WOOD & GRIEVE ENGINEERS

ENQUIRIES: OLIVER WALSH
PROJECT NO: 35986

12 June 2019

Penrith Rugby League Club Ltd
C/- Census Advisory Pty Ltd
Email: adelaide.dalton@censusadvisory.com.au

Attention: Adelaide Dalton

Dear Adelaide

**RE: WESTERN SYDNEY COMMUNITY AND CONFERENCE CENTRE PHASE 2 – STORMWATER MANAGEMENT REPORT FOR REVISED DEVELOPMENT APPLICATION (DA 18/1260)**

**INTRODUCTION**
Wood & Grieve Engineers (WGE) have been commissioned by Census Advisory Pty Ltd to prepare this Stormwater Management Plan (SMP) in support of the revised Phase 2 Development Application (DA 18/1260) for the proposed Western Sydney Community and Conference Centre (WSCCC) development at Ransley Road & Mulgoa Road.

**PROPOSED DEVELOPMENT**
Phase 2 of the development will consist of the following:

- Construction of an additional three (3) stories (upon the two storey Phase 1 building);

Phase 2 (Hotel) of the development will have no impact on the Phase 1 (Western Sydney Community and Conference Centre) DA with regard to building extent, landscaping and pavement layout. The stormwater management strategy and facilities designed in Phase 1 have taken into account the future Phase 2 development and as a result the Phase 1 Stormwater Management Plan can be adopted. Phase 1 Stormwater Management Report included in Appendix A.

We trust that these responses are satisfactory however feel free to contact the undersigned should you have any queries.

Yours faithfully

**Oliver Walsh**
**for Wood & Grieve Engineers**

# *Appendix A – Phase 1 Stormwater Management Report*

WOOD & GRIEVE ENGINEERS

# Western Sydney Community & Convention Centre – Phase 1

## Stormwater Management Report

Prepared for:

**Client name**
Penrith Rugby League
Club Pty Ltd

**Date:**
12 June 2019

Prepared by:

**Oliver Walsh**
Project No. 35986
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# Revision

| | |
|---|---|
| **Site Address:** | Ransley Road & Mulgoa Road, Penrith NSW |
| **Property Description:** | Part of Lot 2 on DP 1216321 |
| **Proposed Development:** | Mixed-use Development |
| | |
| **Client:** | Penrith Rugby League Club Pty Ltd |
| **Local Authority:** | Penrith City Council |
| **Authority Reference #:** | DA18/0340 |
| **Wood & Grieve Reference:** | 35986 |

**Oliver Walsh BEng – Civil**
For and on behalf of
**Wood & Grieve Engineers**

| REVISION | DATE | COMMENT | APPROVED BY |
|---|---|---|---|
| A | 6 April 2018 | DA Issue | TF |
| B | 23 July 2018 | DA Issue | **OKW** |
| **C** | 12 June 2019 | Section 4.55 Issue | **OKW** |
| | | | |

# Introduction


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# 1. Introduction

Wood & Grieve Engineers (WGE) have been commissioned by Census Advisory Pty Ltd to prepare this Stormwater Management Plan (SMP) in support of Section 4.55 Application for the proposed development at Ransley Road & Mulgoa Road. The Site is part of Lot 2 on DP 1216321.

This SMP outlines the conceptual stormwater design for the proposed mixed-use development.

This SMP illustrates that the proposed development complies with the Penrith City Council's requirements, Australian Rainfall and Runoff, Australian Standards and best engineering practise.

The purpose of this SMP is to evaluate the quantity and quality of stormwater associated with the proposed development plan to demonstrate to Council that an appropriate stormwater management strategy has been adopted.

The SMP specifically addresses the following items for both the construction and operational phases of the development:

- Stormwater runoff volumes and detention (Stormwater Quantity);
- Stormwater quality treatment measures (Stormwater Quality); and
- Erosion and Sedimentation Control.

The following will be achieved with the correct application of this SMP report:

- Appropriate standards to be maintained on all aspects of stormwater within the site;
- Pollution control to be maintained; and
- Establishment of a unified, clear and concise stormwater management strategy.

# 2. Existing Site & Proposed Development

## 2.1 Property Detail

**Address:** Ransley Road & Mulgoa Road
**Property Description:** Part of Lot 2 on DP 1216321
**Total Site Area:** 18463 m²

The existing site consist of 100% impervious asphalt carpark.

The site fronts Mulgoa Road to the east and comprises the entire Mulgoa Road frontage between Retreat Drive to the north and Panthers Place to the south. To its west, the site is bound by Panthers Link. The site comprises an on-grade car park with perimeters planting around all sides.

Refer to locality plan in Figure 1 for further detail.

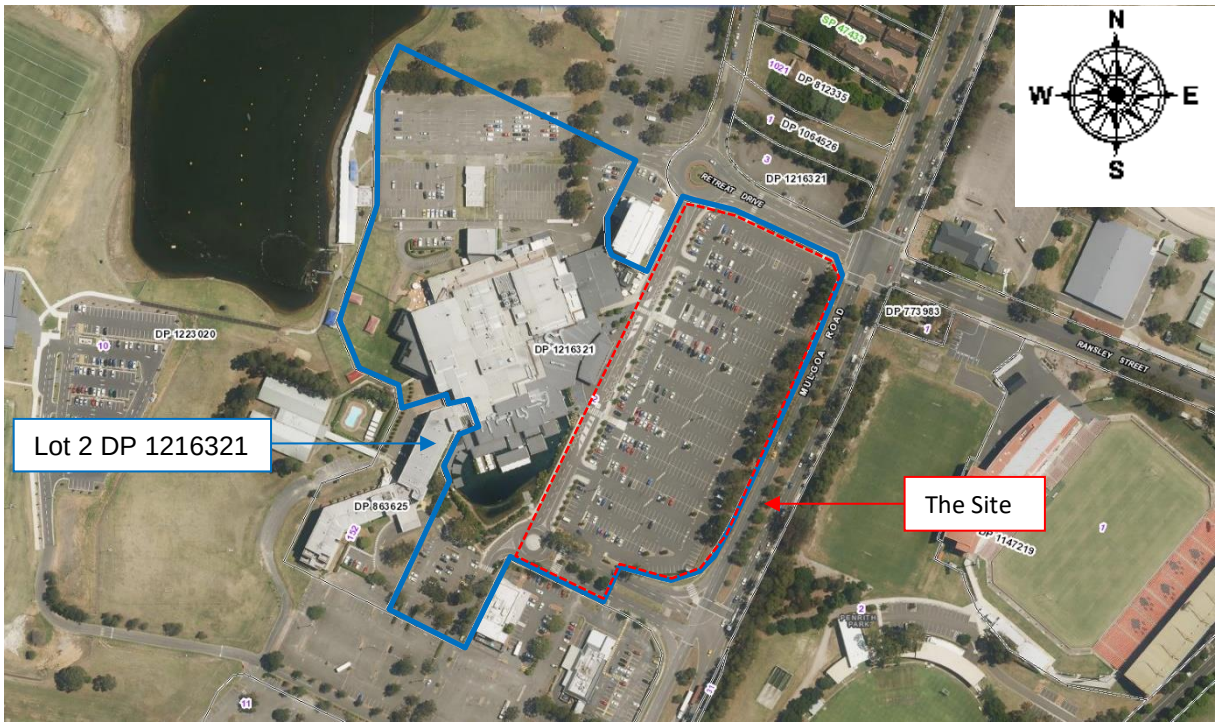


*Figure 1: Locality Plan (Source: nearmaps.com.au, 2017)*

# Existing Site & Proposed Development

## 2.2 Topography

The existing site consists of an open ground floor car park at Ransley Street & Mulgoa Road, Penrith.

The site falls from the north to the south. The high point of the site is located at the north-east with a level of RL27.65mAHD and the low point is located at the south boundary of RL26.00AHD, this equates to 1.65m fall across the site.

## 2.3 Stormwater Catchments

The surrounding area has been investigated to determine the likely impact of existing external stormwater catchments on the proposed site. The results from the investigation reveal that minimal effect to the proposed site will occur because of upstream catchments. Overland flow from upstream catchments are captured by the adjacent road reserve and travel downstream bypassing the site. The proposed development site is located midway up the existing catchment.

## 2.4 Existing Stormwater Discharge

The existing site discharges into the existing stormwater kerb inlet pit along Panther Place. The existing drainage network drains to a drainage easement located downstream via a 760mm diameter pipe. The drainage system discharges into Peach Tree Creek.

## 2.5 Proposed Development

The subject application is for Phase 1 of a two (2) Phase development of the site. Phase 1 will consist of the following:

- Conference centre, community centre;
- Construction of a two storey building (including ground floor);
- Two levels of basement car parking;
- Maintain existing southern on-grade car parking;
- Landscaping and associated public domain works; and
- Site preparation, including excavation.

# 3. Local Authority Requirements

Penrith City Council's Local Environment Plan, Development Control Plan, Stormwater Drainage Specification for Building Developments, Water Sensitive Urban Design (WSUD) Policy and WSUD Technical Guidelines set the design requirements for any new stormwater management system associated with any development.

Development of the site forms part of development of the greater redevelopment of the 'Panthers Precinct', for which a stormwater masterplan has been developed ('Panthers Precinct Redevelopment – Stormwater Management & WSUD Strategy' prepared by Diversi Consulting, Reference 008-C-911, Revision C, June 2014). Due regard must also be given to the precinct stormwater strategy in developing a site specific strategy.

A summary of the key requirements for the development of the stormwater management system for this development are summarised below.

## 3.1 Stormwater Conveyance Requirements

Council's standards state that the following design storm Average Recurrence Intervals (ARI's) should be considered when designing the stormwater runoff conveyance systems for the development.

| Design Parameter | Annual Exceedance Probability (%) | Design Storm ARI (Years) | Conveyance Method |
|---|---|---|---|
| Minor Drainage System | 5 | 20 | In Ground (Piped) |
| Major Drainage System | 1 | 100 | Overland |

*Table 2: Design Events for Stormwater Conveyance*

## 3.2 On Site Detention Requirements

The Council advised Cabe Developments (NSW) Pty Ltd in a letter dated 3 July 2018 that on-site detention is not required for development of the site due to the proximity of the development to downstream trunk infrastructure.

## 3.3 Water Conservation

Councils WSUD Policy states the following requirements for all buildings not covered by the State Environmental Planning Policy - BASIX:

a) that are installing any water use fittings must demonstrate minimum standards defined by the Water Efficiency Labelling and Standards (WELS) Scheme. Minimum WELS ratings are 4 star dual-flush toilets, 3 star showerheads, 4 star taps (for all taps other than bath outlets and garden taps) and 3 star urinals. Water efficient washing machines and dishwashers are to be used wherever possible.
b) to install rainwater tanks to meet 80% of non-potable demand including outdoor use, toilets, and laundry.
c) to incorporate passive cooling methods that rely on improved natural ventilation to supplement or preclude mechanical cooling.

The WSUD Policy also states that water use within public open space (for uses such as irrigation, pools, water features etc) should be supplied from sources other than potable mains water (e.g. treated stormwater or greywater) to meet 80% water use demand.

## 3.4 Water Pollutant Reduction Targets

The Council's pollutant load reduction targets are set as follows:

a) 90% reduction in the post development mean annual load of total gross pollutant (greater than 5 mm);
b) 85% reduction in the post development mean annual load of Total Suspended Solids (TSS);
c) 60% reduction in the post development mean annual load of Total Phosphorus (TP);
d) 45% reduction in the post development mean annual load of Total Nitrogen (TN).

The Diversi Stormwater Masterplan indicates that runoff from the site should be treated via a 200sq.m raingarden and a Rocla CDS 0708 gross pollutant trap however this is indicative only.

# 4. Flood Impact Assessment

WGE have reviewed Council's LEP documentation and a flood assessment report prepared by J. Wyndham Prince that covers the site area (November 2014). J. Wydham Prince's report indicates that the proposed development is not impacted by 1% AEP flood event, as shown in Figure 2.

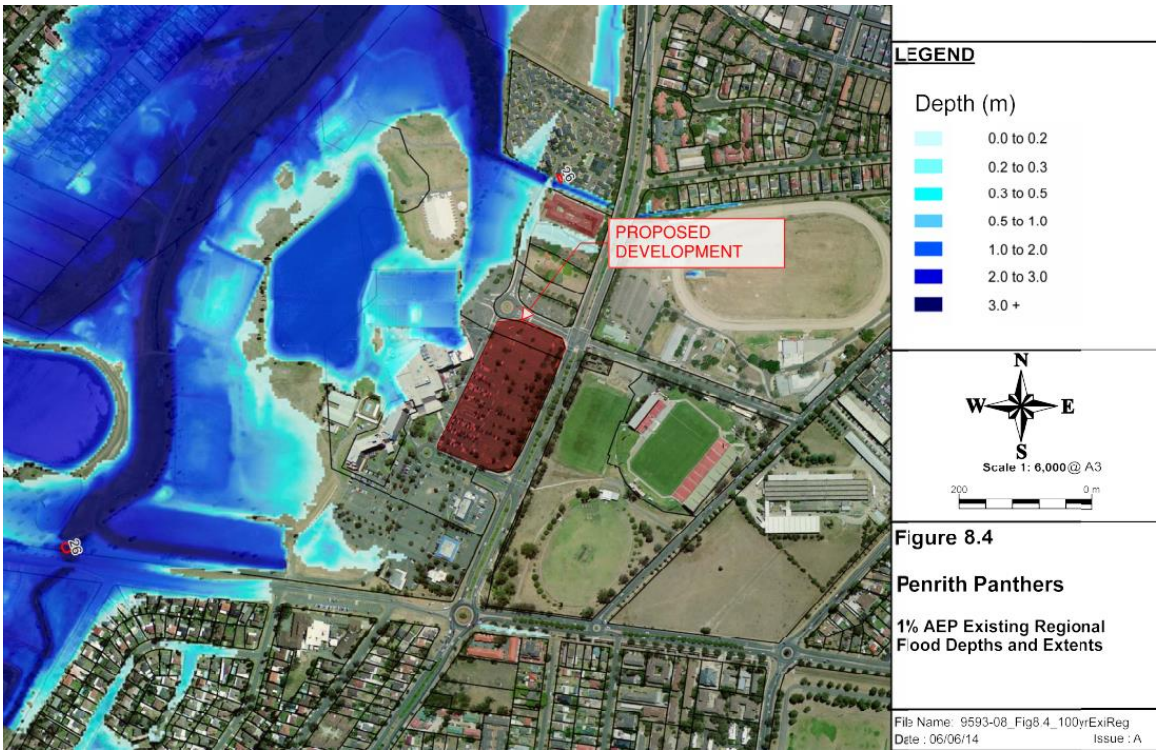


*Figure 3: Peak Design Floodwater Depths for the 100 year ARI Flood (Source: J.Wyndham Prince Engineers November 2014).*

No flood related development controls for the site are required.

