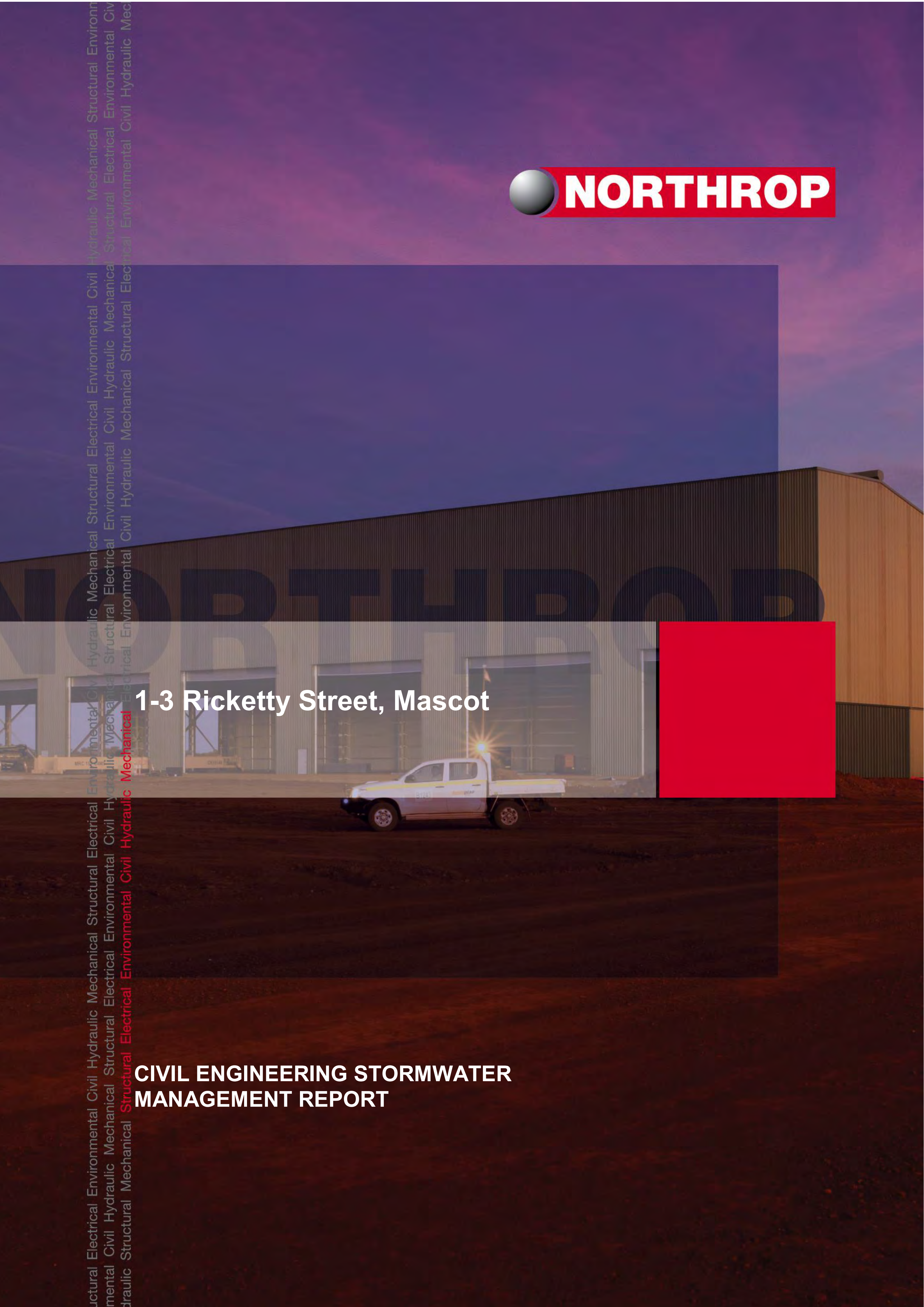

NORTHROP

1-3 Ricketty Street, Mascot

CIVIL ENGINEERING STORMWATER MANAGEMENT REPORT

Disclaimer

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Document Control

Prepared for	Self-Storage Investments
Project Name	1-3 Ricketty Street, Mascot
File Reference	S170463
Date	09/03/2018

Document Control

S170938-D01–D Stormwater Management Strategy Report

Rev	Description	Prepared by	Reviewed by	Issue Date	Client App	Approval Date
A	DA Issue	MC	RH	08/09/17		
B	DA Issue	MC	RH	14/09/17		
C	DA Issue	MC	RH	27/10/17		
D	DA Issue	MC	RH	09/03/18		

Contents

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Appendices

1. Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Self Storage Investments Pty Ltd to prepare and undertake civil engineering design and documentation in support of a Development Application (DA) submission to Bayside Council for the proposed self-storage warehouse development on Lots 24 and 25 DP 515070, otherwise known as 1-3 Ricketty Street, Mascot.

This report covers the proposed earthworks and stormwater drainage strategy including:

- Erosion and sediment control;
- Bulk earthworks;
- Stormwater quantity and quality management;
- Water Sensitive Urban Design; and
- Flood risk management.

2. Related Reports and Documents

This report is to be read in conjunction with the following reports and documents:

a. Development Application Documentation prepared by Northrop (refer Appendix A):
    - DA01-C01.01 Cover Sheet, Drawing Schedule and Locality Plan
    - DA01-C02.01 Sediment and Soil Erosion Control Plan
    - DA01-C02.11 Sediment and Soil Erosion Control Details
    - DA01-C03.01 Cut & Fill Plan
    - DA01-C03.01 Cut & Fill Sections
    - DA01-C04.01 Concept Siteworks and Stormwater Management Plan
    - DA01-C05.01 Details – Sheet 1
    - DA01-C05.02 Details – Sheet 2
    - DA01-C06.01 Catchment Plan

b. NSW Department of Housing Manual – Managing Urban Stormwater Soil & Construction 2004
c. Botany Bay Development Control Plan 2013;
d. Stormwater Management Technical Guidelines – December 2013;
e. Sydney Water Technical requirements and guidelines;
f. Local Flood Impact Study prepared by Northrop Engineers; and
g. Alexandra Canal Model Conversion prepared by BMT WBM Pty Ltd.

3. The Development Site

3.1. Existing Site Description

The subject site is situated on the southern side of Alexandra Canal and on the eastern side of Ricketty Street. The subject site is within Bayside Council Local Government Area (LGA) and is presented in Figure 1 below.

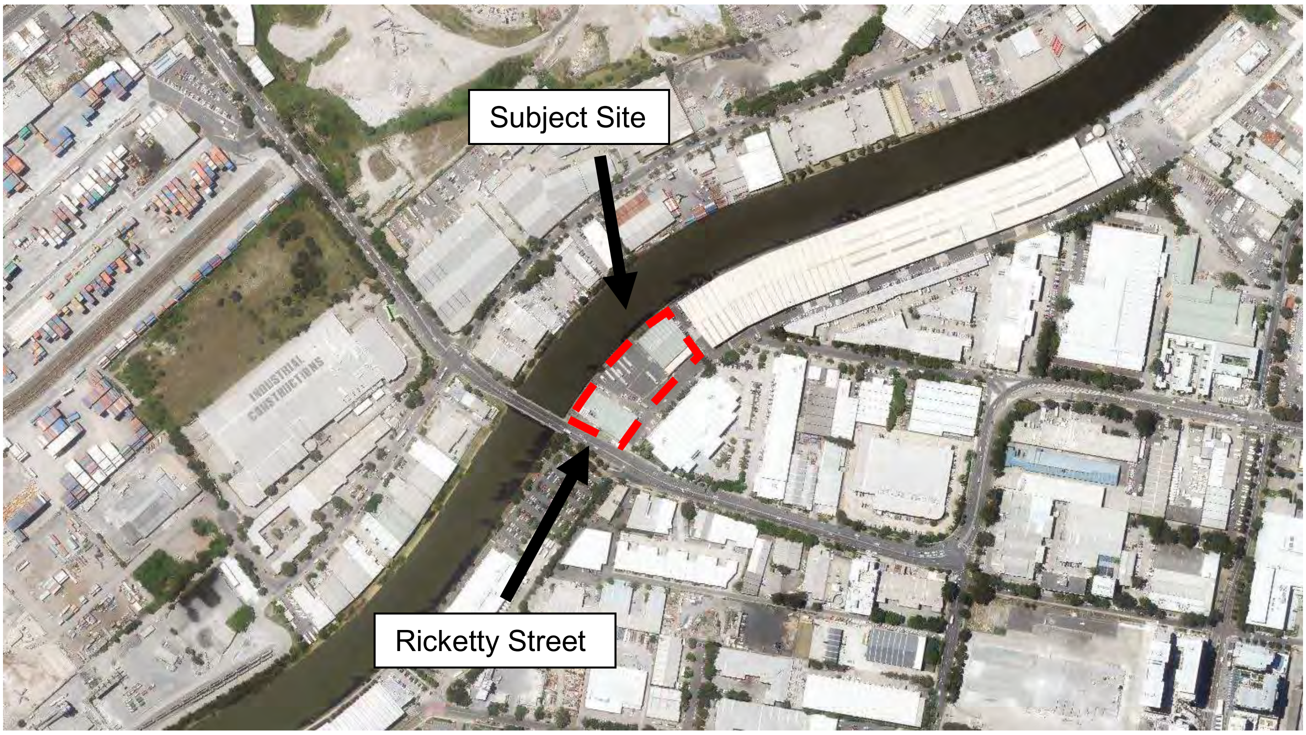

Figure 1 - Site Location

The site occupies approximately 0.90 hectares in total and is situated:

- East of Ricketty Street;
- South and directly adjacent Alexandra Canal; and
- Adjacent to an existing industrial site to the west.

The site currently comprises two (2) existing warehouses, car and truck parking areas, as well as landscaping. Refer Figure 2 for an overview of the site.

Figure 2 - Site Plan (NEARMAP, 2017)

3.2 Proposed Development

The proposed development will involve the construction of two (2) new self-storage buildings, carparking and landscape areas. The site is traversed by the Alexandria and Mascot LGA boundary alignment as shown in Figure 2 above. The civil stormwater design has been designed and documented to exist within the Mascot LGA boundary.

Refer to the architectural drawings prepared by MCHP Architects and Northrop's civil drawing package for a more detailed site layout and description.

The site generally falls to the north-west corner with the majority of surface runoff (catchment area of approximately 0.9ha) to be directed to the northern boundary. Stormwater runoff will be collected by a below ground pit and pipe stormwater drainage network as well as below ground culverts prior to discharging to Alexandra Canal.

Roof catchment areas of the proposed warehouse buildings will be directed to two (2) rainwater reuse tanks and any overflow from the rainwater tank will be discharged to Alexandra Canal. The rainwater tank will pre-treat captured runoff. Other pre-treatment strategies include use of proprietary filter cartridges and coarse sediment traps at each surface inlet pit.

On-site stormwater detention has not been provided for the site and is in accordance with Council's requirements. Stormwater quantity control is to be provided by below ground box culverts as well as additional flood storage.

Refer to the civil design drawings in Appendix A for a more detailed analysis of the drainage network.

4. Erosion and Sediment Control

The objectives of the erosion and sediment control for the development site is to ensure:

- Adequate erosion and sediment control measures are applied prior to the commencement of construction and are maintained throughout construction; and
- Construction site runoff is appropriately treated in accordance with the requirements of Bayside Council and in accordance with Botany Bay Development Control Plan 2013.

As part of the works, the erosion and sedimentation control will be constructed in accordance with Council requirements and the NSW Department of Housing Manual, “Managing Urban Stormwater Soil & Construction” 2004 prior to any earthworks commencing on site. The Concept Sediment and erosion control measures are documented in Northrop’s Development Application drawing DAC02.01.

All sediment and erosion control measures are to ensure no negative impact will be imposed on Alexandra Canal or any nearby natural watercourse, as well as the existing drainage network.

The stormwater drainage network has been designed to ensure that runoff from the development is velocity controlled through two (2) x 375 diameter outlets (low flow) prior to discharging to Alexandra Canal. This is to mitigate any issues associated with sediment displacement or erosion of the foreshore embankment.

4.1. Sediment Basin

A sediment basin has been designed to capture site runoff during construction and has been located towards the North West corner of the site, at the lowest point.

Calculations to determine concept design basin sizes have been based on information regarding soil types and through the use of the Soils and Construction Volume 1 Manual.

To ensure the sediment basin is working effectively it is to be maintained throughout the construction works. Maintenance includes water to be removed by pumping to reach the minimum storage volume at the lower level of the settling zone. The settling zone will be identified by pegs to clearly show the level at which design storage capacity is available.

Concept sediment basin sizing is reflected in Table 1.

Table 1 - Concept Sediment Basin Volumes

Basin	Catchment Area (Ha)	Volume Required (m^3)	Volume Provided (m^3)
Sediment Basin	0.90	182.5	200

4.2. Construction Measures

Prior to any earthworks commencing, construction erosion and sediment control measures will have to be implemented in accordance with the approved drawings. The measures shown on the drawings describe the minimum treatment requirements. The contractor will be required to modify the erosion and sedimentation control measures to suit the construction program, sequencing and techniques. Construction measures include:

- A site security fence around the site and site office areas;
- Sediment fencing downstream and surrounding disturbed areas, including any topsoil stockpiles;
- Installation for silt arrestors to collect site runoff and retain suspended particles;
- Dust control measures which includes covering stockpiles, maintaining site fences and watering exposed areas;
- Placement of mesh and gravel filters around and along proposed catch drains and around stormwater inlets pits; and
- The construction of a temporary sediment basin as noted above in Section 4.1

5. Bulk Earthworks

The proposed works will generally consist of earthworks cut and fill operations to establish design levels to provide the proposed platforms for the self-storage buildings. The existing site is relatively flat throughout, with a slight fall in the North West direction. Preliminary earthworks calculations indicate that the site will require importation of material to achieve the required design levels. This is represented on Northrop's Cut & Fill Drawing DAC03.01. Preliminary bulk earthworks quantities are summarised in Table 2.

Table 2 - Concept Earthworks Volumes

Earthworks	Volume (m^3)
Cut	0.440
Fill	5233
Balance	5232 (Import)

Any stockpiled material, including topsoil, shall be located as far away as possible from Alexandra Canal and any associated natural watercourses. Sediment Fences shall be installed on the downstream side of stockpiles and the embankment formation, and all stockpiles and embankment formations shall be stabilised by hydro seeding or hydro mulching on formation.

The bulk earthworks cut/fill volumes provided are conceptual only and are subject to change pending final coordination and detailed design. It should be noted the above mentioned cut/fill operations have been calculated based on the following assumptions.

- No allowance for earthworks bulking factors;
- No allowance for spoil generated from utility service and stormwater drainage trenching; and
- No allowance for spoil generated from water quality media.

5.1. Construction Sequence

The proposed development will be in two (2) stages. The first stage will be the construction of the western self-storage warehouse, whilst stage 2 being the eastern self-storage warehouse.

The sequence of work for the bulk earthworks will generally include:

- Provision of site erosion and sediment control measures typically outlined above in Section 4;
- Inspection of exposed underlying material to ensure conformity with design assumptions and requirements; and
- Placement of fill in layers not greater thank 200mm in thickness and compacted to not less than 98% Standard Maximum Dry Density (SMDD) in accordance with the geotechnical report.

6. Stormwater Management Objectives and Controls

6.1 Development Control Plan Objectives

The stormwater strategy for the site has been developed in accordance with Botany Bay Development Control Plan 2013.

The DCP states the following objectives:

(a) To outline the technical requirements in relation to the design of stormwater management systems within the City of Botany Bay Local Government Area (LGA);
(b) To ensure an unified approach to the design of on-site stormwater management system;
(c) To manage the quality and quantity (flow rate and volume) of the stormwater runoff generated from the site into Council's drainage system;
(d) To minimise the impact of flooding (mainstream and local) to the natural environment and built up areas;
(e) To contribute to environmental sustainability by encouraging water conservation through the reuse of stormwater runoff from roof areas;
(f) To implement and incorporate Water Sensitive Urban Design (WSUD) principles into the design of the stormwater drainage system;
(g) To allow replenishment and recharge of groundwater;
(h) To prevent negative impacts of stormwater on public health and safety; and
(i) To protect existing public stormwater drainage assets.

7. Stormwater Quantity Management

7.1 Existing Catchment

The existing catchment for the subject site is approximately 0.9ha in size and is directly adjacent the Alexandra Canal. The area generally drains from the East to West direction, with various low points located throughout the catchment.

Figure 3 shows the existing catchment plan for the site.

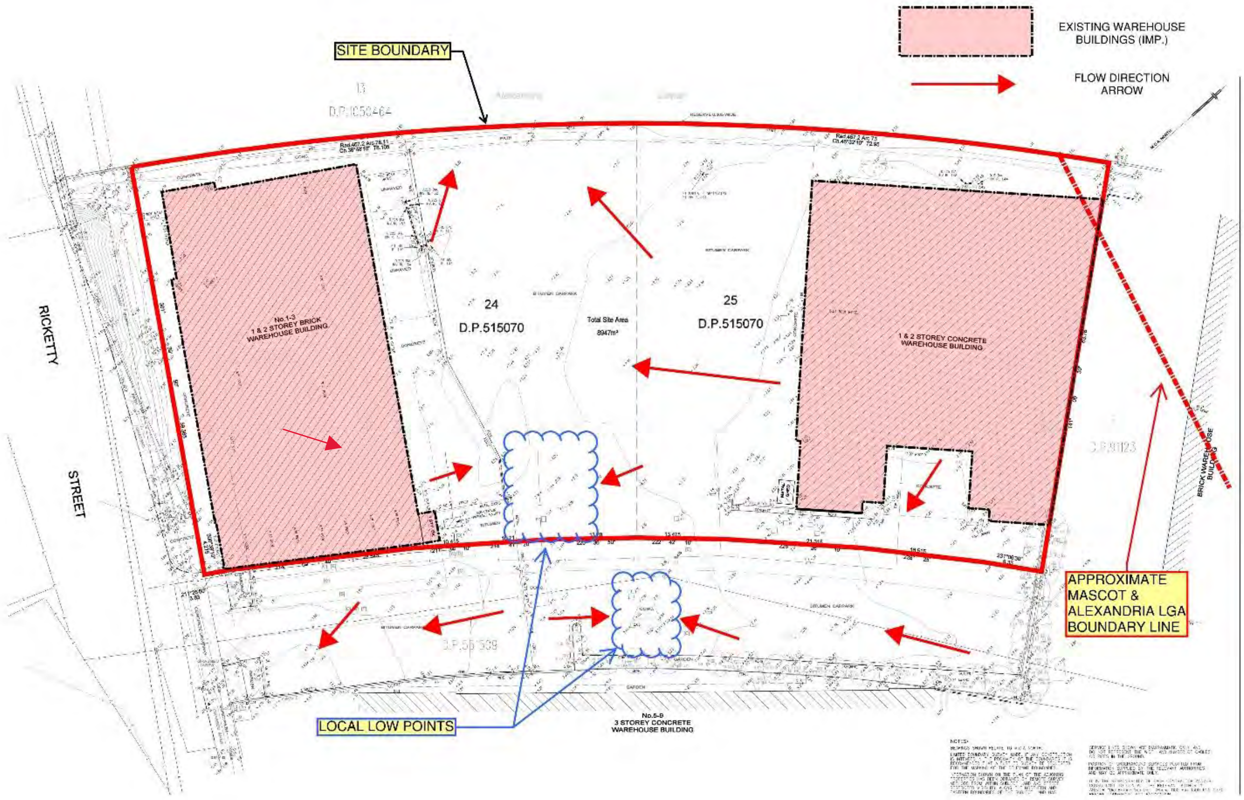

Figure 3 - Existing Catchment

7.2 Stormwater Quantity Management Strategy

The stormwater quantity management strategy has been designed so that any hardstand runoff from the catchment will discharge via the following methods;

1. Proposed box culverts by a means of "conveyance", prior to discharging into Alexandra Canal.
2. In-ground pit and pipe drainage network

Stormwater runoff from the roof catchments has been designed to be captured by rainwater tanks for reuse opportunities within the site whilst any overflow is to be directed to Alexandra Canal.

Additional flood storage has also been provided and is in the order of 500m^2 in surface area. Refer to DAC04.01 for details

Refer to Figure 4 for the Post-Developed Catchment.

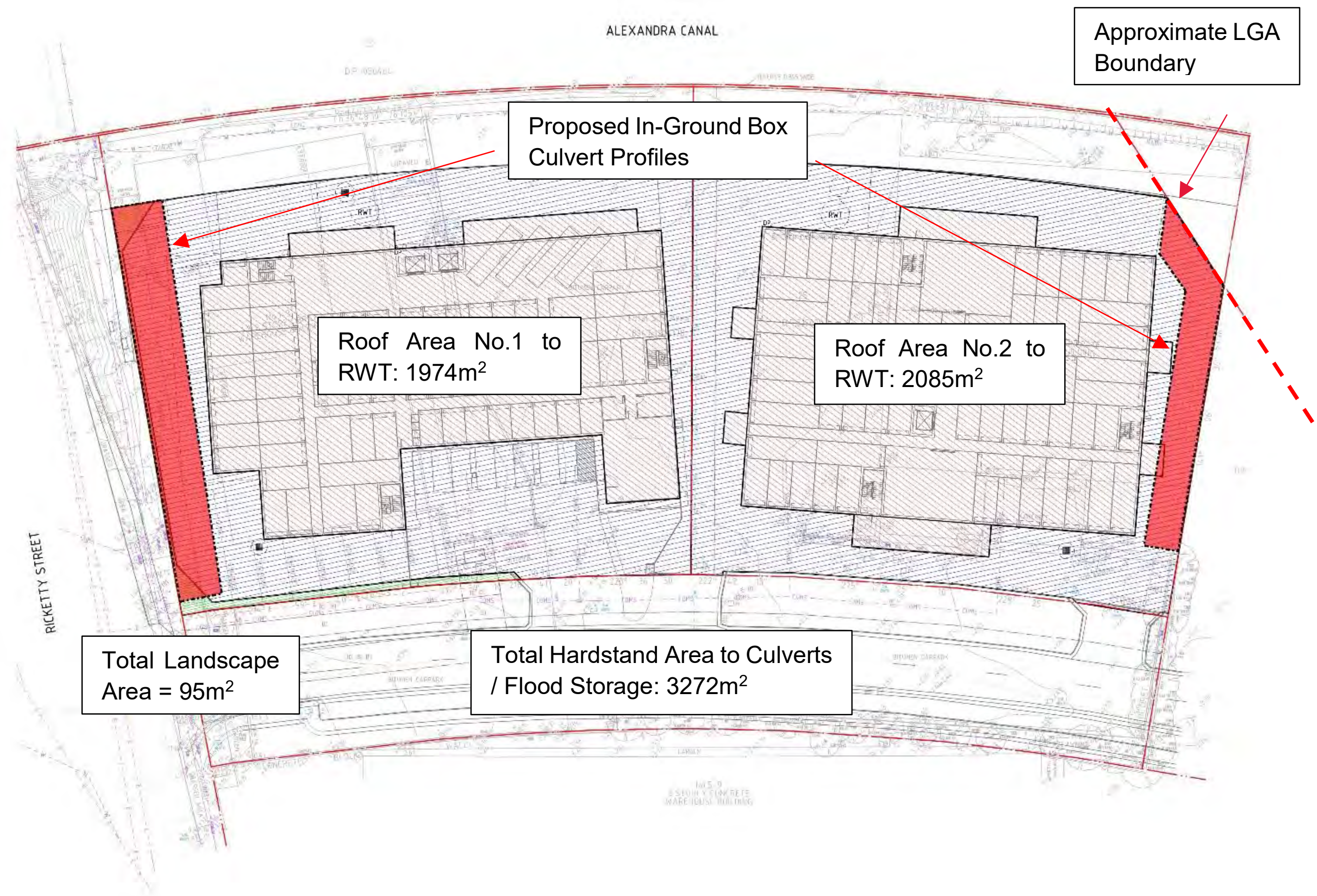

Figure 4 - Post-Developed Catchment

7.3 Hydrological Modelling

The Hydrology of the proposed catchment has been assessed using XP-Storm software and TUFLOW finite difference computational engine. The existing slopes of the catchments were calculated based on site survey prepared by Rygate Surveyors as well as information from LiDAR software. Refer to Appendix B for the site survey.

