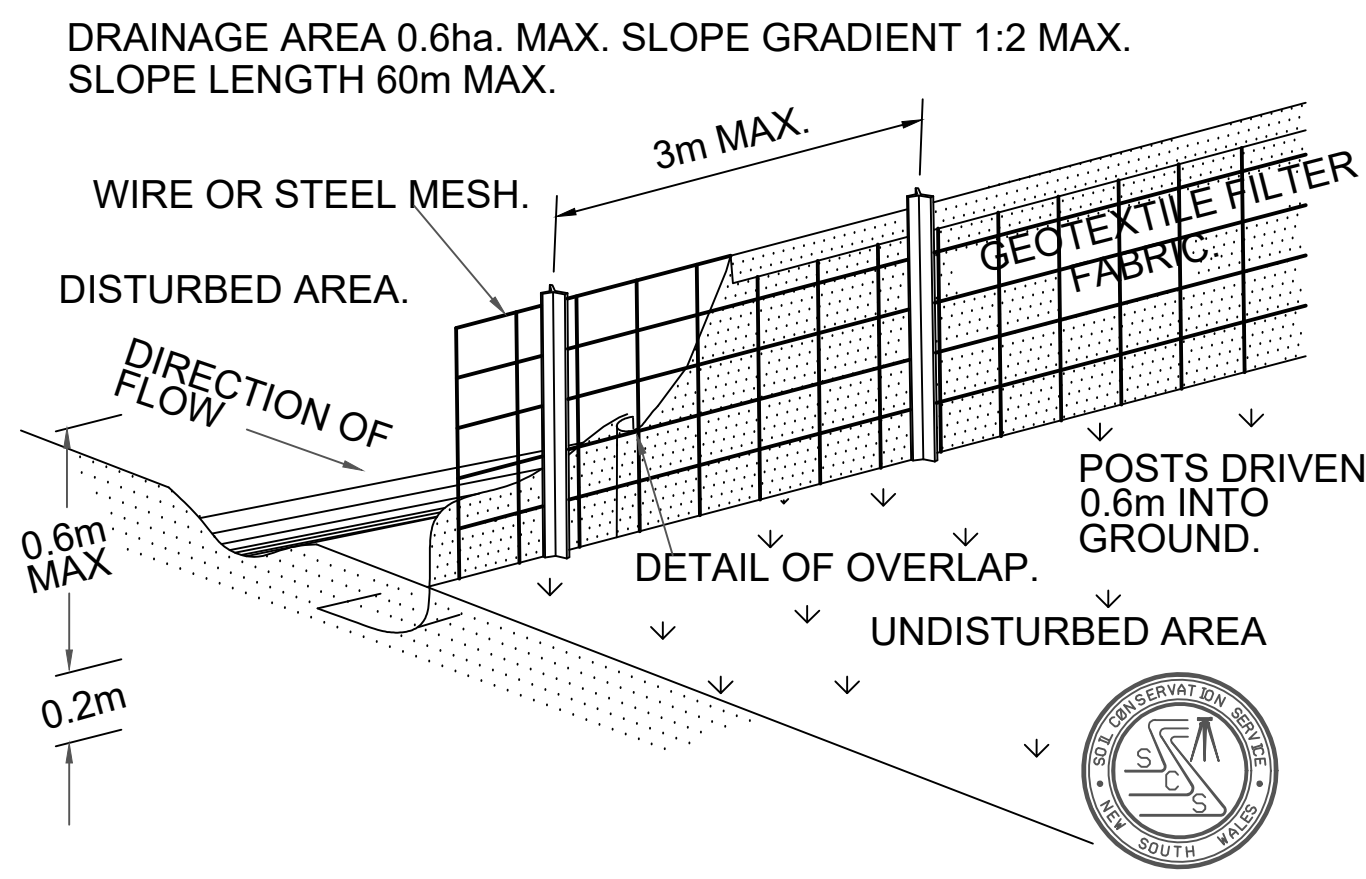
SEDIMENT CONTROL MEASURES

- SC1
- DURING EARTHWORKS, CAR PARK WORKS, ROADWORKS, TEMPORARY DIVERSION BANKS SHOULD BE CONSTRUCTED TO LIMIT SLOPE LENGTH, WHERE POSSIBLE, IN ACCORDANCE WITH THE FOLLOWING:

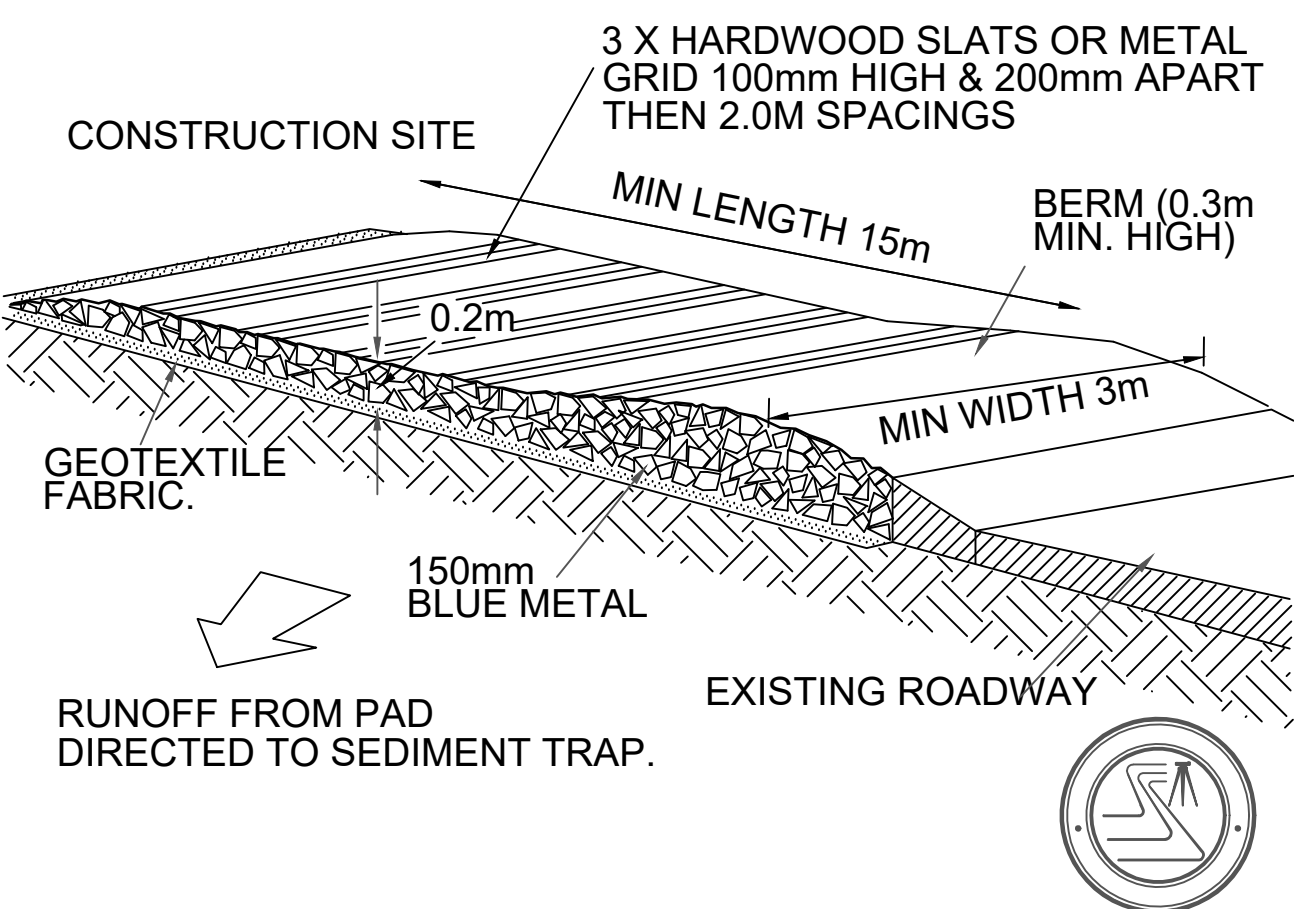
RECOMMENDED MAXIMUM SPACING BETWEEN CROSS BANKS ON ALL ROADS.