# 5. Stormwater Conveyance

This section of the report discusses the systems proposed to allow for stormwater to be conveyed across the site to the legal point of discharge.

## 5.1 Roof

All roof areas will be drained through a Siphonic system. The roof drainage to be documented during detailed design phase. The drainage system will be designed in accordance with AS3500.3 to convey the minor design storm runoff from the roof to a rainwater tank. The rainwater tank will overflow to the in ground drainage system. Flows in excess of the design flows will surcharge the roof drainage system and discharge onto the surrounding ground where it will then be conveyed to the surrounding ground drainage within the roads.

## 5.2 Surface Drainage

The surface areas will be drained through a variety of methods, discussed below, in accordance with AS3500.3 and council's stormwater drainage guidelines.

The in ground drainage has been designed to meet the following criteria:

- In the minor design storm event (5% AEP) there will be no surcharging of the in ground drainage system and;
- In the major design storm event (1% AEP) surface areas will discharge into surrounding roads. Any minor trapped lowpoints will be conveyed in pipes sufficiently sized to convey the 1% AEP flow.

## 5.3 Legal Point of Discharge

The development will discharge into an existing DN600mm pipe that currently passes through the Site. A portion of the pipe will be removed (as detailed on the engineering plans) to facilitate the development.

# 6. Stormwater Quality

## 6.1 Phase 1

Stormwater quality objectives are proposed to be met via the use of a rainwater tank, Stormwater360 Enviropods (or similar approved) and a SPEL Filter (or similar approved) as shown on the below excerpt from MUSIC stormwater quality modelling software.

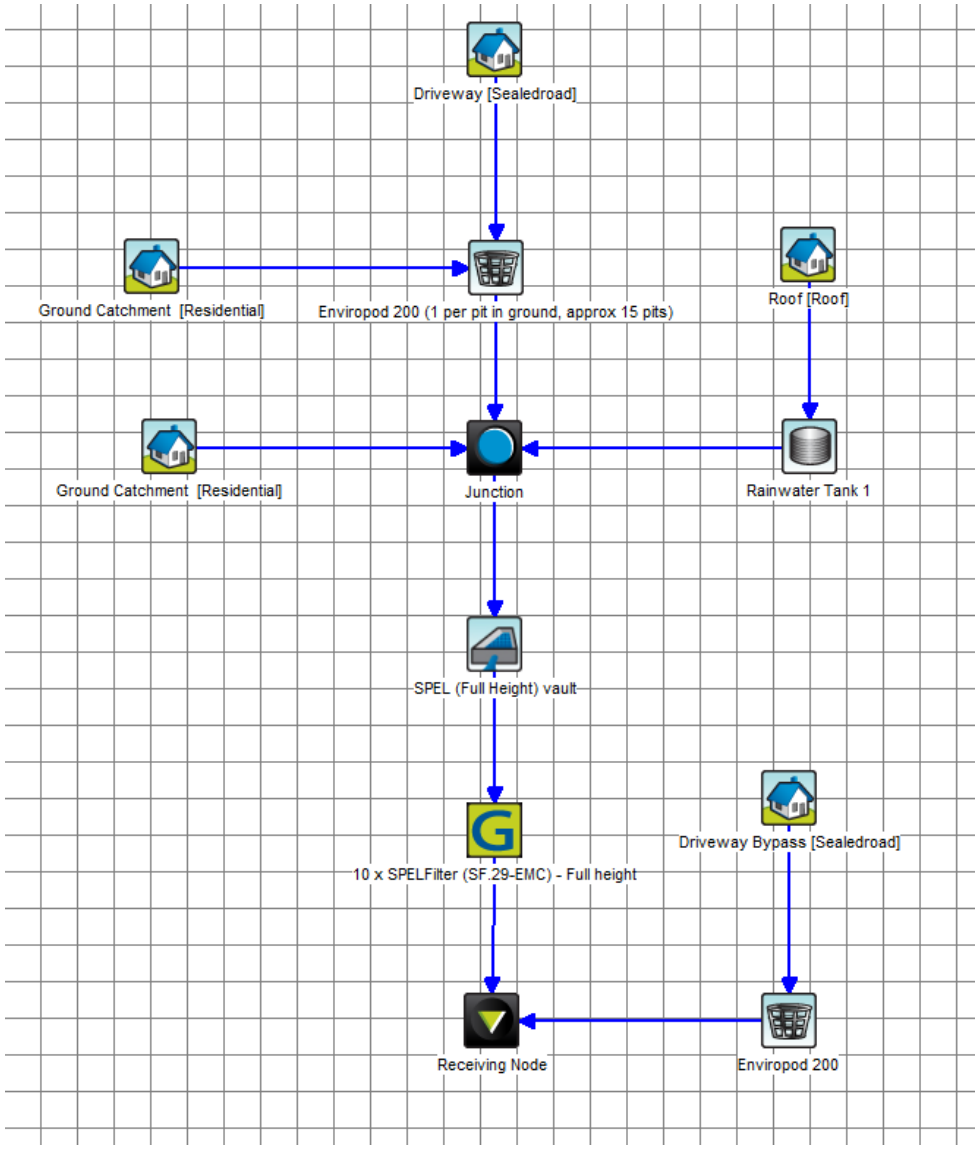


*Figure 4: Phase 1 MUSIC Model Arrangement*

The tables overleaf outlines MUSIC source and treatment node parameters.

| Source Node | MUSIC Node Zoning/Surface Type | Area | % Impervious | Total Suspended Solids (log mg/L) | Total Phosphorus (log mg/L) | Total Nitrogen (log mg/L) |
|---|---|---|---|---|---|---|
| North Ground Catchment | Residential | 0.030 Ha | 50% | Base - Mean - 1.20<br>Base - Std Dev - 0.17<br>Storm - Mean – 2.15<br>Storm - Std Dev - 0.32 | Base - Mean - -0.85<br>Base - Std Dev - 0.19<br>Storm - Mean - -0.60<br>Storm - Std Dev - 0.25 | Base - Mean - 0.11<br>Base - Std Dev - 0.12<br>Storm - Mean - 0.30<br>Storm - Std Dev - 0.19 |
| Centre Ground Catchment | Residential | 0.423 Ha | 25% | Base - Mean - 1.20<br>Base - Std Dev - 0.17<br>Storm - Mean – 2.15<br>Storm - Std Dev - 0.32 | Base - Mean - -0.85<br>Base - Std Dev - 0.19<br>Storm - Mean - -0.60<br>Storm - Std Dev - 0.25 | Base - Mean - 0.11<br>Base - Std Dev - 0.12<br>Storm - Mean - 0.30<br>Storm - Std Dev - 0.19 |
| Driveway | Sealed Road | 0.025 Ha | 100% | Storm - Mean – 2.43<br>Storm - Std Dev - 0.32 | Storm - Mean - -0.30<br>Storm - Std Dev - 0.25 | Storm - Mean - 0.34<br>Storm - Std Dev - 0.19 |
| Driveway Bypass | Sealed Road | 0.022 Ha | 100% | Storm - Mean – 2.43<br>Storm - Std Dev - 0.32 | Storm - Mean - -0.30<br>Storm - Std Dev - 0.25 | Storm - Mean - 0.34<br>Storm - Std Dev - 0.19 |
| Roof | Roof | 0.603 Ha | 100% | Storm - Mean – 1.30<br>Storm - Std Dev - 0.32 | Storm - Mean - -0.89<br>Storm - Std Dev - 0.25 | Storm - Mean - 0.30<br>Storm - Std Dev - 0.19 |

*Table 5: Phase 1 MUSIC Model Input Parameters*

| Treatment Node | Properties | Detail | Quantity |
|---|---|---|---|
| Rainwater Tanks | Inlet | Low Flow Bypass | 0 $m^3/s$ |
| | | High Flow Bypass | 100 $m^3/s$ |
| | Individual Tank | Number of Tanks | 1 |
| | | Volume below overflow pipe | 85 kL |
| | | Depth above overflow | 0.2 m |
| | | Surface Area | 40 $m^2$ |
| | | Initial Volume | 1.0 kL |
| | Outlet | Overflow Pipe Diameter (Each Tank) | 450 mm |
| | Re-Use | Max Drawdown Height | 3.667 m |
| | | Annual Demand | 1065 kL/yr, PET -Rain Distribution |
| Stormwater360 Enviropods (200 Micron) – 20 Total | Inlet Properties | Low Flow By-pass | 0 $m^3/s$ |
| | | High Flow By-Pass | 0.4 $m^3/s$ |
| | Transfer Functions (Concentration Based) | Total Suspended Solids | Input = 0 Output = 0<br>Input = 100 Output = 46 |
| | | Total Nitrogen | Input = 0 Output = 0<br>Input = 10 Output = 7.8 |
| | | Total Phosphorous | Input = 0 Output = 0<br>Input = 10 Output = 7 |
| | | Gross Pollutants | No reduction |
| SPEL Filter (SF.29-EMC) Full Height | Inlet Properties | Low Flow By-pass | 0 $m^3/s$ |
| | | High Flow By-Pass | 0.055 $m^3/s$ |
| | Transfer Functions (Concentration Based) | Total Suspended Solids | Input = 0 Output = 0<br>Input = 200 Output = 22 |
| | | Total Nitrogen | Input = 0 Output = 0<br>Input = 7 Output = 3.2 |
| | | Total Phosphorous | Input = 0 Output = 0<br>Input = 0.4 Output = 0.14 |
| | | Gross Pollutants | Input = 0 Output = 0<br>Input = 100 Output = 1 |
| SPEL (Full Height) Vault | Inlet | Low Flow Bypass | 0 $m^3/s$ |
| | | High Flow Bypass | 100 $m^3/s$ |
| | Storage Properties | Surface Area (square metres) | 6.0 |
| | | Extended Detention Depth (m) | 0.85 |
| | | Exfiltration Rate (mm/hr) | 0.00 |
| | | Evaporative Loss as % PET | 0.00 |
| | Outlet Properties | Low Flow Pipe Diameter (mm) | 172 |
| | | Overflow Weir Width (m) | 2.0 |
| | | Notational Detention Time (hrs) | 22.3E-3 |

*Table 6: Phase 1 MUSIC Model Treatment Parameters*

# Stormwater Quality

The following table and the MUSIC-link report included in Appendix B shows the effectiveness of the treatment train, demonstrating compliance with Council's controls.

| Pollutant | Council Pollutant Reduction Target | Post-Development Pollutants - Sources (kg/year) | Post-Development Pollutants - Residual (kg/year) | Actual Pollution Reduction |
|---|---|---|---|---|
| Total Suspended Solids (TSS) | 85% | 372 | 54 | 85.5% |
| Total Phosphorous (TP) | 60% | 0.982 | 0.277 | 71.8% |
| Total Nitrogen (TN) | 45% | 10.6 | 5.12 | 51.8% |
| Gross Pollutants | 90% | 142 | 0 | 100% |

*Table 7: Phase 1 MUSIC Treatment Train Effectiveness*

WGE have also performed alternate modelling for Phase 1 of the development. In the event that the usage of Enviropods is not feasible, a Rocla CDS0708 Gross Pollutant Trap may be utilised in lieu of Enviropods.

WGE note that the proposed treatment train is not in accordance with the Diversi report for the Panthers Precinct. The Diversi report notionally makes allowance for a raingarden to meet WSUD objectives. WGE note that a raingarden would not be appropriate for the site given a basement is proposed covering the majority of the site area.

Maintenance of the proposed WSUD measures shall be in accordance with the manufacturer's recommendations which are included in Appendix C.

# 7. Water Conservation

Calculations have been performed for Phase 1 of the development to determine the non-potable water usage for the development. These calculations have been used in the aforementioned MUSIC models to determine an appropriate rainwater tank size.

The calculations have yielded that it is impractical to source toilet and laundry water from rainwater re-use due to the large number of proposed toilets and laundries and the comparatively small roof area. Supply of water for irrigation of landscaped areas is practical. The calculated area requiring irrigation is 3,550 m² for Phase 1 of the development. Oculus Landscape Architects have advised that irrigation is likely to be drip-fed. At a rate of 0.3 kL/year/m² irrigated area, the quantum of water required is 1,065 kL/yr for Phase 1.

A 85kL rainwater tank is required to supply 80% of water for irrigation from rainwater for Phase 1.

This rainwater tank is proposed to be located in the basement as shown on civil engineering and architectural plans.

# 8. Erosion & Sedimentation Control

Landcom have published a design guide entitled “Managing Urban Stormwater - Soils and Construction” which is regarded as the standard to which erosion and sedimentation control should be designed to within NSW. Penrith City Council specifies compliance with the Landcom design guide in there Stormwater and Floodplain Management Technical Manual.

The control of erosion and sedimentation describes the measures incorporated during and following construction of a new development to prevent the pollution and degradation of the downstream watercourse.

A Soil and Water Management Plan has prepared as part of the development application documentation and is included in Appendix A of this report.