Analysis of the hydrological model has resulted in the implementation of below-ground box culverts acting as “conveyance” and flood storage. Multiple box culverts are required for the site, with sizes varying from 2.4m (w) x 1.5m (h) and 3.6m (w) x 0.6m (h). Refer to the engineering plans presented in Appendix A as well as the flood study report in Appendix D.

Stormwater analysis of the internal pit and pipe drainage network (hydraulics) was assessed using DRAINS software. Preliminary pit and pipe sizes are indicated on the engineering plans presented in Appendix A.

8. Stormwater Quality Management

8.1. Adopted Water Quality Objectives

The main objectives for stormwater quality are indicated in Sydney Water's technical requirements and are presented in Table 3.

Table 3 - Water Quality Targets

Pollutant	% Reduction Post-Development Average Annual Load Reduction (Targets)
Gross Pollutants	90
Total Suspended Solids (TSS)	85
Total Phosphorous (TP)	65
Total Nitrogen (TN)	45

8.2. Stormwater Quality Management Scheme

The stormwater treatment train has two stages of treatment; the first being pit inlet filter baskets (proprietary product) to capture gross pollutants and the coarser suspended solids. The secondary treatment is to be provided by multiple filter cartridge systems (proprietary product) that are designed to remove nutrients such as nitrogen and phosphorous.

Refer to Appendix A for engineering plans relating to the water quality treatment network.

8.3. Rainwater Tanks

Two (2) rainwater tanks have been proposed to collect all roof water from the development which will pass through first flush systems prior to capture. The rainwater tanks will be located below ground and along the North West portion of the site. Each rainwater tank will incorporate a 100 year overflow to the external stormwater drainage network.

The collected water will be used for toilet flushing and irrigation purposes. The tank will be equipped with the following:

- Solid access lid and step irons;
- High level overflow to external stormwater drainage network;
- Duty and standby pump configured for alternative operation;
- Backup fuel generator;
- Mains water top-up; and
- Associated float valves and control panels.

8.4. Rainfall Data

For the analysis of the MUSIC modelling, historical rainfall records were obtained from the Bureau of Meteorology for Station No. 66062 at Observatory Hill, Sydney. The MUSIC analysis was undertaken using a 6 min time step for year 1962 to 1966 of historical data.

The mean annual rainfall for the modelled data was 1215.7mm.

The evapotranspiration values have been entered from the default data provided by the MUSIC software for the Sydney area.

METHODOLOGY

The water quality modelling software MUSIC v6 was used to analyse the performance of the treatment train. Figure 5 shows the MUSIC node and link diagram used to describe the proposed treatment train. The model has been built to assess the adequacy of the Stormwater treatment measure proposed and to ensure that the quality of stormwater meets the objectives prior to stormwater runoff leaving the site.

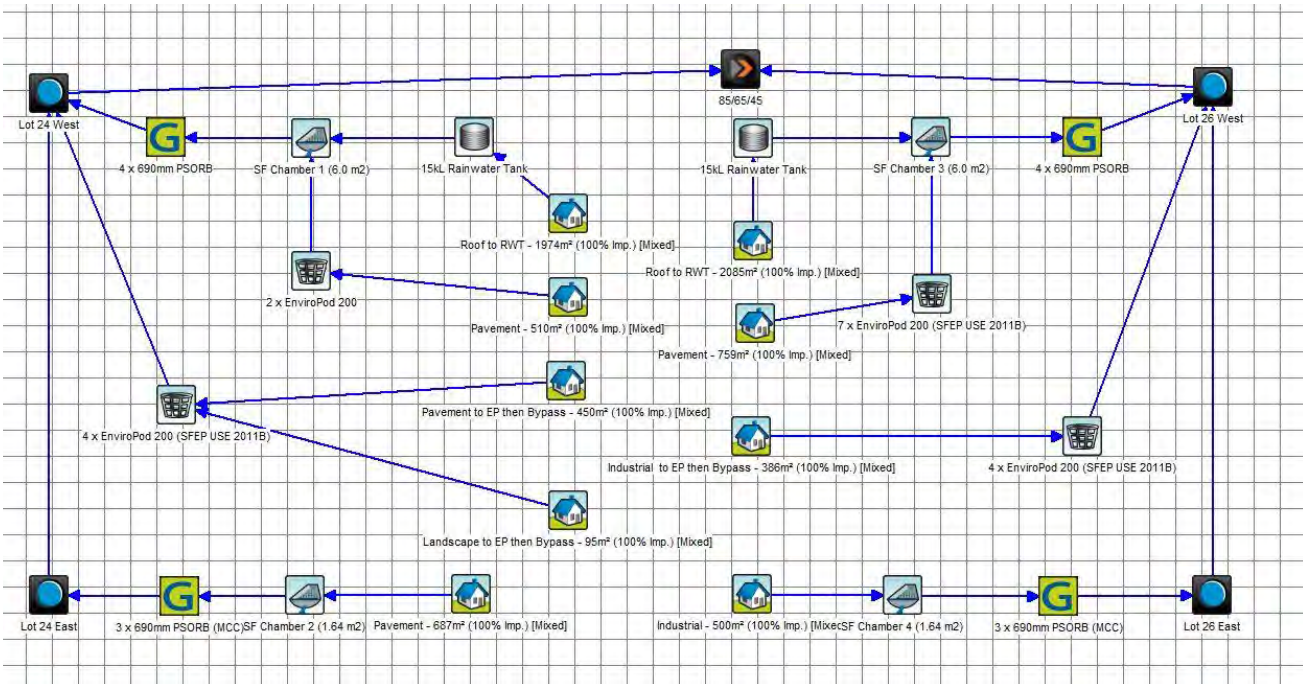

Figure 5 - MUSIC Link and Node Diagram

The following rainfall and runoff parameters shown in Table 4 have been utilised.

Table 4 - Rainfall Runoff Parameters

Parameter	Recommended Values
Rainfall Threshold (mm/day)	1.4
Soil Storage Capacity (mm)	170
Initial Storage (% of Capacity)	30

Field Capacity (mm)	70
Infiltration Capacity Coefficient – a	210
Infiltration Capacity Exponent – b	4.7
Initial Depth (mm)	10
Daily Recharge Rate (%)	50
Daily Base flow Rate (%)	4
Daily Deep Seepage Rate (%)	0

8.5. Model Results

The results of the analysis showed the treatment train will achieve the water quality targets set out in Council's DCP. Table 5 displays the effectiveness of the treatment train for the primary and secondary treatment measures.

The water quality model created using MUSIC software provides an indication of the pollutant removal rates expected when a treatment train of water quality measures is applied to the proposed layout of the development.

Table 5 - MUSIC Model Results

Pollutant	Before Treatment	After Treatment	% Reduction	% Objective	Compliance
Total Suspended Solids (kg/yr)	1420	185	87	85	OK
Total Phosphorus (kg/yr)	2.95	1.02	65.5	65	OK
Total Nitrogen (kg/yr)	20	10.5	47.8	45	OK
Gross Pollutants (kg/yr)	210	0	100	90	OK

A summary of the MUSIC model results are presented in Figure 6.

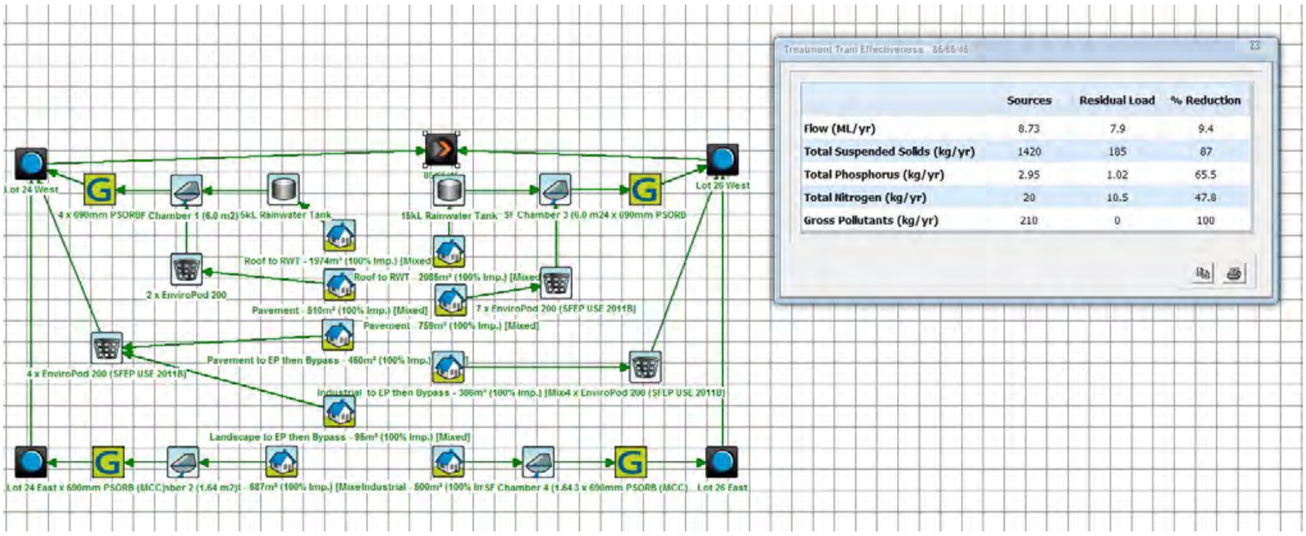

Figure 6 - MUSIC Results

8.6 Proposed Stormwater Treatment Train

In order to achieve the reduction targets the following treatment devices are required as part of the treatment train:

- Stormwater360 690mm PSORB Stormfilter Cartridges

A total of fourteen (14) cartridges are to be introduced to the design as a major filter device located within the WSUD tank at the end of the treatment train. The capture rates provided by the manufacturer, Stormwater360:

  - TSS 73.5%
  - TN 32%
  - TP 49%
  - Litter 95%

- Stormwater360 Enviropod 200 Inserts

Enviropod 200 inserts will be used as a pre-treatment for stormwater runoff to capture litter and coarse sediment surface flows on the site. Enviropod inserts are to be installed on all surface inlet pits across the site. The following capture rates have been adopted for the MUSIC model, based on information provided by Stormwater360:

  - TSS 54%
  - TN 21%
  - TP 30%
  - Litter 100%

- 30kL Rainwater Tank (2 x 15kL tanks)

A total of two (2) x 15kL rainwater tanks will be implemented to capture stormwater runoff generated from the roof of the warehouse. The collected rainwater will be used for irrigation of the landscaped areas across the site and for internal reuse within the development.

Refer to Appendix C for information relating to the proposed WSUD products.

9. Flooding

The subject site has been identified to be located within the Alexandra Canal floodplain and is subject to significant local catchment flooding. The site is affected from both the local catchment to the east and from Alexandra Canal. Flooding assessment has been

The local catchment extends to the east and covers an area of approximately 44 hectares. This catchment is highly urbanised with the majority of surface area being impervious with only small portions of pervious areas.

Results from the flood modelling analysis indicate that for all events considered, flood elevation and velocity impacts due to the proposed development are generally contained within the site with the most significant increases and decreases caused by the change in location of structures within the site.

The flood impact assessment concludes that the development is compliant with the local council development controls and adheres to the guidance set out in the NSW Floodplain Development Manual. Adjacent properties are not affected by changes in flood behaviour caused by the proposed development, and finished floor levels have been set above the flood planning level of 1% AEP flood level plus 500mm.

For a detailed analysis of the flood risk refer to localised Flood Study conducted by Northrop Engineers as well as Figures from the report which are provided in Appendix D.

10. Conclusion

Based on preliminary investigations, analyses and designs, it is anticipated that the Botany Bay Council stormwater quantity and quality measures will be met by the management measures proposed as part of the new industrial development at 1-3 Ricketty Street, Mascot.

The Water Management Plan herein, proposes a series of individual elements arranged in a treatment train consisting of on-site treatment. Suggested treatment measures for the development include:

- Stormwater pit filter inserts;
- Proprietary filter cartridge systems downstream; and
- Two (2) rainwater reuse tanks - 30,000L in total.

The civil engineering and stormwater assessment report has been prepared to conform to the requirements of the Council’s Development Control Plan (DCP) 2013.

In addition, Northrop has prepared a Flood Study Assessment for the proposed site and is referenced in the Appendix D of this report.

Appendix A – Civil Engineering Plans

STORAGE PLUS - 1-3 RICKETTY STREET, MASCOT

CIVIL ENGINEERING WORKS
DEVELOPMENT APPLICATION

SOURCE : NEARMAP.COM.AU (©2017)

DRAWING SCHEDULE	
DRG No.	DRAWING TITLE
DAC01.01	COVER SHEET, DRAWING SCHEDULE AND LOCALITY PLAN
DAC02.01	SEDIMENT AND SOIL ERSOION CONTROL PLAN
DAC02.11	SEDIMENT AND SOIL EROSION CONTROL DETAILS
DAC03.01	CUT & FILL PLAN
DAC03.02	CUT & FILL SECTIONS
DAC04.01	CONCEPT SITEWORKS AND STORMWATER MANAGEMENT PLAN
DAC05.01	DETAILS - SHEET 1
DAC05.02	DETAILS - SHEET 2
DAC06.01	CATCHMENT PLAN

DRAWN: C. WALKER-HEALION DESIGNED: R. HUTCHINSON JOB MANAGER: R. HUTCHINSON VERIFIER: A. DAWES

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	07.09.17

CLIENT: STORAGE PLUS SELF STORAGE 8345 6000

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ARCHITECT: MCHP ARCHITECTS

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PROJECT: 1-3 RICKETTY STREET, MASCOT

DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION

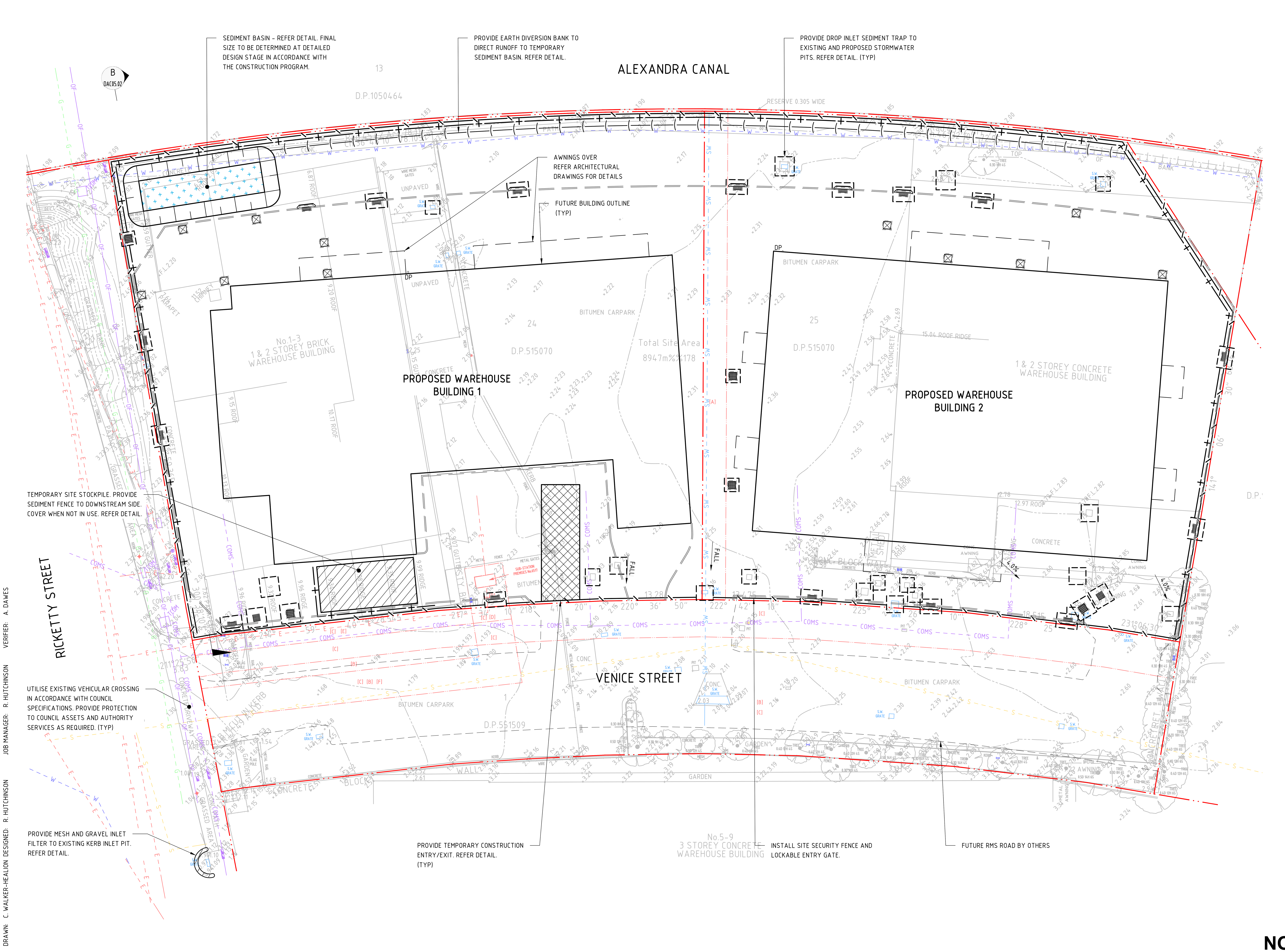
COVER SHEET, DRAWING SCHEDULE AND LOCALITY PLAN

JOB NUMBER: 170463

DRAWING NUMBER: DAC01.01

REVISION: 1

DRAWING SHEET SIZE = A1



LEGEND

—·—·—	EXISTING BOUNDARY LINE
	EASEMENT LINE
— — —	FUTURE RMS ROAD BY OTHERS
	EXISTING CONTOURS
—+—	PROPOSED SEDIMENT FENCE
—\—	PROPOSED SECURITY FENCE
	PROPOSED WIRE MESH AND GRAVEL SEDIMENT FILTER
	PROPOSED DROP INLET SEDIMENT TRAP
—)—)—)—	PROVIDE DIVERSION BANK

SEDIMENT AND SOIL EROSION

1. THE SEDIMENT & EROSION CONTROL PLAN PRESENTS CONCEPTS ONLY. THE CONTRACTOR SHALL AT ALL TIMES BE RESPONSIBLE FOR THE ESTABLISHMENT & MANAGEMENT OF A DETAILED SCHEME MEETING COUNCILS DESIGN, OTHER REGULATORY AUTHORITY REQUIREMENTS AND MAKE GOOD PAYMENT OF ALL FEES.
2. THE CONTRACTOR SHALL INSTIGATE ALL SEDIMENT AND EROSION CONTROL MEASURES IN ACCORDANCE WITH STATUTORY REQUIREMENTS AND IN PARTICULAR THE 'BLUE BOOK' (MANAGING URBAN STORMWATER SOILS AND CONSTRUCTION), PRODUCED BY THE DEPARTMENT OF HOUSING AND COUNCILS POLICIES. THESE MEASURES ARE TO BE INSPECTED AND MAINTAINED ON A DAILY BASIS.
3. THE SITE SUPERINTENDENT SHALL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS INSTRUCTED IN THE DRAWINGS AND ADHERE TO ALL REGULATORY AUTHORITY REQUIREMENTS.
4. THE CONTRACTOR SHALL INFORM ALL SUB CONTRACTORS OF THEIR RESPONSIBILITIES IN MINIMISING THE POTENTIAL FOR SOIL EROSION AND POLLUTION TO DOWNSLOPE LANDS AND WATERWAYS.
5. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE SHALL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE;
   - 5.1. CONSTRUCT TEMPORARY STABILISED SITE ACCESS INCLUSIVE OF SHAKE DOWN / WASH PAD.
   - 5.2. INSTALL ALL TEMPORARY SEDIMENT FENCES AND BARRIER FENCES. WHERE FENCES ADJACENT EACH OTHER, THE SEDIMENT FENCE CAN BE INCORPORATED INTO THE BARRIER FENCE.
   - 5.3. INSTALL SEDIMENT CONTROL MEASURES AS OUTLINED ON THE APPROVED PLANS.
6. UNDERTAKE SITE DEVELOPMENT WORKS SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF MINIMUM WORKABLE SIZE.
7. AT ALL TIMES AND IN PARTICULAR DURING WINDY AND DRY WEATHER, LARGE UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL ENSURING CONFORMITY TO REGULATORY AUTHORITY REQUIREMENTS.
8. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) SHALL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.
9. WATER SHALL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS THE CATCHMENT AREA HAS BEEN STABILISED AND/OR ANY LIKELY SEDIMENT BEEN FILTERED OUT.
10. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES SHALL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE STABILISED / REHABILITATED.
11. ALLOW FOR GRASS STABILISATION OF EXPOSED AREAS, OPEN CHANNELS AND ROCK BATTERS DURING ALL PHASES OF CONSTRUCTION.
12. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED TO ENSURE THAT THEY OPERATE EFFECTIVELY. REPAIRS AND/OR MAINTENANCE SHALL BE UNDERTAKEN REGULARLY AND AS REQUIRED, PARTICULARLY FOLLOWING RAIN EVENTS.
13. RECEPTORS FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER SHALL BE DISPOSED OF IN ACCORDANCE WITH REGULATORY AUTHORITY REQUIREMENTS. CONTRACTOR TO PAY ALL FEES AND PROVIDE EVIDENCE OF SAFE DISPOSAL.
14. IF A TEMPORARY SEDIMENT BASIN IS REQUIRED, ENSURE SAFE BATTER SLOPES IN ACCORDANCE WITH THE GEOTECHNICAL REPORT. MAINTAIN ADEQUATE STORAGE VOLUME IN ACCORDANCE WITH PLANS. TEMPORARY PUMP 'CLEAN FLOCCULATED' WATER TO COUNCILS STORMWATER SYSTEM . ENSURE WHOLE SITE RUN-OFF IS DIRECTED TO TEMPORARY SEDIMENT BASIN.

NOT FOR CONSTRUCTION

DRAWN: C. WALKER-HEALION DESIGNED: R. HUTCHINSON JOB MANAGER: R. HUTCHINSON VERIFIER: A. DAWES

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	07.09.17
2	RE-ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	14.09.17
3	RE-ISSUED FOR DEVELOPMENT APPLICATION	DC	AD	RH	09.03.18

CLIENT: STORAGE PLUS SELF STORAGE

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ARCHITECT: MCHP ARCHITECTS

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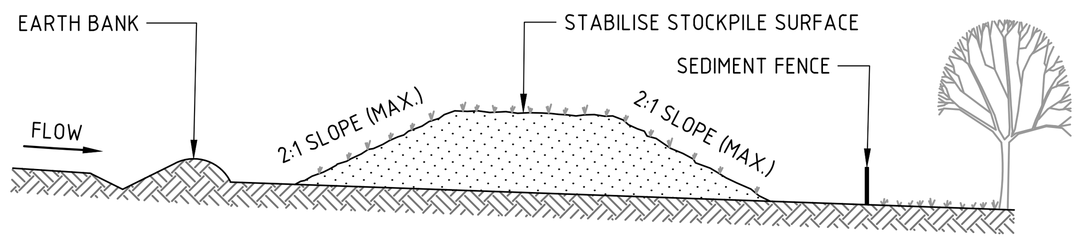
PROJECT: 1-3 RICKETTY STREET, MASCOT

DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION — CONCEPT SEDIMENT AND SOIL ERSOION CONTROL PLAN

JOB NUMBER: 170463

DRAWING NUMBER: DAC02.01 REVISION: 3

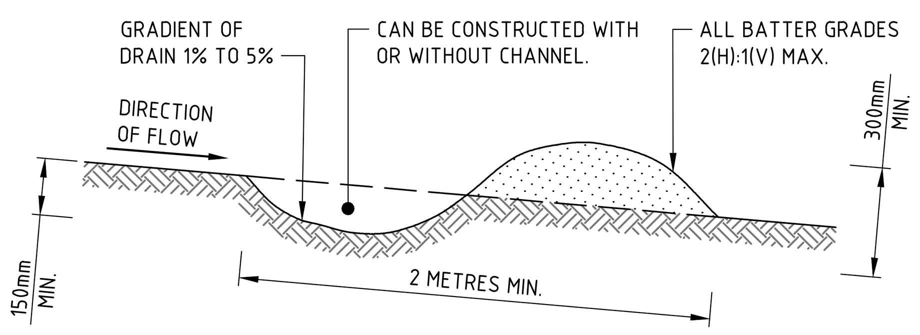
DRAWING SHEET SIZE = A1



CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2m (PREFERABLY 5m) FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2m DOWNSLOPE.

