



STORMWATER REPORT

Flower Power Redevelopment

277 Mona Vale Road, Terrey Hills

PREPARED FOR
Flower Power Pty Ltd
277 Mona Vale Road
Terrey Hills NSW 2084

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Stormwater Report

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1. Introduction

Northrop Consulting Engineers Pty Ltd have been engaged by Flower Power to prepare Civil Engineering Drawings for redevelopment works at 277 Mona Vale Road, Terrey Hills. This report will be lodged with Northern Beaches Council to support the Development Application.

1.1 Site Description and Proposed works

The subject site is located within Terrey Hills, at 277 Mona Vale Road, and falls within the Northern Beaches Council Local Government Area (LGA). The proposed work will take place throughout the existing Flower Power complex in Terrey Hills. Refer to Appendix A – Survey for site survey.

The site covers an area of approximately 28,301 m² and is bounded by:

- Mona Vale Road to the East.
- Cooyong Road to the North.
- Myoora Road to the West.

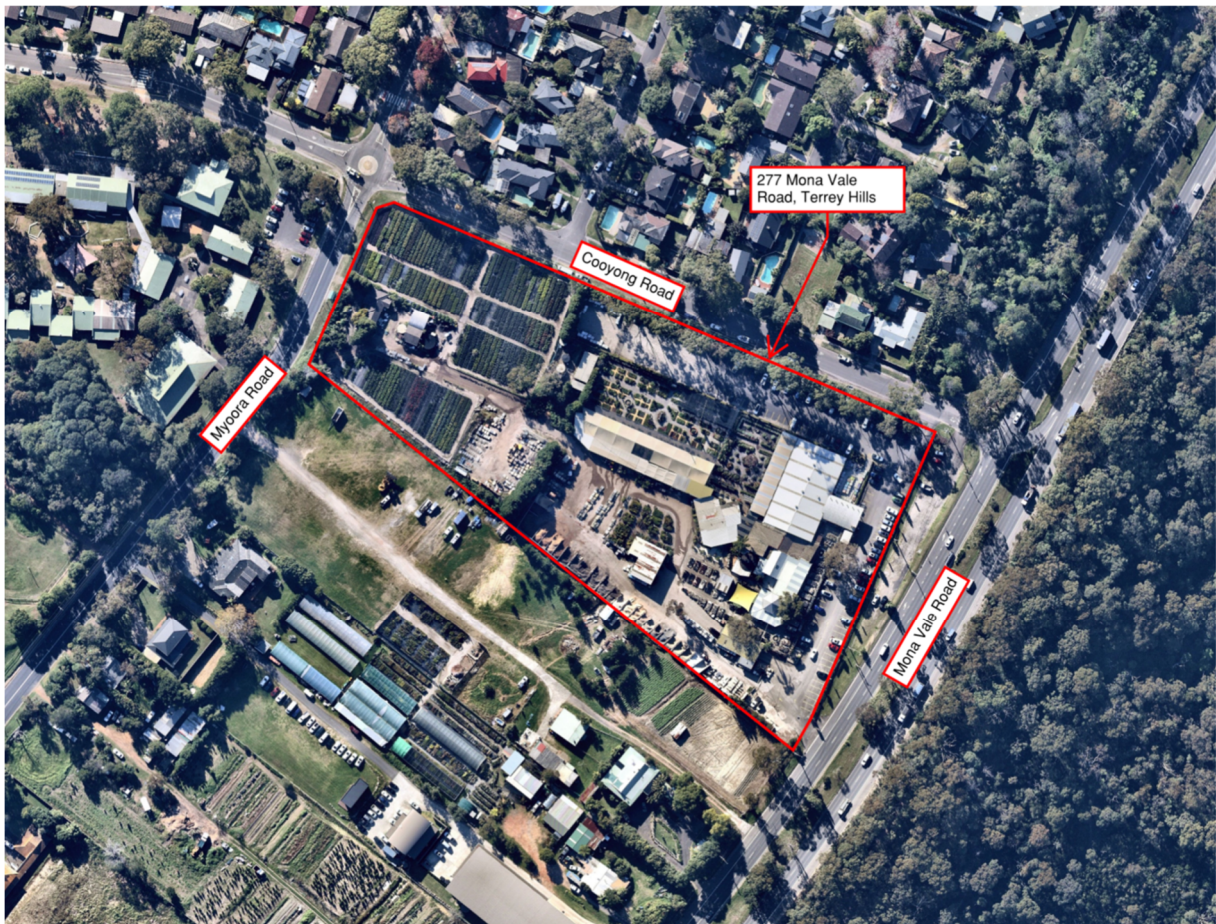


Figure 1: Site Aerial Image (Source: Nearmaps)

1.2 Project Description

The proposed development for Flower Power Terrey Hills consists of an open nursery, internal shops and storage, office space, and external and basement car parking. The architectural ground floor plan is shown in Figure 2.

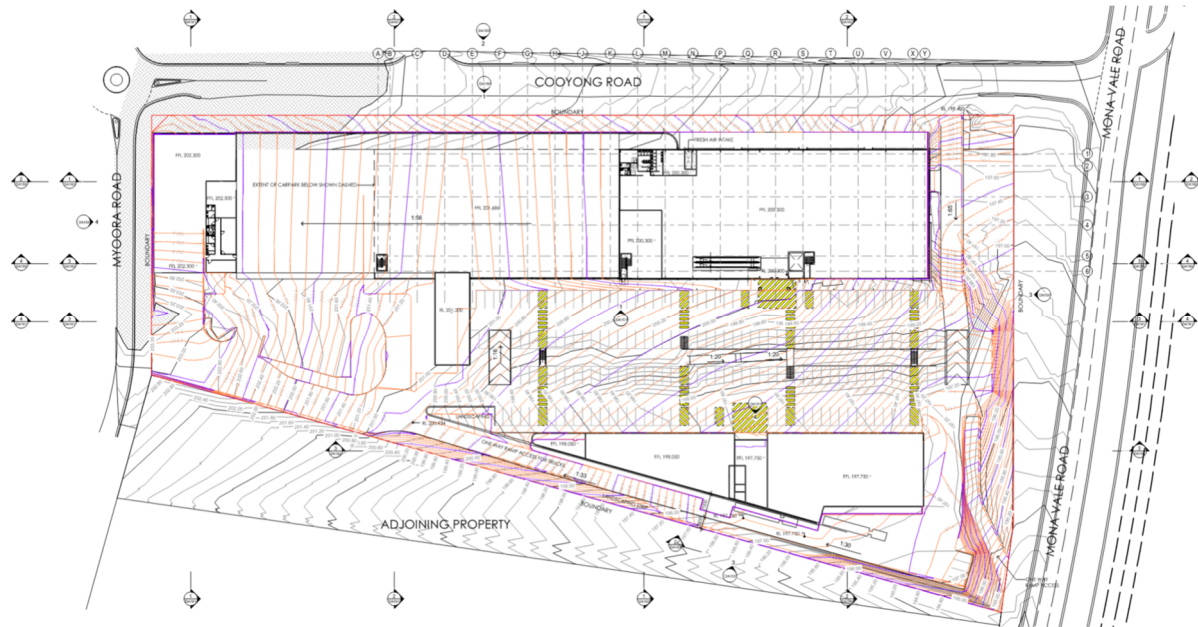


Figure 2: Architectural Ground Floor Site Plan

2. Civil Engineering Design

2.1 Design Criteria & Methodology

The Civil Engineering design has considered a number of relevant documents and reports applicable to the proposed development. The objectives of this report are to ensure the proposed integrated water cycle management of the site meets the requirements of the following documents:

- Warringah Development Control Plan (2011)
- Warringah Local Environment Plan (2011)
- Warringah On-site Stormwater Detention Technical Specification (1998)
- Northern Beaches Water Management for Development Policy (2021)
- Australian Standard 3500:2018
- Managing Urban Stormwater Soil & Construction (2004) by Landcom (The Blue Book)

2.2 Sediment and Erosion Control

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

- Adequate sediment and erosion 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 Northern Beaches Council, prior to discharge.

Prior to any earthworks commencing on site, the sediment and erosion control will need to be provided during the construction phase of the development in accordance with the requirements of Northern Beaches Council and The Blue Book.

2.2.1 Sediment Basin

Due to the size of the proposed development, a temporary sediment basin will be required to capture site runoff during construction. The construction of the basin may be undertaken in stages to enable maximum runoff capture assisted by diversion swales and direct runoff to the basin. The design parameters of this temporary sediment basin are summarised in Table 1(below).

Calculations to determine the required basin size are to be based on available geotechnical information regarding soil types and using The Blue Book.

To ensure the sediment basin is working effectively it will need to be maintained throughout the construction works. Maintenance includes ensuring adequate settlement times or flocculation and pumping of clean water 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.

The pumped water from the sediment basin can be reused for dust control during construction.

Overflow weirs are to be provided to control overflows for rainfall events more than the design criteria.

Table 1: Sediment Basin Sizing Values

Parameter	Adopted value
Total disturbed area (ha)	2.8301
Soil Texture Group	D or F
Design rainfall depth (days)	5
Design rainfall depth (percentile)	80
x-day, y-percentile rainfall event	35.2
Cv	0.42
Settling zone volume (m ³)	418.402
Sediment storage volume (m ³)	209.201
Total basin volume required (m ³)	627.603

2.2.2 Sediment and Erosion Control Measures

Prior to any earthworks commencing on site, sediment and erosion control measure shall be implemented generally in accordance with the engineering drawings, Council requirements, and The Blue Book. The measures are intended to be a minimum treatment only as the contractor will be required to modify and stage the sediment and erosion control measures to suit the construction program, sequencing, and techniques. These measures may include:

- A temporary site security/safety fence is to be constructed around the site, the site office area, and the proposed sediment basin.
- Sediment fencing provided downstream of disturbed areas, including any topsoil stockpiles, shown in Figure 3 (below).
- Dust control measures including covering stockpiles, installing fence hessian, and watering exposed areas.
- Placement of hay bales or mesh and gravel inlet filters around and along proposed catch drains and around stormwater inlets pits
- The construction of a temporary sediment basin as noted above.
- Stabilised site access at the construction vehicle entry/exits.
- Any stockpiled material, including topsoil, shall be located as far away as possible from any associated natural watercourses or temporary overland flow paths. All stockpiles and embankment formations shall be stabilised by hydroseeding or hydro mulching on formation.



Figure 3: Sediment Fence

2.3 Stormwater Infrastructure and modelling

The objectives of this investigation include:

- Management of 'minor' flows using piped systems for at least the 5% AEP
- Management of 'major' flows using dedicated overland flow paths for the 1% AEP
- OSD design as per the Warringah On-site Stormwater Detention Technical Specification

The proposed stormwater system was designed using DRAINS Hydrologic and the ILSAX Hydrological Model. The following parameters were adopted:

- Major Storm = 1% AEP
- Minor Storm = 5% AEP
- Soil Type - 2.5
- Paved (Impervious) Area Depression Storage - 1mm
- Supplementary Area Depression Storage - 1mm
- Grassed (Pervious) Area Depression Storage - 5mm
- Sag pit Blocking Factor - 0.5
- On Grade Pit Blocking Factor - 0.2

The DRAINS Model Layout is shown below. The DRAINS model can be provided for assessment upon request.