SLOPE	MAXIMUM SPACING (m)
0 TO 1%	150
1 TO 3%	100
3 TO 5%	70
5 TO 10%	50
10 TO 17%	16

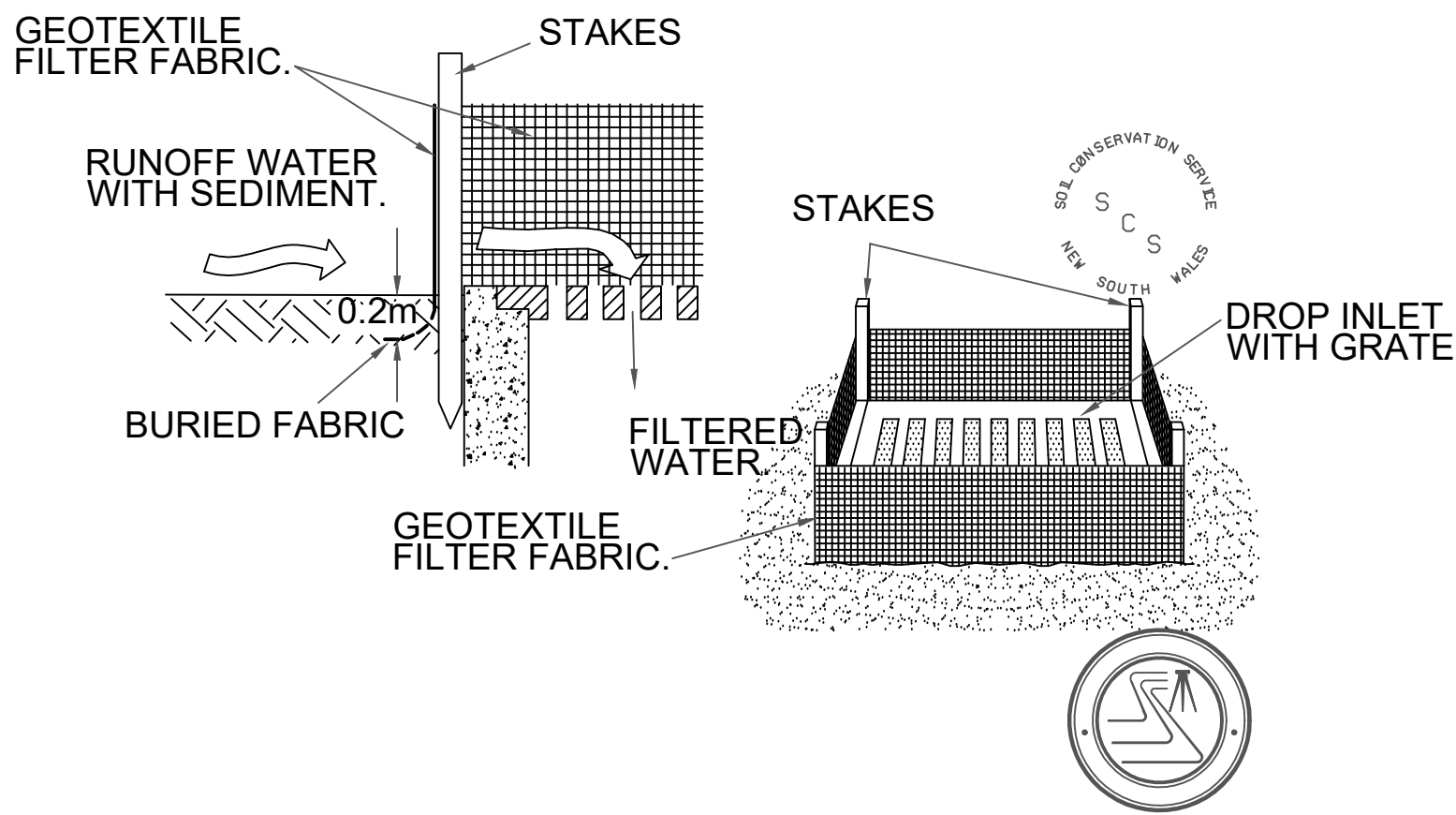
- SC2
- ALL STORMWATER PITS TO BE COVERED OR DROP INLET SEDIMENT TRAPS PROVIDED IN ACCORDANCE WITH DRAWING No. PP-ARP-DRG-C-000101 & PP-ARP-DRG-C-000102. KERB INLET SEDIMENT TRAPS ARE TO BE INSTALLED AFTER COMPLETION OF PAVING.
- SC3
- SEDIMENT TRAPS ARE TO BE MAINTAINED SUCH THAT:
- (A)
- SEDIMENT IS REMOVED SUCH THAT NO LESS THAN 70% OF THE DESIGN CAPACITY REMAINS AT ANY ONE TIME.
- (B)
- MATERIALS ARE REPLACED OR REPAIRED AS REQUIRED TO ENSURE SERVICEABILITY OF BOTH THE ELEMENT AND THE TRAP.
- SC4
- PERMANENT DRAINAGE STRUCTURES INCLUDING: PIPES, PITS ARE TO BE HANDED OVER IN A CLEAN CONDITION AT THE COMPLETION OF THE CONTRACT MAINTENANCE PERIOD.
- SC5
- FOLLOWING COMPLETION AND RESTORATION OF SITE, REMOVE ALL MATERIALS AND FILL DIVERSION DRAINS, WATERWAYS AND SEDIMENT TRAPS TO MATCH LEVELS OF THE PREVIOUSLY COMPLETED WORKS.
- SC6
- ALL TREES OTHER THAN THOSE IDENTIFIED FOR REMOVAL BY THE ARBORIST SHALL BE RETAINED UNLESS APPROVED FOR REMOVAL BY PROJECT MANAGER.
- SC7
- AN ACCESS POINT TO ALLOW MACHINE ENTRY / EXIT ARE TO INCLUDE A ROUNDED EARTH MOUND 0.3m HIGH WITH 10H:1V BATTERS.
- SC8
- THE CONTRACTOR SHALL PROVIDE A 0.4m WIDE TURF STRIP BEHIND ALL KERB AND GUTTER AT COMPLETION OF FOOTPATH FORMATION AND 1.0m WIDE AROUND ALL SURFACE INLET PITS.
- SC9
- THE CONTRACTOR SHALL MAINTAIN A LOG BOOK DETAILING
- RECORDS OF ALL RAINFALL
- CONDITION OF SOIL AND WATER MANAGEMENT STRUCTURES
- ANY ADDITIONAL REMEDIAL WORKS REQUIRED
- THE LOG BOOK SHALL BE MAINTAINED ON A DAILY BASIS AND BE MADE AVAILABLE TO ANY AUTHORISED PERSON UPON REQUEST. THE ORIGINAL LOG BOOK SHALL BE ISSUED TO THE PROJECT MANAGER AT THE COMPLETION OF THE WORKS.
- SC10
- THE CONTRACTOR SHALL AT ALL TIMES RESTRICT CONSTRUCTION EQUIPMENT MOVEMENT TO THE ESSENTIAL CONSTRUCTION AREAS.THE CONTRACTOR SHALL NOT EXTEND LAND DISTURBANCE BEYOND 2m FROM THE EDGE OF ANY ESSENTIAL CONSTRUCTION ACTIVITY.
- SC11
- THE CONTRACTOR SHALL PROVIDE CATCH DRAINS AT THE BOTTOM OF ALL BATTERS AND DIVERT THE CATCH DRAINS AND ANY TAIL OUT DRAINS TO DRAIN TO THE NEAREST STORMWATER PIT.