STOCKPILES (SD 4-1)

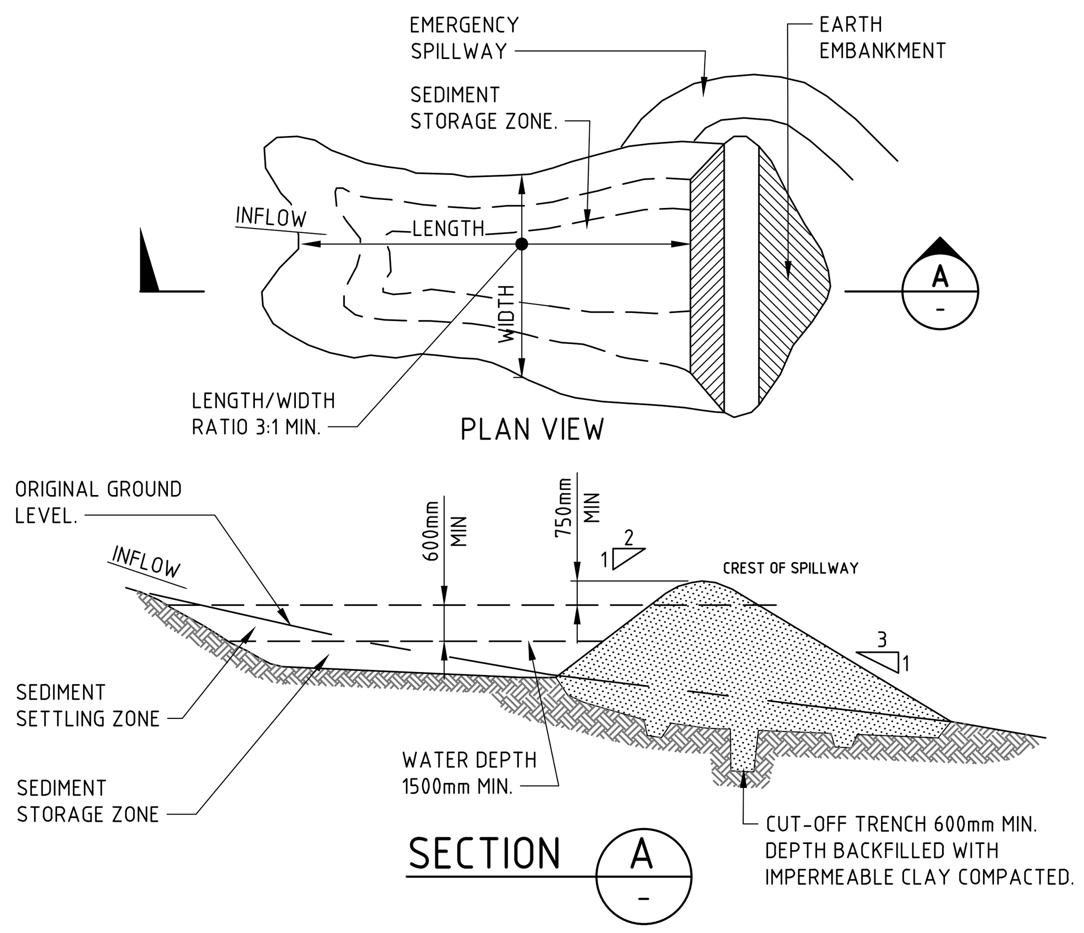


CONSTRUCTION NOTES

1. BUILD WITH GRADIENTS BETWEEN 1 AND 5 PERCENT.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTIONS, NOT V SHAPED.
5. ENSURE THE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITHIN 10 DAYS OF CONSTRUCTION.

NOTE: ONLY TO BE USED AS TEMPORARY BANK WHERE MAXIMUM UPSLOPE LENGTH IS 80 METRES.

EARTH BANK - LOW FLOW (SD 5-5)

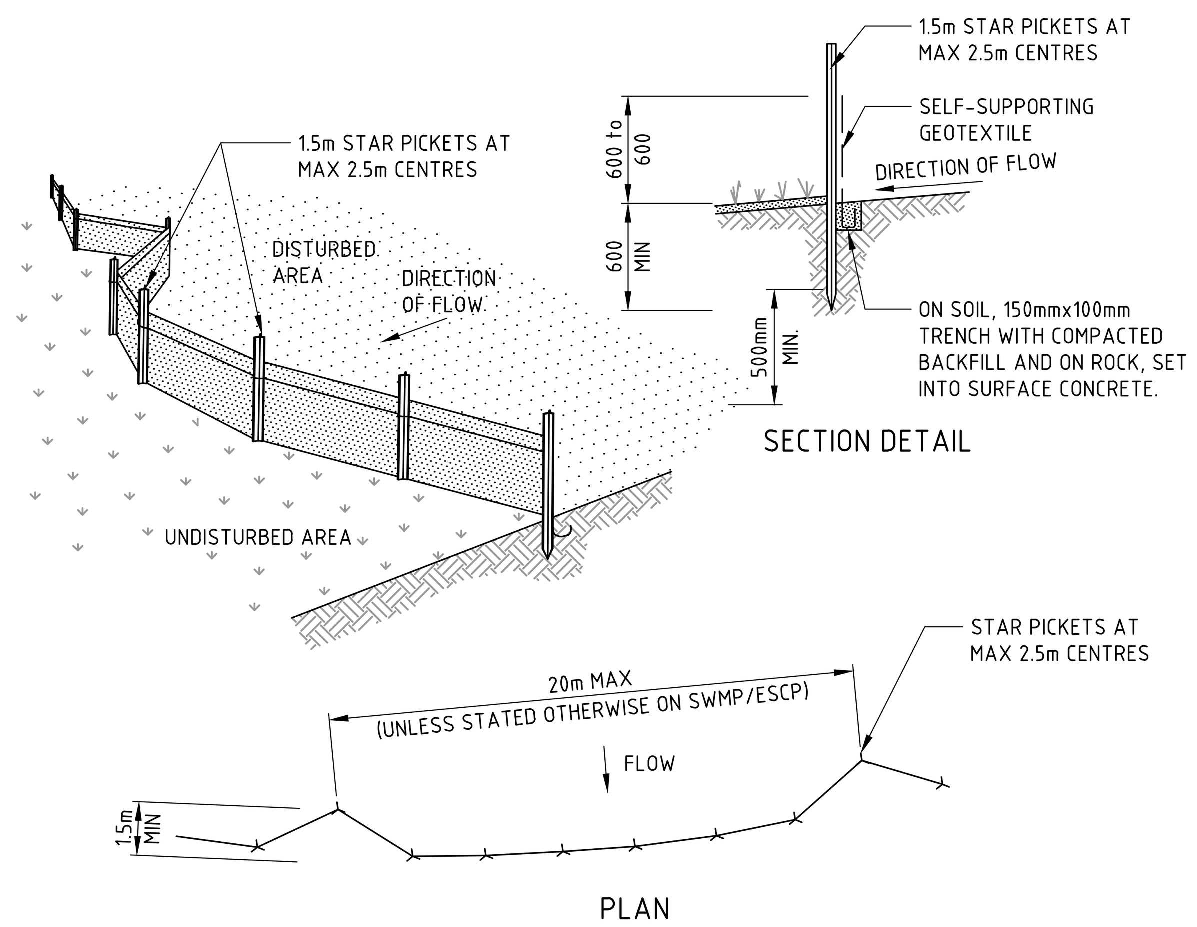


CONSTRUCTION NOTES

1. REMOVE ALL VEGETATION AND TOPSOIL FROM UNDER THE DAM WALL AND FROM WITHIN THE STORAGE AREA.
2. CONSTRUCT A CUT-OFF TRENCH 500mm DEEP AND 1200mm WIDE ALONG THE CENTRELINE OF THE EMBANKMENT EXTENDING TO A POINT ON THE GULLY WALL LEVEL WITH THE RISER CREST.
3. MAINTAIN THE TRENCH FREE OF WATER AND RECOMPACT THE MATERIALS WITH EQUIPMENT AS SPECIFIED IN THE SWMP TO 95 PER CENT STANDARD PROCTOR DENSITY.
4. SELECT FILL FOLLOWING THE SWMP THAT IS FREE OF ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL.
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING TO AT LEAST 100mm TO HELP BOND COMPACTED FILL TO THE EXISTING SUBSTRATE.
6. SPREAD THE FILL IN 100mm TO 150mm LAYERS AND COMPACT IT AT OPTIMUM MOISTURE CONTENT FOLLOWING THE SWMP.
7. CONSTRUCT THE EMERGENCY SPILLWAY.
8. REHABILITATE THE STRUCTURE FOLLOWING THE SWMP.

(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)

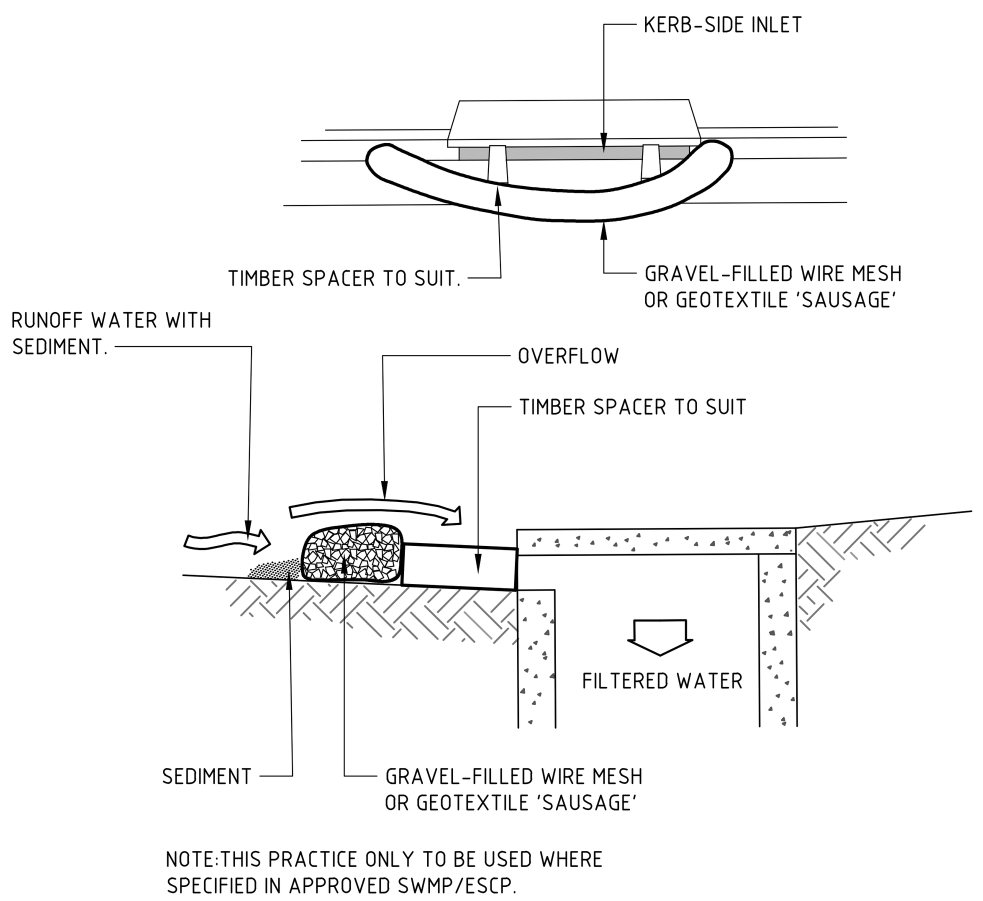
SEDIMENT BASIN - WET (SD 6-4)



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5 METRE LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

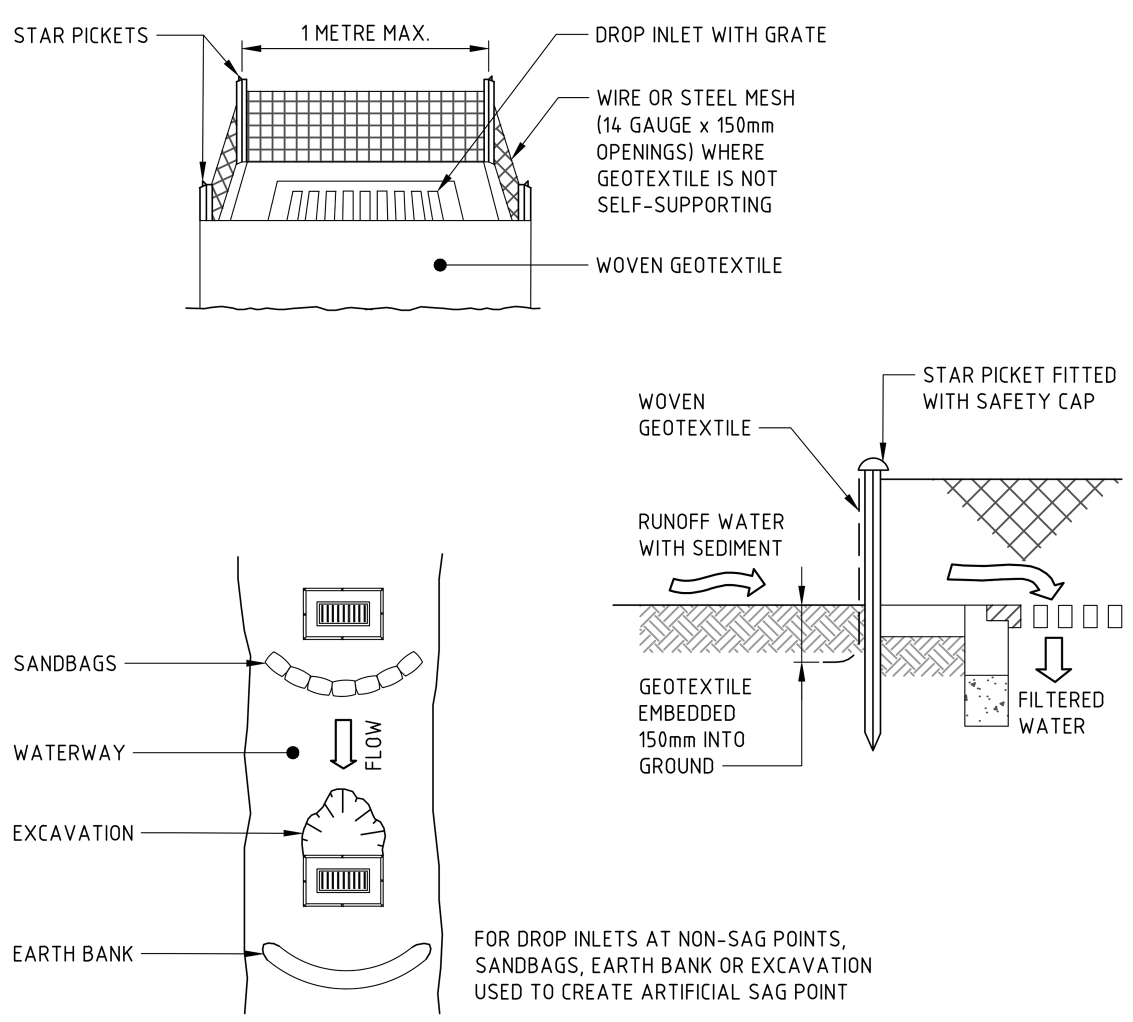
SEDIMENT FENCE (SD 6-8)



CONSTRUCTION NOTES

1. INSTALL FILTERS TO KERB INLETS ONLY AT SAG POINTS.
2. FABRICATE A SLEEVE MADE FROM GEOTEXTILE OR WIRE MESH LONGER THAN THE LENGTH OF THE INLET PIT AND FILL IT WITH 25mm TO 50mm GRAVEL.
3. FORM AN ELLIPTICAL CROSS-SECTION ABOUT 150mm HIGH x 400mm WIDE.
4. PLACE THE FILTER AT THE OPENING LEAVING AT LEAST A 100mm SPACE BETWEEN IT AND THE KERB INLET. MAINTAIN THE OPENING WITH SPACER BLOCKS.
5. FORM A SEAL WITH THE KERB TO PREVENT SEDIMENT BYPASSING THE FILTER.
6. SANDBAGS FILLED WITH GRAVEL CAN SUBSTITUTE FOR THE MESH OR GEOTEXTILE PROVIDING THEY ARE PLACED SO THAT THEY FIRMLY ABUT EACH OTHER AND SEDIMENT-LADEN WATERS CANNOT PASS BETWEEN.

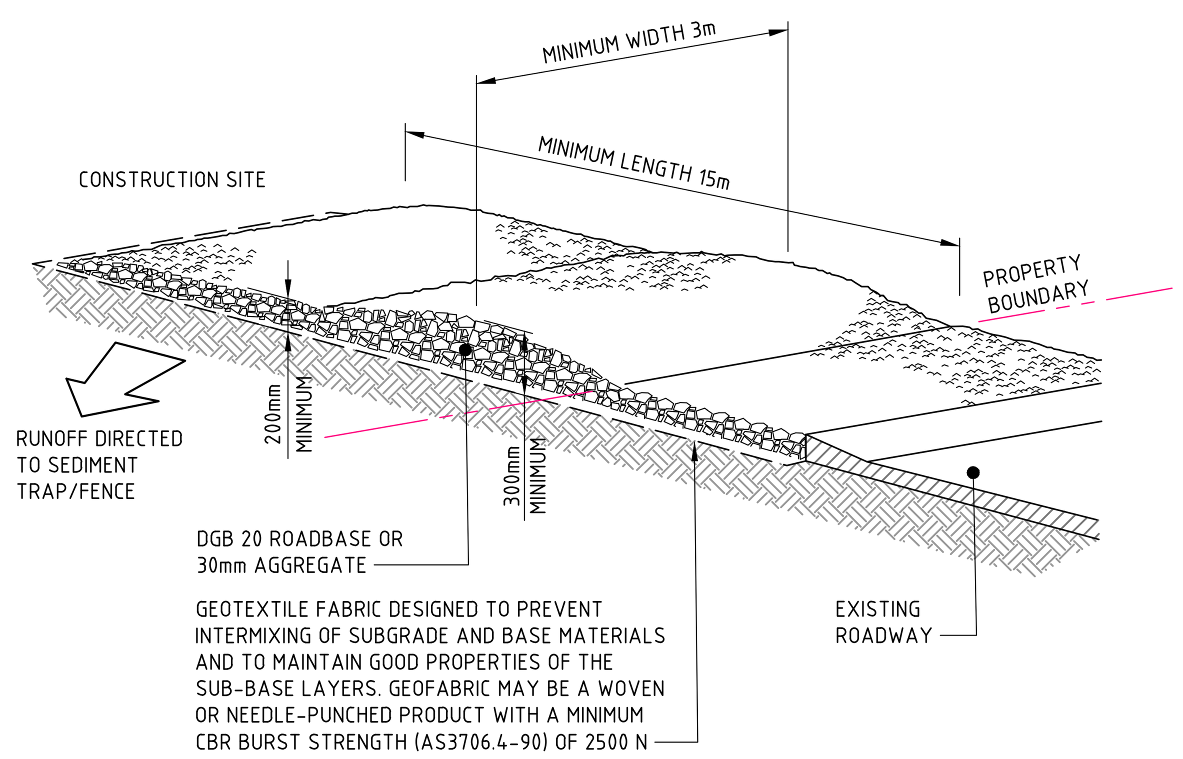
MESH AND GRAVEL INLET FILTER (SD 6-11)



CONSTRUCTION NOTES

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. FOLLOW STANDARD DRAWING 6-7 AND STANDARD DRAWING 6-8 FOR INSTALLATION PROCEDURES FOR THE STRAW BALES OR GEOFABRIC. REDUCE THE PICKET SPACING TO 1 METRE CENTRES.
3. IN WATERWAYS, ARTIFICIAL SAG POINTS CAN BE CREATED WITH SANDBAGS OR EARTH BANKS AS SHOWN IN THE DRAWING.
4. DO NOT COVER THE INLET WITH GEOTEXTILE UNLESS THE DESIGN IS ADEQUATE TO ALLOW FOR ALL WATERS TO BYPASS IT.

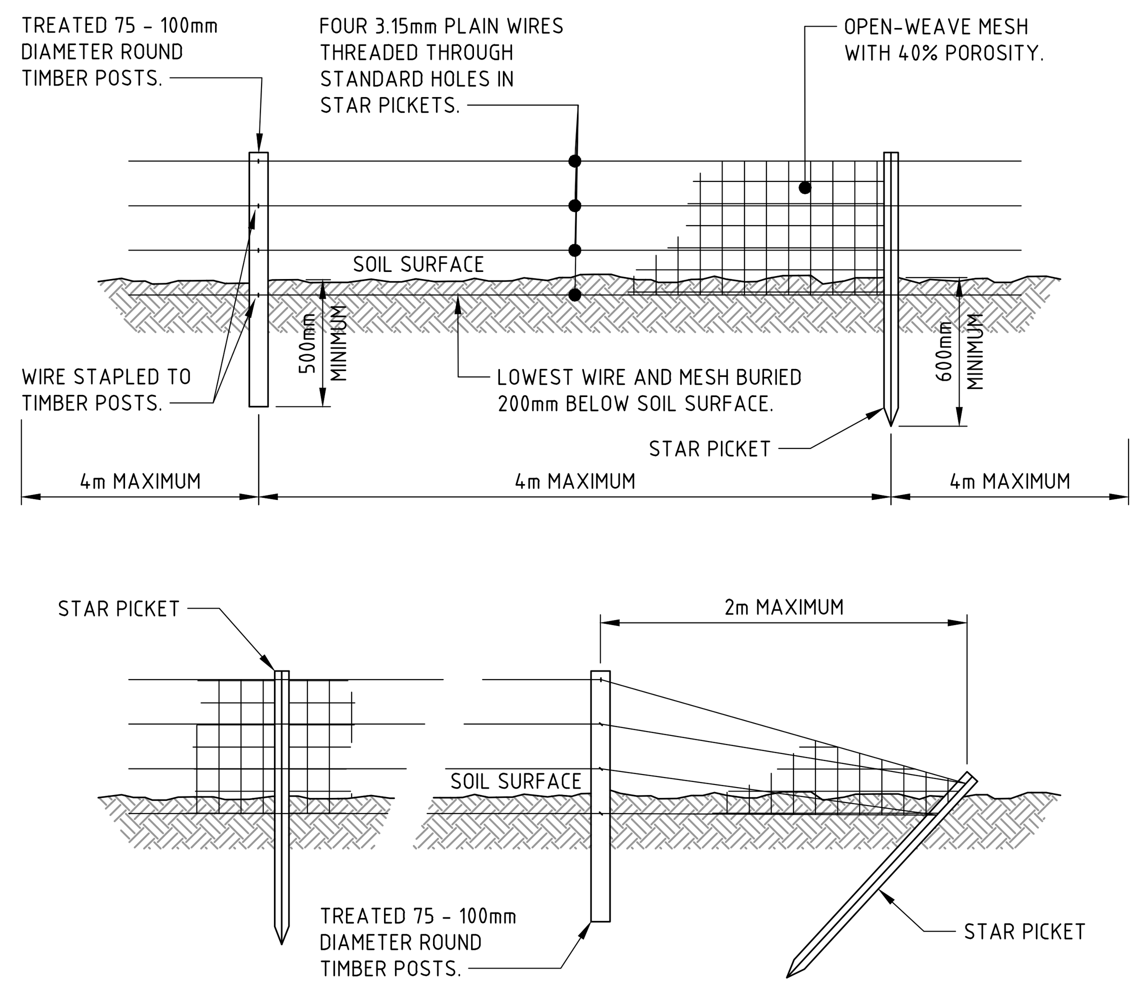
GEOTEXTILE INLET FILTER (SD 6-12)



CONSTRUCTION NOTES

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15 METRES LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3 METRES WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO THE SEDIMENT FENCE.