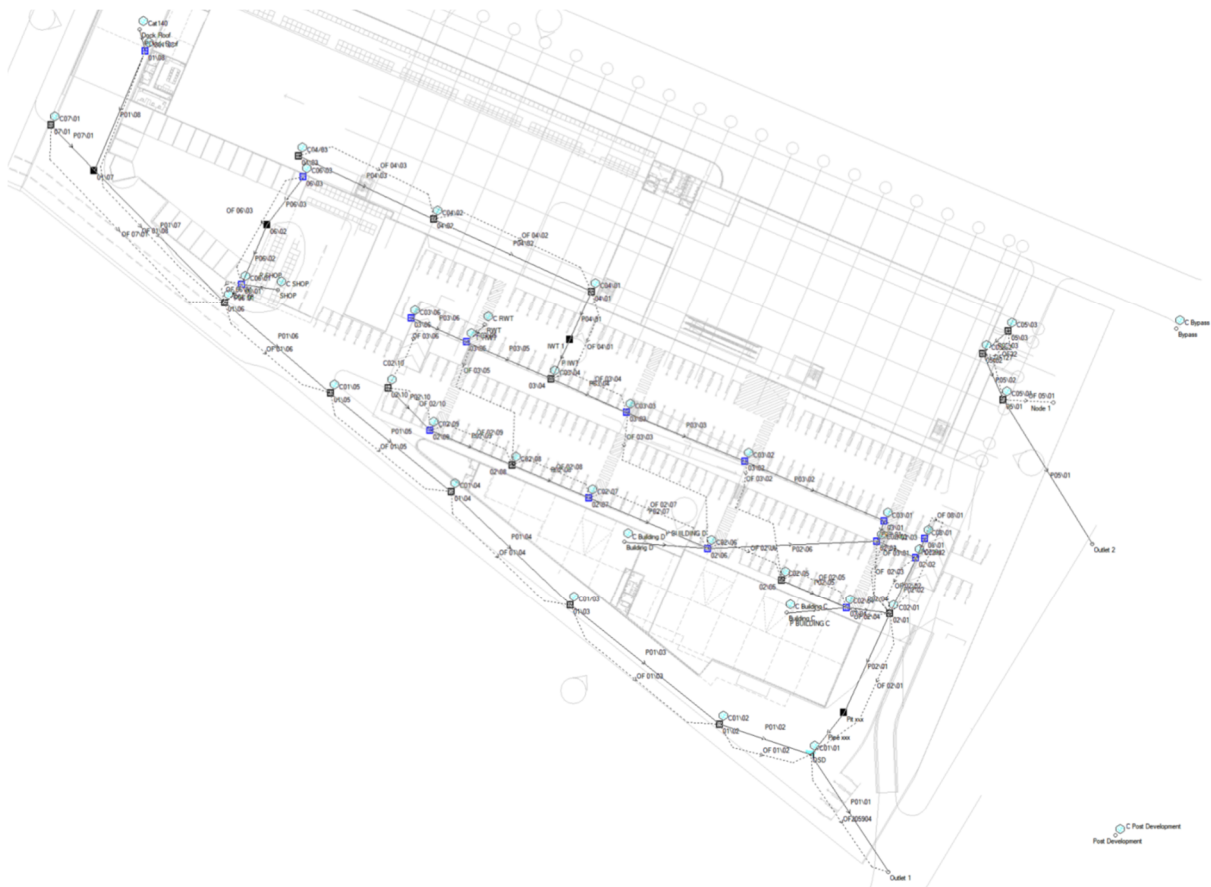


Figure 4: DRAINS Model Layout

2.4 On-site Stormwater Detention

2.4.1 OSD Requirements

On-site Stormwater Detention has been provided for the site. The proposed OSD has been modelled in accordance with the Warringah On-site Stormwater Detention Technical Specification.

According to the specification the proposed on-site detention tank should be designed in accordance with the following control standards:

- For all developments, the runoff from the site after development is not to exceed the runoff from the total site prior to the development for all storm durations for the 20% AEP, 5% AEP and a 1% AEP storm event.
- For all developments except single residential dwelling developments the PSD is to be calculated on the maximum allowable impervious fraction of 0%. That is, discharge off the site is to be restricted to the “state of nature” condition.

The pre and post development discharges were calculated using drains and can be seen in the below table.

Table 2: Site Discharge

Storm Event	Pre-Development Discharge	Post-Development Discharge
20% AEP	0.574 m ³ /s	0.484 m ³ /s
5% AEP	0.936 m ³ /s	0.674 m ³ /s
1% AEP	1.380 m ³ /s	0.897 m ³ /s

2.4.2 OSD Design

The tank has been designed in accordance with the Warringah On-site Stormwater Detention Technical Specification (1998), to store and attenuate the peak discharge from the site in smaller events (20% and 5% AEP) and in larger events (1% AEP). A 450mm diameter outflow culvert has been sized to control flows for up to 1% AEP storm event. The outflow culvert will enter the legal point of discharge located at the southeastern driveway with an assumed tailwater level of 194.034m. The key OSD design parameters are presented in the Table below.

Table 3: Summary of OSD Design Parameters

Item	Design Parameters
Total OSD volume	660.00m ³
1% AEP RL	196.63m
5% AEP RL	195.81m
20% AEP RL	195.19m
Average Depth	3.00m
Footprint Required	220.00m ²

2.5 Stormwater Overland Flow

The stormwater piped system has been designed to cater for the 5% AEP. The surface flow paths have been designed for the 1% AEP storm event so that the $v \times d$ relation is less than 0.4.

2.6 Stormwater Quality

2.6.1 Stormwater Quality Requirements

According to the Northern Beaches WSUD and MUSIC Modelling Guidelines, the Stormwater Quality treatment target reduction removal rates are:

- 90% reduction in the post development mean annual load of total gross pollutant load (>5mm).
- 85% reduction in the post development mean annual load of Total Suspended Solids (TSS).
- 65% reduction in the post development mean annual load of Total Phosphorus (TP).
- 45% reduction in the post development mean annual load of Total Nitrogen (TN).

2.6.2 Proposed Stormwater Quality Treatment System

The stormwater pollutant load reduction and water conservation objectives will be met by the use of a rainwater tank and stormwater treatment devices such as storm filters and ocean guards.

2.6.3 Modelling of Stormwater Quality

Stormwater treatment was modelled using Modelling Urban Stormwater Improvement Conceptualisation (MUSIC) software v 6.3.0 for both water quality and quantity. The water quality model used Sydney Observatory 6-minute rainfall data from the period of 1981-1985 and the water quantity model used Sydney Observatory daily rainfall data from the period of 1925-1974.

The stormwater quality treatment parameters are included below:

- 32 x Ocean Guard Pit Inserts
- Rainwater Tank (50kL)
- Storm Filter Chamber (12.0m²)
- 32 x P_{Sorb} Storm Filters (690mm)

MUSIC Model Layout and pollutant removal performance is shown below.

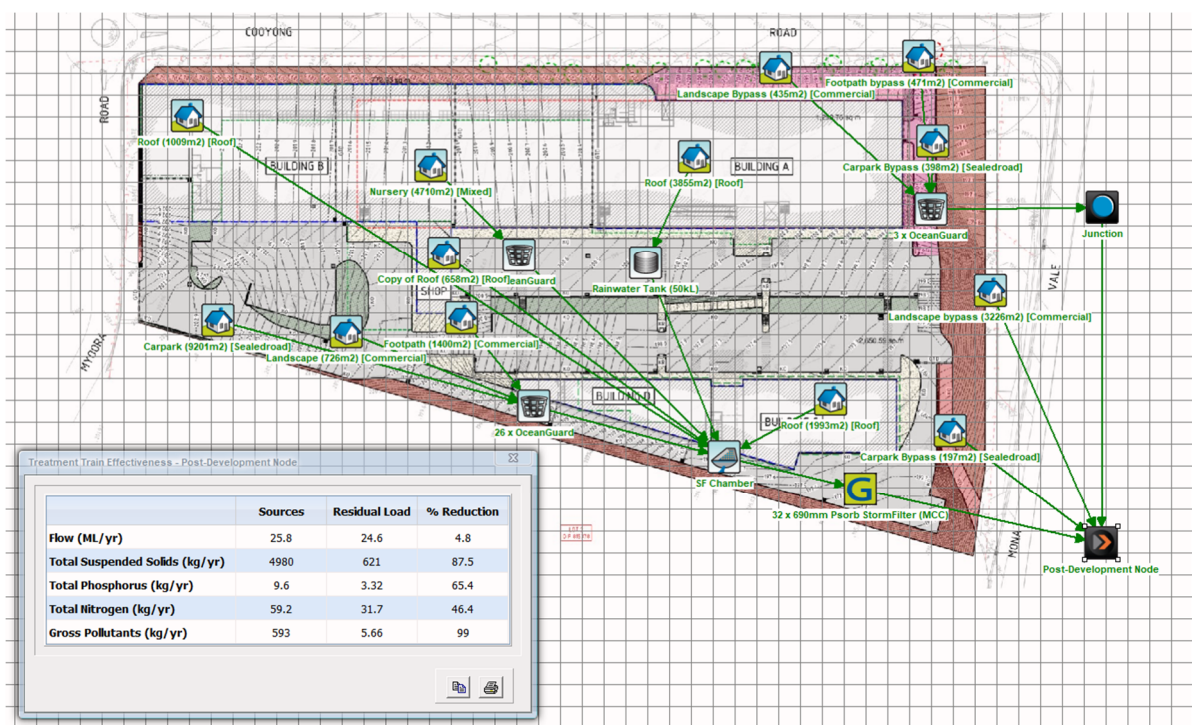


Figure 5: MUSIC Water Quality Model

Table 4: MUSIC Model Results

Item	Target Reduction Rate (%)	Removal	% Reduction
Total Suspended Solids	85		87.5
Total Phosphorus	65		65.4
Total Nitrogen	45		46.4
Gross Pollutants	90		99.0

As shown above, the stormwater treatment targets appropriate for the site will be met by the treatment measures provided. The pollutant removal performance as calculated by MUSIC modelling meets the Northern Beaches Council targets.

2.7 Water Conservation

2.7.1 Water Conservation Requirements

According to chapter 7.1.3 from the Northern Beaches Water Management for Development Policy (2021), rainwater tanks are to comply with the following:

- “Be fitted with a first-flush device that causes initial rainwater run-off to bypass the tank and must drain to a landscaped area. The first flush device will not be permitted to connect to the stormwater system”
- “Have a sign affixed to the tank stating the contents is rainwater”
- “Be constructed or installed in a manner that prevents mosquitoes breeding, such as the use of mesh to protect inlets and overflows”
- “Have its overflow connected to an existing stormwater drainage system that does not discharge to an adjoining property, or cause a nuisance to adjoining owners”
- “Pumping equipment must be housed in a soundproof enclosure”

According to the Architectural drawings, there are 24 toilets in the building and 4799m² of landscaping which will require irrigation. Assuming the rates of 0.1kL/day/toilet and 0.4kL/year/m² the daily and annual demand is 2.4kL/day and 1919.6kL/year, respectively.

2.7.2 Rainwater Tank Specification

A 50kL rainwater tank achieves a sufficient reuse demand met value of 47.50% for toilet flushing and irrigation.