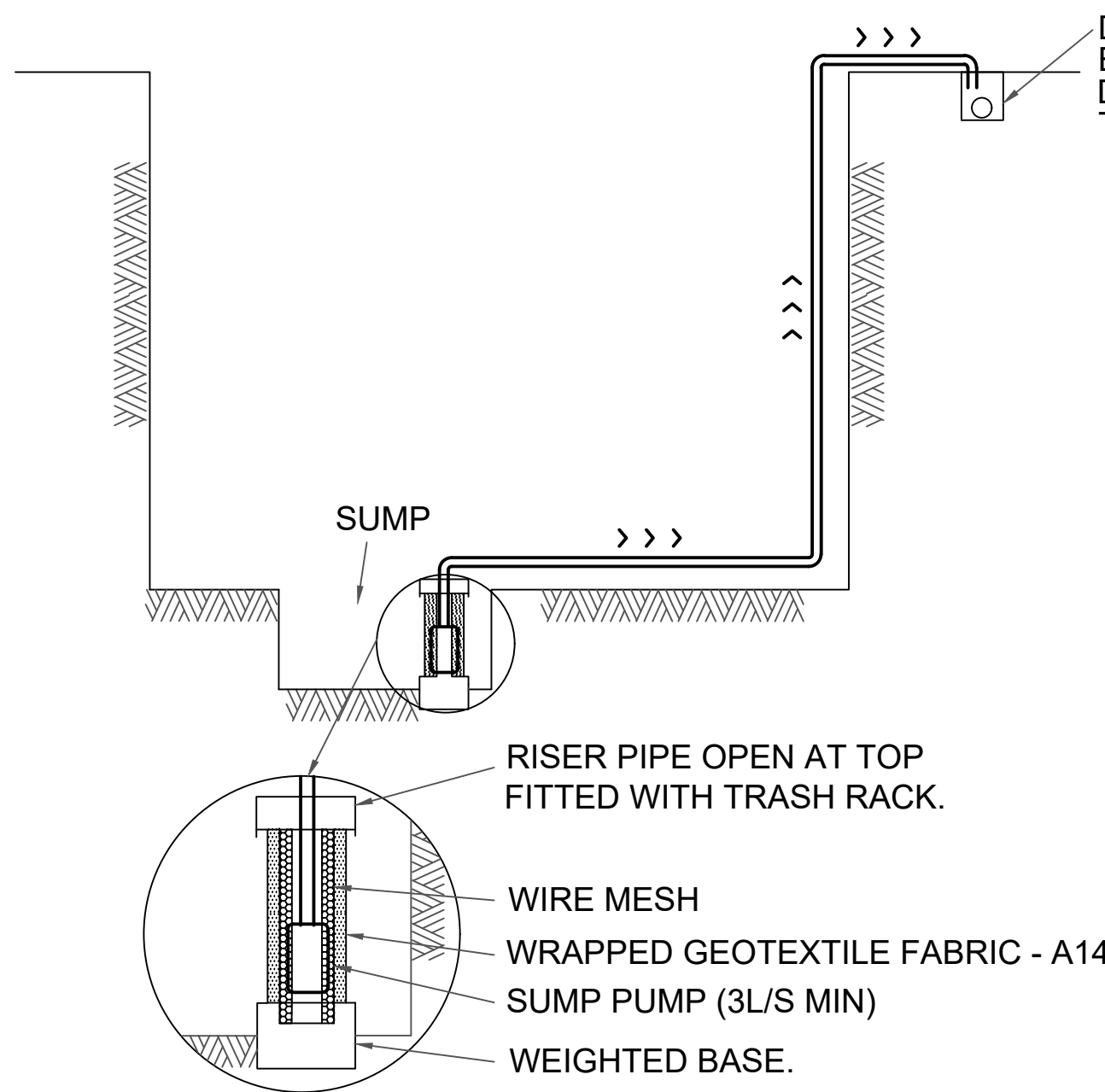
SEDIMENT FENCE



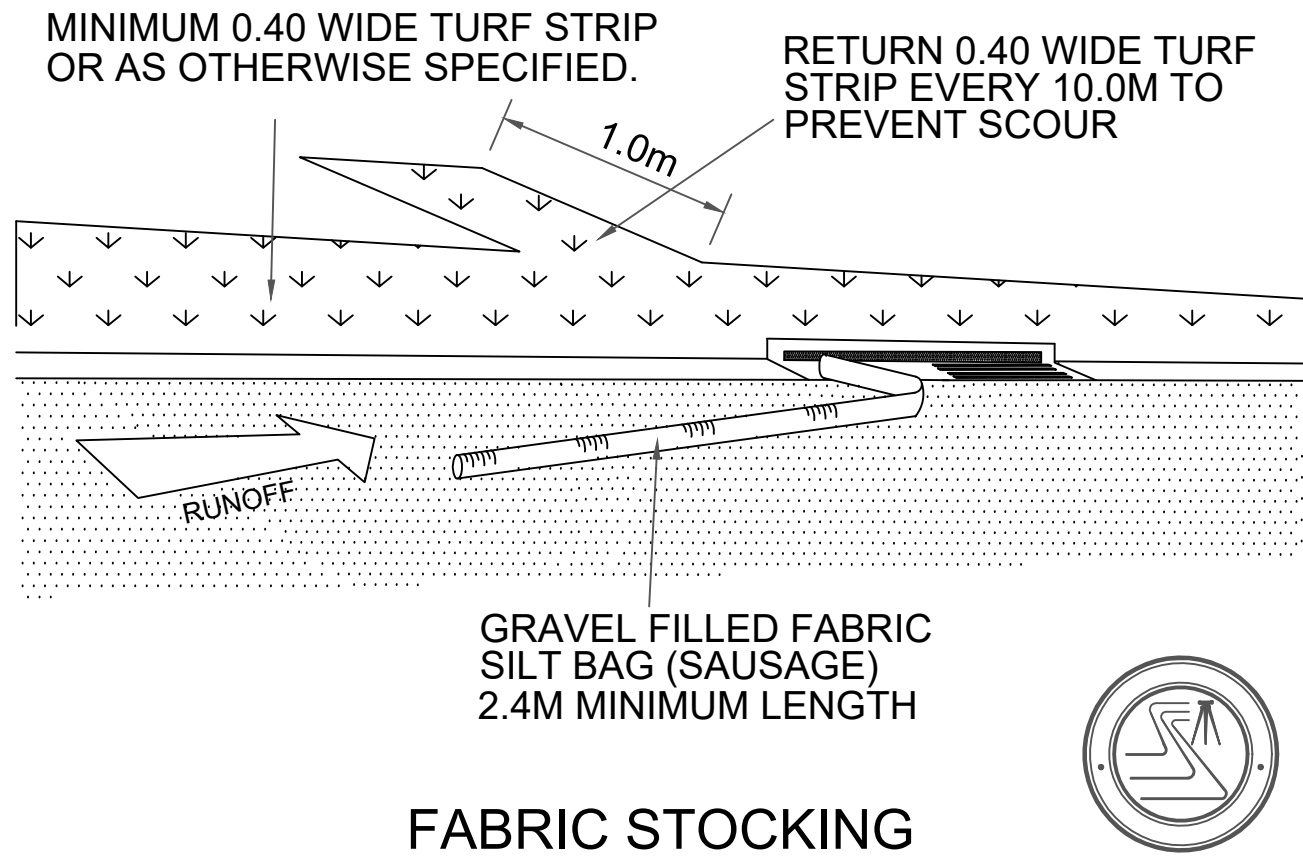