Common control measures adopted are:

- Sedimentation fences;
- Stormwater drainage inlet protection;
- Overland flow diversion swales;
- Shaker Grids and wash downs for vehicles leaving the construction site; and
- Dust control measures.

The maintenance of these control measures throughout their intended lifespan will ensure that the risk of erosion and sedimentation pollution of the downstream watercourse will be minimised. Review of the proposed measures is required at detailed design phase by a suitably qualified professional.

# Appendix A – Civil Engineering Drawings

# CIVIL ENGINEERING WORKS


| Sheet List Table | |
|---|---|
| Sheet Number | Sheet Title |
| CI-000-01 | COVER SHEET |
| CI-007-01 | GENERAL NOTES |
| CI-070-01 | EROSION AND SEDIMENT CONTROL PLAN |
| CI-076-01 | EROSION AND SEDIMENT DETAILS |
| CI-520-01 | GENERAL ARRANGEMENT PLAN - GROUND FLOOR |
| CI-520-02 | GENERAL ARRANGEMENT PLAN - BASEMENT |
| CI-526-01 | STORMWATER DRAINAGE DETAILS |
| CI-568-01 | DRAINAGE CALCULATIONS |

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CLIENT

WESTERN SYDNEY COMMUNITY & CONFERENCE CENTRE - PHASE 1
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## GENERAL NOTES

1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH OTHER SUCH WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
2. ALL DIMENSIONS ARE IN MILLIMETRES & ALL LEVELS ARE IN METRES, UNO (UNLESS NOTED OTHERWISE).
3. NO DIMENSION SHALL BE OBTAINED BY SCALING THE DRAWINGS.
4. ALL LEVELS AND SETTING OUT DIMENSIONS SHOWN ON THE DRAWINGS SHALL BE CHECKED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORK.
5. EXISTING SERVICES WHERE SHOWN HAVE BEEN PLOTTED FROM SUPPLIED DATA AND SUCH THEIR ACCURACY CAN NOT BE GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH THE LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF WORK.
6. ON COMPLETION OF STORMWATER INSTALLATION, ALL DISTURBED AREAS MUST BE RESTORED TO ORIGINAL CONDITION, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL AND GRASSED AREAS AND ROAD PAVEMENTS, UNLESS DIRECTED OTHERWISE.

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**WESTERN SYDNEY COMMUNITY & CONFERENCE CENTRE - PHASE 1**

PROJECT

GENERAL NOTES

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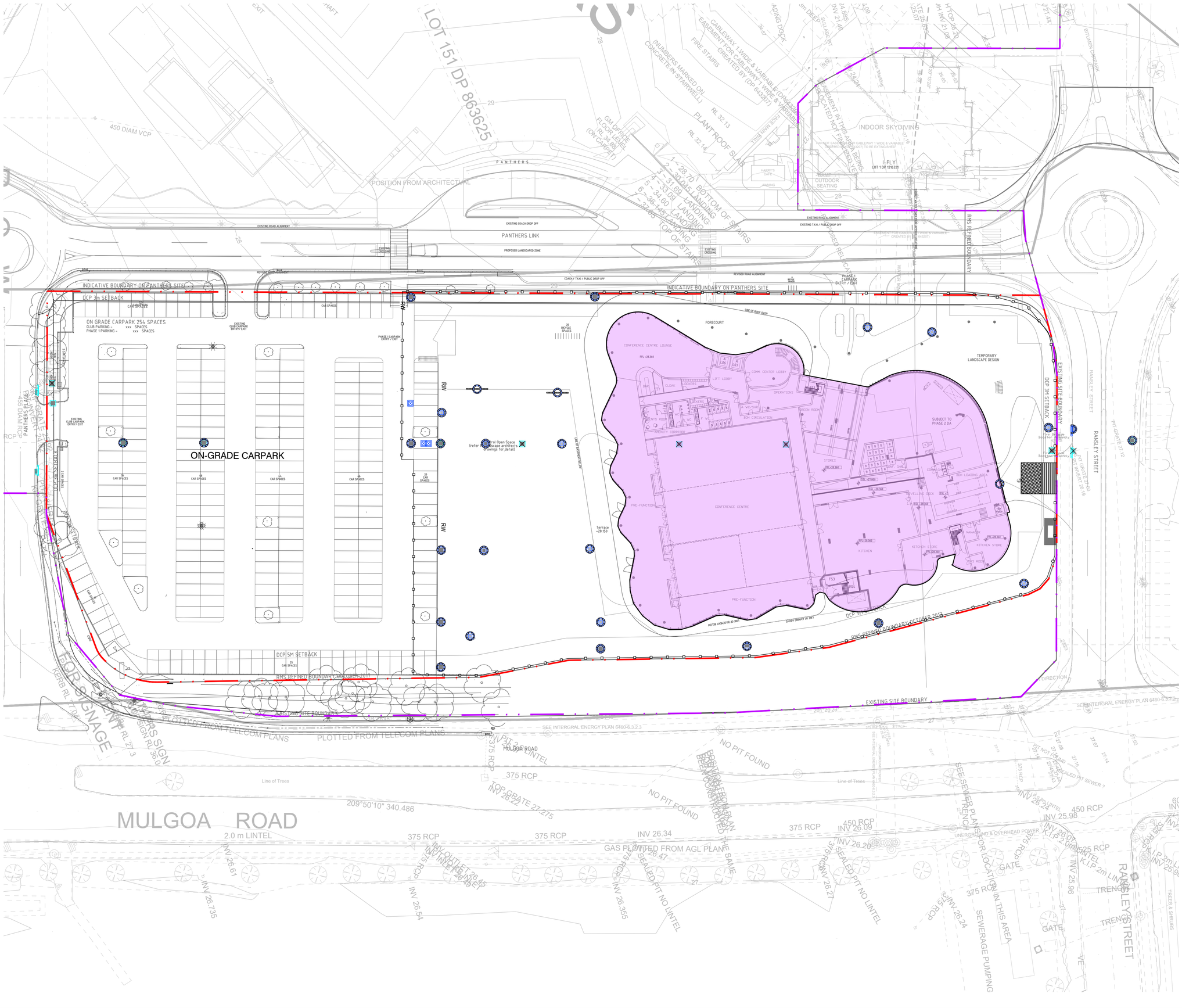


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**WESTERN SYDNEY COMMUNITY & CONFERENCE CENTRE - PHASE 1**

PROJECT

EROSION AND SEDIMENT CONTROL PLAN

TITLE

FOR APPROVAL

NOT FOR CONSTRUCTION

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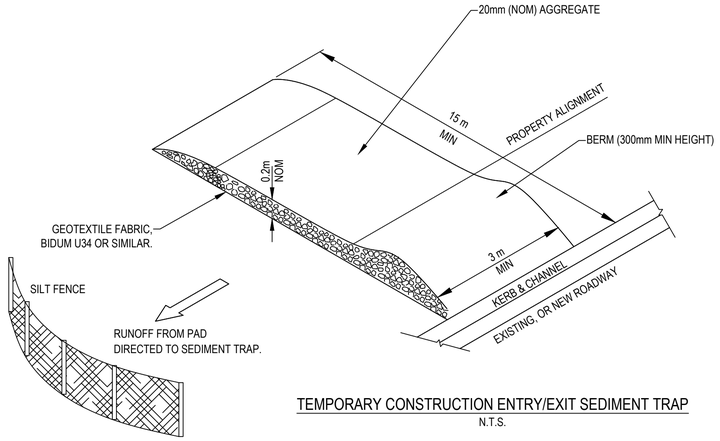
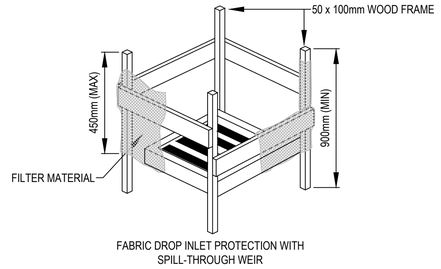
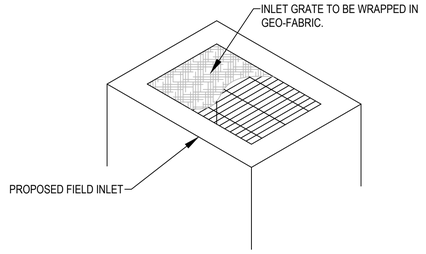



TEMPORARY CONSTRUCTION ENTRY/EXIT SEDIMENT TRAP
N.T.S.

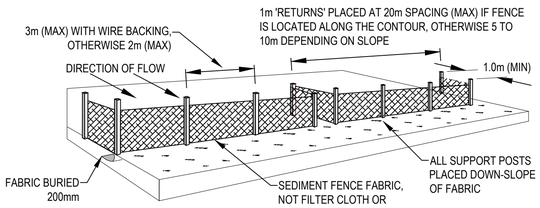



FABRIC DROP INLET PROTECTION WITH
SPILL-THROUGH WEIR

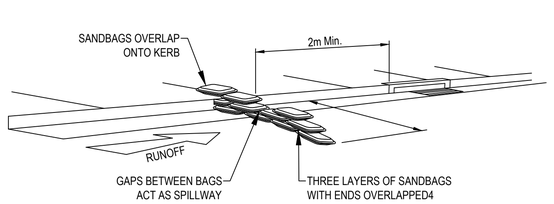
FIELD INLET PROTECTION
N.T.S.



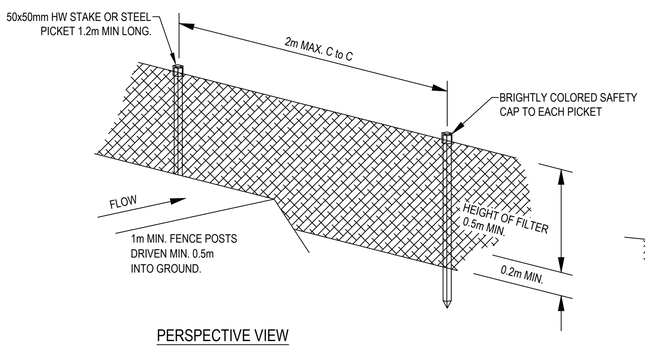

FIELD INLET SEDIMENT CONTROL
N.T.S.



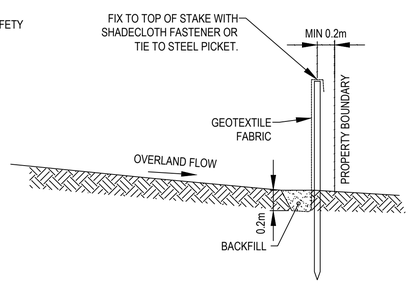

INSTALLATION OF SEDIMENT FENCE
N.T.S




SANDBAG KERB INLET SEDIMENT TRAP
N.T.S.




PERSPECTIVE VIEW




TYPICAL SECTION

SEDIMENT FENCE DETAIL
N.T.S.

1:5 0.1 0 0.1 0.2 A1
1:10 A3

| REV | DESCRIPTION | DRAWN | APP'D | DATE |
|---|---|---|---|---|
| . | . | . | . | . |
| . | . | . | . | . |
| . | . | . | . | . |
| . | . | . | . | . |
| . | . | . | . | . |
| C | ISSUED FOR SECTION 4.55 APPLICATION | ATC | OKW | 12.06.19 |
| B | ISSUED FOR DEVELOPMENT APPLICATION | ATC | OKW | 20.07.18 |
| A | ISSUED FOR DEVELOPMENT APPLICATION | ATC | TIF | 06.04.18 |

TURNER

census advisory

ARCHITECT/CLIENT

WOOD & GRIEVE ENGINEERS

| | |
|---|---|
| DRAWN: | OKW |
| DESIGNED: | ATC |
| VERIFIED: | OKW 12.06.19 |
| APPROVED FOR TENDER: | ... J.J.. |
| APPROVED FOR CONSTRUCTION: | ... J.J.. |

**WESTERN SYDNEY COMMUNITY & CONFERENCE CENTRE - PHASE 1**

PROJECT

EROSION AND SEDIMENT DETAILS

TITLE

FOR APPROVAL
NOT FOR CONSTRUCTION

| | | | |
|---|---|---|---|
| AS SHOWN | 35986 | CI-076-01 | C |
| SCALE @ A1 | PROJECT No | DRAWING No | REV |

35986-CI-076-01.dwg
12/06/2019 5:25:01 PM

EXISTING CARPARK AND CARPARK DRAINAGE

ON-GRADE CARPARK

INDICATIVE BOUNDARY ON PANTHERS SITE

DCP 3m SETBACK

DCP 5M SETBACK

PANTHERS LINK

PANTHERS PLACE

MULGOA ROAD

EXISTING SITE BOUNDARY

RMS REFINED BOUNDARY OCTOBER 2017

RMS SETBACK BOUNDARY

TEMPORARY LANDSCAPE DESIGN

TREES & SHRUBS

Line of Trees

Line of Trees

MAINTAIN EXISTING GRATED PIT SL 26.165 IL 24.655

MAINTAIN EXISTING GRATED PIT SL 26.335 IL 24.805

BREAK INTO EXISTING PIPE. IL TO BE CONFIRMED ON SITE.