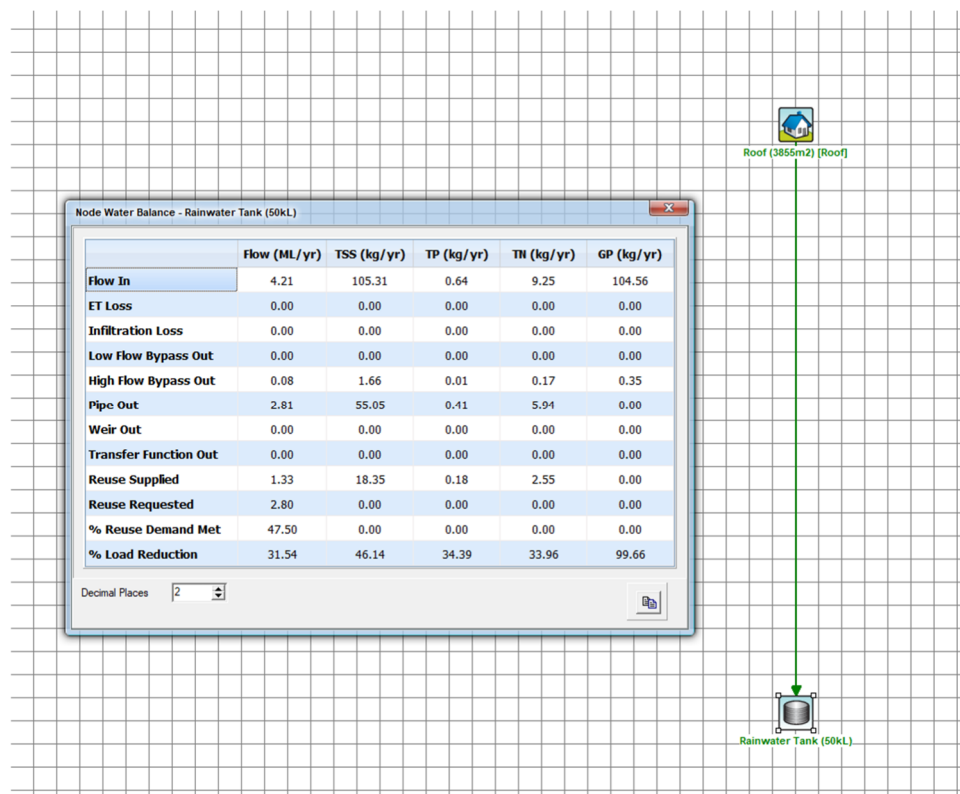


Figure 6: MUSIC Water Quantity Model

Rainwater tanks of varying sizes were implemented into this design and their rainwater reuse percentages can be seen in Figure 7.

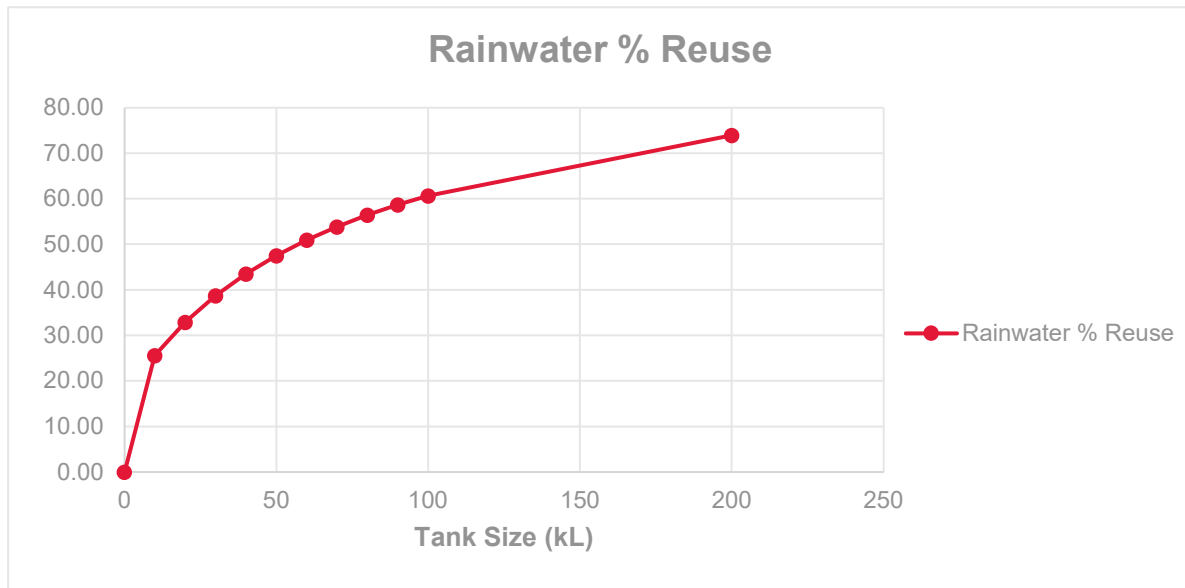


Figure 7: Rainwater % Reuse vs Tank Size

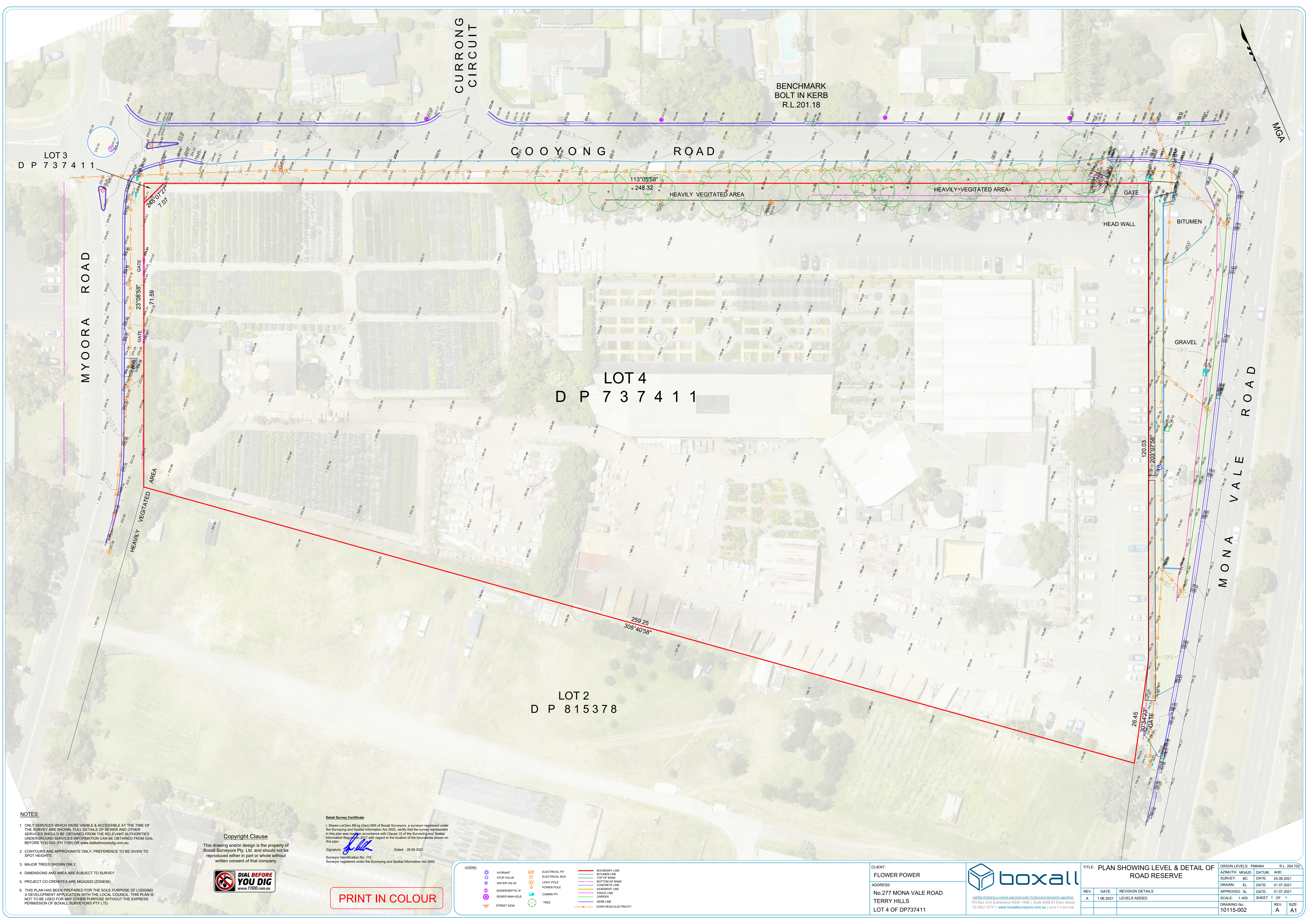
As illustrated, beyond the 50kL tank the curve flattens off and the percentage rainwater reuse begins to increase insignificantly which does not justify the cost for a larger tank.

3. Conclusion

In summary, the civil engineering requirements for the proposed development are as follows:

- Sediment & Erosion Control – A sediment basin is required to effectively capture sediment laden site runoff during siteworks. Sediment and erosion control measures should be installed and maintained for the duration of the construction works.
- Stormwater Infrastructure – The stormwater design has considered the major/minor philosophy consistent with the requirements of Northern Beaches Council for the below ground pit and pipe network inclusive of On-site Stormwater Detention.
- Water Quality and Conservation – Water Quality requirements will be achieved through the provision of pit baskets and filter cartridges, in accordance with the requirements of Northern Beaches Council. A Rainwater Tank has been designed to reduce non-potable water demand.

Appendix A – Survey



NOTES:

- ONLY SERVICES WHICH WERE VISIBLE & ACCESSIBLE AT THE TIME OF THE SURVEY ARE SHOWN. FULL DETAILS OF SEWER AND OTHER SERVICES SHOULD BE OBTAINED FROM THE RELEVANT AUTHORITIES. UNDERGROUND SERVICES INFORMATION CAN BE OBTAINED FROM DIAL BEFORE YOU DIG (PH 1100) OR www.dialbeforeyoudig.com.au.
- CONTOURS ARE APPROXIMATE ONLY, PREFERENCE TO BE GIVEN TO SPOT HEIGHTS.
- MAJOR TREES SHOWN ONLY.
- DIMENSIONS AND AREA ARE SUBJECT TO SURVEY.
- PROJECT CO-ORDINATES ARE MGA2020 (ZONE56).
- THIS PLAN HAS BEEN PREPARED FOR THE SOLE PURPOSE OF LODGING A DEVELOPMENT APPLICATION WITH THE LOCAL COUNCIL. THIS PLAN IS NOT TO BE USED FOR ANY OTHER PURPOSE WITHOUT THE EXPRESS PERMISSION OF BOXALL SURVEYORS PTY LTD.

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Detail Survey Certificate

I, Shawn LeClerc BEng (Geo) MIS of Boxall Surveyors, a surveyor registered under the Surveying and Spatial Information Act 2002, certify that the survey represented in this plan was made in accordance with Clause 10 of the Surveying and Spatial Information Regulation 2017 with regard to the location of the boundaries shown on this plan.

Signature:

Dated: 28.06.2021

Surveyor Identification No: 115

Surveyor registered under the Surveying and Spatial Information Act 2002.