STABILISED SITE ACCESS (SD 6-14)



CONSTRUCTION NOTES

1. INSTALL THE FENCE TO THE HEIGHT SPECIFIED IN THE ESCP/SWMP.
2. CUT A CHANNEL 200mm DEEP ALONG THE FENCE LINE.
3. PLACE WIRE AND LIGHT RESISTANT, OPEN-WEAVE POLYMER MESH WITH 40 PERCENT POROSITY ON THE PREVAILING WIND SIDE OF FENCE.
4. FASTEN THE MESH TO ALL WIRES USING RING FASTENERS AT 100mm TO 150mm INTERVALS ON TOP WIRE AND 300mm INTERVALS ON OTHER WIRES.
5. USE ONE 75mm TO 100mm DIAMETER TREATED ROUND TIMBER POST EVERY 20 METRES.
6. WHERE STAR PICKETS ARE USED, ENSURE THEY ARE FITTED WITH SAFETY CAPS.

CONTROL OF WIND EROSION (SD 6-15)

DRAWN: C. WALKER-HEALION DESIGNED: R. HUTCHINSON JOB MANAGER: R. HUTCHINSON VERIFIER: A. DAWES

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	07.09.17
2	RE-ISSUED FOR DEVELOPMENT APPLICATION	DC	AD	RH	09.03.18

CLIENT: STORAGE PLUS

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: MCHP ARCHITECTS

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PROJECT: 1-3 RICKETTY STREET, MASCOT

DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION

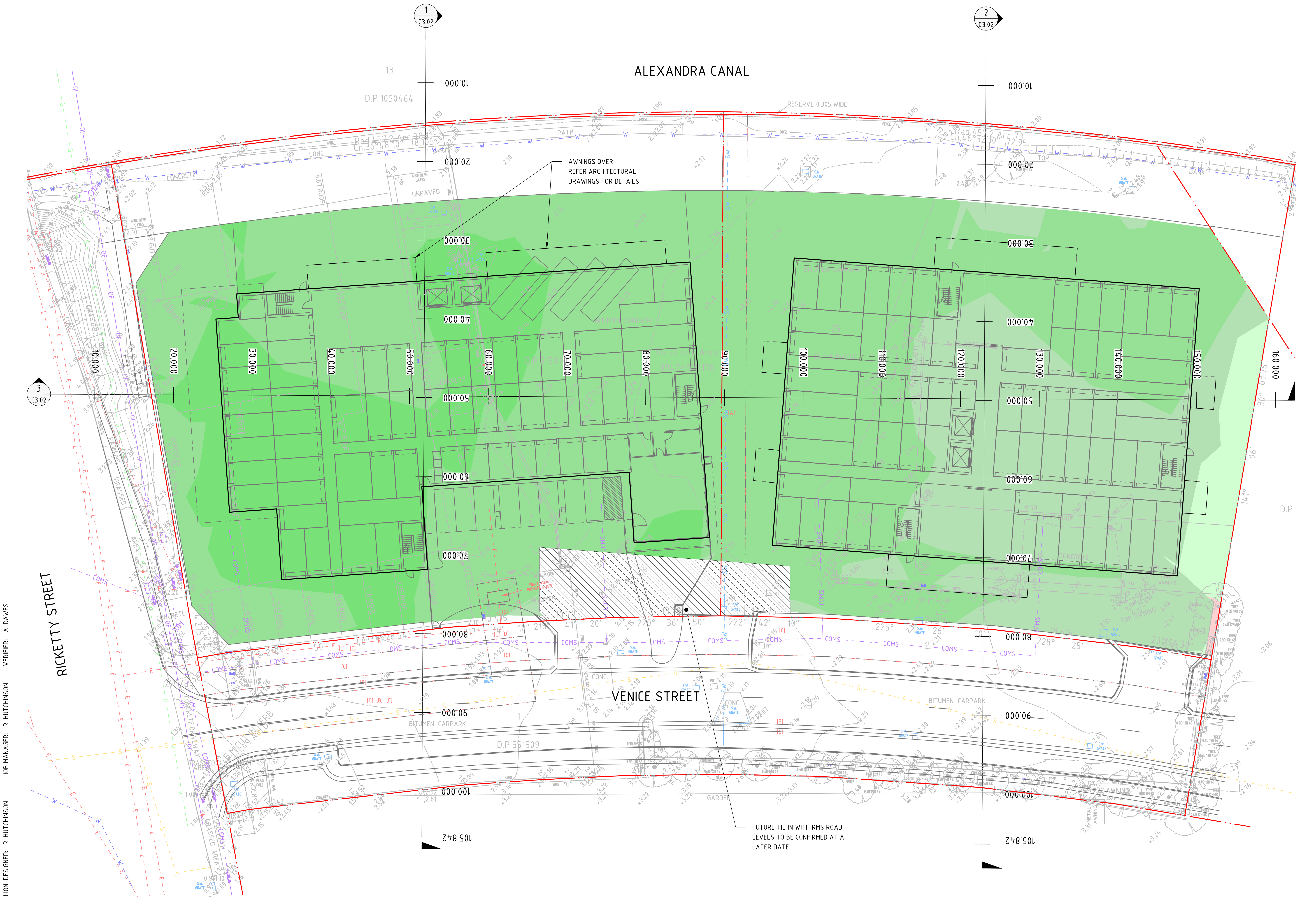
SEDIMENT AND SOIL EROSION CONTROL DETAILS

JOB NUMBER: 170463

DRAWING NUMBER: DAC02.11

REVISION: 2

DRAWING SHEET SIZE = A1



LEGEND

— · —	EXISTING BOUNDARY LINE
— — —	EASEMENT LINE
• BEXX.XX	BULK EARTHWORKS SPOT HEIGHT
+ eRLXX.XX	EXISTING SPOT HEIGHT
BEXX.XX	BULK EARTHWORKS PAD LEVEL
	BATTERS
XX.XX	CONTOURS

DEPTH OF CUT

	- 999m TO - 15.0m
	- 15.0m TO - 10.0m
	- 10.0m TO - 5.0m
	- 5.0m TO - 2.0m
	- 2.0m TO - 1.0m
	- 1.0m TO - 0.5m
	- 0.5m TO - 0.25m
	- 0.25m TO - 0.0m

DEPTH OF FILL

	0.0m TO 0.25m
	0.25m TO 0.5m
	0.5m TO 1.0m
	1.0m TO 2.0m
	2.0m TO 5.0m
	5.0m TO 10.0m
	10.0m TO 15.0m
	15.0m TO 999m

NOTES:

1. CUT AND FILL CALCULATIONS:
   FINISHED SURFACE TO EXISTING SURFACE LEVEL:
   TOTAL CUT : $0.44m^3$
   TOTAL FILL : $5233m^3$
   CUT TO EXPORT : $5232m^3$

CUT TO FILL CALCULATIONS DEMONSTRATE ULTIMATE CHANGE IN LEVELS. QUANTITIES SHOWN REPRESENT CUT TO FILL TO ULTIMATE LEVELS. (I.E. INCLUDING PAVEMENTS).

2. NO ALLOWANCE HAS BEEN MADE FOR TOPSOIL STRIP
3. NO ALLOWANCE HAS BEEN MADE FOR DETAILED EARTHWORKS i.e, SERVICES TRENCHING, DETAILED EXCAVATION, FOOTINGS, RETAINING WALLS AND THE LIKE.
4. REFER SPECIFICATIONS NOTES FOR EARTHWORKS GENERAL REQUIREMENTS.
5. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL / RELEVANT AUTHORITY SPECIFICATIONS AND DETAILS.
6. THE CONTRACTOR SHALL USE FINAL SURFACE LEVELS AND TYPICAL PAVEMENT DETAILS FOR ACTUAL EARTHWORKS LEVELS.

CUT AND FILL PLAN SHOWS FINISHED SURFACE LEVEL COMPARED TO SURVEY SURFACE TO DEMONSTRATE TOTAL CHANGE IN LEVELS.

DRAWN: C. WALKER-HEALION DESIGNED: R. HUTCHINSON JOB MANAGER: R. HUTCHINSON VERIFIER: A. DAWES

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	07.09.17
2	RE-ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	14.09.17
3	RE-ISSUED FOR DEVELOPMENT APPLICATION	CP	AD	RH	27.10.17

CLIENT: STORAGE PLUS SELF STORAGE 8345 6000

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ARCHITECT: MCHP ARCHITECTS

SCALE 1:250@ A1 — 0 2 4 6 8 10 12m

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PROJECT: 1-3 RICKETTY STREET, MASCOT

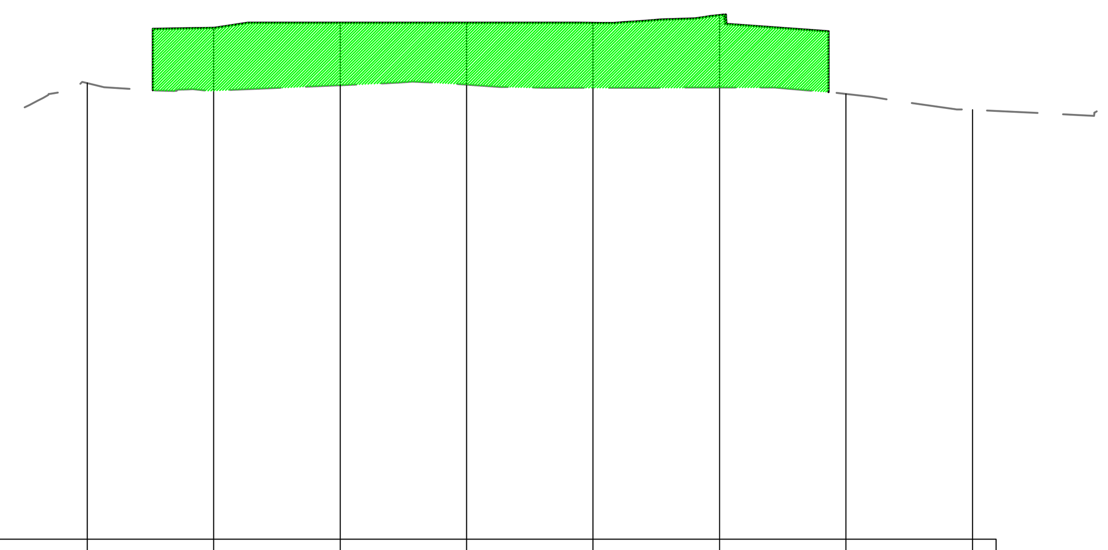
DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION

CUT & FILL PLAN

JOB NUMBER: 170463

DRAWING NUMBER: DAC03.01 REVISION: 3

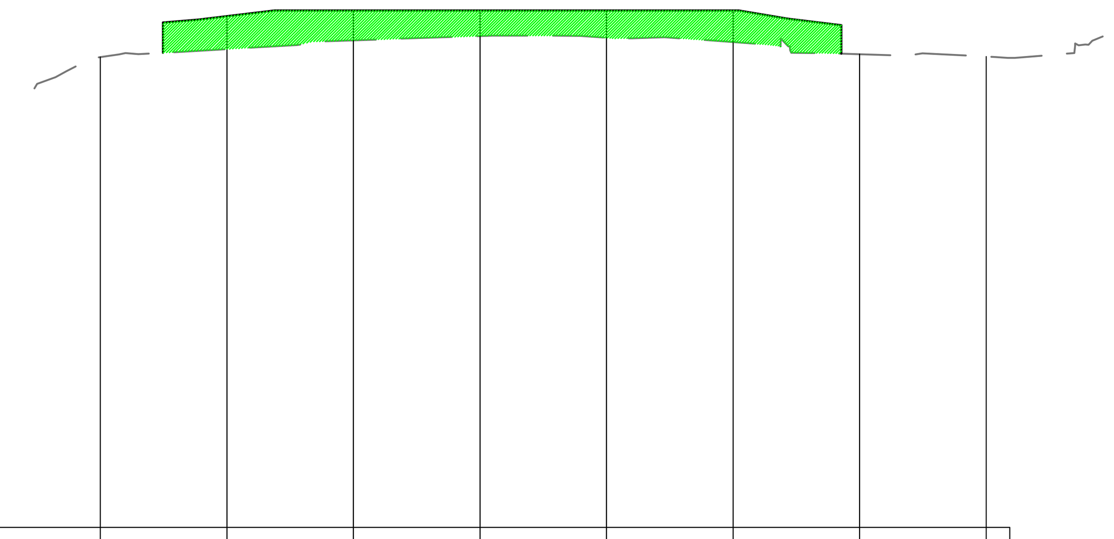
DRAWING SHEET SIZE = A1



DATUM RL -5.0

DESIGN SURFACE				3.088	3.17	3.17	3.166	3.289		
EXISTING SURFACE			2.215	2.095	2.181	2.191	2.14	2.143	2.043	1.792
CHAINAGE	0	10	20	30	40	50	60	70	80	90

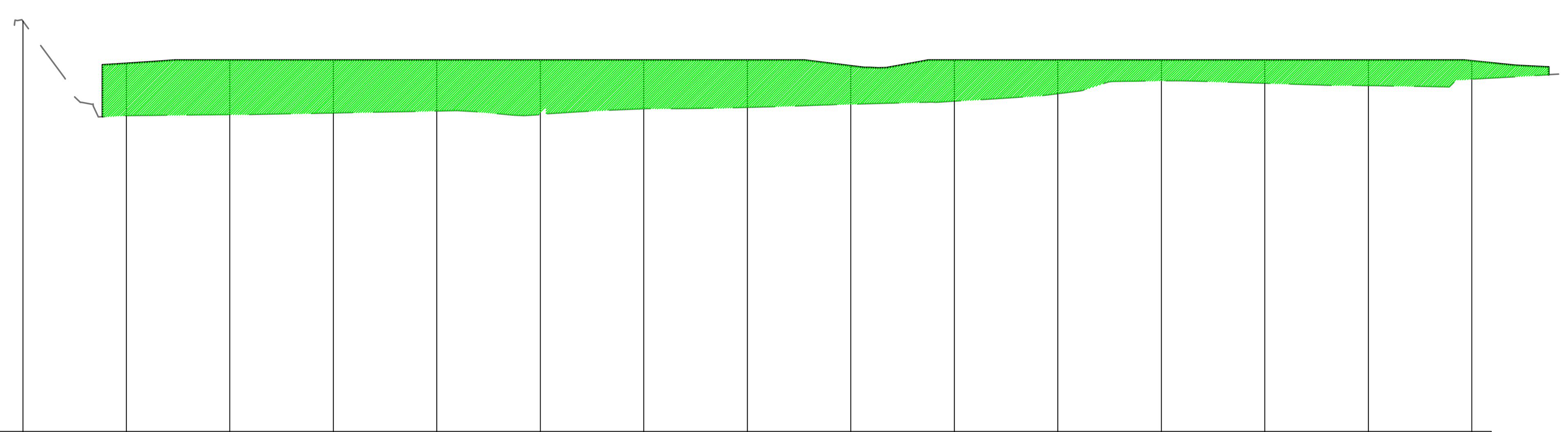
LONGITUDINAL SECTION 1 / C3.01
HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1



DATUM RL -5.0

DESIGN SURFACE				3.08	3.17	3.17	3.17	3.17		
EXISTING SURFACE			2.435	2.56	2.699	2.767	2.738	2.67	2.481	2.442
CHAINAGE	0	10	20	30	40	50	60	70	80	90

LONGITUDINAL SECTION 2 / C3.01
HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1



DATUM RL -4.0

DESIGN SURFACE			3.103	3.17	3.17	3.17	3.17	3.17	3.17	3.056	3.17	3.17	3.17	3.17	3.17	3.154
EXISTING SURFACE		3.921	2.098	2.117	2.149	2.187	2.135	2.23	2.257	2.319	2.376	2.521	2.769	2.722	2.677	2.801
CHAINAGE	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

LONGITUDINAL SECTION 3 / C3.01
HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1

DRAWN: C. WALKER-HEALION DESIGNED: R. HUTCHINSON JOB MANAGER: R. HUTCHINSON VERIFIER: A. DAWES

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	07.09.17

CLIENT: STORAGE PLUS SELF STORAGE

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ARCHITECT: MCHP ARCHITECTS

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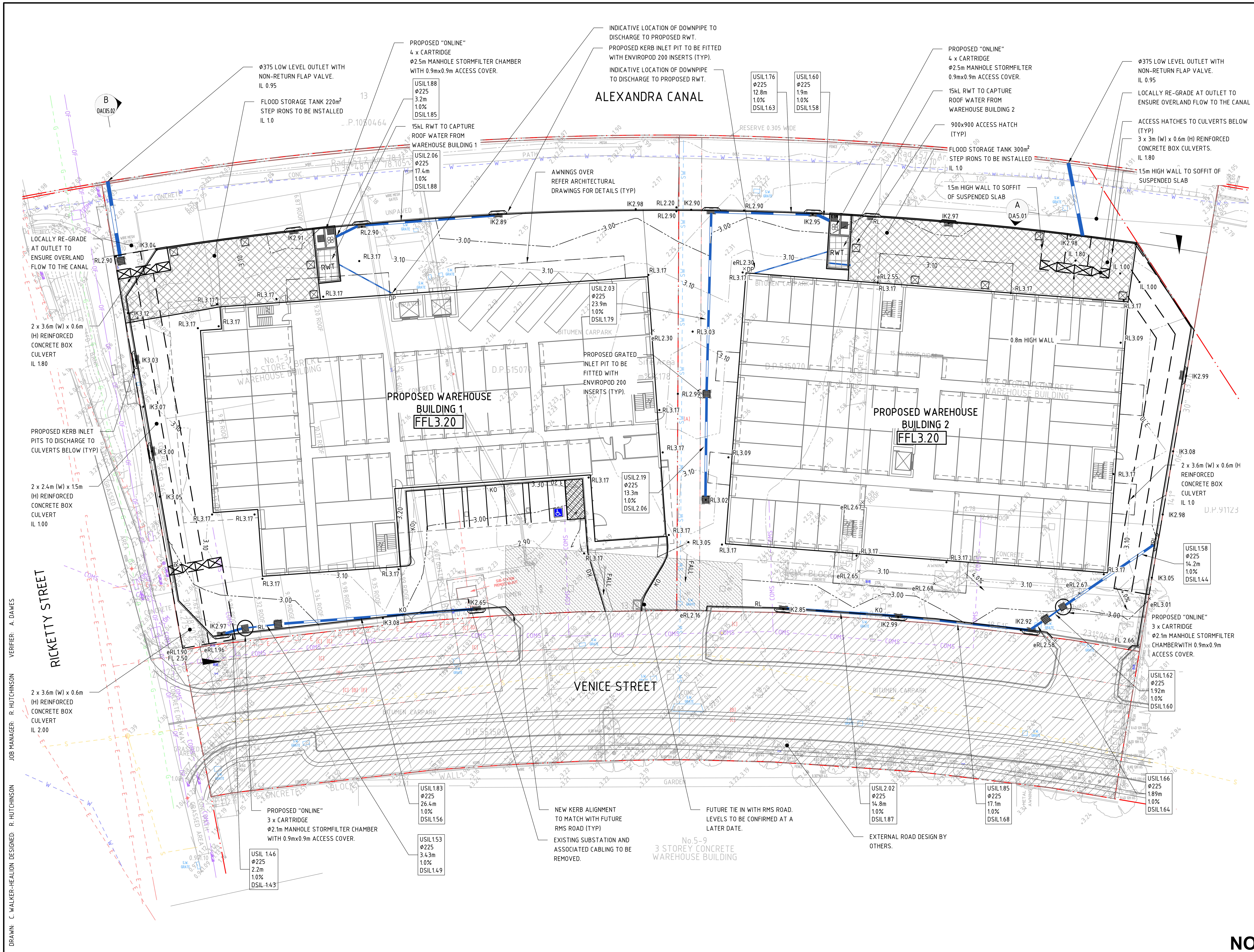
PROJECT: 1-3 RICKETTY STREET, MASCOT

DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION
CUT & FILL SECTIONS

JOB NUMBER: 170463
DRAWING NUMBER: DAC03.02
REVISION: 1
DRAWING SHEET SIZE = A1



LEGEND

	EXISTING BOUNDARY LINE
	EASEMENT LINE
	PROPOSED KERB
	SAWCUT AND PAVEMENT INFILL
KO	KERB ONLY
KG	KERB AND GUTTER
RL	INTEGRAL KERB
KR	KERB RAMP
• RLXX.XX	PROPOSED SPOT HEIGHT
FFLXX.XX	PROPOSED FINISHED FLOOR LEVEL
X.X	DIRECTION OF GRADE
USIL 1.59 / ø225 / 2.2m / 1.0% / DSIL 1.61	UPSTREAM INVERT LEVEL / PIPE SIZE / PIPE LENGTH / PIPE GRADE / DOWNSTREAM INVERT LEVEL
ø150	PROPOSED STORMWATER PIPE
SW	EXISTING STORMWATER PIPE
	DRAINAGE STRUCTURE WITH EXTENDED CHAMBER (NEW / EXTG)
	GRATED INLET PIT (NEW / EXTG)
	KERB INLET PIT (NEW / EXTG)
	JUNCTION PIT (NEW / EXTG)
OSD	FLOOD STORAGE
RWT	RAIN WATER TANK
• B	BOLLARD
RW1	RETAINING WALL
XX.XX	CONTOURS
XX.XX	EXISTING CONTOURS

SERVICES LEGEND

E	EXISTING ELECTRICITY
G	EXISTING GAS
COMS	EXISTING TELECOMMUNICATIONS
OF	EXISTING OPTICAL FIBRE
W	EXISTING WATER
SW	EXISTING STORMWATER
S	EXISTING SEWER

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	07.09.17
2	RE-ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	14.09.17
3	RE-ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	16.10.17
4	RE-ISSUED FOR DEVELOPMENT APPLICATION	DC	AD	RH	09.03.18

CLIENT: STORAGE PLUS

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: MCHP ARCHITECTS

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SCALE 1:250@A1 — 0 2 4 6 8 10 12m

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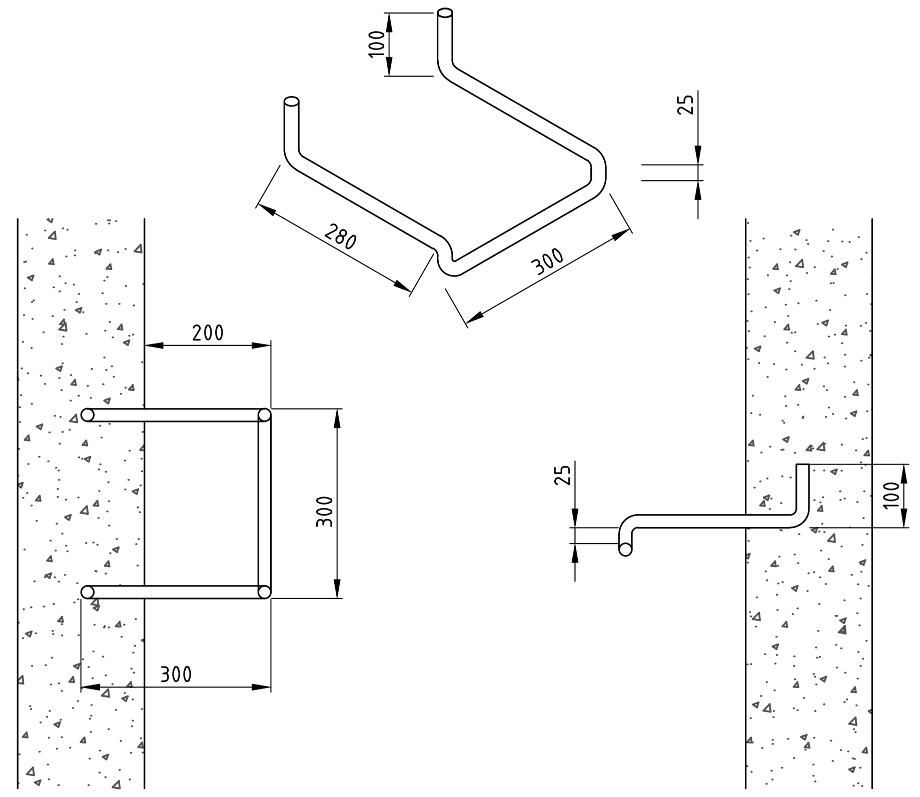
PROJECT: 1-3 RICKETTY STREET, MASCOT

DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION — CONCEPT SITEWORKS AND STORMWATER MANAGEMENT PLAN

JOB NUMBER: 170463

DRAWING NUMBER: DAC04.01 REVISION: 4

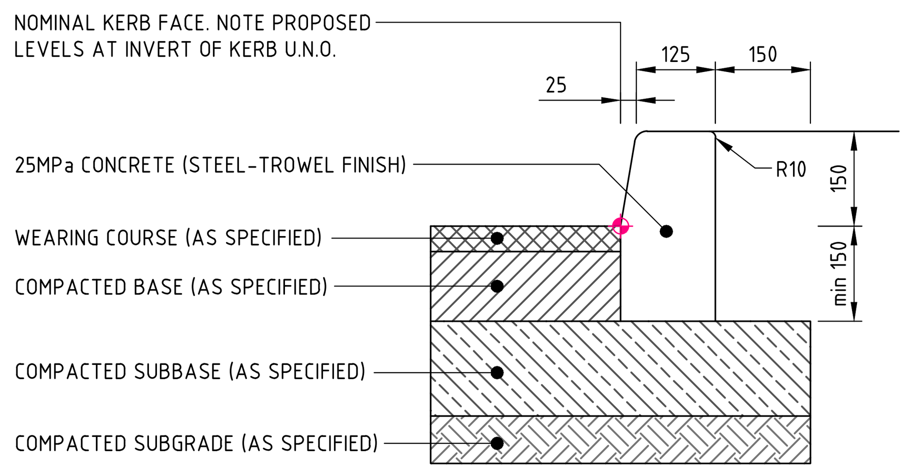
DRAWING SHEET SIZE = A1



STEP IRON DETAIL

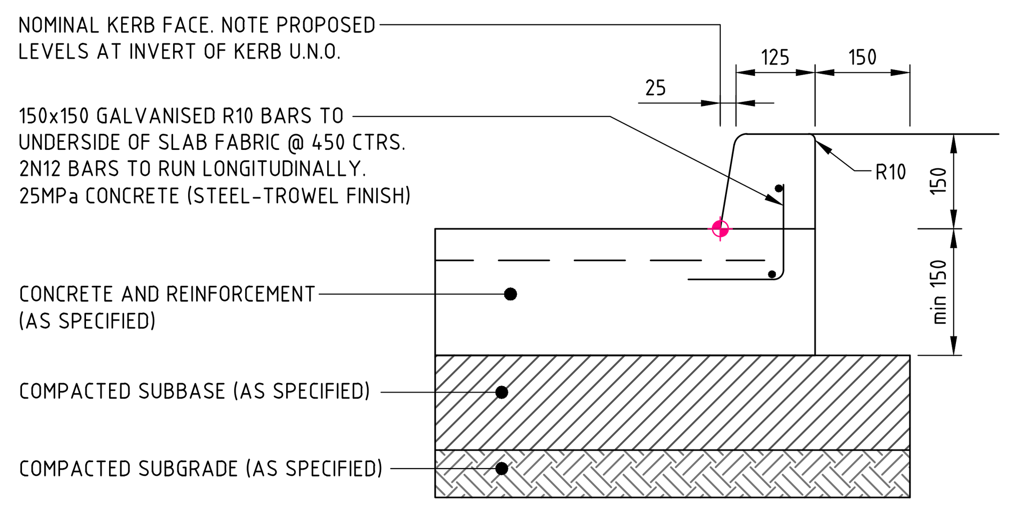
STEP IRON OF 20mm GALVANISED STEEL MADE TO SHAPE AND DIMENSIONS AS SHOWN, PLACED AT 300 CENTRES AND STAGGERED HORIZONTALLY FOR ALL PITS DEEPER THAN 1.0m. THE USE OF PROPRIETARY STEP IRONS ARE ACCEPTABLE PROVIDED THE PRODUCT IS IN ACCORDANCE WITH AUSTRALIAN STANDARDS

SCALE 1:10



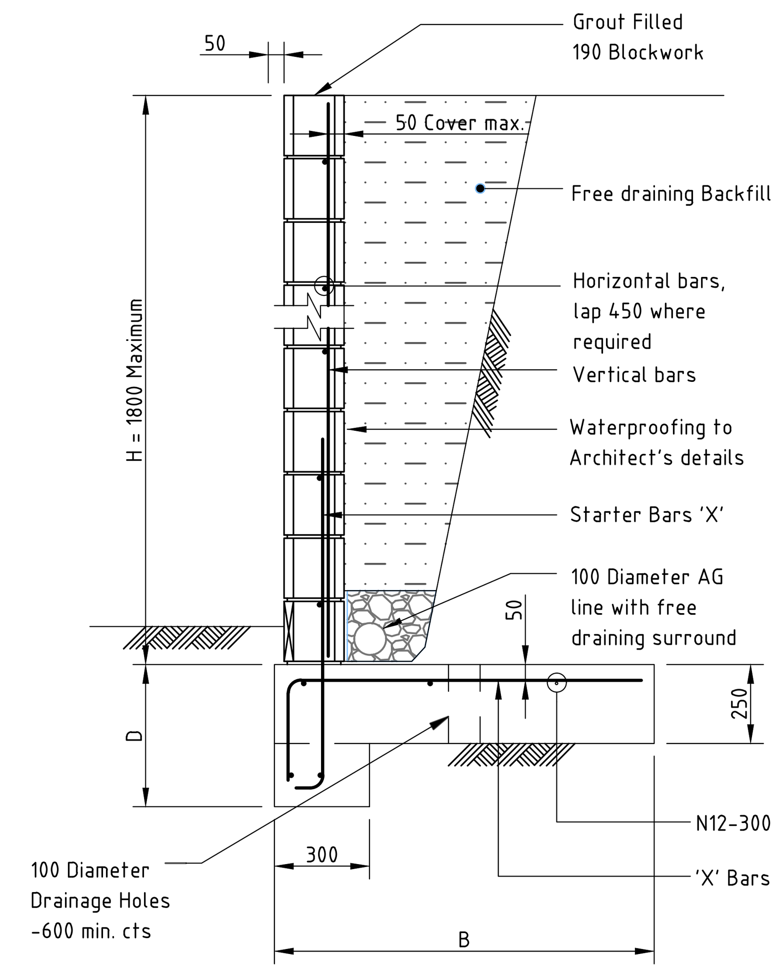
KERB ONLY 'KO'

EXPANSION JOINTS @ MAX 12m CTRS / TOOL JOINTS @ MAX 3m CTRS
ALL RADII TO BE 20mm U.N.O.
SCALE 1:10



INTEGRAL KERB 'IK'

EXPANSION JOINTS @ MAX 12m CTRS / TOOL JOINTS @ MAX 3m CTRS TO ALIGN WITH PAVEMENT JOINTING. ALL RADII TO BE 20mm U.N.O.
SCALE 1:10

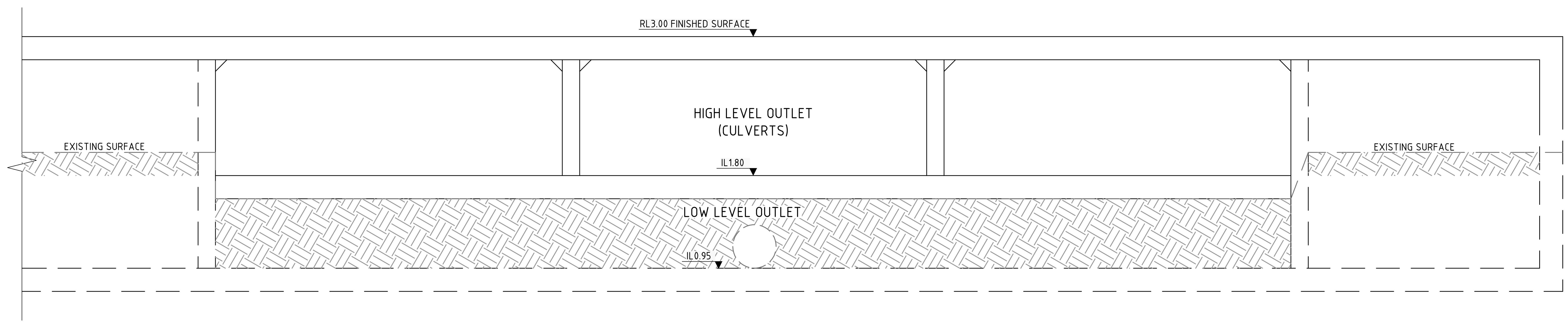


TYPICAL 190 THICK BLOCK RETAINING WALL DETAILS

- BUILDER TO MAINTAIN STABILITY OF WALL DURING BACK FILLING.
- BUILDER TO PROVIDE APPROPRIATE NUMBER OF CLEAN OUT BLOCKS IN BOTTOM COURSE.
- WALL DESIGNED FOR MAX. 5.0kPa SURCHARGE AND NON-SLOPING BACKFILL.

190 THICK RETAINING WALL SCHEDULE

BASE			WALL			
Width "B"	Heel Depth "D"	Reinforcment "X"	Height "H"	Vertical Bars	Horizontal Bars	COMMENTS
800	500	N12-400	800	N12-400	N12-400	190 Blockwork
1000	500	N12-400	1000	N12-400	N12-400	190 Blockwork
1100	500	N12-400	1200	N12-400	N12-400	190 Blockwork
1300	500	N16-400	1400	N16-400	N12-400	190 Blockwork
1400	600	N16-400	1600	N16-400	N12-400	190 Blockwork
1600	700	N16-400	1800	N16-400	N12-400	190 Blockwork



SECTION A

DAC04.01
SCALE 1:25

DRAWN: C. WALKER-HEALION DESIGNED: R. HUTCHINSON JOB MANAGER: R. HUTCHINSON VERIFIER: A. DAWES

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	08.09.17
2	RE-ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	14.09.17

CLIENT: STORAGE PLUS

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: MCHP ARCHITECTS

SCALE VARIES

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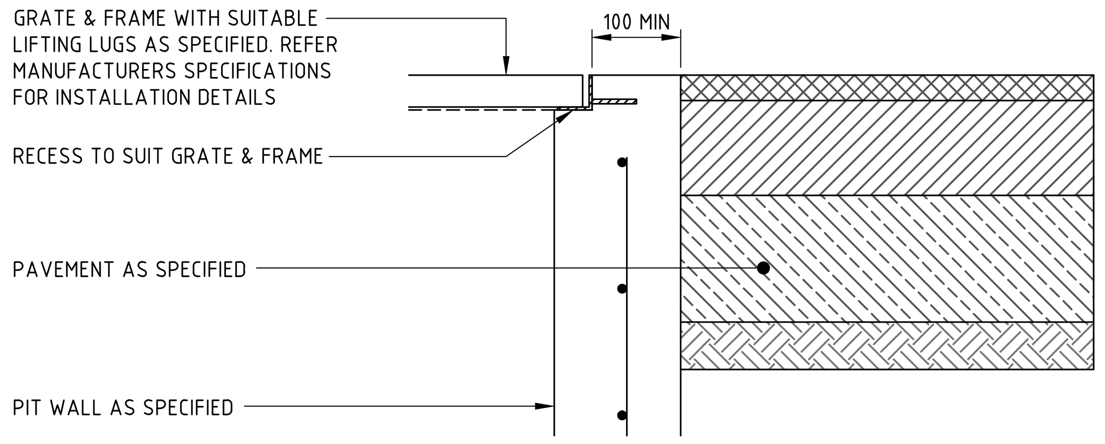
PROJECT: 1-3 RICKETTY STREET, MASCOT

DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION — DETAILS - SHEET 1

JOB NUMBER: 170463

DRAWING NUMBER: DAC05.01 REVISION: 2

DRAWING SHEET SIZE = A1



PIT INTERFACE – DETAIL 'A'

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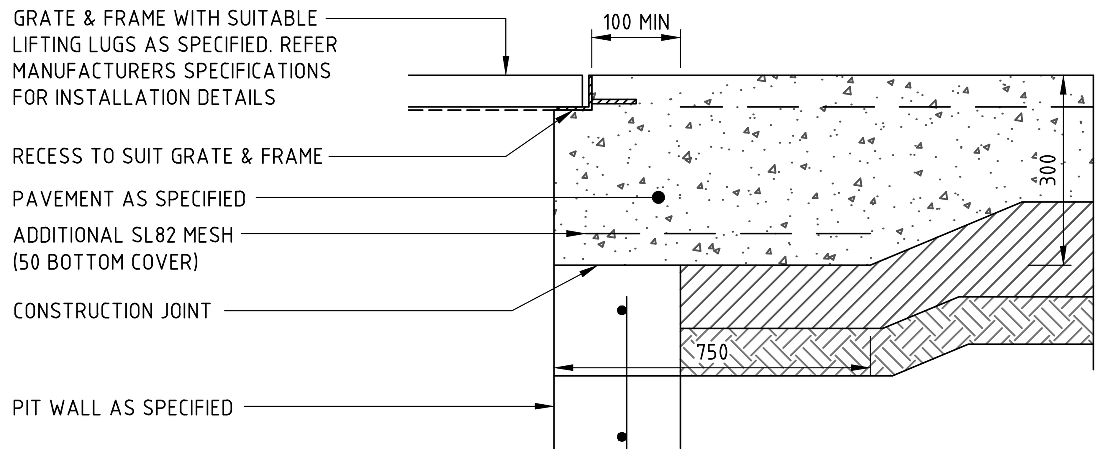

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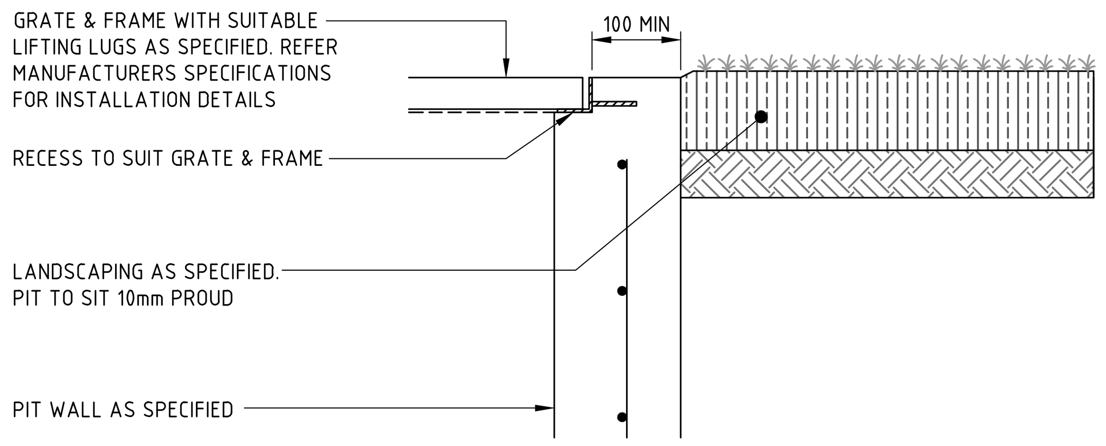

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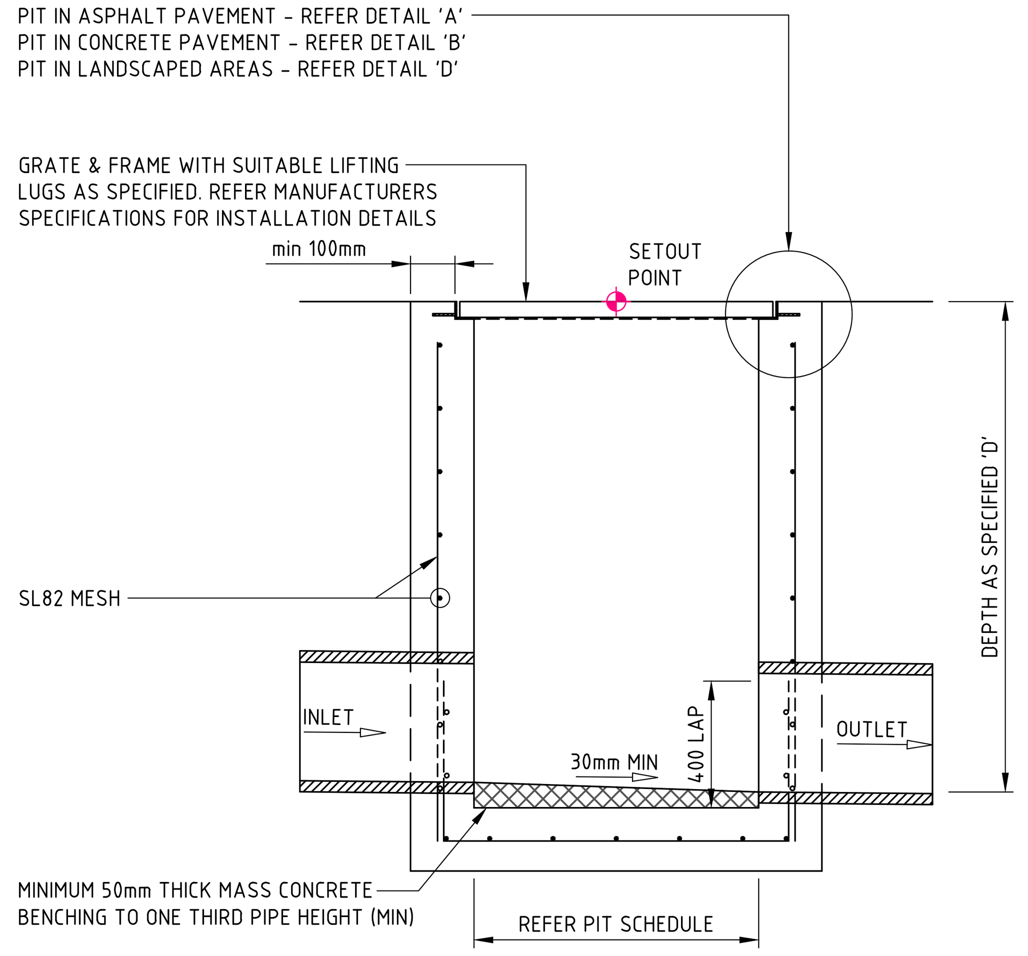
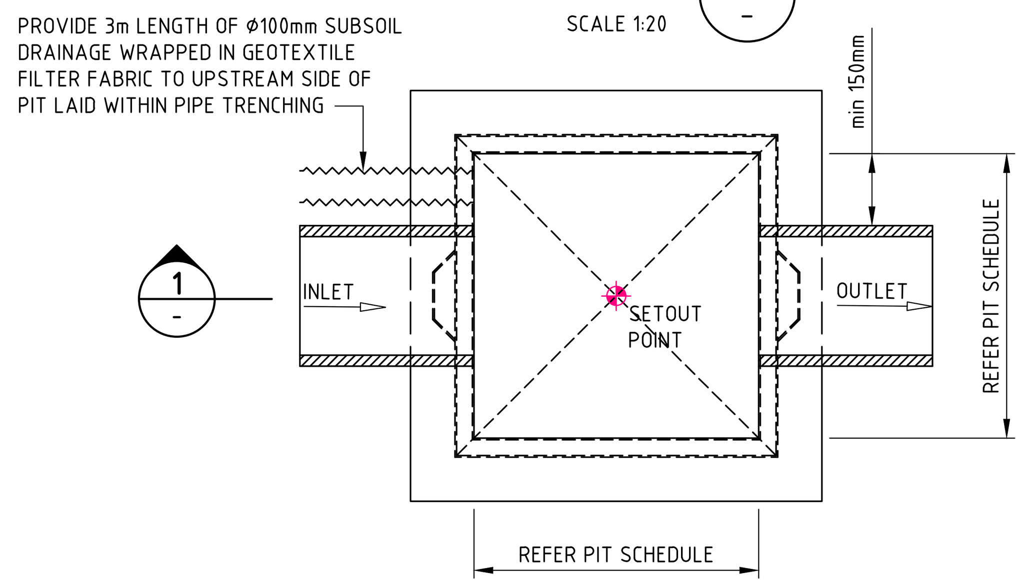


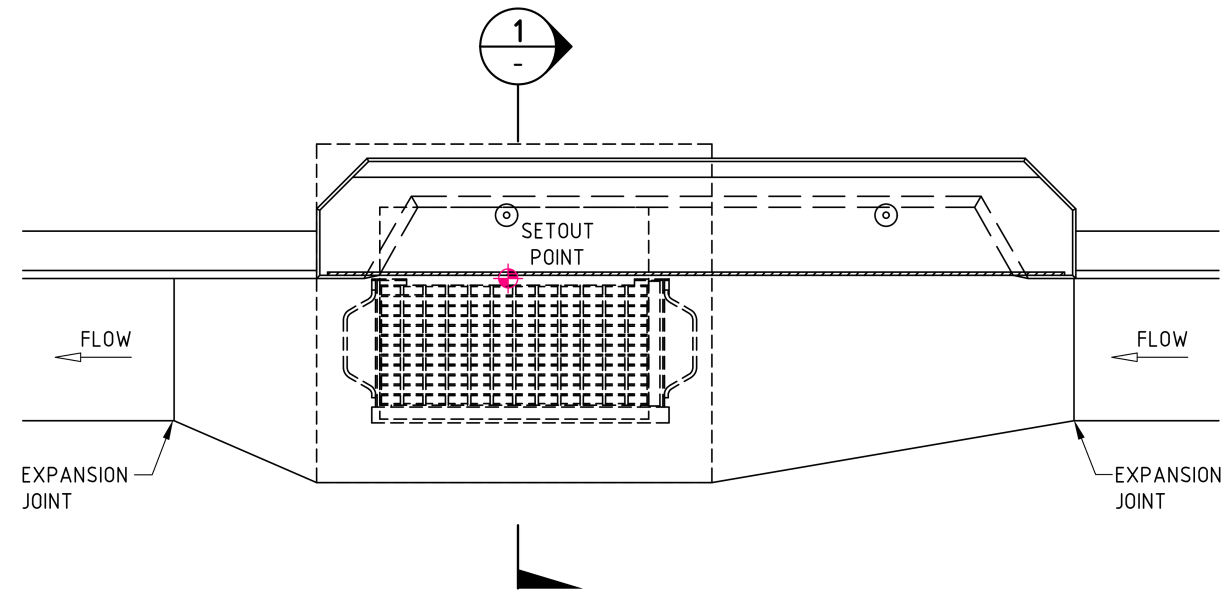
SECTION 1

SCALE 1:20



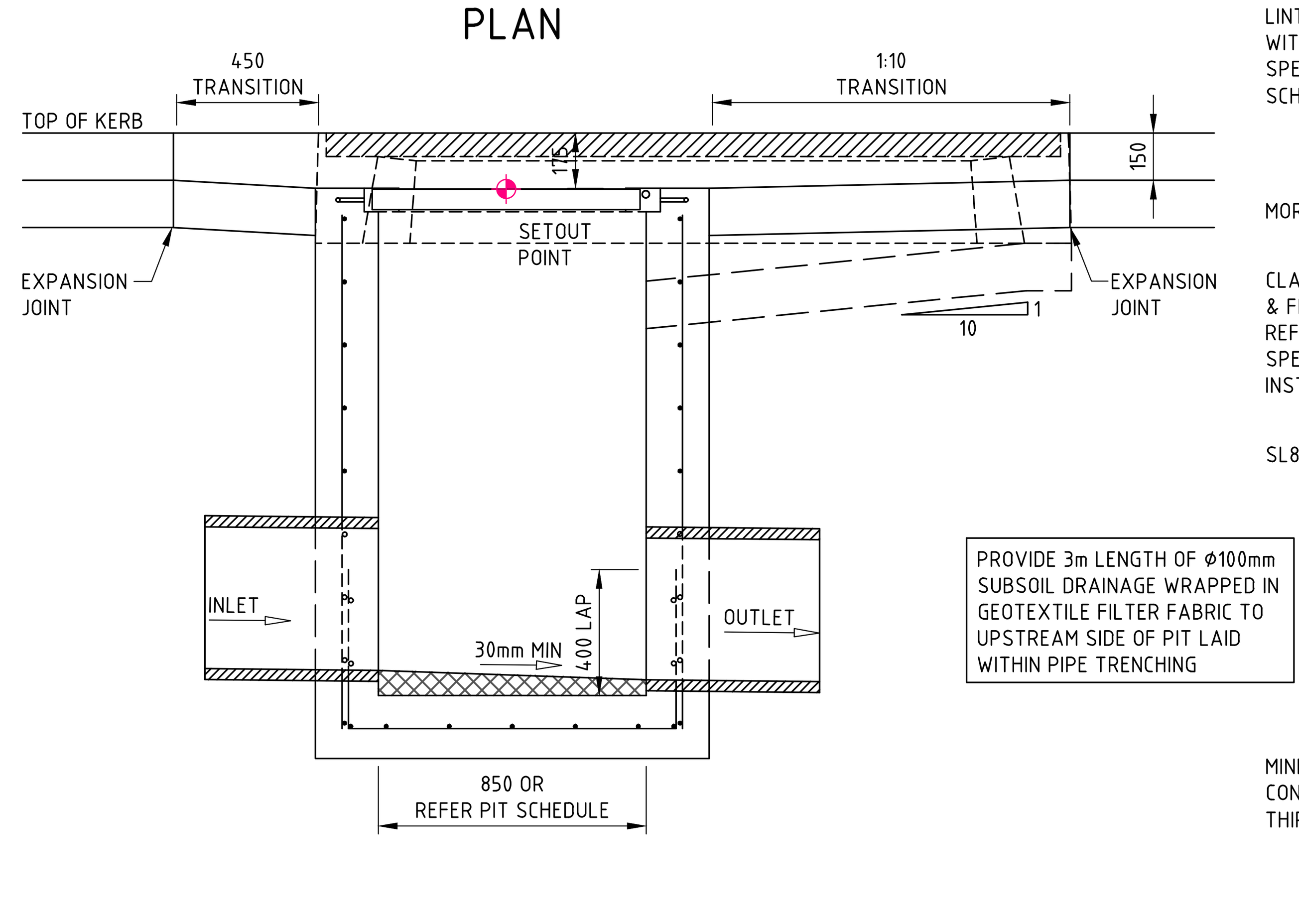
PLAN
SURFACE INLET 'SIP' / JUNCTION PIT 'JP'