RECONSTRUCT EXISTING GRATED PIT SL 28.150 IL 25.360

900x900 JUNCTION PIT SL 27.600 IL 25.650

900x900 JUNCTION PIT SL 27.150 IL 25.800

900x900 GRATED PIT SL 27.200 IL 25.900

900x900 GRATED PIT SL 28.800 IL 25.650

600x600 JUNCTION PIT SL 26.800 IL 25.400

15m3 SPELFILTER CHAMBER SL 26.700 IL 25.195

450x450 GRATED PIT SL 28.300 IL 27.700

GRATED DRAIN SL 28.700

600x600 GRATED PIT SL 28.100 IL 27.350

450x450 GRATED PIT SL 28.150 IL 27.550

GRATED DRAIN SL 28.700

900x900 GRATED PIT SL 28.800 IL 26.100

600x600 GRATED PIT SL 27.550 IL 26.800

450x450 GRATED PIT SL 27.650 IL 27.050

450x450 GRATED PIT SL 27.500 IL 26.900

450x450 GRATED PIT SL 27.200 IL 26.600

900x900 GRATED PIT SL 27.400 IL 26.250

600x900 GRATED PIT SL 27.600 IL 26.600

PIPES SUSPENDED IN BASEMENT IL 26.400

300x300 WASTE PIT SL 28.200

300x300 WASTE PIT SL 28.050 IL 26.700

300x300 WASTE PIT SL 27.950 IL 26.850

300x300 WASTE PIT SL 27.84

300x300 WASTE PIT SL 27.600

300x300 WASTE PIT SL 27.650

450x450 GRATED PIT SL 27.800

450x450 GRATED PIT SL 27.500

450x450 GRATED PIT SL 27.400 IL 26.800

KERB INLET PIT SL 27.120 IL 26.250

MAINTAIN EXISTING PIT SL 27.120 IL 25.90 (NOT SURVEYED)

GRATED DRAIN SL 27.260

450x450 GRATED PIT SL 27.950 IL 27.200

600x600 GRATED PIT SL 27.750 IL 26.900

SSL 28.360

SSL 27.800

SSL 27.260

Ø225 @ 1%

Ø150 @ 1%

Ø450 @ 1%

Ø375 @ 1%

Ø100 @ 1%

Ø760

Ø600

3/4 3/3 2/2b 2/1a 2/a 1/8 2/2 2/1 1/7 1/7a 1/7b 1/6 1/6a 1/5 1/4a 1/4 1/3 3/2 3/1 4/2 4/3 1/2 1/1 4/1

## LEGEND

- INDICATIVE DEVELOPMENT BOUNDARY
- EXISTING CADASTRAL BOUNDARY
- EXTENT OF BASEMENT WALL
- EXTENT OF ROOF
- PROPOSED BUILDING
- PROPOSED STORMWATER PIPE
- EXISTING STORMWATER PIPE
- EXISTING STORMWATER PIPE TO BE REMOVED
- PROPOSED JUNCTION PIT
- EXISTING JUNCTION PIT
- PROPOSED GRATED PIT WITH ENVIROPOD
- EXISTING GRATED PIT
- EXISTING KERB INLET PIT
- PROPOSED RETAINING WALL

NOTE:

1) BASEMENT AND BUILDING DRAINAGE TO BE DOCUMENTED BY HYDRAULIC ENGINEER DURING DETAILED DESIGN.
2) INSTALL 200 MICRON ENVIROPOD (OR SIMILAR APPROVED), IN ALL GROUND FLOOR INLET PITS GREATER THAN 300x300 . ALTERNATIVELY, 1 x ROCLA CDS 0708 UNIT (OR SIMILAR APPROVED) MAY BE UTILISED IN LIEU OF ENVIROPODS, PROVIDING GROUND LEVEL SURFACE AREAS DISCHARGES TO THE UNIT.
3) INSTALL SPEL FILTER WITHIN SPEL FILTER CHAMBER IN ACCORDANCE WITH 'SPEL' (OR SIMILAR APPROVED).

1:400 4 0 4 8 12 16 20 A1
1:800 A3

| REV | DESCRIPTION | DRAWN | APP'D | DATE |
|---|---|---|---|---|
| D | ISSUED FOR SECTION 4.55 APPLICATION | ATC | OKW | 12.06.19 |
| C | ISSUED FOR DEVELOPMENT APPLICATION | ATC | OKW | 20.07.18 |
| B | ISSUED FOR DEVELOPMENT APPLICATION | ATC | TIF | 06.04.18 |
| A | ISSUED FOR DEVELOPMENT APPLICATION | SJL | TIF | 18.12.17 |

TURNER

census advisory

ARCHITECT/CLIENT

WOOD & GRIEVE ENGINEERS

| | |
|---|---|
| DRAWN: | ATC |
| DESIGNED: | OKW |
| VERIFIED: | OKW 12.06.19 |
| APPROVED FOR TENDER: | ... /.../.. |
| APPROVED FOR CONSTRUCTION: | ... /.../.. |

**WESTERN SYDNEY COMMUNITY & CONFERENCE CENTRE - PHASE 1**

PROJECT

GENERAL ARRANGEMENT PLAN - GROUND FLOOR

TITLE

FOR APPROVAL

NOT FOR CONSTRUCTION

| AS SHOWN | 35986 | CI-520-01 | D |
|---|---|---|---|
| SCALE @ A1 | PROJECT No | DRAWING No | REV |

35986-CI-520-01.dwg

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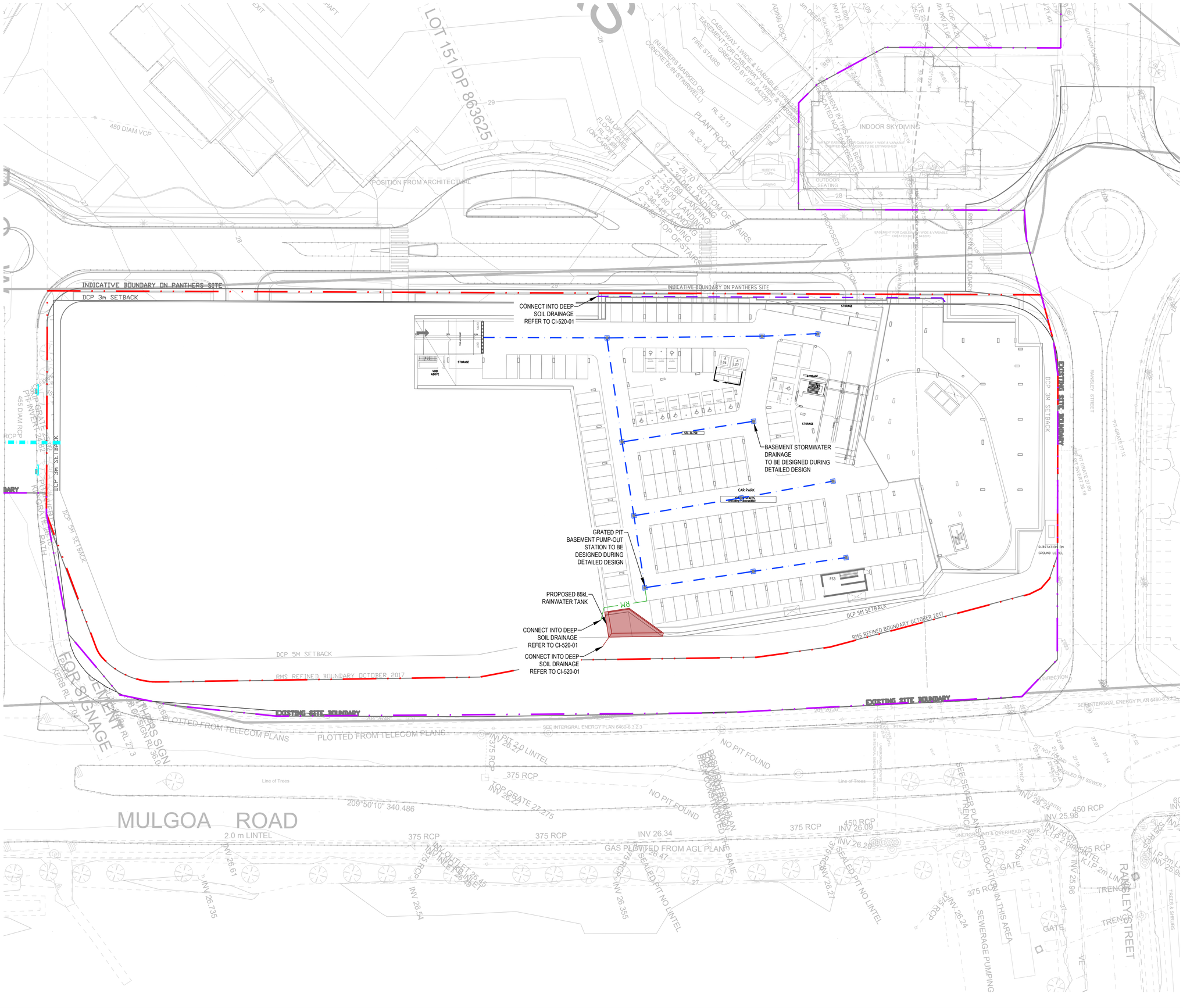


## LEGEND

- INDICATIVE DEVELOPMENT BOUNDARY
- EXISTING CADASTRAL BOUNDARY
- RISING MAIN
- PROPOSED STORMWATER PIPE
- EXISTING STORMWATER PIPE
- EXISTING STORMWATER PIPE TO BE REMOVED
- SUSPENDED STORMWATER PIPE (REFER TO CI-520-01)
- PROPOSED JUNCTION PIT
- EXISTING JUNCTION PIT
- PROPOSED GRATED PIT
- EXISTING GRATED PIT
- EXISTING KERB INLET PIT

NOTE:

1) BASEMENT AND BUILDING DRAINAGE TO BE DOCUMENTED BY HYDRAULIC ENGINEER DURING DETAILED DESIGN.
2) THESE DRAINAGE SYSTEMS TO CONNECT DIRECTLY INTO THE STORMWATER SYSTEM DOCUMENTED ON THIS SHEET
3) DIVERSI CONSULTING PTY LTD HAVE DESIGNED AND DOCUMENTED STORMWATER INFRASTRUCTURE (COVERING QUANTITY AND QUALITY) FOR THE WHOLE SITE. REFER TO DIVERSI CONSULTING PTY LTD DOCUMENTATION FOR DETAILS.
4) SUSPENDED DRAINAGE PIPE TO BE SUPPORTED WITH SUPPORT SPACING IN ACCORDANCE WITH AS3500.3.
5) SUSPENDED DRAINAGE PIPE SIZES UP TO 375Ø TO BE PVC. PIPE SIZES LARGER TO BE GRP (GLASS REINFORCED PIPES).
6) ALL GRATED PITS TO BE 900x900 MIN UNO.

1:400 4 0 4 8 12 16 20 A1
1:800 A3

| REV | DESCRIPTION | DRAWN | APP'D | DATE |
|---|---|---|---|---|
| D | ISSUED FOR SECTION 4.55 APPLICATION | ATC | OKW | 12.06.19 |
| C | ISSUED FOR DEVELOPMENT APPLICATION | ATC | OKW | 20.07.18 |
| B | ISSUED FOR DEVELOPMENT APPLICATION | ATC | TIF | 06.04.18 |
| A | ISSUED FOR DEVELOPMENT APPLICATION | SJL | TIF | 15.12.17 |

TURNER

census advisory

ARCHITECT/CLIENT

WOOD & GRIEVE ENGINEERS

| | |
|---|---|
| DRAWN: | ATC |
| DESIGNED: | OKW |
| VERIFIED: | OKW 12.06.19 |
| APPROVED FOR TENDER: | ... /../.. |
| APPROVED FOR CONSTRUCTION: | ... /../.. |

**WESTERN SYDNEY COMMUNITY & CONFERENCE CENTRE - PHASE 1**

PROJECT

GENERAL ARRANGEMENT PLAN - BASEMENT

TITLE

FOR APPROVAL
NOT FOR CONSTRUCTION

| AS SHOWN | 35986 | CI-520-02 | D |
|---|---|---|---|
| SCALE @ A1 | PROJECT No | DRAWING No | REV |

35986-CI-520-02.dwg

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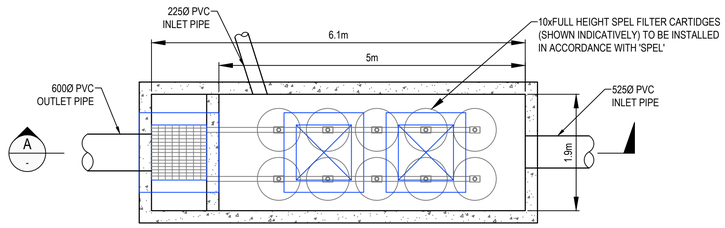
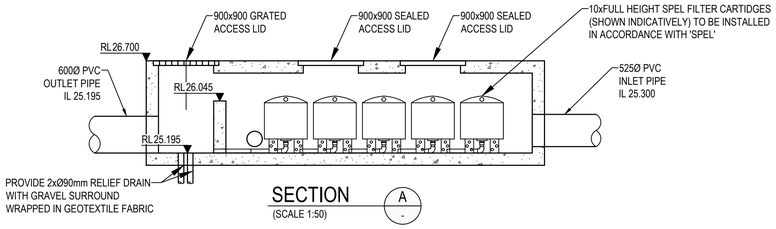


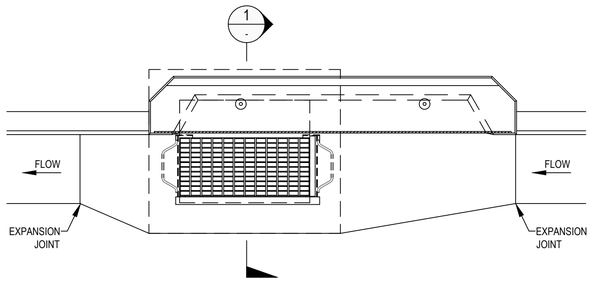

## SPEL FILTER CHAMBER - PLAN

(SCALE 1:50)

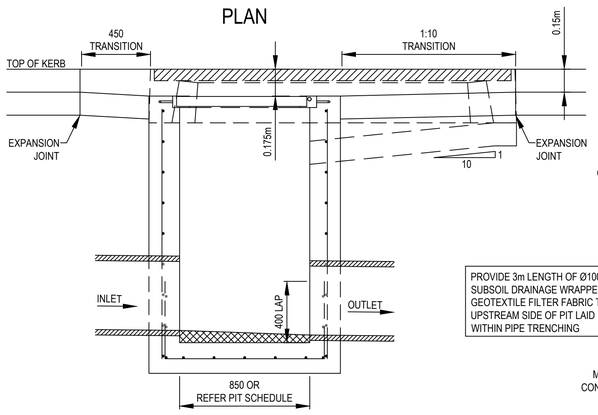



## SECTION A

(SCALE 1:50)