LEGEND:

- | | | | | | |
|--|----------------|--|----------------|--|-----------------------|
| | HYDRANT | | ELECTRICAL PIT | | BOUNDARY LINE |
| | STOP VALVE | | LIGHT POLE | | BITUMEN LINE |
| | WATER VALVE | | POWER POLE | | TOP OF BANK |
| | SEWER IN PIT | | COMMS PIT | | BOTTOM OF BANK |
| | SEWER MAN HOLE | | TREE | | CONCRETE LINE |
| | STREET SIGN | | | | EASEMENT LINE |
| | | | | | FENCE LINE |
| | | | | | GARDEN |
| | | | | | KERB LINE |
| | | | | | OVER HEAD ELECTRICITY |

CLIENT:

FLOWER POWER

ADDRESS:

No 277 MONA VALE ROAD
TERRY HILLS
LOT 4 OF DP737411



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TITLE: PLAN SHOWING LEVEL & DETAIL OF ROAD RESERVE

REVISIONS

REV	DATE	REVISION DETAILS
A	1.06.2021	LEVELS ADDED

ORIGIN LEVELS: PM9464

DATE: 25.06.2021

DATE: 01.07.2021

DATE: 01.07.2021

DATE: 01.07.2021

DATE: 01.07.2021

DATE: 01.07.2021

DATE: 01.07.2021

DATE: 01.07.2021

DATE: 01.07.2021

Appendix B - Operation and Maintenance Manuals



StormFilter

Operations & Maintenance Manual

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Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes for the StormFilter as recommended by the manufacturer.

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

Why do I need to perform maintenance?

Adhering to the inspection and maintenance schedule of each stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most of all ensures the long term effective operation of the StormFilter.

Health and Safety

Access to a StormFilter unit requires removing heavy access covers/grates, and it is necessary to enter into a confined space. Pollutants collected by the StormFilter will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or objects such as broken glass and syringes. For these reasons, all aspects of maintaining and cleaning your StormFilter require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel. As a result, it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the StormFilter, precautions should be taken in order to minimise (or, if possible, prevent) contact with sediment and other captured pollutants by maintenance personnel. The following personal protective equipment (PPE) is subsequently recommended:

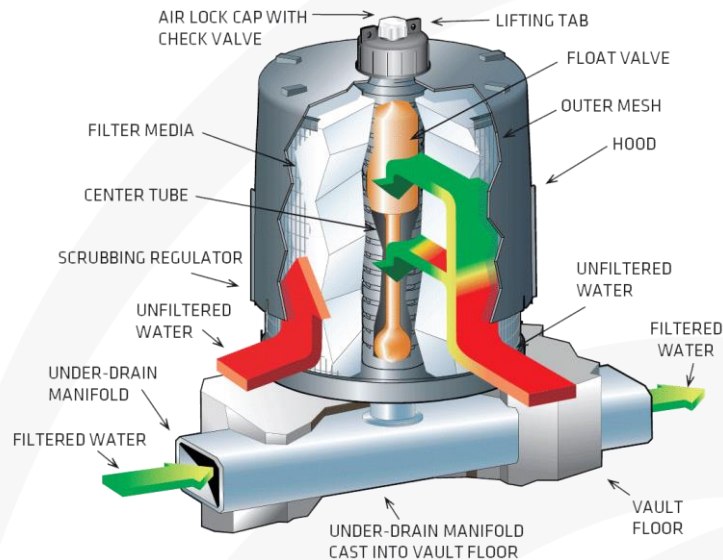
- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities, it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site-specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

Whilst some aspects of StormFilter maintenance can be performed from surface level, there will be a need to enter the StormFilter system (confined space) during a major service. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry applications.

How does it Work?

Stormwater enters the cartridge chamber, passes through the filtration media and begins filling the cartridge center tube. When water reaches the top of the cartridge the float valve opens and filtered water is allowed to drain at the designed flow rate. Simultaneously, a one-way check valve closes activating a siphon that draws stormwater evenly throughout the filter media and into the center tube. Treated stormwater is then able to discharge out of the system through the underdrain manifold pipework.



As the rain event subsides, the water level outside the cartridge drops and approaches the bottom of the hood, air rushes through the scrubbing regulators releasing the water column and breaking the siphon. The turbulent bubbling action agitates the surface of the cartridge promoting trapped sediment to drop to the chamber floor. After a rain event, the chamber is able to drain dry by way of an imperfect seal at the base of the float valve.

Maintenance Procedures

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically, the StormFilter requires an inspection every 6 months with a minor service at 12 months. Additionally, as the StormFilter cartridges capture pollutants the media will eventually become occluded and require replacement (expected media life is 1-3 years).

Primary Types of Maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the StormFilter.

	Description of Typical Activities	Frequency
Inspection	Visual Inspection of cartridges & chamber Remove larger gross pollutants Perform minimal rectification works (if required)	Every 6 Months
Minor Service	Evaluation of cartridges and media Removal of accumulated sediment (if required) Wash-down of StormFilter chamber (if required)	Every 12 Months
Major Service	Replacement of StormFilter cartridge media	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Inspection

The purpose of the inspecting the StormFilter system is to assess the condition of the StormFilter chamber and cartridges. When inspecting the chamber, particular attention should be taken to ensure all cartridges are firmly connected to the connectors. It is also an optimal opportunity to remove larger gross pollutants and inspect the outlet side of the StormFilter weir.

Minor Service

This service is designed to ensure the ongoing operational effectiveness of the StormFilter system, whilst assessing the condition of the cartridge media.

1. Establish a safe working area around the access point(s)
2. Remove access cover(s)
3. Evaluate StormFilter cartridge media (if exhausted schedule major service within 6 months)
4. Measure and record the level of accumulated sediment in the chamber
(if sediment depth is less than 100 mm skip to step 9)
5. Remove StormFilter cartridges from the chamber
6. Use vacuum unit to removed accumulated sediment and pollutants in the chamber
7. Use high pressure water to clean StormFilter chamber
8. Re-install StormFilter cartridges
9. Replace access cover(s)

Major Service (Filter Cartridge Replacement)

For the StormFilter system a major service is reactionary process based on the outcomes from the minor service, specifically the evaluation of the cartridge media.

Trigger Event	Maintenance Action
Cartridge media is exhausted ^[1]	Replace StormFilter cartridge media ^[2]

[1] Multiple assessment methods are available, contact Ocean Protect for assistance

[2] Replacement filter media and components are available for purchase from Ocean Protect.

This service is designed to return the StormFilter device back to optimal operating performance

1. Establish a safe working area around the access point(s)
2. Remove access cover(s)
3. By first removing the head cap, remove each individual cartridge hood to allow access to the exhausted media.
4. Utilise a vacuum unit to remove exhausted media from each cartridge
5. Use vacuum unit to remove accumulated sediment and pollutants in the chamber
6. Use high pressure water to clean StormFilter chamber
7. Inspect each empty StormFilter cartridges for any damage, rectify damage as required
8. Re-fill each cartridge with media in line with project specifications
9. Re-install replenished StormFilter cartridges
10. Replace access cover(s)

Additional Types of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, the StormFilter unit should be inspected and cleaned. Specifically, all captured pollutants and liquids from within the unit should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. Additionally, it will be necessary to inspect the filter cartridges and assess them for contamination, depending on the type of spill event it may be necessary to replace the filtration media.

Blockages

In the unlikely event that flooding occurs upstream of the StormFilter system the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

1. Inspect the upstream diversion structure (if applicable) ensuring that it is free of debris and pollutants
2. Inspect the StormFilter unit checking the underdrain manifold as well as both the inlet and outlet pipes for obstructions (e.g. pollutant build-up, blockage), which if present, should be removed.

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the StormFilter after a major storm event. The focus is to inspect for damage and higher than normal sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants should be removed and disposed.

Disposal of Waste Materials

The accumulated pollutants found in the StormFilter must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filter media has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of our StormFilter system we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement media for cartridges.

For more information please visit www.OceanProtect.com.au



OceanGuard™

Operations & Maintenance Manual

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Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes as recommended by the manufacturer.

The OceanGuard technology is a gully pit basket designed to fit within new and existing gully pits to remove pollution from stormwater runoff. The system has a choice of Filtration liners, designed to remove gross pollutants, total suspended solids and attached pollutants as either a standalone technology or as part of a treatment train with our StormFilter or Jellyfish Filtration products. OceanGuard pit baskets are highly effective, easy to install and simple to maintain.

Why do I need to perform maintenance?

Adhering to the maintenance schedule of each stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most of all ensures the long term effective operation of the OceanGuard.

Health and Safety

Access to pits containing an OceanGuard typically requires removing (heavy) access covers/grates, but typically it is not necessary to enter into a confined space. Pollutants collected by the OceanGuard will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or sharp objects such as broken glass and syringes. For these reasons, there should be no primary contact with the waste collect and all aspects of maintaining and cleaning your OceanGuard require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel, as a result it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the OceanGuard pit insert, precautions should be taken in order to minimise (or when possible prevent) contact with sediment and other captured pollutants by maintenance personnel. In order to achieve this the following personal protective equipment (PPE) is recommended:

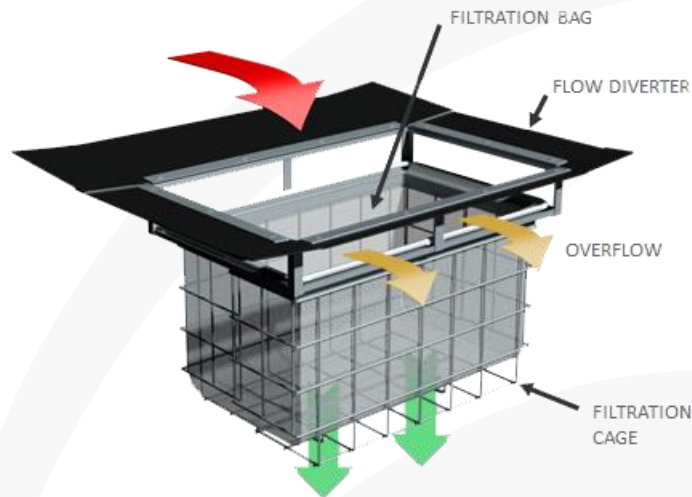
- Puncture resistant gloves
- Steel capped safety boots,
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

The OceanGuard pit insert is designed to be maintained from surface level, without the need to enter the pit. However depending on the installation configuration, location and site specific maintenance requirements it may be necessary to enter a confined space occasionally. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry.

How does it Work?

OceanGuard is designed to intercept stormwater as it enters the stormwater pits throughout a site. The OceanGuard has diversion panels that sit flush with the pit walls, this ensures that as stormwater enters at the top of the pit it is directed to the middle of the insert where the Filtration bag is situated. The filtration bag allows for screening to occur removing 100% of pollutants greater than the opening of the filtration material (200micron, 1600micron bags available).



During larger rain events the large flows overflow slots in the flow diverter of the OceanGuard ensure that the conveyance of stormwater is not impeded thus eliminating the potential for surface flooding. As the flow subsides, the captured pollutants are held in the OceanGuard Filtration bag dry. The waste then starts to dry which reduces the magnitude of organic material decomposition transitioning between maintenance intervals.

Maintenance Procedures

To ensure that each OceanGuard pit insert achieves optimal performance, it is advisable that regular maintenance is performed. Typically the OceanGuard requires 2-4 minor services annually, pending the outcome of these inspections additional maintenance servicing may be required.

Primary Types of Maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the OceanGuard.

	Description of Typical Activities	Frequency
Minor Service	Filter bag inspection and evaluation Removal of capture pollutants Disposal of material	2-4 Times Annually
Major Service	Filter Bag Replacement Support frame rectification	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Minor Service

This service is designed to return the OceanGuard device back to optimal operating performance. This type of service can be undertaken either by hand or with the assistance of a Vacuum unit.