TEMPORARY CONSTRUCTION EXIT



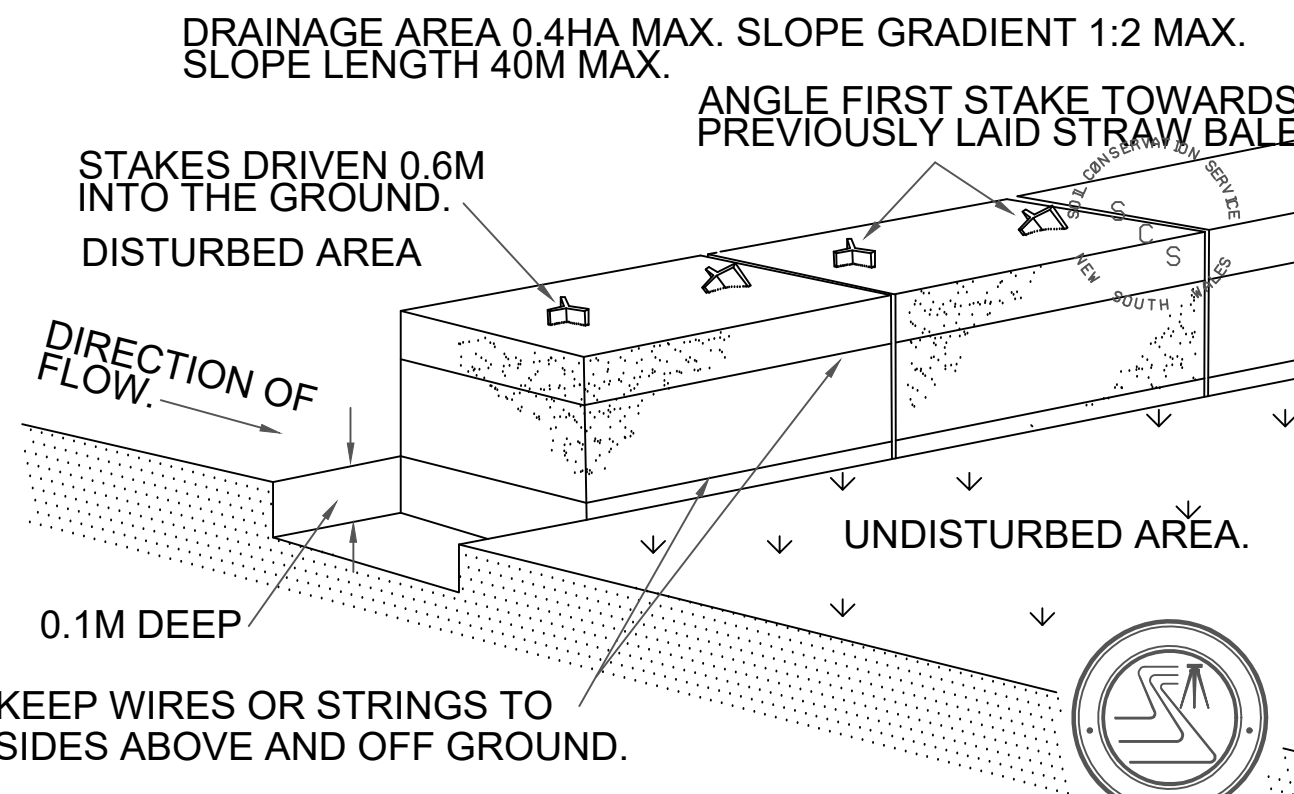
GEOTEXTILE FILTER