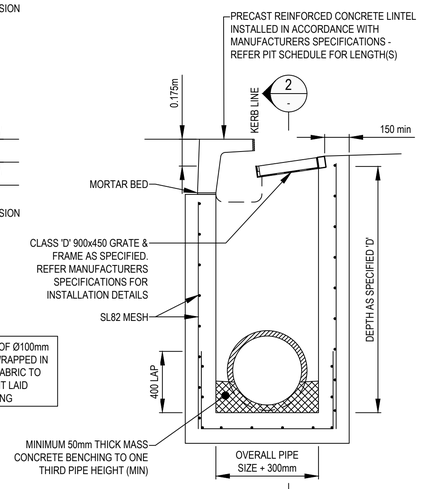

## PLAN




## SECTION 2

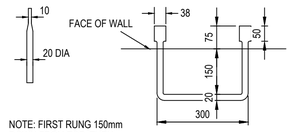
SCALE 1:20

PROVIDE 3m LENGTH OF Ø100mm SUBSOIL DRAINAGE WRAPPED IN GEOTEXTILE FILTER FABRIC TO UPSTREAM SIDE OF PIT LAID WITHIN PIPE TRENCHING




## SECTION 1

SCALE 1:20



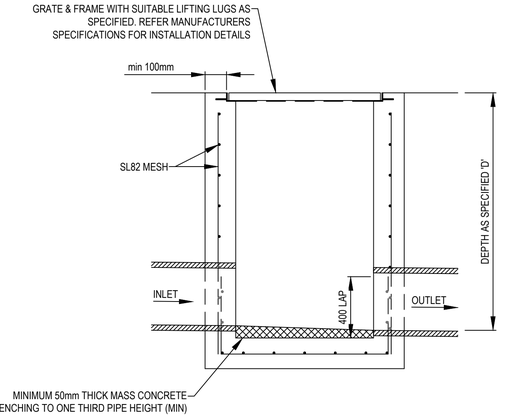

NOTE: FIRST RUNG 150mm DOWN FROM TOP, THEN SPACED AT 300 CENTRES.

MATERIAL : 20mm DIA MILD STEEL HEAVY GALVANIZED

## STEP IRONS FOR DRAINAGE PITS

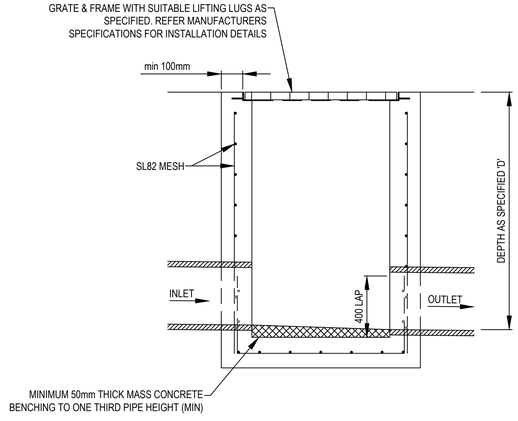
N.T.S.

| | | | |
|---|---|---|---|
| 1:50 | 1 0.5 0 1 2 | | A1 |
| 1:100 | | | A3 |
| 1:20 | 0.2 0 0.2 0.4 0.6 0.8 1 | | A1 |
| 1:40 | | | A3 |
| 1:10 | 0.1 0 0.1 0.2 0.3 0.4 0.5 | | A1 |
| 1:20 | | | A3 |




## SECTION 3

SCALE 1:20

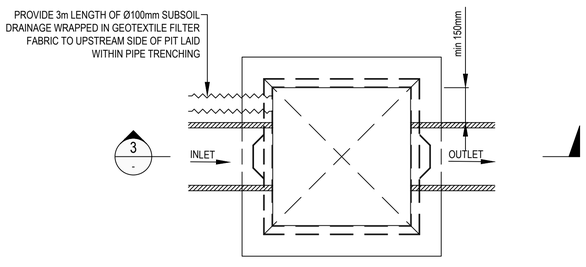



## SECTION 3

SCALE 1:20

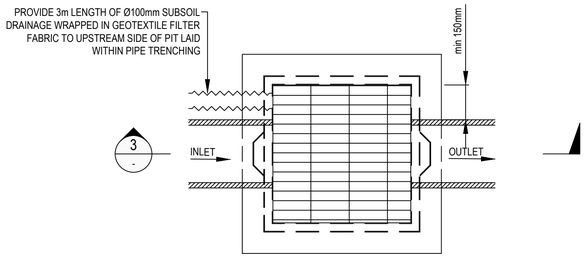
## KERB INLET PIT

SCALE 1:20



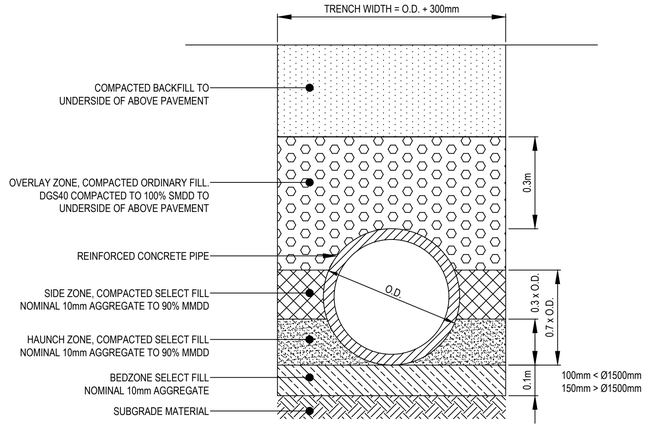

## JUNCTION PIT PLAN

SCALE 1:20




## GRATED PIT PLAN

SCALE 1:20




## TYPICAL PIPE TRENCH DETAIL

SCALE 1:10

| REV | DESCRIPTION | DRAWN | APP'D | DATE |
|---|---|---|---|---|
| A | ISSUED FOR SECTION 4.55 APPLICATION | ATC | OKW | 12.06.19 |

TURNER

census advisory

ARCHITECT/CLIENT

WOOD & GRIEVE ENGINEERS

| | |
|---|---|
| DRAWN: | OKW |
| DESIGNED: | ATC |
| VERIFIED: | OKW 12.06.19 |
| APPROVED FOR TENDER: | ... /../.. |
| APPROVED FOR CONSTRUCTION: | ... /../.. |

**WESTERN SYDNEY COMMUNITY & CONFERENCE CENTRE - PHASE 1**

PROJECT

STORMWATER DRAINAGE DETAILS

TITLE

FOR APPROVAL

NOT FOR CONSTRUCTION

| | | | |
|---|---|---|---|
| AS SHOWN | 35986 | CI-526-01 | A |
| SCALE @ A1 | PROJECT No | DRAWING No | REV |

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**Pipe Flows**
**PENRITH**
**071663**

| | | | |
|---|---|---|---|
| 10yr 1hr | 50.6 | | **n = 0.0125** |
| $C^*_{10}$= | 0.44048 | | |
| Fy= | **1.05** | | |
| ARI = | **20** | years | |
| $I5_{min}$ = | **125.86** | mm/hr | |

| Pit | Area | % Impervious | C | Pit Inflow | Cumulative Flow | Pipe Diametre | Pipe Grade | Pipe Capacity |
|---|---|---|---|---|---|---|---|---|
| | | | | | L/s | mm | % | L/s |
| 1/1 | 170 | 50% | 0.70 | 4.2 | 4.2 | 225 | 1.00 | 46.70 |
| 1/2 | 250 | 50% | 0.70 | 6.2 | 10.3 | 225 | 1.00 | 46.70 |
| 1/3 | 290 | 50% | 0.70 | 7.1 | 17.5 | 225 | 1.00 | 46.70 |
| 1/4a | 50 | 50% | 0.70 | 1.2 | 1.2 | 375 | 1.00 | 182.34 |
| 1/4 | 6280 | 25% | 0.58 | 128.0 | 146.7 | 450 | 1.00 | 296.51 |
| 1/5 | 323 | 25% | 0.58 | 6.6 | 153.3 | 450 | 1.00 | 296.51 |
| 1/6a | 560 | 25% | 0.58 | 11.4 | 11.4 | 150 | 1.00 | 15.84 |
| 1/6 | 107 | 25% | 0.58 | 2.2 | 166.9 | 450 | 1.00 | 296.51 |
| 1/7b | 71 | 25% | 0.58 | 1.4 | 1.4 | 150 | 1.00 | 15.84 |
| 1/7a | 600 | 25% | 0.58 | 12.2 | 13.7 | 225 | 1.00 | 46.70 |
| 1/7 | 248 | 25% | 0.58 | 5.1 | 185.6 | 450 | 1.00 | 296.51 |
| | | | | | | | | |
| 2/1a | 393 | 25% | 0.58 | 8.0 | 8.0 | 150 | 1.00 | 15.84 |
| 2/1 | 174 | 25% | 0.58 | 3.5 | 11.6 | 150 | 1.00 | 15.84 |
| 2/2b | 427 | 25% | 0.58 | 8.7 | 8.7 | 150 | 1.00 | 15.84 |
| 2/2a | 65 | 25% | 0.58 | 1.3 | 10.0 | 150 | 1.00 | 15.84 |
| 2/2 | 100 | 25% | 0.58 | 2.0 | 23.6 | 225 | 1.00 | 46.70 |
| 1/8 | 100 | 25% | 0.58 | 2.0 | 211.3 | 450 | 1.00 | 296.51 |
| | | | | | | | | |
| 3/1 | 282 | 100% | 0.95 | 9.3 | 9.3 | 225 | 1.00 | 46.70 |
| 3/2 | 247 | 100% | 0.95 | 8.2 | 17.5 | 225 | 1.00 | 46.70 |
| 3/3 | 148 | 100% | 0.95 | 4.9 | 22.4 | 225 | 1.00 | 46.70 |
| 3/4 | 20 | 100% | 0.95 | 0.7 | 23.0 | 225 | 1.00 | 46.70 |
| | | | | | | | | |
| 4/1 | 225 | 100% | 0.95 | 7.4 | 7.4 | 225 | 1.00 | 46.70 |
| 4/2 | 10 | 100% | 0.95 | 0.3 | 7.8 | 225 | 1.00 | 46.70 |
| 4/3 | 100 | 100% | 0.95 | 3.3 | 11.1 | 375 | 1.00 | 182.34 |

1:5 1:10 0.1 0 0.1 0.2 A1 A3

| REV | DESCRIPTION | DRAWN | APP'D | DATE |
|---|---|---|---|---|
| A | ISSUED FOR SECTION 4.55 APPLICATION | ATC | OKW | 12.06.19 |

TURNER

census advisory

ARCHITECT/CLIENT

WOOD & GRIEVE ENGINEERS

| | |
|---|---|
| DRAWN: | OKW |
| DESIGNED: | ATC |
| VERIFIED: | OKW 12.06.19 |
| APPROVED FOR TENDER: | ... ../../.. |
| APPROVED FOR CONSTRUCTION: | ... ../../.. |

**WESTERN SYDNEY COMMUNITY & CONFERENCE CENTRE - PHASE 1**

PROJECT

DRAINAGE CALCULATIONS

TITLE

FOR APPROVAL

NOT FOR CONSTRUCTION

| AS SHOWN | 35986 | CI-568-01 | A |
|---|---|---|---|
| SCALE @ A1 | PROJECT No | DRAWING No | REV |

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# Appendix B – Phase 1 MUSIC Link Report

PENRITH CITY COUNCIL

music@link

## MUSIC-*link* Report

| Project Details | | Company Details | |
|---|---|---|---|
| **Project:** | WSCCC | **Company:** | WGE |
| **Report Export Date:** | 12/06/2019 | **Contact:** | ATC |
| **Catchment Name:** | 35986-DA-Rainwater Reuse Phase 2_190604 | **Address:** | 207 Pacific HWY, St Leonards |
| **Catchment Area:** | 1.103ha | **Phone:** | 84847000 |
| **Impervious Area*:** | 69.79% | **Email:** | anthony.chua@wge.com.au |
| **Rainfall Station:** | 67113 PENRITH | | |
| **Modelling Time-step:** | 6 Minutes | | |
| **Modelling Period:** | 1/01/1999 - 31/12/2008 11:54:00 PM | | |
| **Mean Annual Rainfall:** | 691mm | | |
| **Evapotranspiration:** | 1158mm | | |
| **MUSIC Version:** | 6.3.0 | | |
| **MUSIC-link data Version:** | 6.31 | | |
| **Study Area:** | Penrith | | |
| **Scenario:** | Penrith Development | | |

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

| Treatment Train Effectiveness | | Treatment Nodes | | Source Nodes | |
|---|---|---|---|---|---|
| **Node: Receiving Node** | **Reduction** | **Node Type** | **Number** | **Node Type** | **Number** |
| **Flow** | 18% | Rain Water Tank Node | 1 | Urban Source Node | 5 |
| **TSS** | 85.5% | Detention Basin Node | 1 | | |
| **TP** | 71.8% | GPT Node | 2 | | |
| **TN** | 51.8% | Generic Node | 1 | | |
| **GP** | 100% | | | | |