Hand Maintenance

1. Establish a safe working area around the pit insert
2. Remove access cover/grate
3. Use two lifting hooks to remove the filtration bag
4. Empty the contents of the filtration bag into a disposal container
5. Inspect and evaluate the filtration bag
6. Inspect and evaluate remaining OceanGuard components (i.e. flow diverter, filtration cage and supporting frame)
7. Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
8. Re-install filtration bag and replace access cover/grate

Vacuum Maintenance

1. Establish a safe working area around the pit insert
2. Remove access cover/grate
3. Vacuum captured pollutants from the filtration bag
4. Remove filtration bag
5. Inspect and evaluate the filtration bag
6. Inspect and evaluate remaining OceanGuard components (i.e. flow diverter, filtration cage and supporting frame)
7. Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
8. Re-install filtration bag and replace access cover/grate

Major Service (Filter Bag Replacement)

For the OceanGuard system, a major service is a reactionary process based on the outcomes from the minor service.

Trigger Event from Minor Service	Maintenance Action
Filtration bag inspection reveals damage	Replace the filtration bag ^[1]
Component inspection reveals damage	Perform rectification works and if necessary replace components ^[1]

[1] Replacement filtration bags and components are available for purchase from Ocean Protect.

Additional Reasons of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, all OceanGuard pits that potentially received flow should be inspected and cleaned. Specifically all captured pollutants from within the filtration bag should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. All filtration bags should be rejuvenated (replaced if required) and re-installed.

Blockages

The OceanGuards internal high flow bypass functionality is designed to minimise the potential of blockages/flooding. In the unlikely event that flooding occurs around the stormwater pit the following steps should be undertaken to assist in diagnosing the issue and implementing the appropriate response.

1. Inspect the OceanGuard flow diverter, ensuring that they are free of debris and pollutants
2. Perform a minor service on the OceanGuard
3. Remove the OceanGuard insert to access the pit and inspect both the inlet and outlet pipes, ensuring they are free of debris and pollutants

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the OceanGuard pit insert after a major storm event. The inspection should focus on checking for damage and higher than normal sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants disposed.

Disposal of Waste Materials

The accumulated pollutants found in the OceanGuard must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filtration bag has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of our OceanGuard system we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement filter bags.

For more information please visit www.OceanProtect.com.au

Appendix C – Civil Engineering Drawings

FLOWER POWER, TERREY HILLS

CIVIL ENGINEERING PACKAGE DEVELOPMENT APPLICATION



SOURCE : NEARMAP.COM.AU (©2018)

DRAWING SCHEDULE	
DRG No.	DRAWING TITLE
DA1.01	COVER SHEET, DRAWING SCHEDULE AND LOCALITY PLAN
DA1.11	SPECIFICATION NOTES
DA2.01	CONCEPT EROSION AND SEDIMENT CONTROL PLAN
DA2.11	EROSION AND SEDIMENT CONTROL DETAILS
DA3.01	CONCEPT BULK EARTHWORKS PLAN
DA4.01	SITEWORKS AND GRADING PLAN
DA4.02	STORMWATER MANAGEMENT PLAN
DA5.01	CATCHMENT PLAN
DA6.01	OSD DETAILS
DA6.02	DETAILS - SHEET 01
DA6.03	DETAILS - SHEET 02

DESIGNED: J GRINSELL
JOB MANAGER: S FRYER
VERIFIER:
DRAWN: MMAI

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR CO-ORDINATION	C.B.		S.F.	04.08.21
02	ISSUED FOR INFORMATION	M.M.		J.R.G.	23.12.21
03	ISSUED FOR DRAFT DEVELOPMENT APPLICATION	M.M.		A.C.	20.01.22



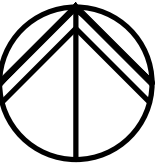
flower
power

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ARCHITECT

LEFFLER SIMES ARCHITECTS

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PROJECT

**FLOWER POWER
277 MONA VALE ROAD,
TERREY HILLS NSW**

DRAWING TITLE

**COVER SHEET, DRAWING SCHEDULE
AND LOCALITY PLAN**

JOB NUMBER

211979

DRAWING NUMBER

DA1.01

REVISION

03

DRAWING SHEET SIZE = A1

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NOTE: ALL CIVIL ENGINEERING CONSTRUCTION WORKS TO BE CARRIED OUT IN ACCORDANCE WITH NORTHERN BEACHES COUNCIL DEVELOPMENT GUIDELINES .THE AFOREMENTIONED GUIDELINES INCLUSIVE OF ALL SPECIFICATIONS TAKE PRECEDENCE OVER NOTES PROVIDED BELOW.

GENERAL NOTES

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.

ALL DIMENSIONS ARE IN MILLIMETRES & ALL LEVELS ARE IN METRES, UNO (UNLESS NOTED OTHERWISE).

NO DIMENSION SHALL BE OBTAINED BY SCALING THE DRAWINGS.

ALL LEVELS AND SETTING OUT DIMENSIONS SHOWN ON THE DRAWINGS SHALL BE CHECKED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORK.

DETAIL SURVEY DATA WAS SUPPLIED BY BOXALL SURVEYORS, DRAWING DATED 01/06/2021.

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.

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.

ALL STORMWATER MANAGEMENT MEASURES SHOWN ON THIS DRAWING HAVE BEEN PREPARED FOR DEVELOPMENT APPLICATION PURPOSES TO DEMONSTRATE FEASIBILITY. ALL MEASURES WILL BE SUBJECT TO DETAIL DESIGN AT THE CONSTRUCTION CERTIFICATE STAGE AND MAY BE SUBJECT TO VARIATION PROVIDED THAT THE DESIGN INTENT IS MAINTAINED.

STORMWATER DRAINAGE

- ALL DRAINAGE LINES SHALL BE UPVC (CLASS SN4) SEWER GRADE DRAINAGE PIPE, U.N.O.
- ALL DRAINAGE LINES SHALL BE LAID AT 1% MIN. FALL, UNO.
- ALL LEVELS ARE AUSTRALIAN HEIGHT DATUM (AHD).
- ALL DOWNPIPES GUTTERS TO BE DESIGNED IN ACCORDANCE WITH AS/NZS 3500.3.2 - 2003 'STORMWATER' DRAINAGE.
- THE STORMWATER DRAINAGE DESIGN HAS BEEN CARRIED OUT IN ACCORDANCE WITH AS/NZS 3500.3.2-2003 'STORMWATER' DRAINAGE.
- ANY VARIATIONS TO THE NOMINATED LEVELS SHALL BE REFERRED TO ENGINEER IMMEDIATELY.
- SUBSOIL DRAINAGE SHALL BE PROVIDED TO ALL RETAINING WALLS & EMBANKMENTS, WITH THE LINES FEEDING INTO THE STORMWATER DRAINAGE SYSTEM.
- ALL GRATES TO BE GALVANISED STEEL WITH HINGES AND CHILD PROOF LOCK.
- THE STORMWATER DRAINAGE IS DESIGNED IN ACCORDANCE WITH NORTHERN BEACHES COUNCIL WATER MANAGEMENT FOR DEVELOPMENT POLICY 2021.

RAINWATER RE-USE

- PROVIDE RAINWATER RE-USE SYSTEM TO SUPPLY WATER FOR TOILET FLUSHING AND IRRIGATION
- GUTTER GUARD TO BE INSTALLED ON ALL EAVES GUTTERS.
- A PERMANENT SIGN IS TO BE LOCATED IN THE VICINITY OF THE TANK STATING THE WATER IS "NON POTABLE WATER" WITH APPROPRIATE HAZARD IDENTIFICATION.
- PIPEWORK USED FOR RAINWATER SERVICES SHALL BE COLOURED LILAC IN ACCORDANCE WITH AS1345.
- ALL VALVES AND APERTURES SHALL BE CLEARLY AND PERMANENTLY LABELLED WITH SAFETY SIGNS TO COMPLY WITH AS1319.
- RAINWATER TANK RETICULATION SYSTEM AND MAINS WATER BYPASS ARRANGEMENT TO BE INSTALLED IN ACCORDANCE WITH AS/NZS 3500.12-2003 AND THE NSW CODE OF PRACTICE : PLUMBING AND DRAINING.
- A FIRST FLUSH FILTRATION DEVICE IS TO BE PROVIDED AT RAINWATER TANK.

DESIGN SUMMARY

SITE DISCHARGE CALCULATIONS:

	20% AEP	5% AEP	1% AEP
PRE-DEVELOPMENT	0.574 m³/s	0.936 m³/s	1.380 m³/s
POST-DEVELOPMENT	0.487 m³/s	0.676 m³/s	0.898 m³/s

ON-SITE DETENTION:

DESIGN BASIS:

- PRE TO POST DEVELOPMENT CONDITIONS

ON-SITE DETENTION SUMMARY:

- BELOW GROUND BLOCK WORK TANK

TOP WATER LEVEL = RL196.640
OVERFLOW LEVEL = RL196.900
ORIFICE CENTERLINE = RL193.925
ORIFICE DIAMETER = Ø450mm

RAINWATER RE-USE:

IN ACCORDANCE WITH BASIX/COUNCIL REQUIREMENTS.
RAINWATER RE-USE STORAGE PROVIDED IS TO BE DESIGNED

RAINWATER RE-USE TO BE USED FOR THE FOLLOWING:

- TOILET FLUSHING;
- IRRIGATION.

A 25% OF THE RAINWATER REUSE TANK VOLUME CAN OFFSET THE OSD VOLUME IN ACCORDANCE WITH COUNCIL'S WATER MANAGEMENT FOR DEVELOPMENT POLICY.

STORMWATER MANAGEMENT REQUIREMENTS HAVE BEEN CALCULATED IN ACCORDANCE WITH NORTHERN BEACHES COUNCIL WATER MANAGEMENT PLAN FOR DEVELOPMENT POLICY 2021: PART 9.0 ONSITE STORMWATER MANAGEMENT.

WATER QUALITY:

MUSIC MODEL SUMMARY (REFER NORTHROP REPORT FOR FURTHER DETAILS).

TREATMENT NODES:

- RAINWATER RE-USE TANK
- 'OCEANGUARD' PIT INSERTS (OR SIMILAR)

MUSIC MODEL PARAMETERS IN ACCORDANCE WITH NORTHERN BEACHES COUNCIL'S MUSIC MODELLING GUIDELINES 2016.

CONCEPT SOIL & WATER MANAGEMENT

- ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH RELEVANT ORDINANCES AND REGULATIONS, NOTE IN PARTICULAR THE REQUIREMENTS OF LANDCOMS MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION' (THE 'BLUE BOOK'). THIS SOIL AND WATER MANAGEMENT PLAN DETAILS THE ACTIONS TO BE TAKEN FOR THE MANAGEMENT AND DEWATERING OF STORMWATER DURING CONSTRUCTION OF THE PROPOSED BUILDING.
- INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
- ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
- INSTALL SEDIMENT FENCING AROUND INDIVIDUAL BUILDING ZONES/AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT.
- ALL TRENCHES INCLUDING ALL SERVICE TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
- THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB & GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED DURING THE DURATION OF CONSTRUCTION. REFER ARCHITECTS PLANS FOR TREES TO BE KEPT.
- ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ONSITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
- STRIP TOPSOIL IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED. ANY SURPLUS MATERIAL SHALL BE REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
- CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE).
- ENSURE STOCKPILES DO NOT EXCEED 2.0m HIGH. PROVIDE WIND AND RAIN EROSION PROTECTION AS REQUIRED IN ACCORDANCE WITH THE 'BLUE BOOK'.
- PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST.
- ONCE CUT/FILL OPERATIONS HAVE BEEN FINALIZED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION & SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A DAILY BASIS & SHALL CONTAIN DETAILS ON THE CONDITION OF CONTROLS AND ANY/ ALL MAINTENANCE, CLEANING & BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
- GROUNDWATER SEEPAGE RATES AND QUALITY TO BE MONITORED AND TREATED IF REQUIRED DURING CONSTRUCTION IN ACCORDANCE WITH REQUIREMENTS OF SUPERVISING GEOTECHNICAL ENGINEER.