FABRIC DROP INLET SEDIMENT TRAP



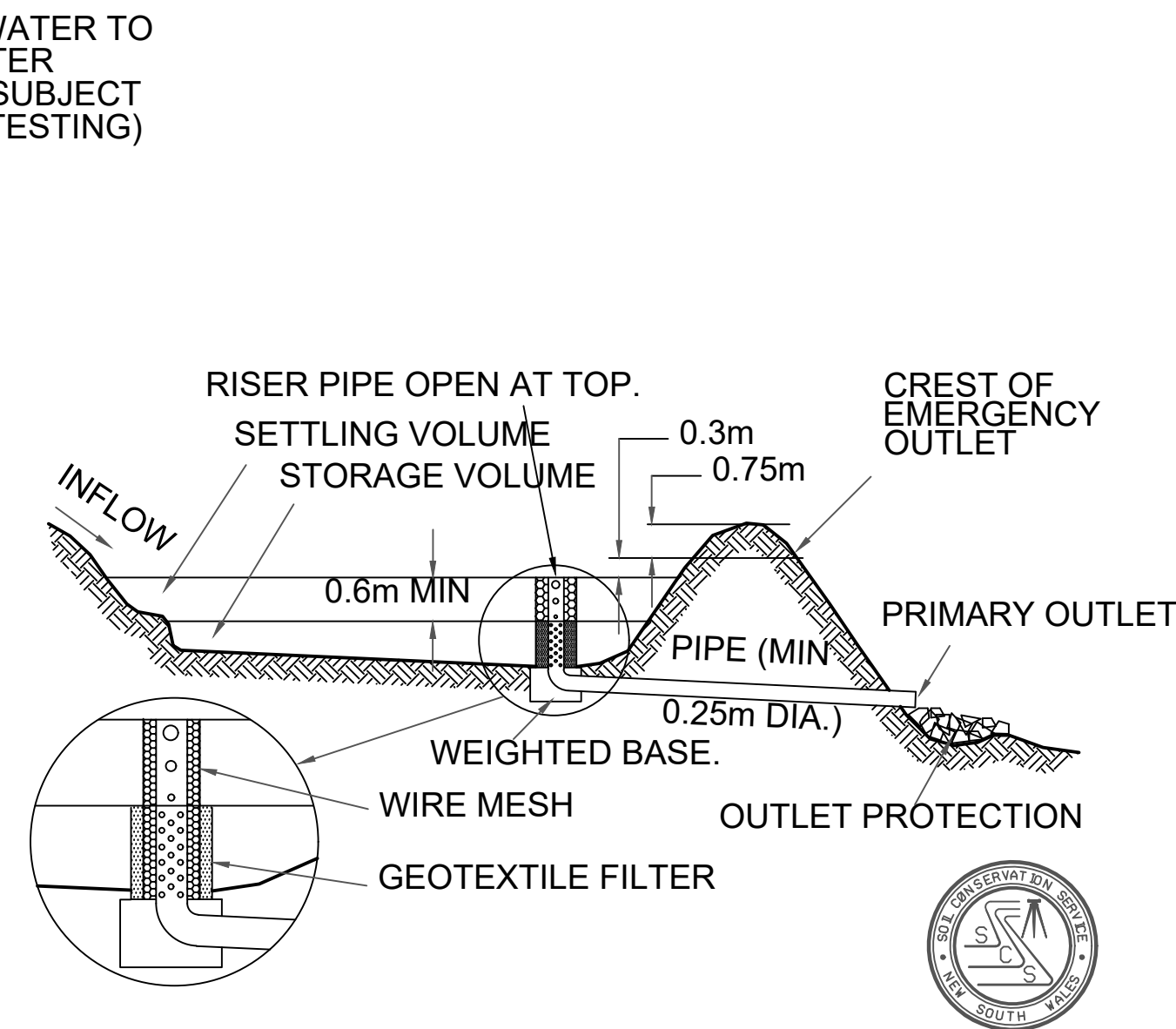
STORMWATER SUMP AND OUTLET