**Comments**

n/a

PENRITH CITY COUNCIL

music@link

**Passing Parameters**

| Node Type | Node Name | Parameter | Min | Max | Actual |
|---|---|---|---|---|---|
| GPT | Enviropod 200 | Hi-flow bypass rate (cum/sec) | None | 99 | 0.02 |
| GPT | Enviropod 200 (1 per pit in ground_ approx 15 pits) | Hi-flow bypass rate (cum/sec) | None | 99 | 0.3 |
| Rain | Rainwater Tank 1 | % Reuse Demand Met | 80 | None | 82.64 |
| Receiving | Receiving Node | % Load Reduction | None | None | 18 |
| Receiving | Receiving Node | GP % Load Reduction | 90 | None | 100 |
| Receiving | Receiving Node | TN % Load Reduction | 45 | None | 51.8 |
| Receiving | Receiving Node | TP % Load Reduction | 60 | None | 71.8 |
| Receiving | Receiving Node | TSS % Load Reduction | 85 | None | 85.5 |
| Urban | Centre Ground Catchment | Area Impervious (ha) | None | None | 0.104 |
| Urban | Centre Ground Catchment | Area Pervious (ha) | None | None | 0.318 |
| Urban | Centre Ground Catchment | Total Area (ha) | None | None | 0.423 |
| Urban | Driveway | Area Impervious (ha) | None | None | 0.025 |
| Urban | Driveway | Area Pervious (ha) | None | None | 0 |
| Urban | Driveway | Total Area (ha) | None | None | 0.025 |
| Urban | Driveway Bypass | Area Impervious (ha) | None | None | 0.022 |
| Urban | Driveway Bypass | Area Pervious (ha) | None | None | 0 |
| Urban | Driveway Bypass | Total Area (ha) | None | None | 0.022 |
| Urban | North Ground Catchment | Area Impervious (ha) | None | None | 0.015 |
| Urban | North Ground Catchment | Area Pervious (ha) | None | None | 0.014 |
| Urban | North Ground Catchment | Total Area (ha) | None | None | 0.03 |
| Urban | Roof | Area Impervious (ha) | None | None | 0.603 |
| Urban | Roof | Area Pervious (ha) | None | None | 0 |
| Urban | Roof | Total Area (ha) | None | None | 0.603 |

Only certain parameters are reported when they pass validation

# Appendix B – Phase 1 MUSIC-link Report

PENRITH CITY COUNCIL

music@link

**Failing Parameters**

| Node Type | Node Name | Parameter | Min | Max | Actual |
|---|---|---|---|---|---|
| Detention | SPEL (Full Height) vault | Hi-flow bypass rate (cum/sec) | None | 99 | 100 |
| Urban | Roof | Baseflow Total Nitrogen Mean (log mg/L) | 0.32 | 0.32 | 1.1 |
| Urban | Roof | Baseflow Total Nitrogen Standard Deviation (log mg/L) | 0.12 | 0.12 | 0.17 |
| Urban | Roof | Baseflow Total Suspended Solids Mean (log mg/L) | 1.1 | 1.1 | 0.32 |
| Urban | Roof | Baseflow Total Suspended Solids Standard Deviation (log mg/L) | 0.17 | 0.17 | 0.12 |

Only certain parameters are reported when they pass validation

# Appendix C – WSUD Supplier Maintenance Manuals

# EnviroPod®

## Operations and Maintenance Manual

Stormwater360
AUSTRALIA

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Appendix A – Service Receipt Example
Appendix B – EXAMPLE Maintenance Form

# 1 INTRODUCTION

The following report details the recommended methods for cleaning and maintaining the Enviropod Stormwater Gully Pit Insert. The aspects associated with cleaning included in this manual are methods for grate removal, filter bag cleaning, unit inspection, filter bag rejuvenation and the re-installation of the filter bags. This plan should be used in conjunction with the appropriate traffic management plans and site safety plans produced for each project. Other Stormwater360 (IES) documents which IES staff should use in conjunction with this report include the IES Employee Health and Safety Manual. It is recommended that contractors develop their own health and safety plans for activities to ensure that the workers are placed in a safe work environment.

Enviropod filter in service.

Each stormwater treatment device must be inspected and maintained regularly to ensure it is working properly throughout the estimated design life. The Enviropod filters require servicing every 1 - 6 months depending on site characteristics; however the maintenance requirements are less labour intensive than alternate traditional treatments. During each inspection and clean, details of the mass, volume and type of material observed should be record to provide ongoing data for future management plan revisions and the optimisation of the maintenance frequency. It is essential that maintenance (including inspections, recording and reporting) be carried out in a systematic manner and is carried out by qualified and experienced personnel. It is also advisable that the treatment device owner has a nominated person responsible for overseeing the management process.

Maintenance is an essential component of stormwater management enabling ongoing at source control of stormwater pollution. Maintenance will also prevent failures such as structural failure (e.g. prevents blocked outlets) or aesthetic failure (e.g. debris accumulation). All stormwater treatment devices require maintenance to ensure the ongoing performance of the system.

Stormwater360 (IES) is a specialised stormwater consultancy with trained and experienced staff. The company has a comprehensive database with detailed information on every Enviropod filter sold and serviced by IES (formerly Enviropod), collecting site-specific data that can be easily accessed and analysed as required.

**This document consists primarily of the processes and tasks associated with the hand maintenance and inductor maintenance procedures. It does not include detail of the traffic management requirements or occupational health and safety requirements. Contractors or IES staff should utilise their own Employee Health and Safety Manual, which details the policies and procedures for safe work.**

## 2. ENVIROPOD HEALTH AND SAFETY

The following section details some of the considerations which may be required for a contactor to comply with relevant health and safety regulations regarding the manual handing activities, hazards associated with the waste material and issues associated with working on roads.

Cleaning of EnviroPod filters is a specialist activity. Material collected can be harmful if not handled correctly. Sediments may contain heavy metals and carcinogenic substances as well as harmful objects such as broken glass and syringes. As all of the EnviroPod units are located on roads particular care must be taken due to the potential build-up of hydrocarbon based products and other vehicle based contaminants which may be carcinogenic or toxic. It is essential that Occupational Safety and Health guidelines are followed at all times, and that the following steps are carried out to ensure safe and successful maintenance operations.

In additional to the hazards associated with the cleaning handling of material in the filter bags, there also hazards associated with traffic at the work site, the removal of the grate, pedestrians and other non-worker personnel, and general work place hazards associated with working outdoors.

This section is not intended to address all the safety issues associated with EnviroPod maintenance, providing only information and suggestions on safety aspects associated with the maintenance procedures. A separate safety plan should be prepared for each project address the specific requirements of the project.

**The procedures indicated in the Operations section of this manual are recommend as the safest and most efficient manner in conducting the maintenance of EnviroPod Units, however contractors and cleaning staff may vary the procedure in response to the site conditions, varying work practices or general preferences in the cleaning techniques. Please note that procedures outlined in this manual are not exhaustive, and that any changes should still comply with general safe work practices.**

### 2.1 EnviroPod Health and Safety

All contractors and staff shall comply with all current Health and Safety Legislation and take all practicable steps to:

- Comply with all applicable laws, regulations and standards.
- Ensure that all employees, contractors and visitors are informed of and understand their obligations in respect of current Health and Safety Legislation.
- Ensure that employees understand and accept their responsibility to practice and promote a safe and healthy work environment.

All relevant precautions must be taken to prevent contact with sediment and litter when maintaining filters. The following personal protective equipment (PPE) safety equipment should be worn:

- Puncture resistant gloves.
- Steel capped safety boots.
- Fluorescent safety vest.
- Overalls or similar skin protection.
- Safety apron. (if necessary)*
- Eye protection. (if necessary)*

*Higher personal safety conditions may be required when maintaining units that may contain more hazardous material, for example pits where syringes have be observed or pits located in areas associated with such activities.

## 2.2 Traffic Control

All stormwater collection pits are typically situated either in/on roads and car parks or adjacent to roads in the footpath or swales. Traffic control requirements at each of these locations is typically the same, with most of the state and local road authorities requiring the same controls implemented whether the work is to be conducted on the road or on the road reserve.

As traffic requirements vary based on the road usage and the specific road configuration, traffic control plans should be prepared for each site. Given that maintenance is typically a quick process, the contractor should liaise with the relevant road authority to determine the specific road safety requirements for each location to ensure that on site workers can conduct the cleaning operations safely and efficiently, while complying with all laws and regulations.

NSW RTA working on roads safety manual indicates the signage requirements, placement of barricades or witches hats and the positioning of traffic control personnel. In addition to standard safety requirements IES recommends that the maintenance vehicle be used to increase safety, through shielding the work area from oncoming traffic.

Plate 1 indicates the vehicle placed to shield the work area with cones placed around the vehicle. Plate 2 indicates at head on view, note the vehicle is positioned to allow access to the drive, whilst still blocking the pit from on-coming traffic. The vehicle has a flashing light on the roof and the hazard lights switched on.


**Plate 1 Vehicle positioned near pit, preventing traffic from passing close to the pit.**

**Plate 2 Head-on view, indicating the placement of the vehicle near the pit.**

## 2.3 Confined Spaces

**Confined spaces poses a serious safety hazard for all personnel, however during the normal maintenance procedures there should be no reason to enter a confined space. All maintenance procedures are able to be conducted from the surface**. Confined space entry procedures are not included as part of this manual, for IES employees confined space entry procedures are included as part of the IES Safety Manual. It is recommend that all contractors evaluate their own needs for confined space entry and compliance with Occupation Health and Safety regulations.

When repairs or maintenance activities cannot be conducted from the surface, the contractor/cleaner should evaluate the need to enter the confined space, considering all alternative options. Where there is a need to proceed in a confined space, only staff with current confined space training shall operate in a confined space. Appropriate measures and controls shall be put in place to meet confined space entry requirements. Safety equipment must be worn where deemed necessary and where gas or oxygen hazard occurs; staff trained in its use will only use BA gear. **Non-trained staff must not go into confined spaces**.

## 3. OPERATIONS

This section details the specific activities required to clean the EnviroPod units. Please note it has been written for use by someone who has never encountered a stormwater pit or an EnviroPod unit, providing a step by step process for each of the cleaning stages.

### 3.1 Maintenance & Monitoring of EnviroPod filters

The maintenance frequency is dependent on several variables, such as catchment area, surrounding land use, vegetation type, traffic loading and rainfall patterns. IES recommends that during the first year of operation the units should be monitored monthly, with maintenance as required.

The ensure that the unit performs optimally, the material collected by the filter bag should be emptied when the level of material is no more than approximately half to two thirds of the total bag depth or when there is evidence of material overflow. Although the bag has greater storage area, it is recommended that it is not left to fill completely prior to empting, for the following reasons; the bags are capable of retaining a heavy mass of material (in excess of 50kg); material near the top of the bag can be re-suspended during high to extreme rainfall events; and blockage of the overflow sections can occur, when material is allowed to build up above the filter bag.

Maintenance frequency should be adjusted to accommodate variable rainfall patterns. Regions east of the Great Dividing Range typically are dominated by greater rainfall during summer and Autumn Months, as such more maintenance is typically required during these periods. It is recommended that biannual inspections be carried out in November and April, while quarterly inspections should be conducted in February, April, July and November.

It is also recommended that additional monitoring should be conducted following moderate to extreme rainfall events, in particular, when preceding months have had little to no rainfall. This monitoring is considered necessary to accommodate for higher volumes of runoff generated during major rainfall events, an anticipated greater accumulation of surface contamination during low rainfall periods and to ensure that the units have not been damaged due to high pipe velocities.

Attached in Appendix A & B is an example of an EnviroPod Service Receipt and Generic Monitoring Form which is to be completed by the Cleaning Contractor when servicing any Filters. Relevant information is recorded and forwarded to the client following each maintenance clean.

| | **Inspection/Minor Maintenance (Times/Year)** | **Major Maintenance (Times/Year)** |
|---|---|---|
| EnviroPod | 12 (and after major storms) | 2-6 (except in case of a spill) |

**Table 1: Frequency of Maintenance Activity**

### 3.2 Stormwater Pit Cover Removal

There are several different types of stormwater pit covers used throughout Australia. These grates/lids are constructed of three main materials, cast iron, galvanised steel and concrete. Stormwater pits covers will either be hinged (lockable) or simply placed on a recessed frame, with cover which are not hinged are typically heavy, to prevent the grate being easily knocked open by passing traffic. Each different pit cover requires different techniques to safely remove the cover to gain access to the EnviroPod Unit.

Plate 3. Hinged galvanised steel pit grate

Plate 4. Heavy duty hinged galvanised steel pit grate

Plate 5. Hinged cast iron grate

Plate 6. Non-hinged heavy duty galvanised steel pit grate

Plate 7. Non-hinged cast iron grate

### *3.2.1 Hinged Pit Grates*

Hinged pit grates are typically either light duty galvanised steel, heavy duty galvanised steel or two-piece cast iron. Generally hinged pit grates can be opened by one person, however heavy duty galvanised lids and cast iron lids may require two people. If you are unclear about the type of grate, always use two people.

To open a hinged pit grate follow the following steps:

1. Insert the lifting hooks beneath the grate. (Position indicated in **Error! Reference source not found.**)
2. Check hinge point is not damaged and debris is not caught in the hinge area.
3. Note many cast iron hinges are not hinged securely (to enable the removal of the grate). This may result in the pit grate not being able to sit in an open position. Additionally the hinge pins may also be damaged or corroded, which may allow for the pit grate to fall into pit. Such pit grates can be removed using the method indicated below for non-hinged grates.
4. Fully open pit grate, ensuring that the grate will stay in the open position without any external forces applied. Grates which do not remain open without being held should be removed or secured during cleaning or maintenance activities. Plate  indicate the grate being opened and grate resting freely in the open position, respectively.

Plate 8. Lifting the grate

Plate 9. Opening Grate

Plate 10. Fully open grate

Plate 11. Lowing grate

To close an open hinged grate

1. Place lifting hooks through grate. (same position to remove grate)
2. Gently lower grate into position. (Plate 10)
3. Note some grates have offset hinges points that prevent the grate from falling over, such pits require the hinged side of the grate to be lifted while the grate is lowered into position. (insert picture)

### *3.2.2 Non-Hinged Pit Grates*

Non hinged pits are typically constructed of cast iron, concrete or heavy duty galvanised steel. As such the pit grates are generally heavy and difficult to remove, generally requiring two people to safely remove the lids.