VERIFIER:

JOB MANAGER: S.FRYER

DESIGNED: J.GRINSELL

DRAWN:M.MAI

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
02	ISSUED FOR CO-ORDINATION	C.B		S.F	04.08.21
02	ISSUED FOR DRAFT DEVELOPMENT APPLICATION	M.M		A.C	20.01.22

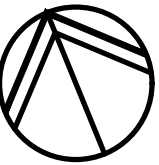


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ARCHITECT

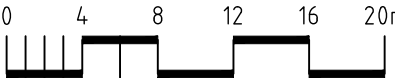
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SCALE 1:400@ A1





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PROJECT

FLOWER POWER
277 MONA VALE ROAD,
TERREY HILLS NSW

DRAWING TITLE

SPECIFICATION NOTES

JOB NUMBER

211979

DRAWING NUMBER

DA1.11

REVISION

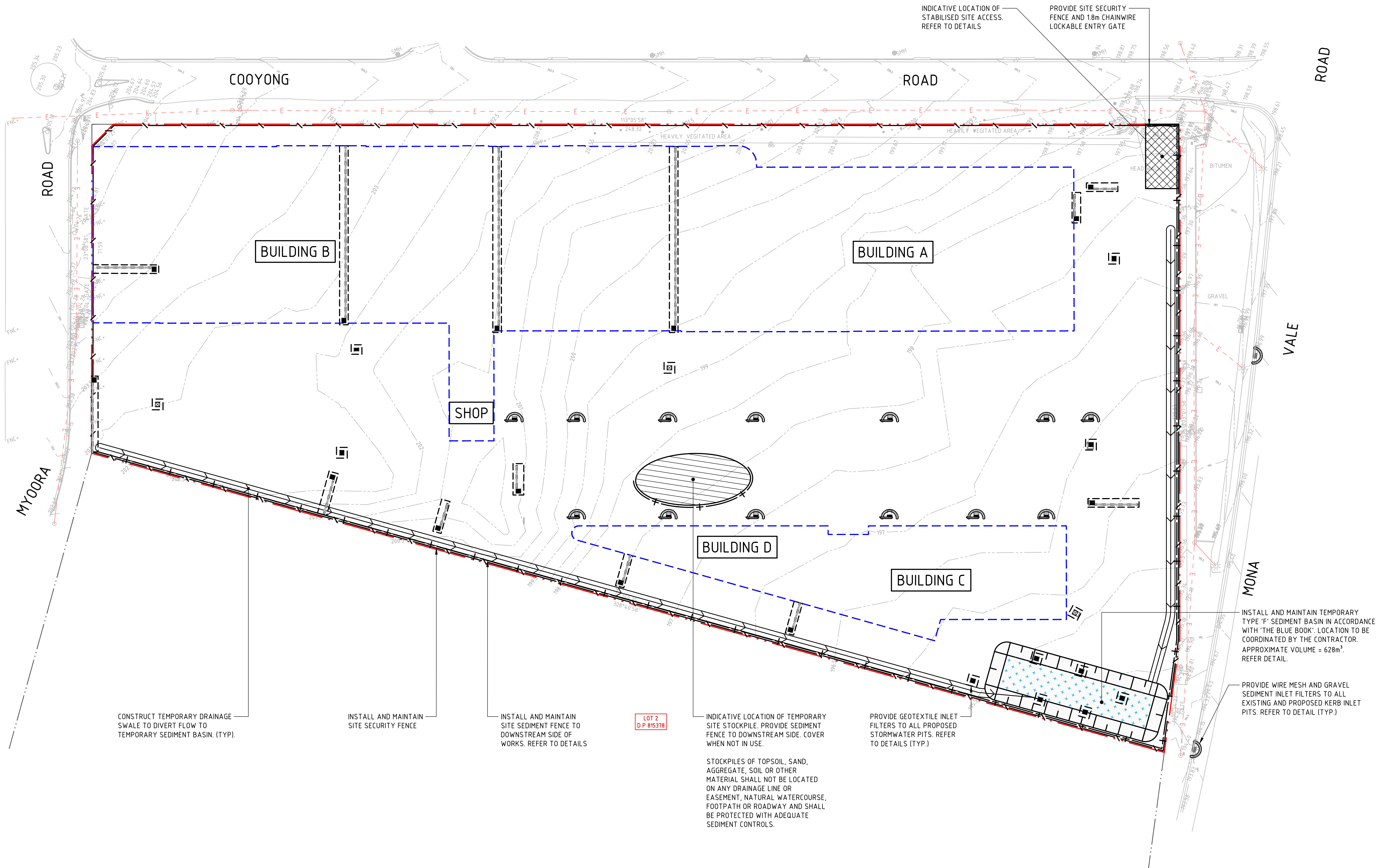
02

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DESIGNED: J GRINSELL
JOB MANAGER: S FRYER
VERIFIER:

DRAWN: M MAI



LEGEND	
	SITE BOUNDARY LINE
	ADJACENT BOUNDARY LINE
	BUILDING FOOTPRINT
	EXISTING CONTOURS
	SEDIMENT FENCE
	SECURITY FENCE
	SITE SECURITY GATE
	WIRE MESH AND GRAVEL SEDIMENT FILTER
	GEOTEXTILE INLET FILTER TRAPS
	TEMPORARY DRAINAGE SWALE
	SEDIMENT BASIN
	STABILISED SITE ACCESS
	STOCKPILE

- ### GENERAL NOTES
- ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL / RELEVANT AUTHORITY SPECIFICATIONS AND DETAILS.
 - ALL SEDIMENT AND SOIL EROSION CONTROL MEASURES TO BE INSTALLED IN ACCORDANCE WITH THE 'BLUE BOOK'. CONTRACTOR TO ENSURE THESE MEASURES ARE IN PLACE AND MAINTAINED AT ALL TIMES DURING CONSTRUCTION WORKS.
 - CONTRACTOR TO PROVIDE 'WIRE MESH AND GRAVEL SEDIMENT FILTER' TO ALL PAVED / ROAD AREAS (BOTH PROPOSED AND EXISTING) IN ACCORDANCE WITH THE 'BLUE BOOK'.
 - CONTRACTOR TO PROVIDE 'GEOTEXTILE INLET FILTER TRAPS' TO ALL STORMWATER DRAINAGE INLETS (BOTH PROPOSED AND EXISTING) IN ACCORDANCE WITH THE 'BLUE BOOK'.

SEDIMENT BASIN CALCULATIONS	
PARAMETER	ADOPTED VALUE
TOTAL DISTURBED AREA (ha)	2.8301
SOIL TEXTURE GROUP	D OR F
DESIGN RAINFALL DEPTH (DAYS)	5
DESIGN RAINFALL DEPTH (PERCENTILE)	80%
x-DAY, y-PERCENTILE RAINFALL EVENT	35.2
Cv	0.42
SETTLING ZONE VOLUME (m³)	418.402
SEDIMENT STORAGE VOLUME (m³)	209.201
TOTAL BASIN VOLUME REQUIRED (m³)	627.603

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR CO-ORDINATION	C.B.		S.F.	04.08.21
02	ISSUED FOR DRAFT DEVELOPMENT APPLICATION	M.M.		A.C.	20.01.22

CLIENT	
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ARCHITECT	LEFFLER SIMES ARCHITECTS
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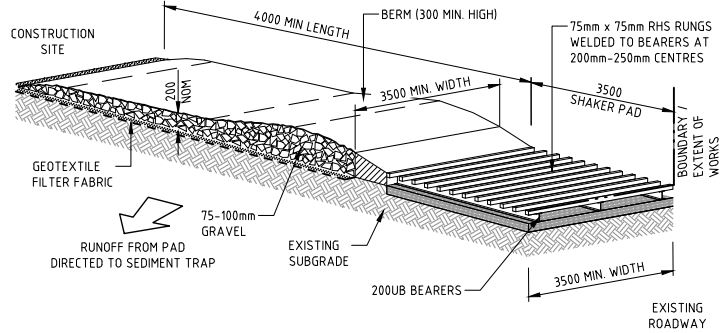
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PROJECT	FLOWER POWER 277 MONA VALE ROAD, TERREY HILLS NSW
---------	---

DRAWING TITLE	CONCEPT EROSION AND SEDIMENT CONTROL PLAN
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JOB NUMBER	211979
DRAWING NUMBER	DA2.01
REVISION	02
DRAWING SHEET SIZE = A1	

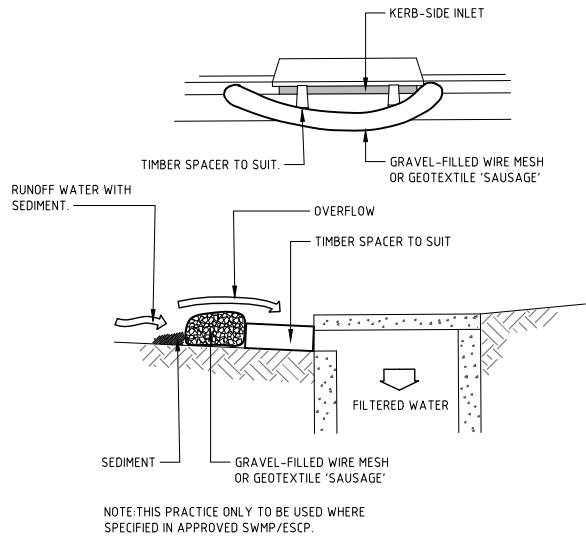
DESIGNED: J GRINSELL
DRAWN: M MAI
JOB MANAGER: S FRYER
VERIFIER:



CONSTRUCTION NOTES

1. THE TEMPORARY ACCESS SHALL BE MAINTAINED IN A CONDITION THAT PREVENTS TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS OF WAY.
 - THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL GRAVEL AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS OF WAY MUST BE REMOVED IMMEDIATELY.
3. INSTALL BARRIER ON EITHER SIDE OF SHAKER PAD. TO ENSURE VEHICLES ARE GUIDED ON TO THE PAD.
4. INVERT OF SHAKER PAD TO BE DRAINED VIA AGRICULTURAL PIPE WRAPPED IN GEOTEXTILE FABRIC.

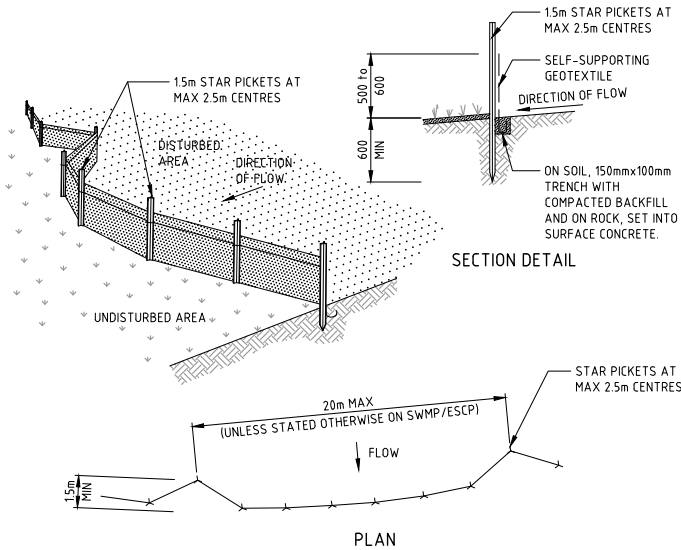
STABILISED SITE ACCESS



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.