PIT STRUCTURE TO BE 200mm THICK UNLESS SHOWN OTHERWISE. DRILL AND EPOXY PLASTIC PROPRIETARY STEP IRONS IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND MANUFACTURERS SPECIFICATIONS (PITS > 1000mm DEPTH).
REFER PIT INTERFACE DETAIL 'F' FOR CORNER REINFORCEMENT
SCALE 1:20

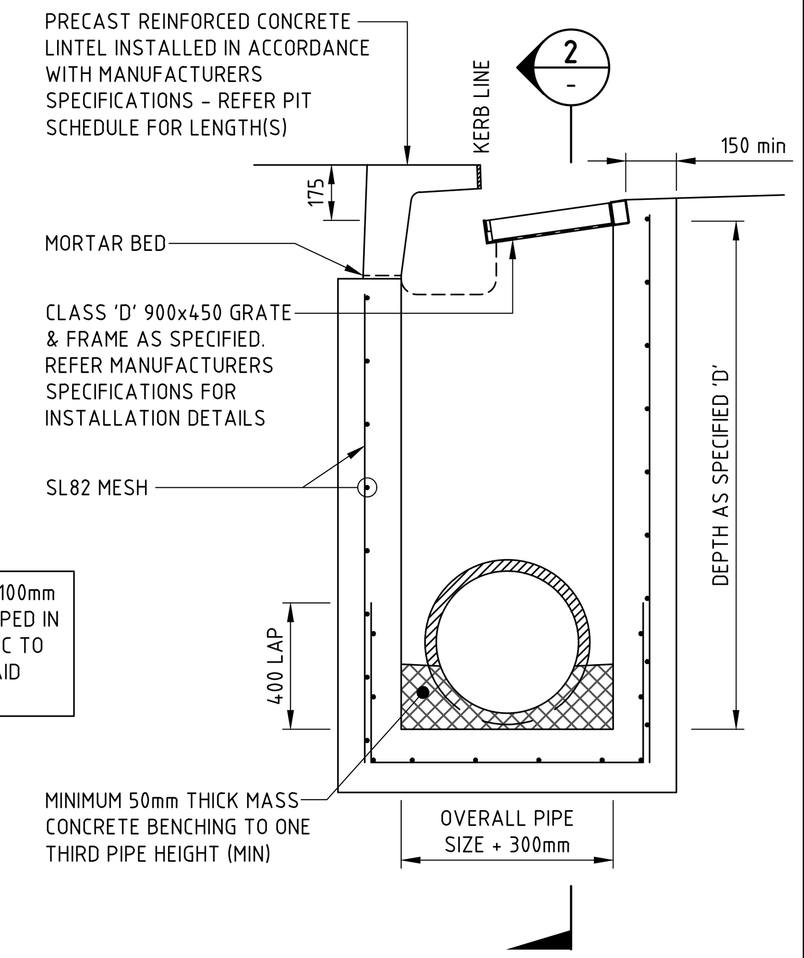


PLAN

FOR SAG PITS, ENSURE PIT LINTEL IS LOCATED CENTRAL TO PIT GRATE AND FRAME AND 1:10 CHUTE IS CONSTRUCTED TO BOTH SIDES OF PIT



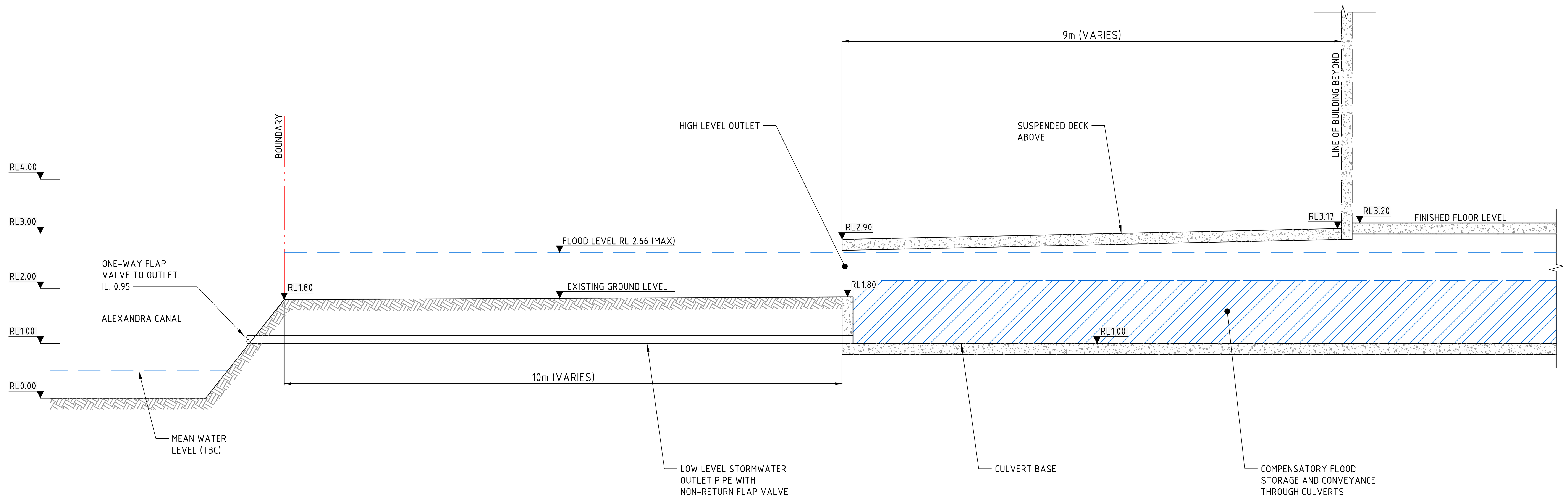
SECTION 2



SECTION 1

KERB INLET PIT 'KIP'

PIT STRUCTURE TO BE 200mm THICK UNLESS SHOWN OTHERWISE. DRILL AND EPOXY PLASTIC PROPRIETARY STEP IRONS IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND MANUFACTURERS SPECIFICATIONS (PITS > 1000mm DEPTH).
REFER PIT INTERFACE DETAIL 'F' FOR CORNER REINFORCEMENT
SCALE 1:20



SECTION B

SCALE 1:50

DRAWN: C. WALKER-HEALION DESIGNED: R. HUTCHINSON JOB MANAGER: R. HUTCHINSON VERIFIER: A. DAWES

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	08.09.17
2	RE-ISSUED FOR DEVELOPMENT APPLICATION	DC	AD	RH	09.03.18

CLIENT: STORAGE PLUS

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

PROJECT: 1-3 RICKETTY STREET, MASCOT

DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION

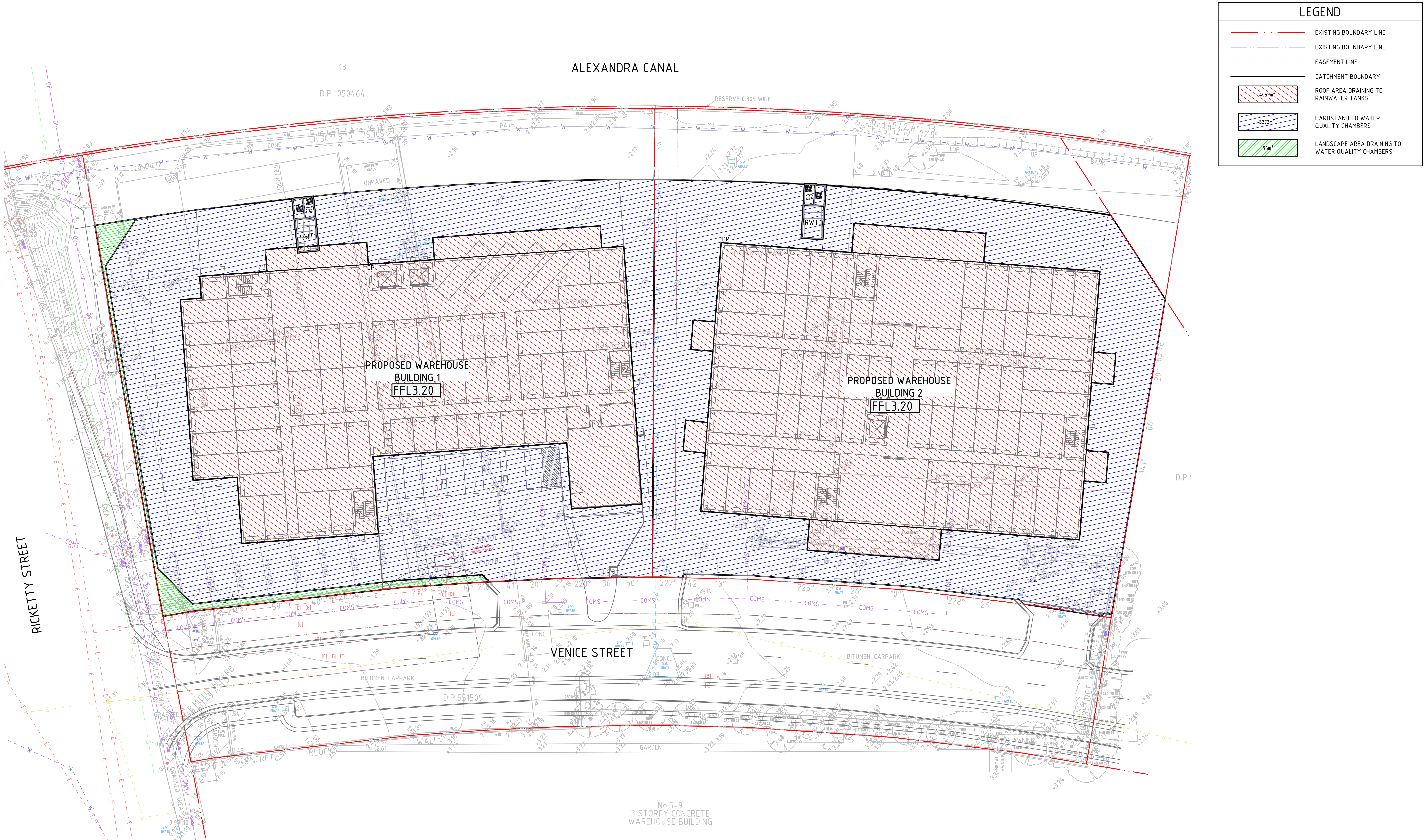
DETAILS - SHEET 2

JOB NUMBER: 170463

DRAWING NUMBER: DAC05.02

REVISION: 2

DRAWING SHEET SIZE = A1



DRAWN: C. WALKER-HEALION DESIGNED: R. HUTCHINSON JOB MANAGER: R. HUTCHINSON VERIFIER: A. DAWES

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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2	RE-ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	14.09.17
3	RE-ISSUED FOR DEVELOPMENT APPLICATION	CWH	AD	RH	16.10.17
4	RE-ISSUED FOR DEVELOPMENT APPLICATION	DC	AD	RH	09.03.18

CLIENT: STORAGE PLUS SELF STORAGE 8345 6000

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SCALE 1:250@ A1 — 0 2 4 6 8 10 12m

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PROJECT: 1-3 RICKETTY STREET, MASCOT

DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION

CATCHMENT PLAN

JOB NUMBER: 170463

DRAWING NUMBER: DAC06.01

REVISION: 4

DRAWING SHEET SIZE = A1

Appendix B – Site Survey Plan

LEGEND

ELECTRICITY PIT	UNDERGROUND ELECTRICITY	WATER METER
ELEC POLE WITH LIGHT	OVERHEAD POWER LINES	WATER VALVE
ELECTRICITY POLE	UNDERGROUND GAS	STOP VALVE
LIGHT POLE	UNDERGROUND SEWER	HYDRANT
TRAFFIC SIGNAL	UNDERGROUND STORMWATER PIPE	STORMWATER GRATE
GAS METER	UNDERGROUND STORMWATER	STORMWATER MANHOLE
GAS VALVE	UNDERGROUND WATER	STORMWATER PIT
POLE (UNSPECIFIED)	TELECOMMUNICATIONS	SEWER PIT
PIT (UNSPECIFIED)	ROADS & MARITIME SERVICES	SEWER MANHOLE
MANHOLE (UNSPECIFIED)	SYDNEY TRAINS	SEWER MANHOLE
TELECOM PIT	RAILCORP	BOLLARD
TELECOM PILLAR		SIGN

NOTES:

BEARINGS SHOWN RELATE TO M.G.A. NORTH.

LIMITED BOUNDARY SURVEY MADE. IF ANY CONSTRUCTION IS INTENDED IN THE PROXIMITY OF THE BOUNDARIES IT IS RECOMMENDED THAT A FURTHER SURVEY BE REQUESTED FOR THE MARKING OF THE RELEVANT BOUNDARIES.

INFORMATION SHOWN ON THE PLAN OF THE ADJOINING PROPERTIES HAS BEEN OBTAINED BY REMOTE SURVEY METHODS FROM WITHIN SUBJECT LAND AND STREET. RESTRICTED VISIBILITY ALONG THE NORTHERN AND EASTERN BOUNDARIES OF THE SUBJECT LAND HAS PREVENTED DIRECT MEASUREMENTS TO THE ADJOINING BUILDINGS.

CONSTRUCTION WORKS MUST BE RELATED TO THE SITE BENCH MARK AND NOT LEVELS OF STRUCTURES SHOWN ON THE PLAN.

TREE SPREADS & TRUNK DIAMETERS SHOWN ARE DIAGRAMMATIC ONLY AND TREE HEIGHTS ARE ESTIMATED. IF ANY OF THESE ELEMENTS ARE CRITICAL TO DESIGN (IN PARTICULAR DRIPLINES) MORE SPECIFIC DETAILS SHOULD BE REQUESTED FOR ACCURATE LOCATION.

SYMBOLS REPRESENTING SERVICE PITS, POLES AND STREET FURNITURE ARE NOT TO SCALE.

PIT SIZE IS SHOWN AT GROUND LEVEL. PITS MAY BE LARGER BELOW THE SURFACE.

SERVICE LINES SHOWN ARE DIAGRAMMATIC ONLY AND DO NOT REPRESENT THE WIDTH AND NUMBER OF CABLES OR PIPES IN THE GROUND.

POSITION OF UNDERGROUND SERVICES PLOTTED FROM INFORMATION SUPPLIED BY THE RELEVANT AUTHORITIES AND MAY BE APPROXIMATE ONLY.

IT IS THE RESPONSIBILITY OF EACH CONTRACTOR AND/OR CONSULTANT TO CONTACT THE RELEVANT AUTHORITY AND/OR "Dial Before You Dig" (Phone 1100 Fax 1300 652 077) BEFORE COMMENCING ANY EXCAVATION.

THIS PLAN HAS BEEN CREATED AT A SCALE OF 1:200 AND MAY NOT BE SATISFACTORY FOR OTHER PURPOSES. THE ACCURACY OF ANY ENLARGEMENT OR OTHER REPRODUCTION MAY BE LESS THAN THAT OF THE ORIGINAL.

REV.	DATE	AMENDMENTS
A	6/6/2017	STORMWATER PIT DETAILS ADDED

[A] - DRAINAGE EASMENT 3.05 WIDE
[B] - EASEMENT FOR ACCESS 15.24 WIDE
[C] - RIGHT OF WAY 20.115 WIDE
[D] - RIGHT OF WAY & EASEMENT FOR ELECTRICITY PURPOSES VARIABLE WIDTH
[E] - EASEMENT FOR ELECTRICITY PURPOSES VARIABLE WIDTH
[F] - RIGHT OF WAY 4 WIDE & 5 WIDE

0 — 20
REDUCTION RATIO 1:200 @ B1

DATUM : AUSTRALIAN HEIGHT DATUM
CONTOUR INTERVAL : 0.25 METRE
ORIGIN OF LEVELS : S.S.M.59271
R.L.2.471 A.H.D.

RYGATE SURVEYORS
Rygate & Company Pty Limited
P.W. Rygate & West
ABN 61 001 204 897
SURVEYING SINCE 1893
a Suite 904 Level 9, 89 York St Sydney NSW 2000
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SUBDIVISION | STRATA PLANS | STRATUM SUBDIVISION | LEASE PLANS | TOPOGRAPHIC SURVEYS | GPS SURVEYS | 3D MODELLING | RACECOURSE DESIGN | PROJECT MANAGEMENT | SUN SHADOW DIAGRAMS

SURVEYOR	DRAWN	CHECKED	APPROVED
M.T.	S.K.	M.T.	G.J.F.

CLIENT: CANAL AVIV PTY. LTD.
LOCALITY: MASCOT
L.G.A.: SYDNEY

PLAN

SHOWING DETAIL AND LEVELS
LOTS 24 & 25 D.P.515070
No.1-3 RICKETTY STREET

REFERENCE No.	PLAN No.	DATE	SHEET No.
77848	77848_A.dgn	5/12/2016	- OF - SHEETS

Appendix C – Stormwater 360 Product Information

Filtration

StormFilter® | SFEP Treatment Train

Stormwater360
AUSTRALIA

www.stormwater360.com.au

> For almost two decades the Stormwater Management StormFilter® has helped meet the most stringent stormwater requirements. The system has been continually tested and refined to ensure maximum reliability and performance.

Stormwater Filtration

The right stormwater solution for every site

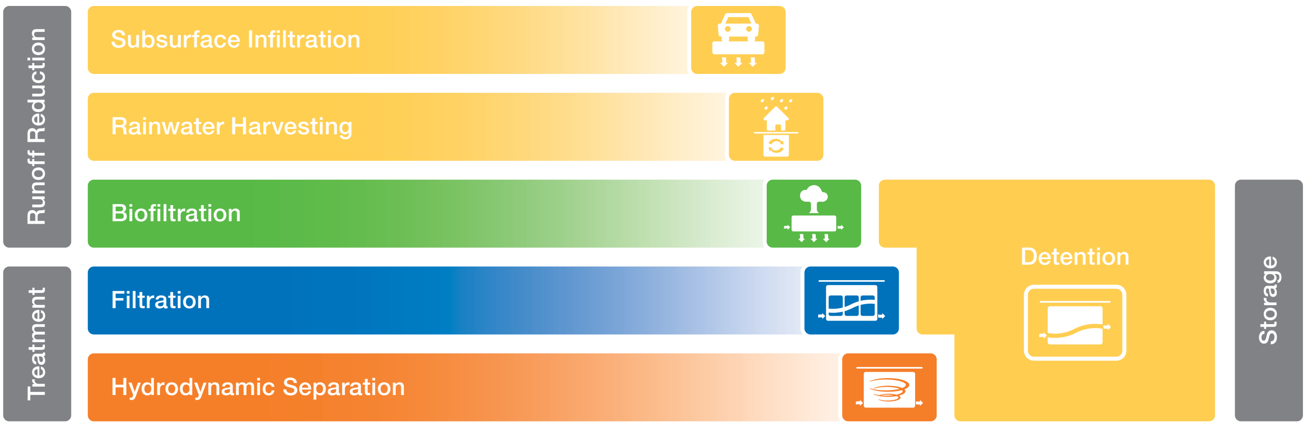
The Stormwater360 UrbanGreen Staircase simplifies the process of integrating a water sensitive urban design (WSUD) that achieves your runoff goals. Its aims are to manage stormwater runoff close to the source and to replicate the site's pre-development hydrology, as much as possible.

The first step in the design process is to select the runoff management practices that best suit your site, such as infiltration and harvesting. Particular attention also needs to be given to pre-treatment needs. If the entire design storm cannot be retained through runoff reduction methods, a best management practice (BMP) is required to manage the balance. Finally, a detention system is selected to address any outstanding downstream erosion.

Highly effective pollutant removal

Meeting pollutant reduction goals for stormwater runoff typically requires a technology that is highly effective at removing solids and associated pollutants. In most cases, the technology must also be capable of removing dissolved pollutants such as metals, nitrogen and phosphorus.

By combining a variety of media and filtration systems, Stormwater360 can help you meet these pollutant removal objectives through products such as the Stormwater Management StormFilter, which has helped meet the most stringent stormwater requirements of hundreds of sites in urbanised areas of countries such as Australia, New Zealand and the United States of America.



Selecting an appropriate filtration system

The performance and longevity of media filtration systems is governed by a number of variables that must be carefully considered when evaluating systems. These variables include the type of media used and its gradation as well as its hydraulic loading rate. Understanding these variables requires careful testing and the development of performance and longevity data to support proper filter design.

Media surface area

Filtration flow rates are typically expressed as a surface area specific operating rate such as $L/s/m^2$ of surface area. Lower specific operating rates translate to better performance and longer maintenance cycles. Specific operating rates higher than 2 $L/s/m^2$ of media surface area negatively impact performance and longevity.

Surface versus radial cartridge filtration

When assessing filtration systems, it is important to consider whether filtration occurs primarily at the media surface or throughout a bed of media, such as with radial-cartridge filters. All else equal, radial-cartridge filters are longer lasting, since pollutants are captured and stored throughout the bed, as opposed to predominantly on the media surface. Radial cartridge filters capture more mass of pollutants per unit area of filter surface. Surface filters, such as sand or flat bed media filters, are prone to rapid failure through clogging. Pollutants are prone to occluding the media surface, which will then require frequent back washing or more costly and intensive maintenance.