To remove a non-hinged pit grate:

1. Place lifting hooks beneath grate, where possible in the four corners of the grate (Plate 11). Concrete lids may have Gatic lifting points, a key arrangement or holes in the lid, as such special equipment, such as Gatic lifters may be required.
2. Position each person either side of the grate. (Plate 12)
3. Lift the grate, ensuring that good heavy lifting posture is used at all times.
4. Place the grate on an angle on the gutter, to allow for the lifting hooks to be removed. (Plate 13)
5. For extremely heavy one piece grates and concrete Gatic covers, insert the lifters in place and slide the lids back. Note some lids may still require two people. (Picture required)

Plate 12. Insert hook near edge of grate

Plate 13. Position each lifter either side of the grate

Plate 14. Lift grate and move grate to one side

Plate 15. Lift grate above the support frame

**Plate 16. Reinstated non hinged grate**

To reinstate a non-hinged pit grate

1. Place lifting hooks though the grate. Note do not place hooks at the very edge of the grate, as this will make it difficult to place grate on the support.
2. Lift the grate into position and lower onto the supporting frame (Plate 14), ensuring that the grate sits level with the finished surface. If the grate does not sit securely remove the pit cover and check for debris in the pit cover frame, then try to lower grate again.
3. Check final position of the cover, ensuring that the cover sits flush with the surface and does not create a trip or traffic hazard. (Plate 15)

Note all grates should be reinstated to the original condition.

Care should be taken with old or damaged pit covers and grates. Grates or covers observed to be in poor condition should be first inspected to determine whether further damage will occur if an attempt to remove the grate is made. Pits grates which appear to be severely damaged or appear as though they would break while being removed should not be removed. Contact the client (and pit owner if not the client) and Stormwater360 (1300 354 722) to discuss an appropriate action. Pit grates and covers damaged by the contractor will be repaired at the cost of the contractor, or as part of an arrangement with the pit owner.

### *3.2.2 Pits unable to be opened*

Pits may be unable to be opened for several reasons, including through corrosion, new road surfaces covering the pit lid, and foreign material jammed in the lid. The following steps may assist in opening the pits:

- Chip away new road coverings or concrete/bitumen spills using a pinch bar or similar device. **Care must be taken not to damage road surfaces**.
- Corroded or jammed pits may be loosened from the grate frame by using a lubricant such as RP7 and tapping the grate frame and grate. **Note if the grate or grate frame appears severely corroded, the grate should not be opened and IES and the client should be contacted to discuss options.**
- Pits which cannot be opened may require a hydraulic lifting arm to fully remove the lid.

## 3.3 Cleaning Methods

One of the following methods of maintenance should be used for the servicing of these Enviropod Filters:

- Cleaning using Inductor Truck.
- Hand Maintenance.

One of the advantages of the Enviropod units is that it doesn't require specialised equipment for maintenance. In certain situations it may be more feasible to maintain the units using the inductor truck method, while for other projects hand maintenance may be the preferred option. The cleaning method for the Enviropod units should be evaluated specifically for each project.

### *3.3.1 Cleaning using Inductor Truck*

The following steps indicate a safe and efficient method to clean the Enviropod using an Inductor:

1. Open gully pit. (See Section 0)
2. Place the inductor hose over the material collected in the filter bag and switch on the inductor.
3. Using the inductor hose suck all of the sediment, organic leaf material, litter etc., collected in the filter bag
4. Allow the filter bag to be sucked up into the inductor hose for a few seconds to allow for the filter mesh pores to be cleaned. Care is to be taken by the operator not to damage the filter, i.e. ensure that there are no sharp edges on the inductor hose.
5. If material has built up around the overflows, use the inductor hose to clear the accumulated material.
6. Remove filter bag from the pit.
7. Sediment retained in the gully pit grate is to be removed.
8. Back opening channels are to be cleared of any debris to ensure flow is not hindered. Debris can be collected using the inductor truck.
9. All gully pit waste is to be removed from the pit.
10. Check the Enviropod unit. (See Section 0)
11. Check filter bag. (See Section 0)
12. Reinstate filter bag and gully pit lids.


Plate 17. Cleaning an Enviropod using the inductor method

Gully pit sediments under no circumstances are to be backwashed into the gully pit.

### *3.3.1 Hand Maintenance*

Two people are generally preferred to maintain the units by hand. However for shallow units and units which contain mainly leaf material (low overall accumulated weight), may be cleaned by one person. Note additional personnel may be required for traffic management purposes or for general safety.

The following steps indicate a safe and efficient method to clean the Enviropod manually by hand:

1. Open gully pit. (See Section 0)
2. Place the lifting hooks in the lifting loops of the filter bag. (See Plate)
3. For extremely heavy and overfilled bags either use a hydraulic lifting arm to lift the bag, or remove excess material using a shovel or similar piece of equipment. IES prefers the use of a post hole shovel, due to the reduced strain on the back when digging and the ability of the shovel to grab material vertically. (Insert Picture)
4. Lift the bag vertically off the supporting frame, ensuring that no undue pressure is placed on the filter bag. (See Plate)
5. Lift the bag clear of the stormwater pit. (See Plate)
6. Position the bag over the truck or other collection vehicle, taking hold of the loops at the base of the bag. (See Plate and Plate)
7. Lift and empty the filter bag by holding the bottom lifting loops only. (See Plate)
8. Completely empty the filter bag. (See Plate)
9. Brush the filter bag with a stiff brush to remove bound sediment from the filter pores. (See Plate)
10. Check the filter bag. (See Section 0)
11. Check the Enviropod unit. (See Section 0)
12. Reinstate filter bag, ensuring bag is installed the correct way. (See Plate and Plate)
13. Reinstate gully pit lids. (See Plate and Plate)

Plate 18. Place the lifting hooks through the bag loops

Plate 19. Lift the bag from the cage and support frame

Plate 20. Lift the bag from the stormwater pit

Plate 21. Lift the bag onto the collection vehicle

Plate 22. Grab the bottom lifting loops

Plate 23. Lifting the bottom bag loops empty the filter bag

Plate 24. Completely empty the contents of the filter bag

Plate 25. Brush the pores filter bag with a stiff brush

Plate 26. Reinstall filter bag

Plate 27.Ensure that the unit is positioned correctly, with the lifting loops on the inside

Plate 28. Correctly installed filter bag

Plate 29. Installed filter bag and sealed pit

### 3.4 Unit Inspection

After the Enviropod filter bag is removed, emptied and cleaned, the following should be checked to ensure that the unit has not been damaged:

- All connections and joints should be checked and broken rivets replaced (See Plate);
- The plastic pit seals should be inspected for unit movement or damage (See Plate 30); and
- The cage should be inspected for damage or movement (See Plate 31).

The overflow diversion channels, and the area between the Enviropod cage and pit wall should also be inspected for the accumulation of debris. Any observed debris should be removed and disposed of off-site. Accumulated material within the outlet pipe may need to be flushed.

Note: If the units are not cleaned regularly the mobilisation of material collected in the Enviropod unit may occur, as such cleaning of the units in accordance with this management plan is required. As this plan is based on observations and data collected during the monitoring period, ongoing adjustment of the cleaning frequency is generally required to improve the overall efficiency in the removal of collected material and prevent material overflow.

Plate 30. Check seals are pushed against the pit walls

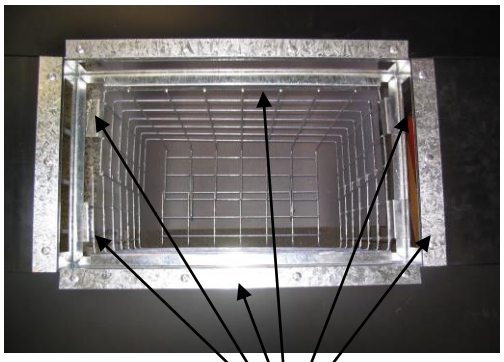


Plate 31. Check joining rivets (two piece unit shown above)

### 3.5 Filter Bag inspection and Rejuvenation

Following the emptying and cleaning of the filter bags, the filter bag should be inspected to evaluate the bag condition. Given the nature of stormwater the filter bag from some Enviropod units can become considerably clogged with fine sediment. Filters can also be damaged by various objects in stormwater as well as fauna. Sharp objects such as sticks combined with high velocity water and a large mass in the filter bag can cause small tears in the filter material. Animals such as rats have also been known to chew through fine mesh filter bags located in gully pits near takeaway food outlets.

### *3.5.1 Clogged Filters*

Clogged filter bags can be clean using several different methods. If the bag cleaning techniques described in the general maintenance sections above are not able to clean the filter bags the following options should be considered:

- Using a stiff brush and a bucket of soapy water scrub the filter bag surface.
- Remove filter bags from the pit and wash the bags using a high pressure water spray. Care has to be taken to not transfer the contamination elsewhere. Waste water from the process should be collected of and disposed of correctly.
- Remove the filter bags from the pits and the support rings and wash the bags in an industrial washing machine.

The final option presented above typically results in the bags appearing like new, with no visible stain or pore clogging within the filter mesh.

**Plate 32. Slightly clogged filter bag, indicated by the brown stain on in the centre of the bag**

**Plate 33. A clean used filter bag**

### *3.5.2 Damaged Filters*

Damaged filters can often be repaired, provided the damage is small. Small tears in the fabric may occur do to several reasons, however the overall strength & structure of the nylon fabric typically prevents small tears becoming much large. Although the bag is unlikely to tear further care must be used when clean torn bags as not to spill the collected material into the pit.

Small tears may repaired by either sewing the tear back together, with additional fabric to increase the strength of the stitching, or by sewing a patch of the filter material onto the filter bag. The filter bags may need to be replaced if large tears are present, as the filter bag is no longer able to function as intended.

Stormwater360 is able to repair bags or replace bags which have been damaged during maintenance. Please contact Stormwater360 on 1300 971 566 for details or a quote.

## 3.6 Disposal of Material

All gully pit wastes from the site are to be taken off site and disposed of at a transfer station or similar approved disposal site. Stormwater Sediments can contain Lead, Copper, Zinc, Mercury, hydrocarbons and PCBs, which are harmful to both humans and the receiving environment. Appropriate sampling and laboratory analysis may be required to classify the material as suitable for reuse, or disposal under appropriate local guidelines.

# 4. EMERGENCY PROCEDURES

## 4.1 Spill Procedures

In the event of a spill discharging into any gully pit all sediment is to be extracted and the filter bags are to be removed and replaced with rejuvenated filter bags. Normal operation procedures apply to additional cleaning as a result of spills.

## 4.2 Blockages

In the unlikely event of surface flooding around a gully pit fitted with an Enviropod the following steps should be carried out:

Check Enviropod over flow bypass. The Enviropod filter has been designed with an overflow mechanism built into the filter box. If surface flooding still exists check the overflow slots underneath the rubber seal. If debris is lodged in the overflow slots these can be easily cleared by hand or steel rod.

If overflow is clear and surface flooding still exists remove Enviropod and check outlet pipe for blockages.

Removal of the Enviropod may be difficult if the filter is clogged and the Enviropod is holding water. If the filter is clogged, brush the side walls of the filter with a yard broom or similar. This will dislodge particles trapped at the interface allowing contained water to flow through the filter.

If the outlet pipe is blocked, it is likely that a gully sucker truck will be required to unblock it. Debris should be removed from the Enviropod with the gully sucker truck before removal of the Enviropod filter.

If a gully sucker truck is not available and the Enviropod needs to be removed by hand, follow the steps below:

- Remove excess debris by hand or brush the side of the filter.
- Lift and place filter ring through the filter box and into cage.
- Remove Filter box.
- Lift cage containing filter bag and ring out of the pit.
- Unblock outlet pipe.

**Appendix A**
**Service Receipt Example**

# SPELFilter

www.spel.com.au

SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS

# SPELFILTER

## Where intuitive technology meets value.

SPEL Applications Engineers are ready to design a custom SPELFilter system to meet the demands of your site.


### How it works

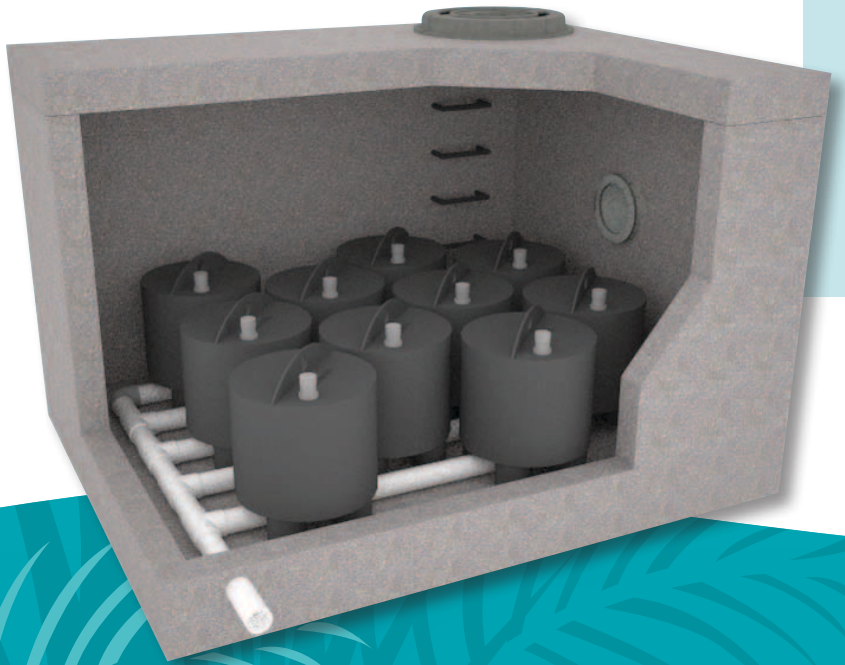
The SPELFilter® has an up-flow, wrapped spiral design that facilitates influent flow over its entire 3.95m$^2$ surface area. What you get is better pollutant removal with a smaller foot print than any storm filter.

Hydraulic pressure forces water through the filter media, discharges through the center tube and out through the outlet collection manifold.