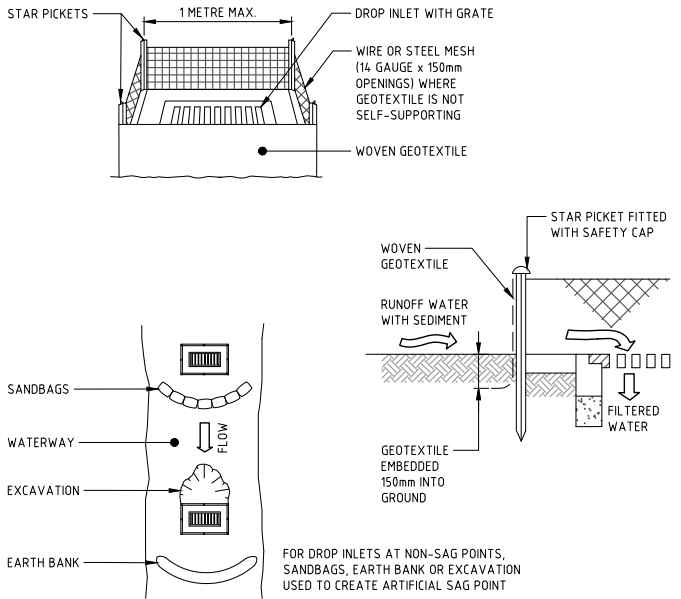
WIRE MESH AND GRAVEL SEDIMENT FILTER



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 15 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.

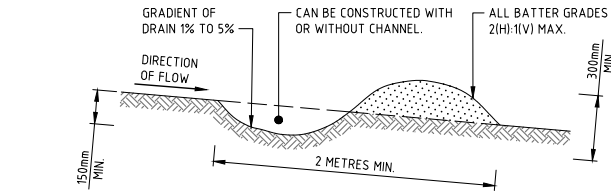
SEDIMENT FENCE



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.

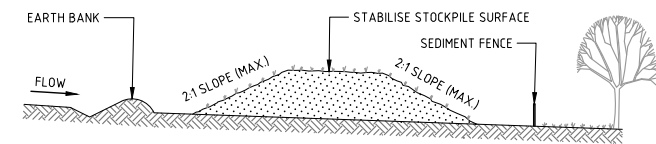
GEOTEXTILE INLET FILTER TRAPS



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.

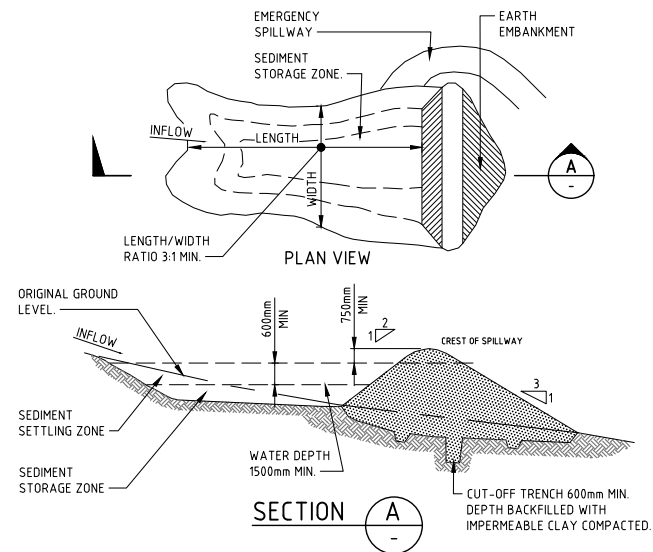
TEMPORARY DRAINAGE SWALE



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.

STOCKPILE



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.

SEDIMENT BASIN

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR CO-ORDINATION	C.B		S.F	04.08.21
02	ISSUED FOR DRAFT DEVELOPMENT APPLICATION	M.M		A.C	20.01.22

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NOT TO SCALE

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Email southcoast@northrop.com.au ABRN 81 094 433 100

PROJECT
FLOWER POWER
277 MONA VALE ROAD,
TERREY HILLS NSW

DRAWING TITLE
EROSION AND SEDIMENT CONTROL
DETAILS

JOB NUMBER
211979
DRAWING NUMBER
DA2.11
REVISION
01
DRAWING SHEET SIZE = A1

DESIGNED: J GRINSELL
JOB MANAGER: S FRYER
VERIFIER:

DRAWN: M MAI

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR CO-ORDINATION	C.B.		S.F.	04.08.21
02	ISSUED FOR INFORMATION	M.M.		J.R.G.	23.12.21
03	ISSUED FOR DRAFT DEVELOPMENT APPLICATION	M.M.		A.C.	20.01.22



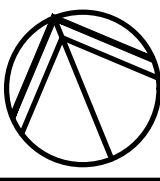
flower
power

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SCALE 1:400@A1





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PROJECT

**FLOWER POWER
277 MONA VALE ROAD,
TERREY HILLS NSW**

DRAWING TITLE

CONCEPT BULK EARTHWORKS PLAN

JOB NUMBER

211979

DRAWING NUMBER

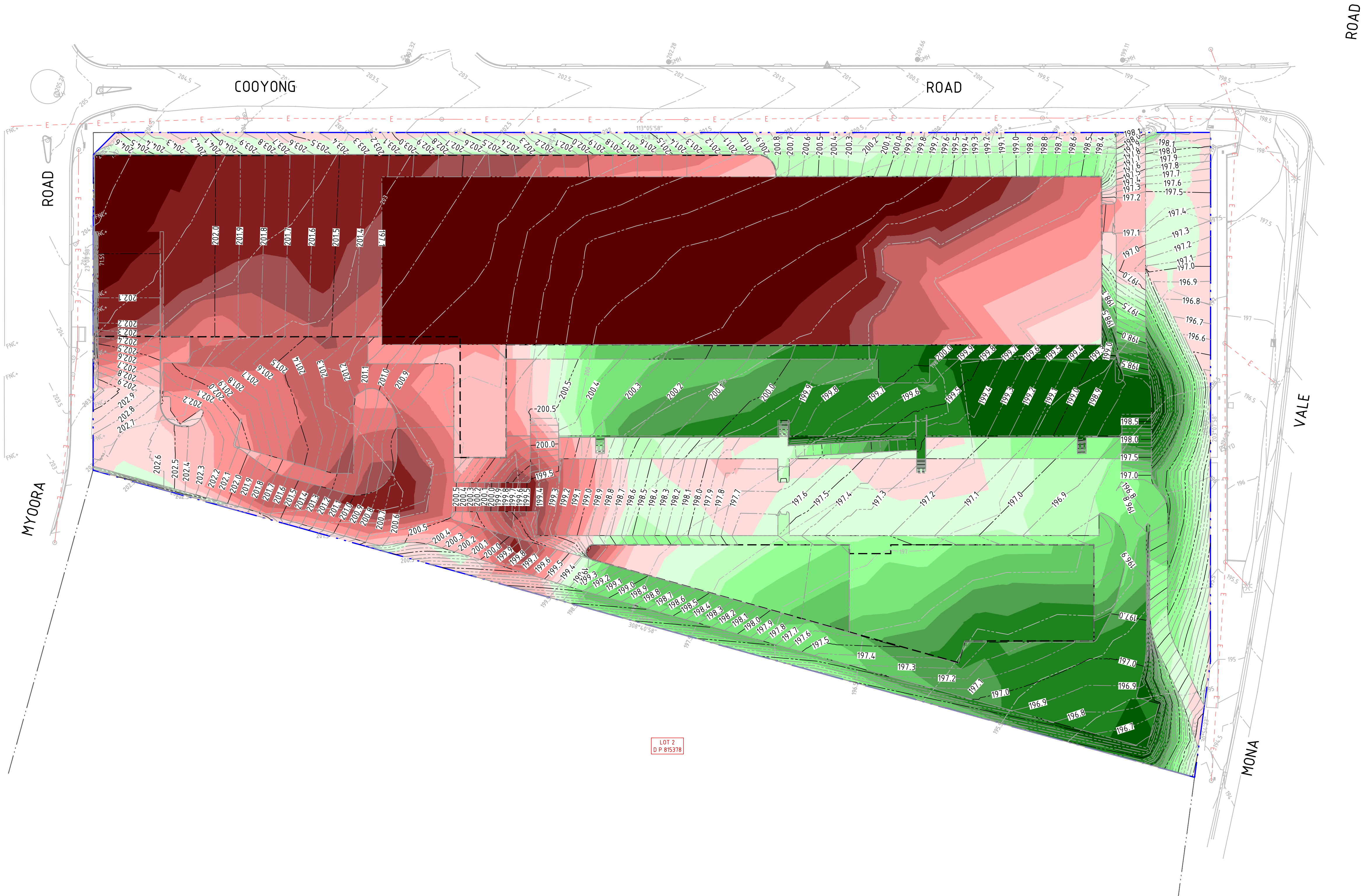
DA3.01

REVISION

03

DRAWING SHEET SIZE = A1

NOT FOR CONSTRUCTION



LEGEND

- SITE BOUNDARY LINE
- ADJACENT BOUNDARY LINE
- BUILDING FOOTPRINT
- BULK EARTHWORKS PAD LEVEL
- BATTERS (MAX. 1:3)
- 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

GENERAL NOTES:

- REFER SPECIFICATIONS NOTES FOR EARTHWORKS GENERAL REQUIREMENTS.
- ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL / RELEVANT AUTHORITY SPECIFICATIONS AND DETAILS.
- CAD FILES / DTM FILES TO BE SUPPLIED IN AUTOCAD FORMAT FOR SETOUT PURPOSES (UPON REQUEST).
- STRIP EXISTING TOPSOIL IN CONSULTATION WITH THE GEOTECHNICAL ENGINEER / REPORT. FOR THE PURPOSES OF EARTHWORKS CALCULATIONS A TOPSOIL STRIPPING DEPTH OF 150mm HAS BEEN ASSUMED.
- NO ALLOWANCE HAS BEEN MADE FOR BULKING FACTORS. NOTE ALL VOLUMES DEPICTED ARE SOLID VOLUMES ONLY AND MAY NOT REFLECT DETAILED EARTHWORKS.
- NO ALLOWANCE HAS BEEN MADE FOR DETAILED EARTHWORKS, ie SERVICE TRENCHING, DETAILED EXCAVATION, FOOTINGS, RETAINING WALLS AND THE LIKE. CONTRACTOR IS TO ALLOW FOR REMOVAL OF ALL EXCESS MATERIAL GENERATED BY THE WORKS.
- THE CONTRACTOR SHALL USE FINAL SURFACE LEVELS AND TYPICAL PAVEMENT DETAILS FOR ACTUAL EARTHWORKS LEVELS.
- BULK EARTHWORKS ARE BASED ON THE FOLLOWING DEPTHS FROM FINISHED SURFACE LEVELS:
 - ASPHALT PAVEMENT 350mm
 - CONCRETE PAVEMENT 200mm
 - BUILDING SLAB 250mm
 - FOOTPATH PAVEMENT 200mm
 - LANDSCAPE AREA 200mm
- APPROXIMATE BULK EARTHWORK VALUES AS FOLLOWS:
 - CUT -25,555.00 cu.m
 - FILL 11,864.00 cu.m
 - BALANCE -13,691.00 cu.m
 - SITE STRIPPING LAYER 4243.200 cu.m

File: 1\2021 Jobs\211979 - FLOWER POWER DEVELOPMENT - TERREY HILLS.Dwg Drawings\1-CAD\211979-CAD\01-DAT\211979_DA3.01.dwg Date: 20-1-22 5:50pm Plotted By: A Cavanahs