> Understanding the hydraulics of the media selected is a key factor in determining the effectiveness of the filtration system in achieving site-specific pollutant removal objectives.

Media hydraulic conductivity and flow control

Filtration media is able to pass more flow per unit of media when it is new than when it has been in operation for a while. With time, pollutants accumulate in the media bed and reduce its hydraulic capacity. It is critical that filtration devices are designed with excess hydraulic capacity to account for this loss. Also, while finer media gradations remove finer particles, they have a lower hydraulic capacity and occlude more rapidly. High performance and superior longevity can be achieved by controlling the flow through a more coarse media bed.

Performance: Laboratory testing

While laboratory testing provides a means to generate hydraulic and basic performance data, it should also be complemented with long-term field data. Laboratory performance trials should be executed with a fine sediment gradation such as Sil-Co-Sil 106, which has a median particle size of 22 microns. Testing with coarser gradations is not likely to be representative of field conditions.

Performance: Field testing

Long-term field evaluations should be conducted on all filtration devices. As a minimum, field studies should generally comply with the Technology Acceptance Reciprocity Partnership (TARP) or the Technology Assessment Protocol – Ecology (TAPE) in the USA, as no recognised protocols exist within Australia. To be considered valid, all field monitoring programs should replicate local pollutant concentrations including soluble fractions together with rainfall, and should be peer reviewed by a reputable third-party.

Stormwater360 has undertaken such field testing in Kuranda, Australia, with the assistance of Queensland University of Technology and James Cook University.

Longevity

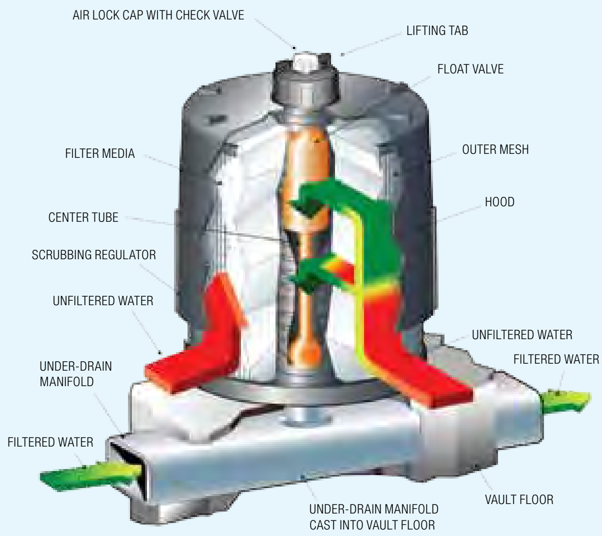
It is essential that loading trials be conducted to evaluate the longevity of a media filter. These trials must be executed with “real” stormwater solids and not silica particles. Reliance on silica particles to assess longevity grossly overstates the loading capacity of the media and the results of such trials should not be relied on. Knowing how much mass a media filter can capture before failure allows it to be sized for a desired maintenance interval by estimating the pollutant load that will be delivered to the filter.

Maintenance

The primary purpose of the media filtration system is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, these pollutants must be periodically removed to restore the system to its full efficiency and effectiveness. Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. Similarly, the system should be inspected after major storm events.

Stormwater360 offers a number of suitable maintenance plans for all our stormwater products. Visit www.stormwater360.com.au or call us on 1300 354 722 to discuss the most suitable plan for your system.

The Stormwater Management StormFilter



Removing the most challenging target pollutants

The Stormwater Management StormFilter is a best management practice (BMP) designed to meet stringent regulatory requirements. It removes the most challenging target pollutants – including fine solids, soluble heavy metals, oil, and total nutrients (inc. soluble) – using a variety of media. For more than two decades, StormFilter has helped clients meet their regulatory needs and through product enhancements the design continues to be refined for ease of use.

Why StormFilter is the best filter available

Superior hydraulics

- External bypass – protects treatment chamber from high flows and ensures captured pollutants are not lost during low frequency, high intensity storm events
- Multiple cartridge heights – minimises head loss to fit within the hydraulic grade line and shrink system size, reducing installation costs
- Multiple StormFilter configurations in use across the country

Reliable longevity

- One-of-a-kind self-cleaning hood – prevents surface blinding, ensures use of all media, and prolongs cartridge life
- Customised maintenance cycles – fewer maintenance events compared to similar products, which reduces costs over the lifetime of the system
- 12 years of maintenance experience – predictable long-term performance comes standard

Proven performance

- Only filter on the Australian market tested within Australia achieving best practice guidelines, for TSS, TP and TN
- Qualifies for a minimum 2 EMI 5 Green star credits
- Achieve water quality goals with confidence – easy approval speeds development assessment process
- 8th generation product – design refined and perfected over two decades of research and experience

Maximising your land use and development profitability

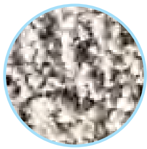
StormFilter systems are utilised in below ground systems. The advantages this offers over above ground systems includes:

- Land space saving that enable an increase in development density and reduce sprawl
- The potential to add car parking, increase building size, and develop out parcels

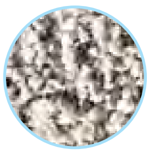
In addition, StormFilter's compact design reduces construction and installation costs by limiting excavation.

Media options

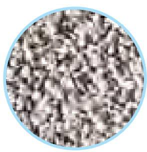
Our filtration products can be customised using different filter media to target site-specific pollutants. A combination of media is often recommended to maximise pollutant removal effectiveness.



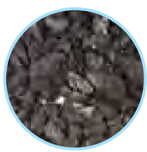
PhosphoSorb™ is a lightweight media built from a Perlite-base that removes total phosphorus (TP) by adsorbing dissolved-P and filtering particulate-P simultaneously.



Perlite is naturally occurring puffed volcanic ash. Effective for removing TSS, oil and grease.



Zeolite is a naturally occurring mineral used to remove soluble metals, ammonium and some organics.



GAC (Granular Activated Carbon) has a micro-porous structure with an extensive surface area to provide high levels of adsorption. It is primarily used to remove oil and grease and organics such as PAHs and phthalates.

	PhosphoSorb	Perlite	ZPG	Zeolite	GAC
Sediments	•	•	•		
Oil and Grease	•	•	•		
Soluble Metals	•		•	•	
Organics			•	•	•
Nutrients	•	•	•	•	•
Total Phosphorus	•		•		

Note: Indicated media are most effective for associated pollutant type. Other media may treat pollutants, but to a lesser degree.

ZPG™ media, a proprietary blend of zeolite, perlite, and GAC.

Cartridge options

With multiple cartridge heights available, you now have a choice when fitting a StormFilter system onto your site.

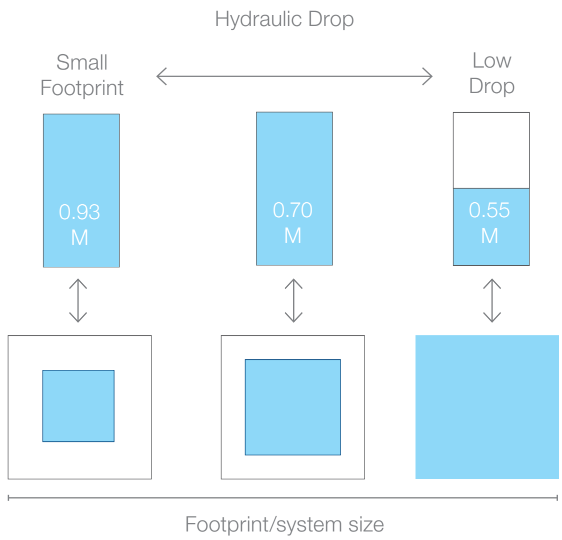
The 69cm cartridge provides 50% more treatment than the previously standard 46cm cartridge, which enables you to meet the same treatment standards with fewer cartridges, and via a smaller system.

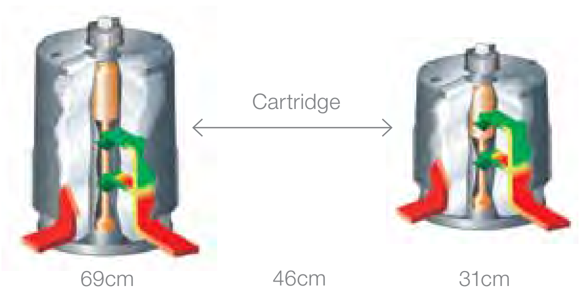
If you are limited by hydraulic constraints, the low drop cartridge provides filtration treatment with only 0.55m of headloss.

Cartridge flow rates

Cartridge Type	Hydraulic Drop	Treatment Capacity (l/sec)	
		0.7 l/s/m²	1.4 l/s/m²
StormFilter 69cm	0.93 m	0.71	1.42
StormFilter 46cm	0.70 m	0.47	0.95
StormFilter Low Drop	0.55 m	0.32	0.63

Selecting cartridge height





Configurations and applications

The StormFilter technology can be configured to meet your unique site requirements. Here are a few of the most common configurations, however many other configurations are available. A Stormwater360 engineer can assist you evaluate the best options for your site or you can find out more by downloading the StormFilter Configuration Guide from www.stormwater360.com.au

Upstream treatment configurations

The following suite of StormFilter configurations are easily incorporated on sites where WSUD is recommended. These low-cost, low-drop, point-of-entry systems also work well when you have a compact drainage area.

GullyPit StormFilter

Combines a gullypit, a high flow bypass device, and a StormFilter cartridge in one shallow structure.

- Treats sheet flow
- Uses drop from the inlet grate to the conveyance pipe to drive the passive filtration cartridge
- No confined space required for maintenance

Gully inlet

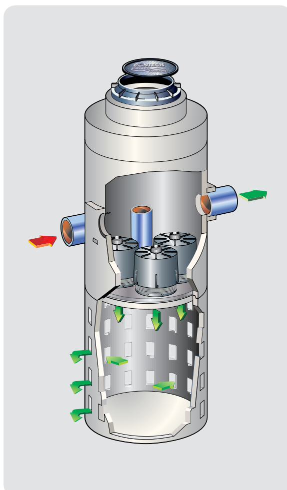
- Accommodates kerb inlet openings from 900 to 3000mm long
- Uses drop from the kerb inlet to the conveyance pipe to drive the passive filtration cartridges

Linear grate

- Can be designed to meet volume based sizing requirements
- Can be installed in place of and similar to a typical gullypit
- No confined space entry required for maintenance
- Accommodates up to 29 StormFilter cartridges

Infiltration/retrofit configuration infiltration

- Provides treatment and infiltration in one structure
- Available for new construction and retrofit applications
- Easy to install
- Re-charge groundwater and reduces run-off



Roof runoff treatment configuration

Down pipe

- Easily integrated into existing gutter systems to treat pollution from rooftop runoff
- Fits most downpipe configurations and sizes; single or dual-cartridge models available
- Treats up to 1300m^2 of rooftop area per dual-cartridge system

Downstream treatment configurations

Conventional stormwater treatment involves collecting, conveying and treating stormwater runoff with an end-of-pipe treatment system before discharging off-site. StormFilter configurations suitable for these applications are listed below and can be engineered to treat a wide range of flows.

Peak diversion

- Provides off-line bypass and treatment in one structure
- Eliminates material and installation cost of additional structures to bypass peak flows
- Reduces the overall footprint of the treatment system, avoiding utility and right-of-way conflicts
- Internal weir allows high peak flows with low hydraulic head losses
- Accommodates large inlet and outlet pipes (up to 900mm) for high flow applications

Vault / manhole

- Treats small to medium sized sites
- Simple installation – arrives on-site fully assembled
- May require off-line bypass structure

High flow

- Treats flows from large sites
- Consists of large, precast components designed for easy assembly on-site
- Configurations available, include, Panel Vault and Cast-In-Place

Volume

- Meets volume-based stormwater treatment regulations
- Captures and treats specific water quality volume (WQv)
- Provides treatment and controls the discharge rate
- Can be designed to capture all, or a portion, of the WQv

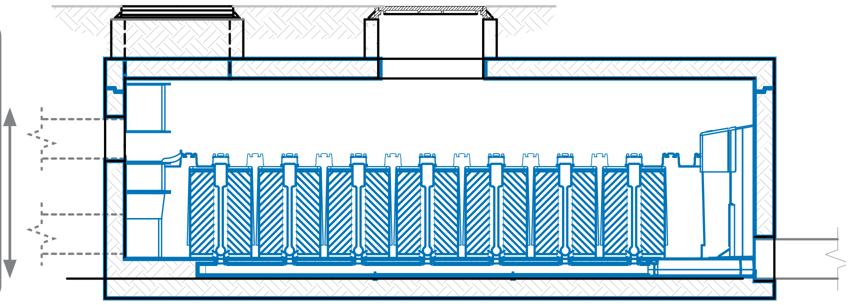
Filtration for low drop sites

Designing for limited drop

In some cases, site constraints limit the hydraulic drop that is available to drive the passive filtration cartridges. Following are a variety of solutions to either create the required drop or work around the limited drop without impacting the performance of the system.

Flexible inlet positions

0.55m from inlet to outlet for low drop configurations, 0.7m for 46cm cartridges and 0.93m for 69cm cartridges



StormFilter configuration using low drop cartridges

0.55m from inlet to outlet (compared to 0.7m for 46cm cartridges or 0.93m for 69cm cartridges)

Solutions for Low Drop Sites

Site modifications	Treatment system modifications
Reduce pipe slope Use an alternate pipe material with a lower Manning's n value for a portion of the site and reduce the pipe slope. **Reduce pipe cover** Use controlled density fill (CDF) at the front-end of the conveyance system to minimise pipe cover and raise the conveyance system. CDF, a method of pouring concrete with fine aggregate (sand vs. gravel) around pipe, allows the use of most pipe materials with limited cover. **Drain inlet treatment** Substitute several shallow inlet configurations for the single end-of-pipe system. Shallow options include the Catchpit/Gullypit StormFilter, CurbInlet StormFilter, Manhole StormFilter and the Linear StormFilter. These systems still require the normal drop (0.7m for 46cm cartridges) but utilise the drop into the conveyance system to drive the cartridges. **Provide pumping system** Stormwater360 offers the Integrated Pumping System (IPS), which can be designed in tandem with filtration system sizing.	**Use low drop cartridges** The StormFilter can be configured with low drop cartridges that activate at 31cm, reducing the overall head loss to only 0.55m, compared to 0.7m for the 46cm cartridge or 0.93m for the 69cm cartridge. **Surcharge the inlet pipe** Backing-up water into the conveyance system can create the necessary drop to drive the StormFilter cartridges. This will affect the HGL and increase the volume of water required to activate the cartridges, which could have a detrimental effect on system longevity. The following design modifications mitigate these risks: • Confer with a Stormwater360 design engineer before surcharging the inlet pipe • Verify this is an acceptable practice in your local jurisdiction • Modify the overall system design to accommodate the increased HGL • Calculate the additional treatment volume and consider using more cartridges

SFEP Treatment Train

Screening and enhanced filtration treatment in series

Most consent authorities within Australia have established pollution removal targets be achieved prior to discharge from urban catchments for an array of pollutants from debris coarse & fine sediments down soluble nutrients. In general each pollutant is removed from the water column using a specific physical, chemical or biological process. Arranging these processes in sequence provides a "treatment train" approach that addresses and treats the whole spectrum of stormwater pollutants.

In order to meet these demands, Stormwater360 provides the StormFilter and EnviroPod (SFEP) as a series of products within a treatment train. The EnviroPod Filter is a gully pit insert designed to be easily retrofitted into new and existing stormwater gully pits, requiring no construction and no land take. Located at the source of stormwater contaminates the EnviroPod Filter has a interchangeable and re-useable bag with 200 micron pore size. The EnviroPod (gully pit basket) is designed to remove gross pollutants, coarse sediment and associated pollutants (hydrocarbons, metals and nutrients) at high flows and is typically located within each gully inlet pit. The EnviroPod filter also holds captured material dry thereby reducing the amount of nutrient leachate from the organic material stored within the bag.

StormFilter operates at a much lower flow rate than the EnviroPod insert – this is necessary in order to achieve extremely high levels of removal efficiency of fine and soluble contaminants. StormFilter cartridges are located typically within a concrete storage structure with the type and media determined by configuration and design. The StormFilter technology is designed to remove both particulate bound and soluble pollutants, and is located near the outlet of the catchment. The SFEP StormFilter technology utilises Stormwater360's patented ZPG media blend containing both zeolite and carbon. This blend specifically targets ammonium and soluble organic nitrogen typically found within Stormwater flows and any nitrogen leachate from organic material held upstream within the EnviroPod filters. The ability of the StormFilter cartridge to retain nitrogen is further enhance as the captured material is again stored dry reducing the amount of nutrient leachate.

Screening

Multiple EnviroPods would be required for a typical site

Enhanced filtration

Features and benefits:

- Turnkey solution – modelling, design, supply and service/maintenance contracts available
- Immediate activation – no need for system "maturity"; starts treating stormwater after filters and cartridges are installed
- Field proven technologies – installations within local conditions for 10 years
- Field proven removal capability – performance data peer reviewed and published in a scientific journal
- Cost effective – comparative cost to traditional vegetated systems
- Increases Development Yield – can be located under carparks and roads. Reduces the need for batters or special maintenance access which further decrease development yield
- Multiple configurations available – meets site specific needs
- Simple, cost effective and recognised maintenance practices
- Ideal solution for infield developments – can be housed close to building footings, pavements and embankments. Reduces the need for ancillary structures such as retaining walls
- Flexible payment options – system can be supplied with zero capital cost upfront on a service inclusive lease with flexible payment options

Comprehensive strategic pollutant removal sequence

Gross pollutants

- Majority of flows treated by EnviroPod with all debris removed from stormwater and held dry, reducing nutrient leachate

Coarse sediment

- Majority of flows treated by EnviroPod whilst removing most sediment above 100µm
- Significantly reduces load and maintenance costs on StormFilter system downstream

Fine sediment

- Custom or specific lower flows treated, targeting particles down to 10µm
- Cartridge back-flush prevents surface clogging avoiding unnecessary maintenance
- Pollutants stored dry reducing nitrogen leachate

Soluble pollutants

- Enhanced filtration by chemical processes (e.g. cation exchange, absorption & adsorption) deep within the cartridge away from the initial screening surface StormFilter cartridge

How to use SFEP Treatment Train?

Typical site with Biofiltration

SFEP Treatment Train

Screening EnviroPod – located with each gully pit

Enhanced Filtration through StormFilter

SFEP can provide additional space for carparks

SFEP can maximise building platforms and increase development yields

Next steps

Learn more

For more detailed technical information about Stormwater360 products and solutions, visit **www.stormwater360.com.au**

Connect with us

With more than 12 years experience in developing, installing and maintaining innovative and efficient site-specific stormwater management solutions, Stormwater360's highly qualified engineers and consultants can assist you with every aspect of your stormwater project.

Whether it's an initial in-house technical presentation, a request to inspect and clean your existing facility, or assistance with designing a specific stormwater management solution for your site, simply complete the enquiry form at **stormwater360.com.au** or call **1300 354 722** to speak to a Stormwater360 consultant.

Start a project

If you are ready to begin a project, our engineering team will provide you with everything you need, from a free preliminary design to MUSIC modelling, CAD drawings to maintenance frequency and associated costs schedules. To find out more, simply visit **www.stormwater360.com.au/custom-solutions** and complete the Design Information Request form.

Stormwater360 supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722

www.stormwater360.com.au

Appendix D – Flood Study

Figure F1
1%AEP, 2.5 m AHD TWL, Exisitng Conditions Flood Depths

100 50 0 100
Meters

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Figure F2
1%AEP, 0.7 m AHD TWL, Existing Conditions Flood Depths

100 50 0 100 Meters

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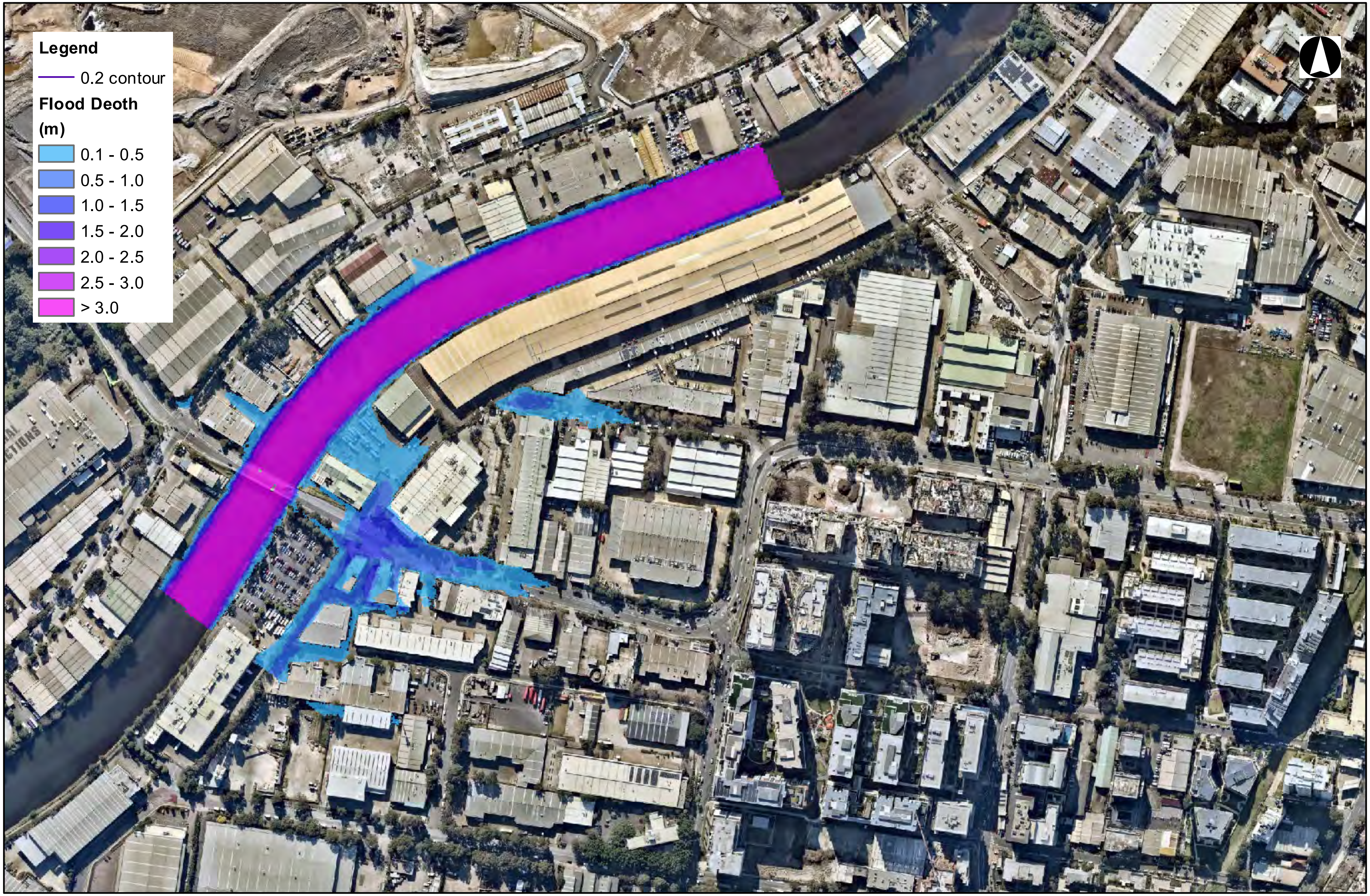

Figure F3
No Rainfall, 2.5 m AHD TWL, Existing Conditions Flood Depths

100 50 0 100
Meters

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Figure F4
1% AEP, 2.5 m AHD TWL, Existing Conditions Flood Velocity

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Figure F5
1% AEP, 0.7 m AHD TWL, Existing Conditions Flood Velocity

100 50 0 100 Meters

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Figure F6
No Rainfall, 2.5 m AHD TWL, Existing Conditions Flood Velocity