Upon completion of a treatment cycle, each cartridge backwashes and effectively dislodges particulats from the filtration layers. This reestablishes filter porosity. The dislodged particles accumulate on the vault floor for easy removal during maintenance.

SPELFilter's patented design has no moving parts and generates a true siphon effect unlike other storm filters that use a floating drain plug and create no siphon.

A SPEL Stormceptor Class 1 upstream of the SPELFilter in the treatment train greatly increases the life cycle interval of the SPELFilter as the SPEL Stormceptor Class1 removes the coarser gross pollutants, Total Suspended Solids and Hydrocarbons, enabling the SPELFilter to target fine form particulate matter and soluble nutrients for greater intervals.



## Features

- Greater than 80% TSS Removal
- Greater than 60% reduction in Total Phosphorus; including Dissolved Phosphorus
- Greater than 48% reduction in Total Nitrogen; including soluble Nitrogen
- Greater than 50% reduction in turbidity

## Value & Benefits

**Proven Sand Filter Performance:**

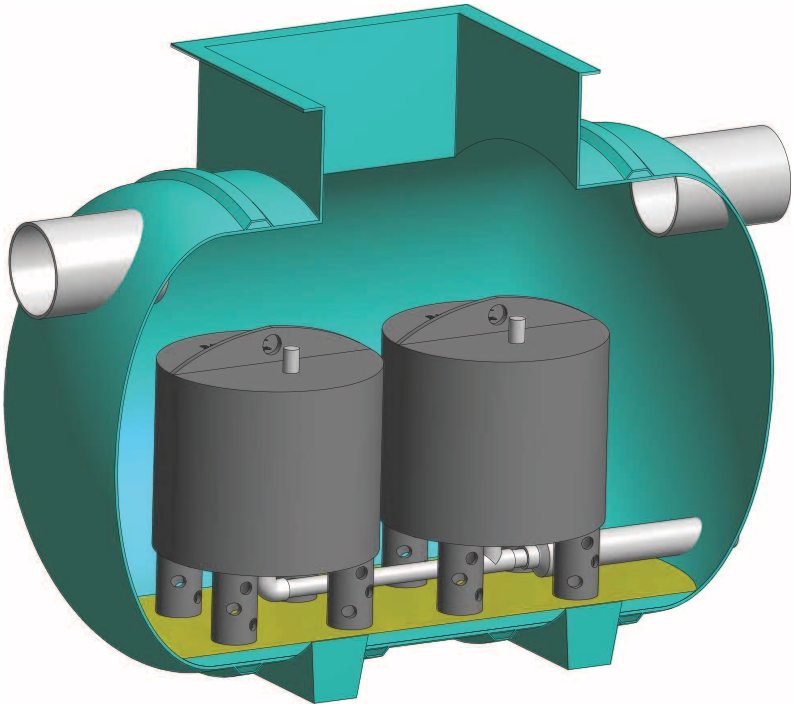
The uniform size silica-sand filter media provides for higher removal efficiencies than coarser types of media used in other cartridge systems. And, SPELFilter media is inorganic – it doesn't leach nitrogen and other nutrients.

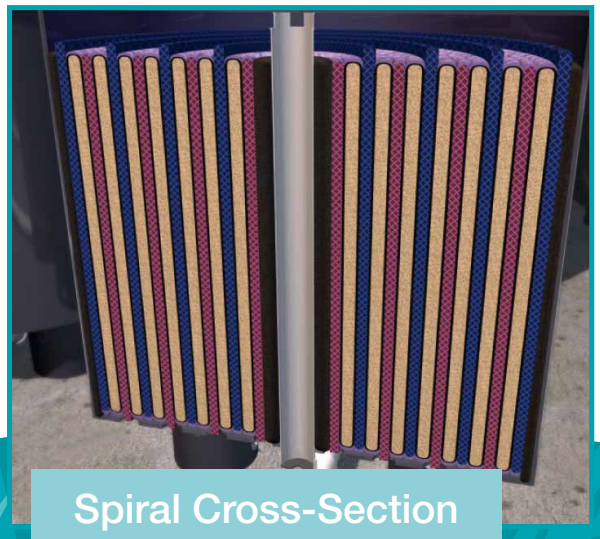
**Greater flexibility:**

Due to the greater surface area and high flow capacity, combined with the modular cartridge design, the SPELFilter system can be deployed in a variety of structures including manholes, precast vaults, or cast-in-place structures.

Our Engineers optimize each system based on site considerations and local agency requirements to provide an optimal configuration for each application.

## Filter Configurations





Spiral Cross-Section

Spiral Design

## HEAD OFFICE

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North Parramatta NSW 1750
104 Grose St
Parramatta NSW 2150

Phone: + 61 2 8838 1055
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## STATE CONTACTS

| | |
|---|---|
| New South Wales | 61 2 8838 1055 |
| Canberra | 61 2 6128 1000 |
| Queensland | 61 7 3277 5110 |
| Victoria & Tasmania | 61 3 5274 1336 |
| South Australia | 61 8 8275 8000 |
| West Australia | 61 8 9350 1000 |
| Northern Territory | 61 2 8838 1055 |
| New Zealand | 64 9 276 9045 |

www.spel.com.au





SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS

CHAPTER 4

# MAINTENANCE

The SPELFilter system requires periodic maintenance to continue operating at the design efficiency. The maintenance process comprises the removal and replacement of each SPELFilter cartridge and the cleaning of the vault or manhole with a vacuum truck. SPELFilter maintenance should be performed by a SPEL Environmental certified maintenance contractor.

The maintenance cycle of the SPELFilter system will be driven mostly by the actual solids load on the filter. The system should be periodically monitored to be certain it is operating correctly. Since stormwater solids loads can be variable, it is possible that the maintenance cycle could be more or less than the projected duration.

The SPELFilter systems in New Development applications are designed to treat the WQv in 24 hours initially. Later in the cycle these cartridges will flow at a slower rate, and when the WQv does not drain down within +/- 40 hours after the storm event, the system must be maintained.

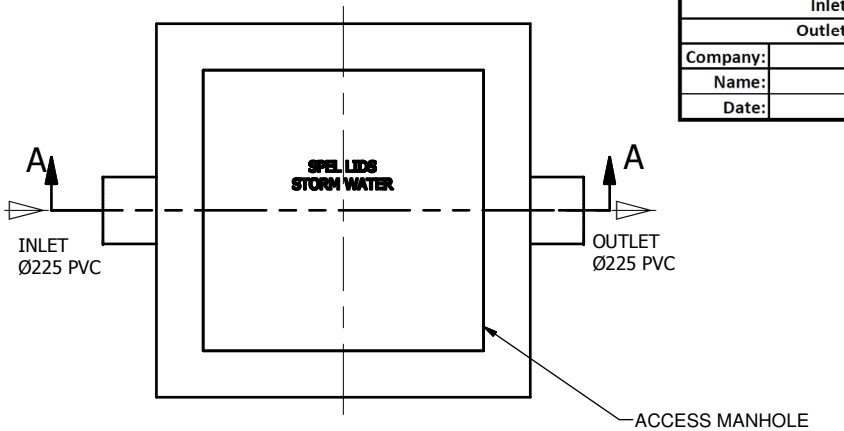
When a SPELFilter system is first installed, it is recommended that it be inspected every six (6) months. When the filter system exhibits flows below design levels the system should be maintained. Filter cartridge replacement should also be considered when sediment levels are at or above the level of the 4 inch manifold system. Please contact SPEL Environmental for maintenance cycle estimations or assistance at 13 SPEL.

# MAINTENANCE

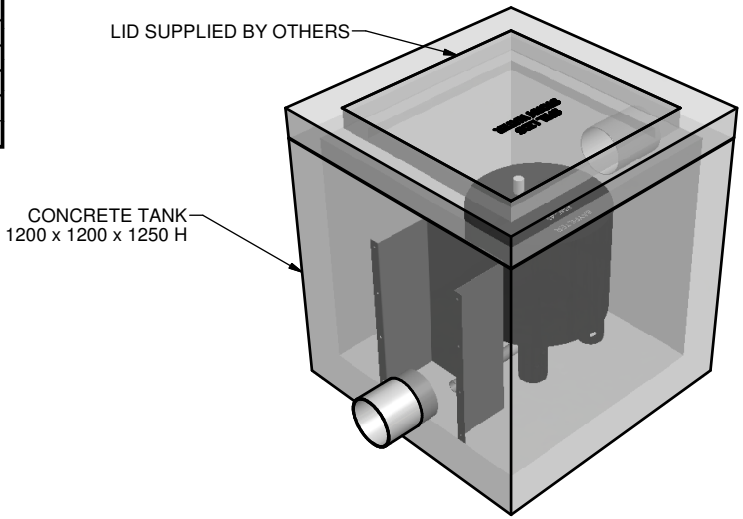
1. Remove the manhole covers and open all access hatches.
2. Before entering the system make sure the air is safe per OSHA Standards or use a breathing apparatus. Use low O2, high CO, or other applicable warning devices per regulatory requirements.
3. Using a vacuum truck remove any liquid and sediments that can be removed prior to entry.
4. Using a small lift or the boom of the vacuum truck, remove the used cartridges by lifting them out.
5. Any cartridges that cannot be readily lifted directly out of the vault should be removed from their location and carried to the lifting point using the Trolley system installed in the Vault (if applicable).
6. When all cartridges are removed, remove the balance of the solids and water; then loosen the stainless clamps on the couplings in the pipe manifold; remove the drain pipes as well. Carefully cap the manifold and rinse the floor removing the balance of the collected solids.
7. Clean the manifold pipes, inspect, and reinstall.
8. Install the exchange cartridges and close all covers.
9. The used cartridges must be sent back to SPEL Environmental for exchange/recycling and credit on undamaged units.

| REVISION HISTORY | | | | |
|---|---|---|---|---|
| REV | DESCRIPTION | BY | DATE | CHECKED BY |
| 1 | INITIAL RELEASE | P.Z. | 17/03/2016 | M.M. |

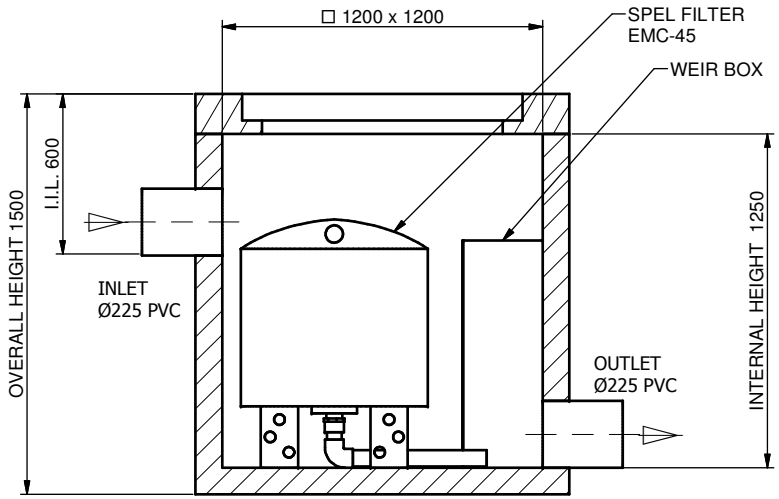
| Site Level Confirmation | |
|---|---|
| Finished Surface Level (FSL) | RL: |
| Access Cover Thickness | mm |
| Inlet Invert Level | RL: |
| Outlet Invert Level | RL: |
| Company: | |
| Name: | |
| Date: | |



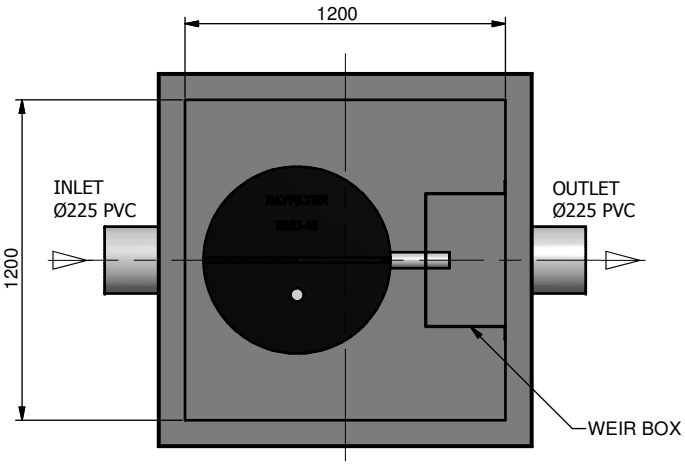

**PLAN VIEW**




**ISOMETRIC VIEW**




**ELEVATION VIEW**




**PLAN VIEW**
COVER & LID REMOVED FOR CLARITY

APPROVED..... ☐
NAME.....
SIGNED.....
DATE...../...../.....

ISSUE FOR APPROVAL
NOT FOR CONSTRUCTION

C:\Vault Working Folder\Designs\SPEL\PRODUCTS\FILTERS\EMC-45\STANDARD\1 FILTER\CONCRETE\1200 SQUARE - WEIR\SP16-SF2820-S.idw

TOLERANCE: ALL DIMENSIONS 10mm UNLESS OTHERWISE STATED.

CLIENT:

DISTRIBUTOR :



| | | |
|---|---|---|
| Drawn | P.Z. | Date 17-03-16 |
| Check | | Date |
| Verified | | Date |
| Approved | | Date |
| Request No. | RN2432 | |

SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS
100 Silverwater Road Silverwater NSW 2128
PH: 1300 773 500 | E: sales@spel.com.au
www.spel.com.au

PROJECT :

TITLE
SPEL FILTER SYSTEM
SF.1212/01-29.CON.225.PVC
1 SPEL FILTER CARTRIDGE
GENERAL ARRANGEMENT

| SCALE | SIZE | SHEET | REV |
|---|---|---|---|
| N.T.S | A3 | 1 | 1 |

CUSTOMER CODE :

DWG No. SP16-SF2820-S