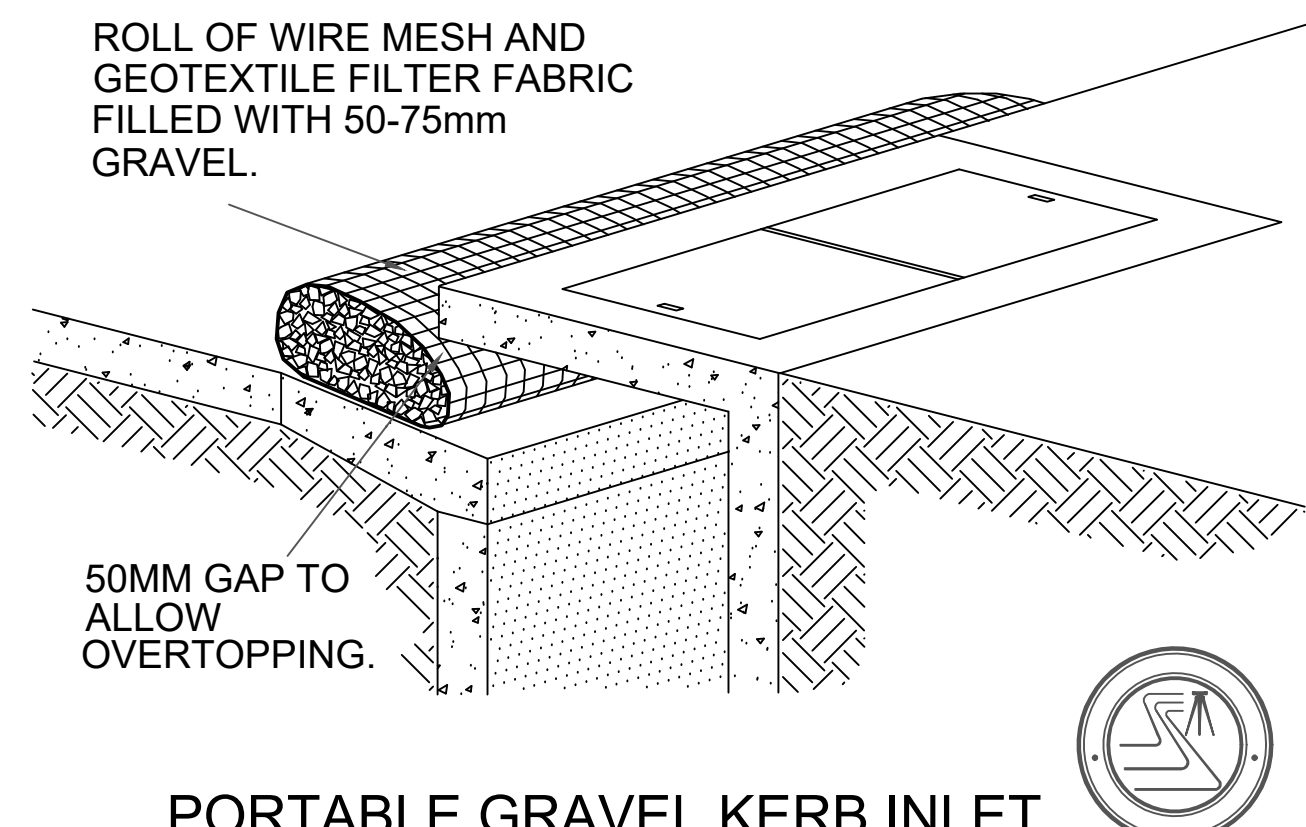
FABRIC STOCKING KERB INLET SEDIMENT TRAP