100 50 0 100
Meters

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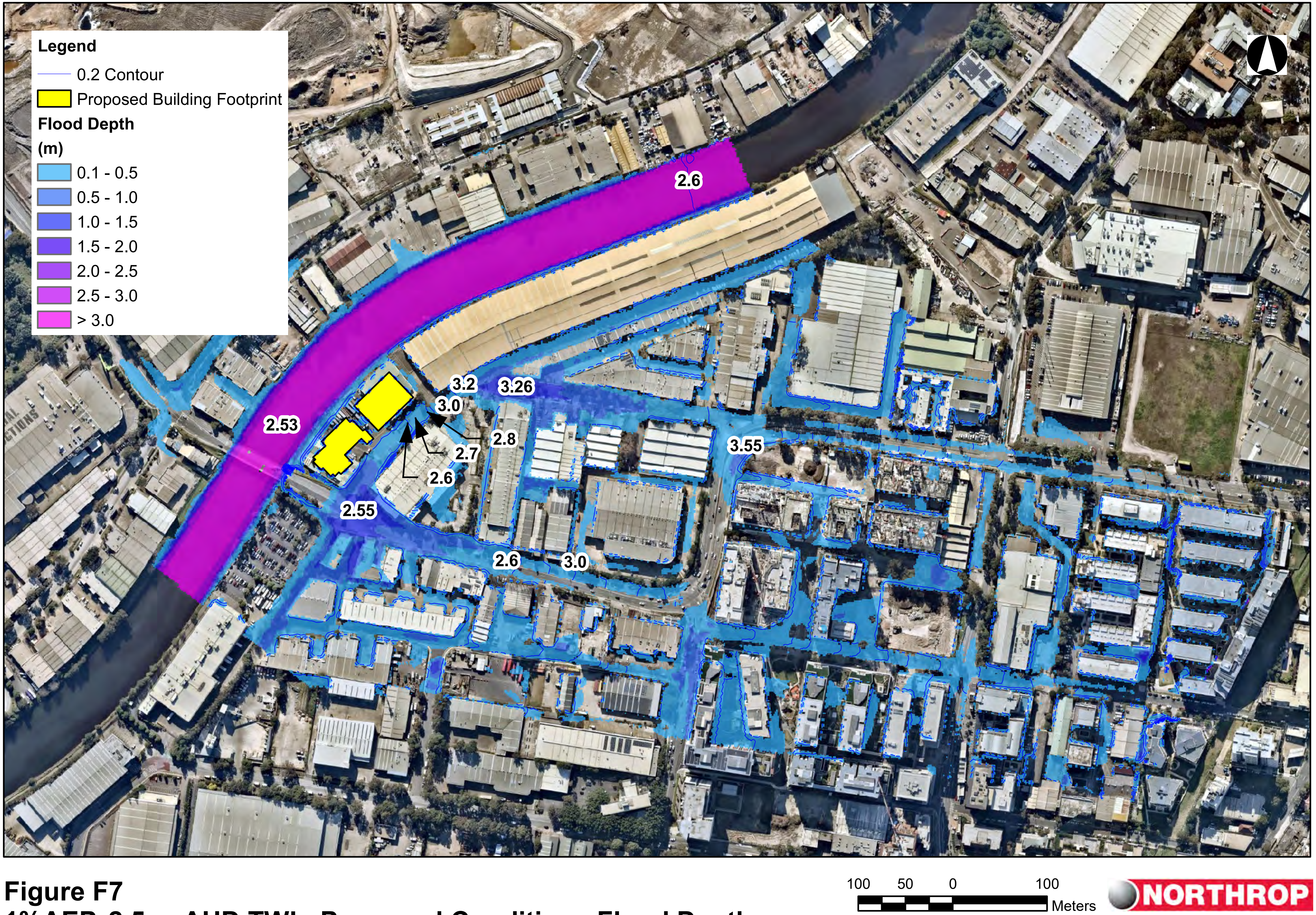

Figure F7
1%AEP, 2.5 m AHD TWL, Proposed Conditions Flood Depths

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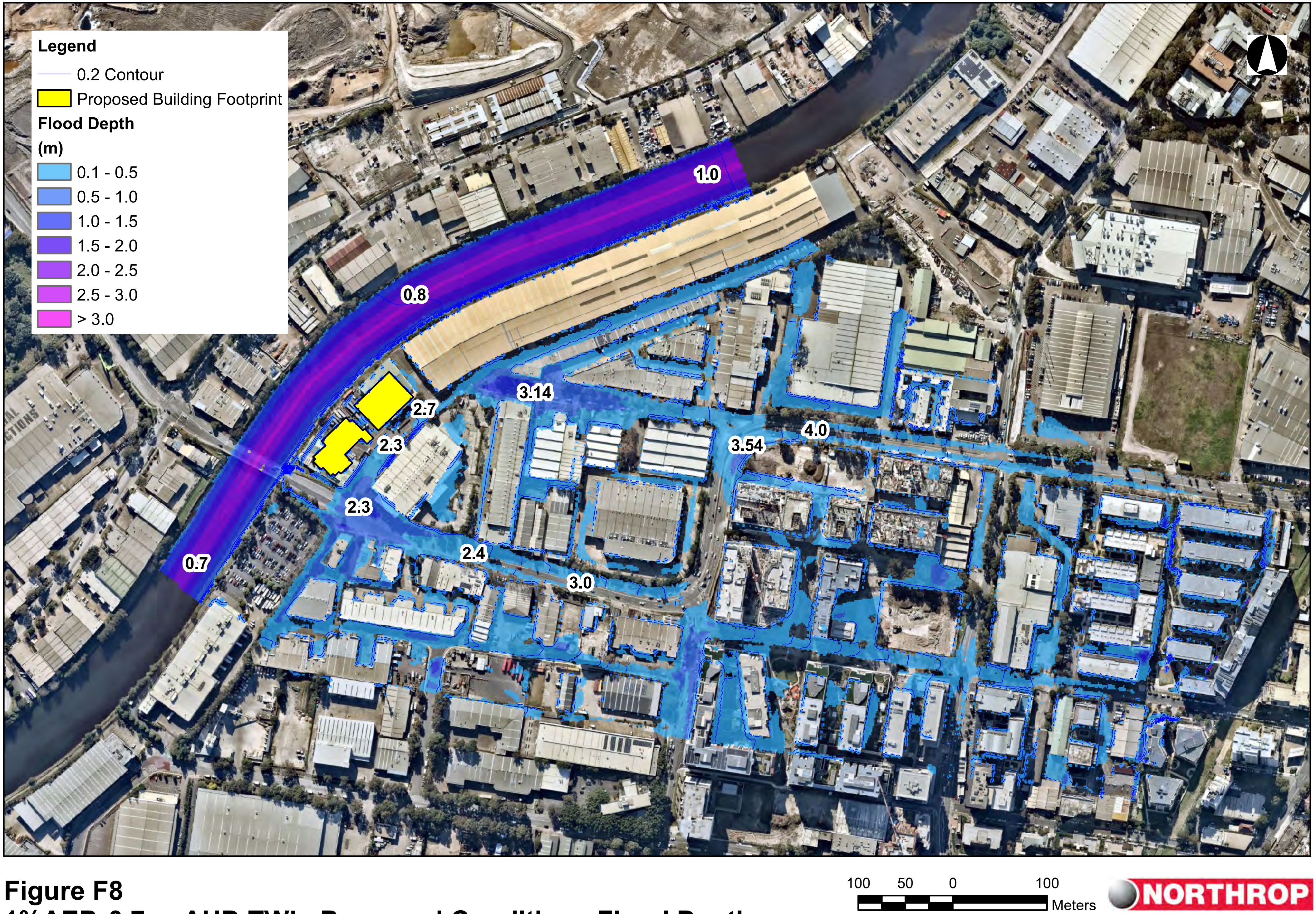

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Figure F8
1%AEP, 0.7 m AHD TWL, Proposed Conditions Flood Depths

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Figure F9
No Rainfall, 2.5 m AHD TWL, Proposed Conditions Flood Depths

100 50 0 100
Meters

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100 50 0 100
Meters

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Figure F10
1%AEP, 2.5 m AHD TWL, Proposed Conditions Flood Velocity

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Figure F11
1% AEP, 0.7 m AHD TWL, Proposed Conditions Flood Velocity

100 50 0 100
Meters

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Figure F12
No Rainfall, 2.5 m AHD TWL, Proposed Conditions Flood Velocity

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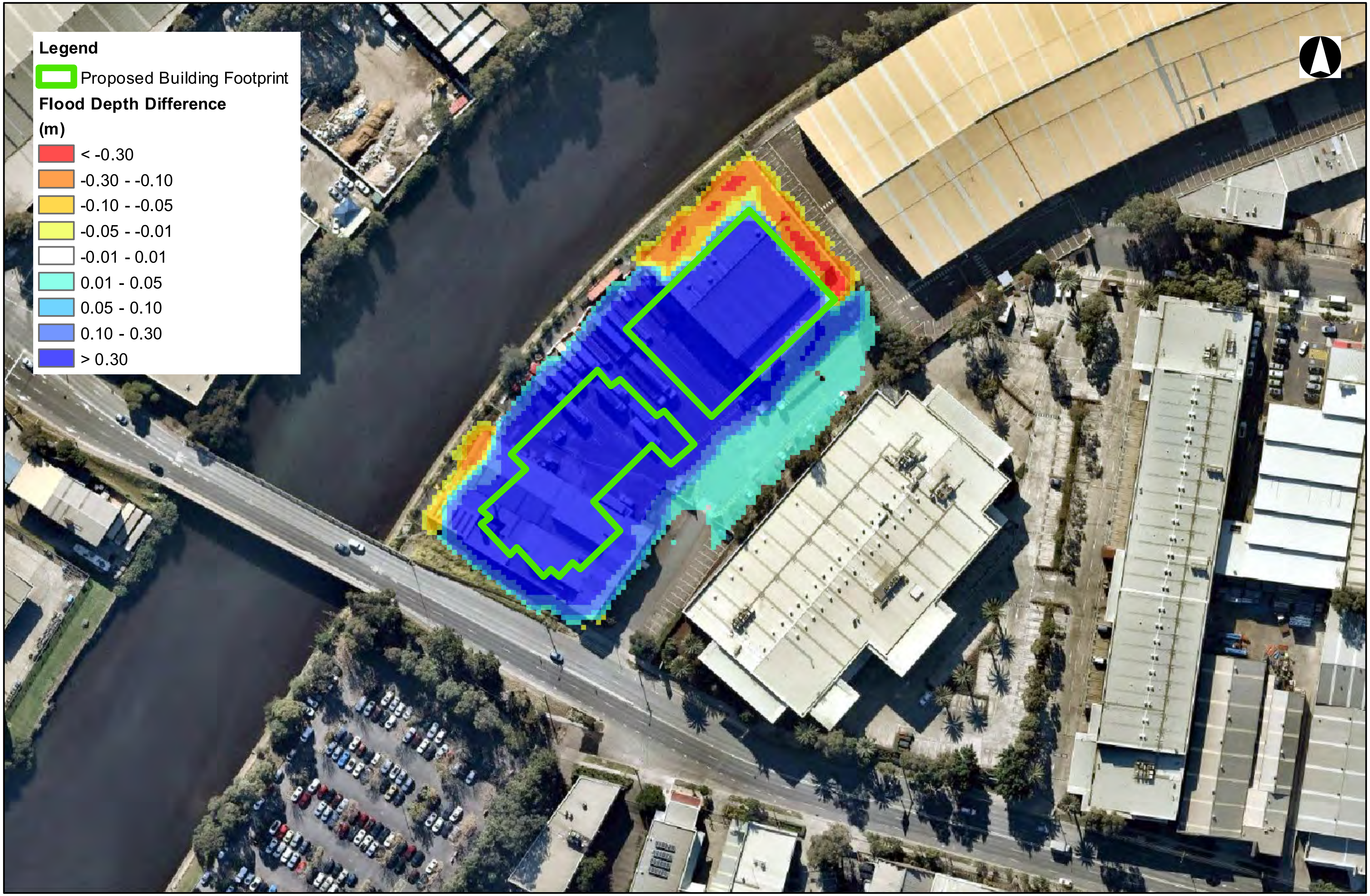

Figure F13

1%AEP, 2.5 m AHD TWL, Proposed Conditions Flood Elevation Difference

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Figure F14

1%AEP, 2.5 m AHD TWL, Proposed Conditions Flood Velocity Difference

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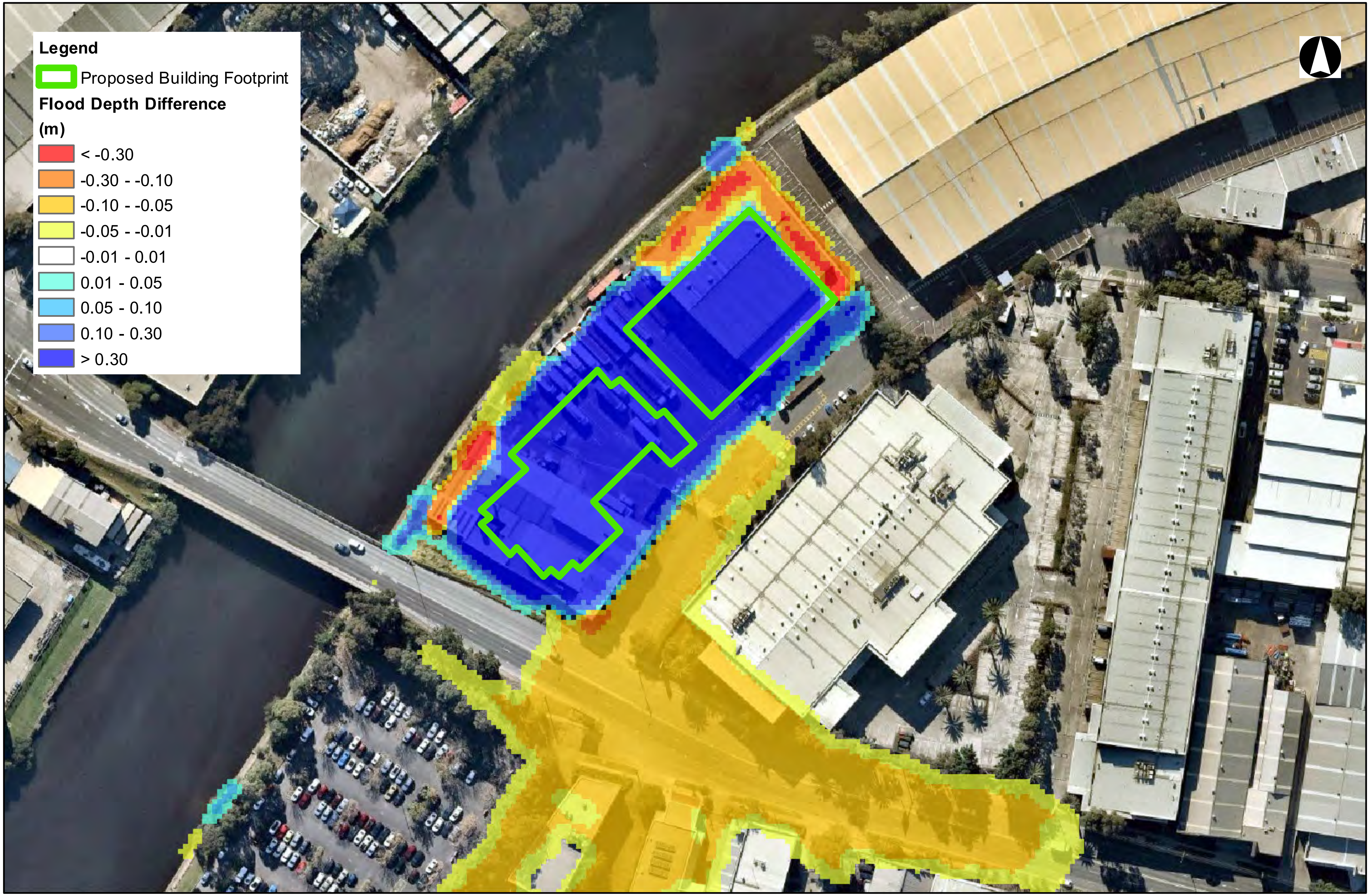

Figure F15
1%AEP, 0.7 m AHD TWL, Proposed Conditions Flood Elevation Difference

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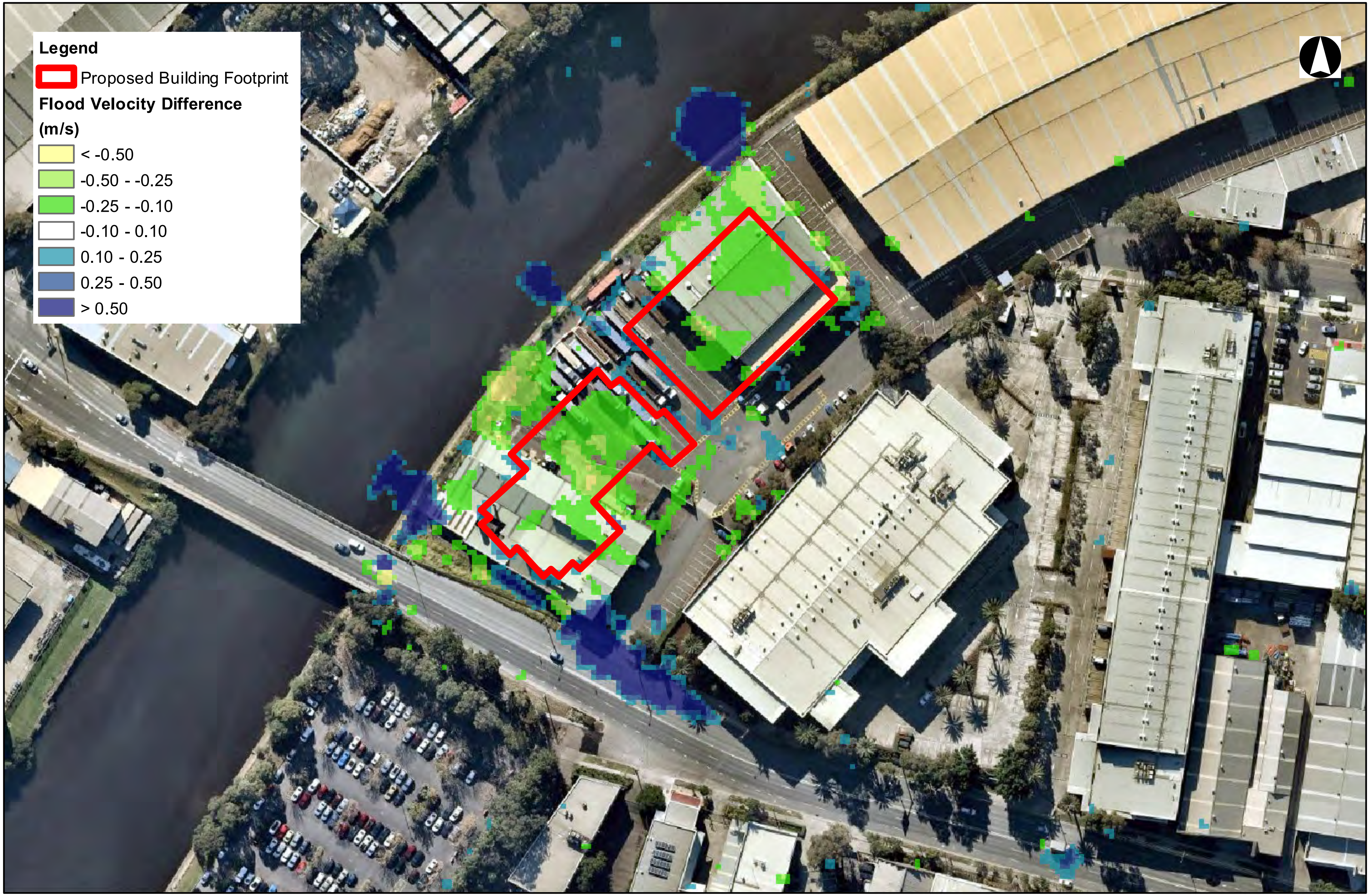

Figure F16

1%AEP, 0.7 m AHD TWL, Proposed Conditions Flood Velocity Difference

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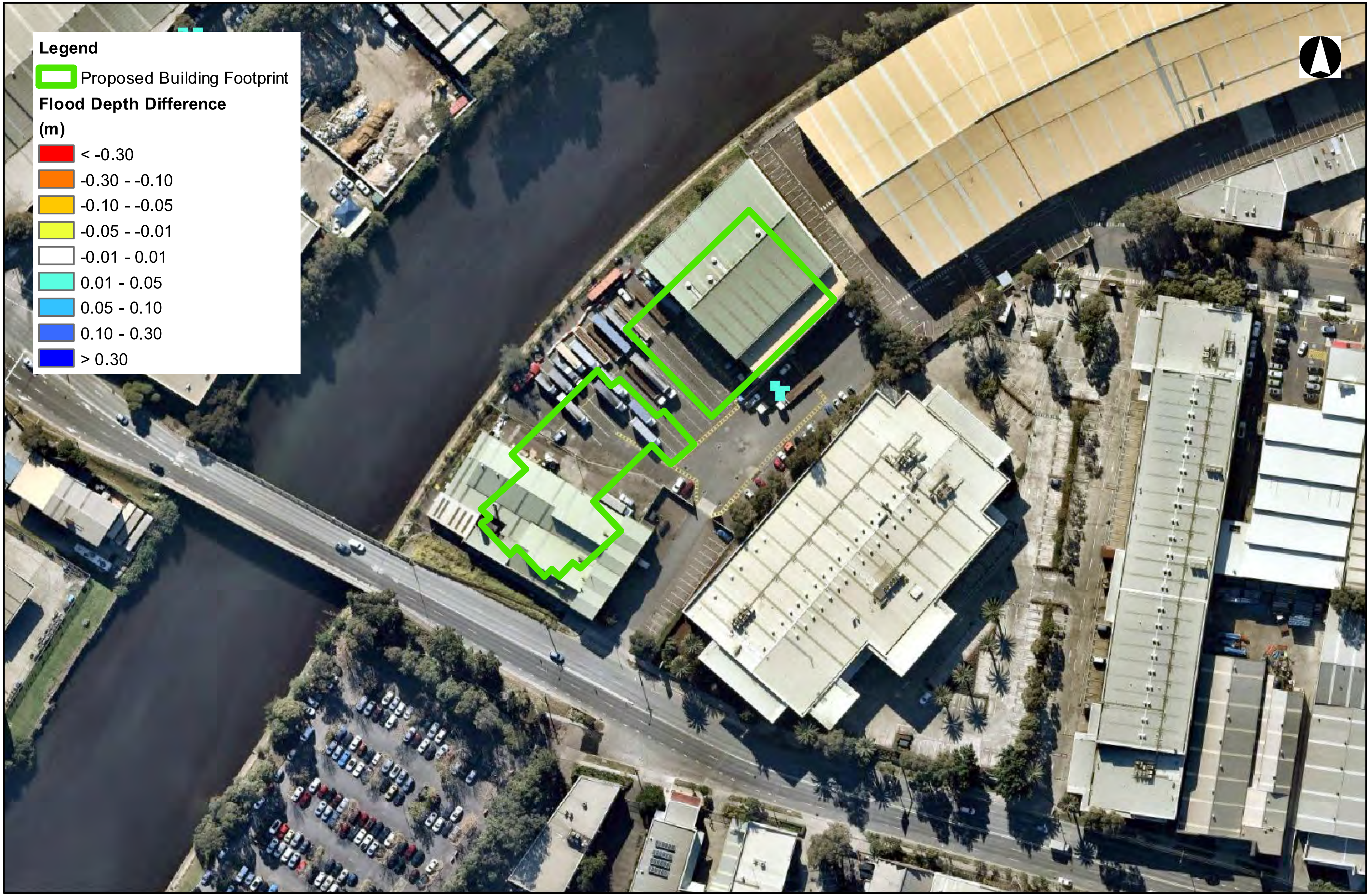

Figure F17
No Rainfall, 2.5 m AHD TWL, Proposed Conditions Flood Elevation Difference

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Figure F18
No Rainfall, 2.5 m AHD TWL, Proposed Conditions Flood Velocity Difference

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