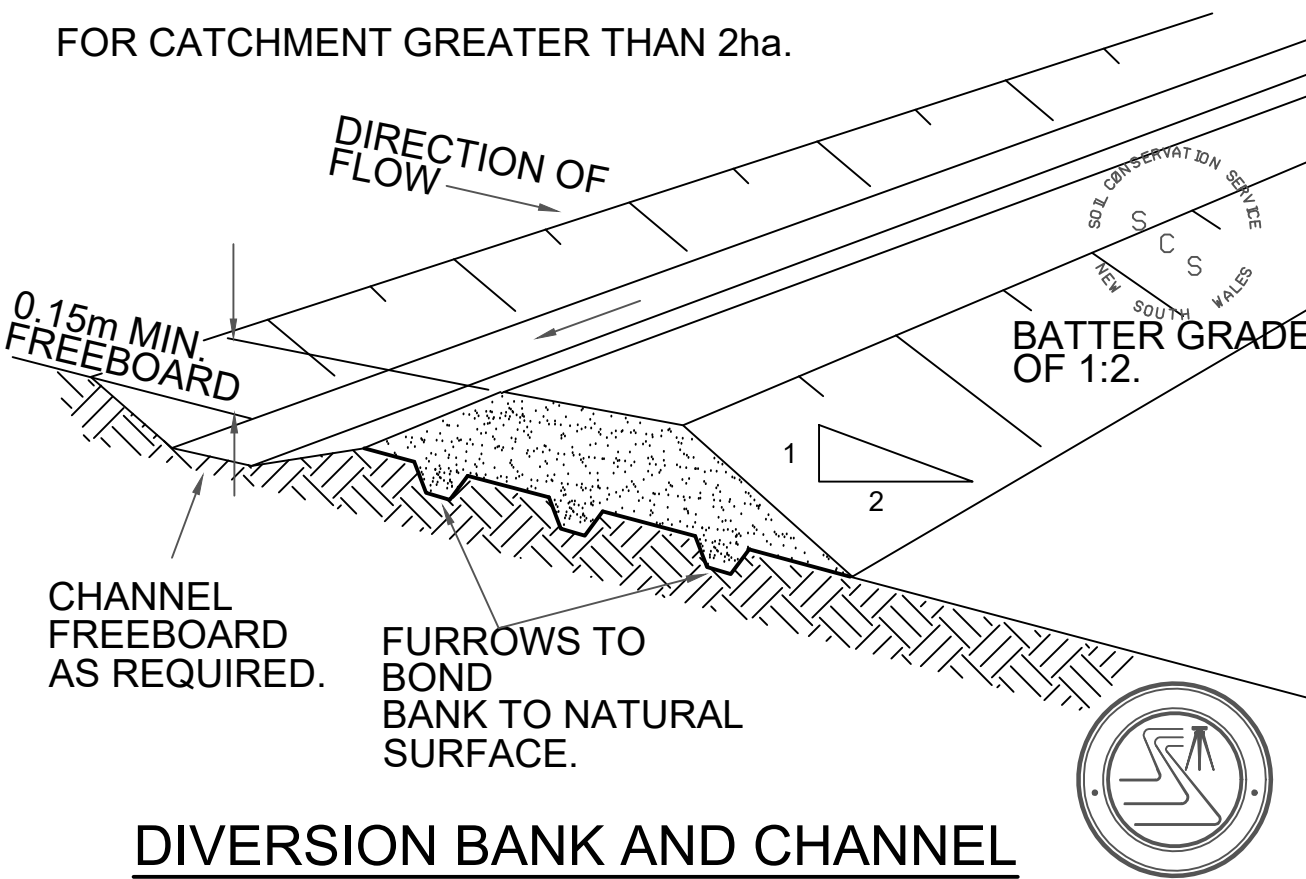
STRAW BALE SEDIMENT FILTER



CROSS SECTION OF TYPICAL SEDIMENT BASIN



PORTABLE GRAVEL KERB INLET SEDIMENT TRAP



DIVERSION BANK AND CHANNEL

- 4
- 26/10/20
- ISSUED FOR TENDER
- 3
- 09/10/20
- ISSUED FOR TENDER
- 2
- 25/09/20
- ISSUED FOR CONCEPT DESIGN
- 1
- 04/09/20
- ISSUED FOR SSDA ADDENDUM

Issue	Date
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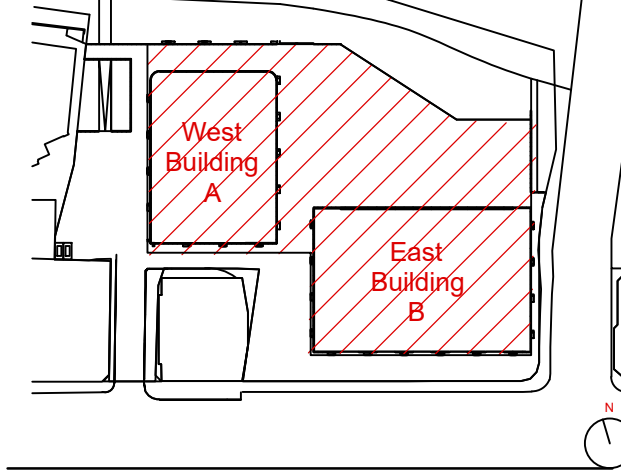
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Client



Project Title
POWERHOUSE PRECINCT,
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Key Plan



Drawing Title
EROSION AND SEDIMENT
CONTROL PLAN
GENERAL NOTES AND DETAILS

Scale of A0	NOT TO SCALE	By / Chkd / Appd	MP/TT/EM
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Role	CIVIL
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Status	FOR TENDER
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