DESIGNED: J. GRINSELL
JOB MANAGER: S. FRYER
VERIFIER:
DRAWN: M. MAI

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR CO-ORDINATION	C.B.		S.F.	04.08.21
02	ISSUED FOR CO-ORDINATION	A.C.		A.C.	10.11.21
03	ISSUED FOR CO-ORDINATION	A.C.		A.C.	12.11.21
04	ISSUED FOR INFORMATION	M.M.		J.R.G.	23.12.21
05	ISSUED FOR DRAFT DEVELOPMENT APPLICATION	M.M.		A.C.	20.01.22



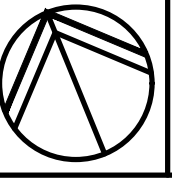
flower
power

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ARCHITECT

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SCALE 1:500@A1





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PROJECT

FLOWER POWER
277 MONA VALE ROAD,
TERREY HILLS NSW

DRAWING TITLE

SITeworks AND GRADING PLAN

JOB NUMBER

211979

DRAWING NUMBER

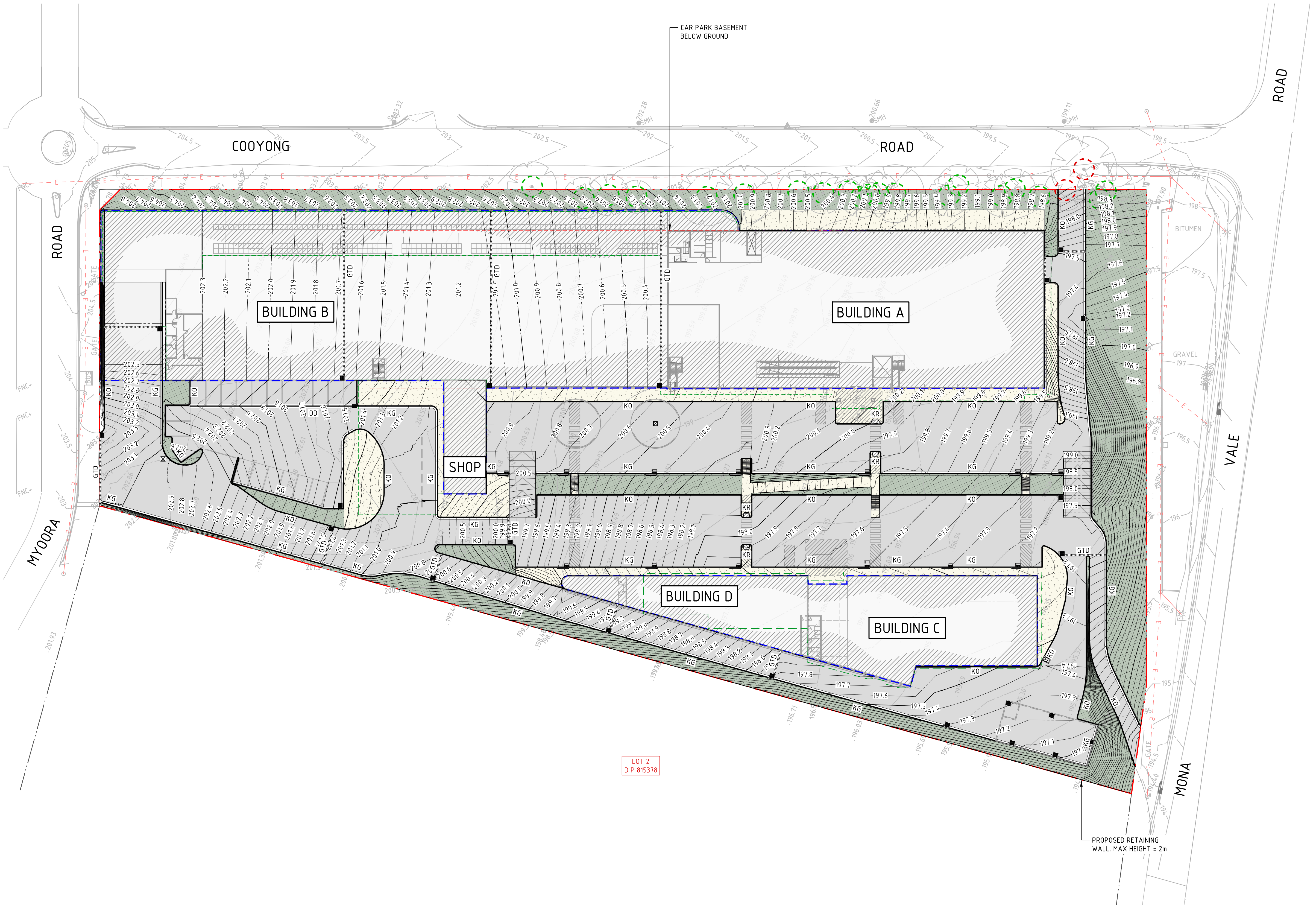
DA4.01

REVISION

05

DRAWING SHEET SIZE = A1

NOT FOR CONSTRUCTION

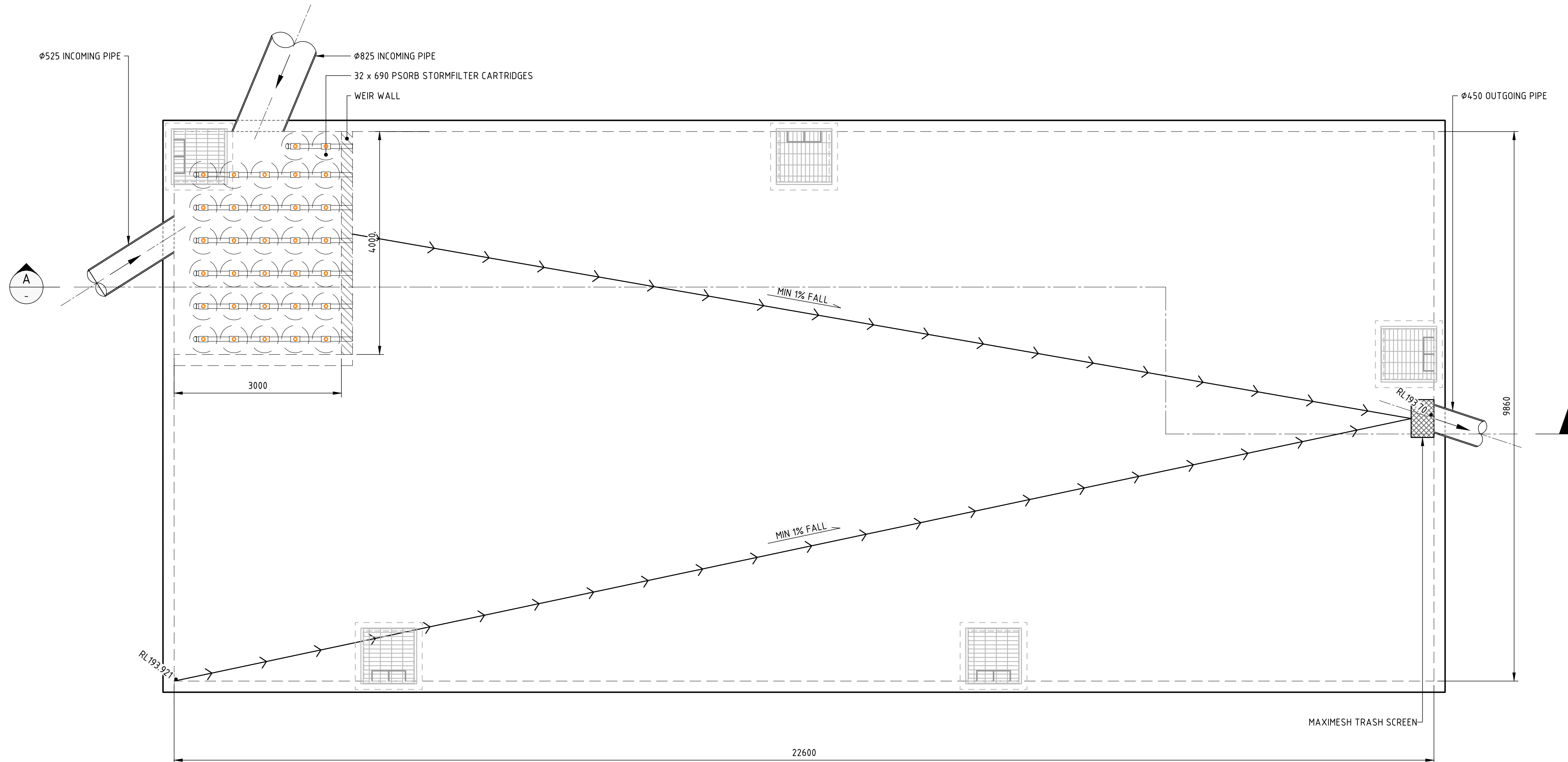


LEGEND

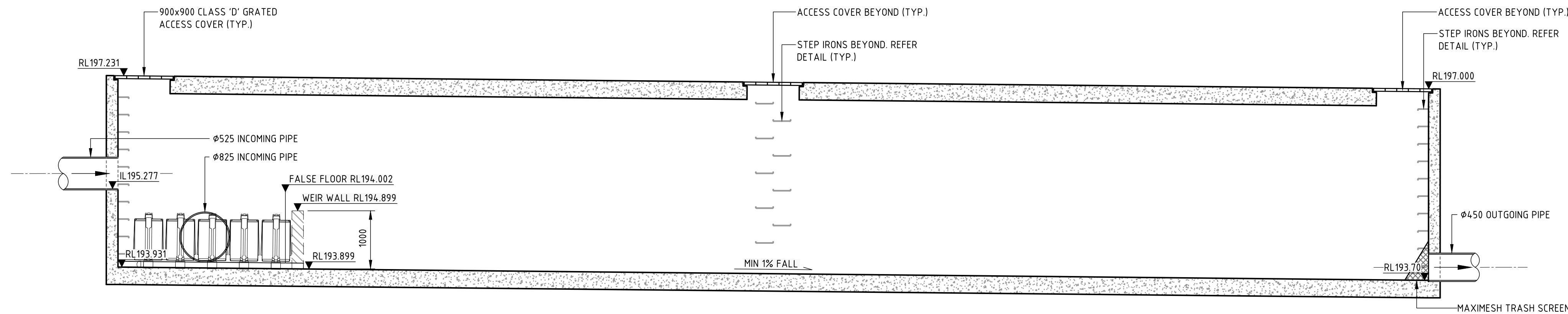
- SITE BOUNDARY LINE
- ADJACENT BOUNDARY LINE
- BUILDING FOOTPRINT
- ROOF FOOTPRINT
- BASEMENT FOOTPRINT
- PROPOSED KERB
- KO KERB ONLY
- KG KERB AND GUTTER
- DD DISH DRAIN
- KR KERB RAMP
- SURFACE INLET PIT / WITH EXTENDED CHAMBER
- SEALED JUNCTION PIT / WITH EXTENDED CHAMBER
- KERB INLET PIT / WITH EXTENDED CHAMBER
- EXISTING KERB INLET PIT
- CARPARK PAVEMENT
- FOOTPATH PAVEMENT
- LANDSCAPING
- TREES TO BE REMOVED (TBC)
- TREES TO BE RETAINED
- EXISTING CONTOURS
- DESIGN CONTOURS

DESIGNED: J GRINSELL
JOB MANAGER: S FRYER
VERIFIER:

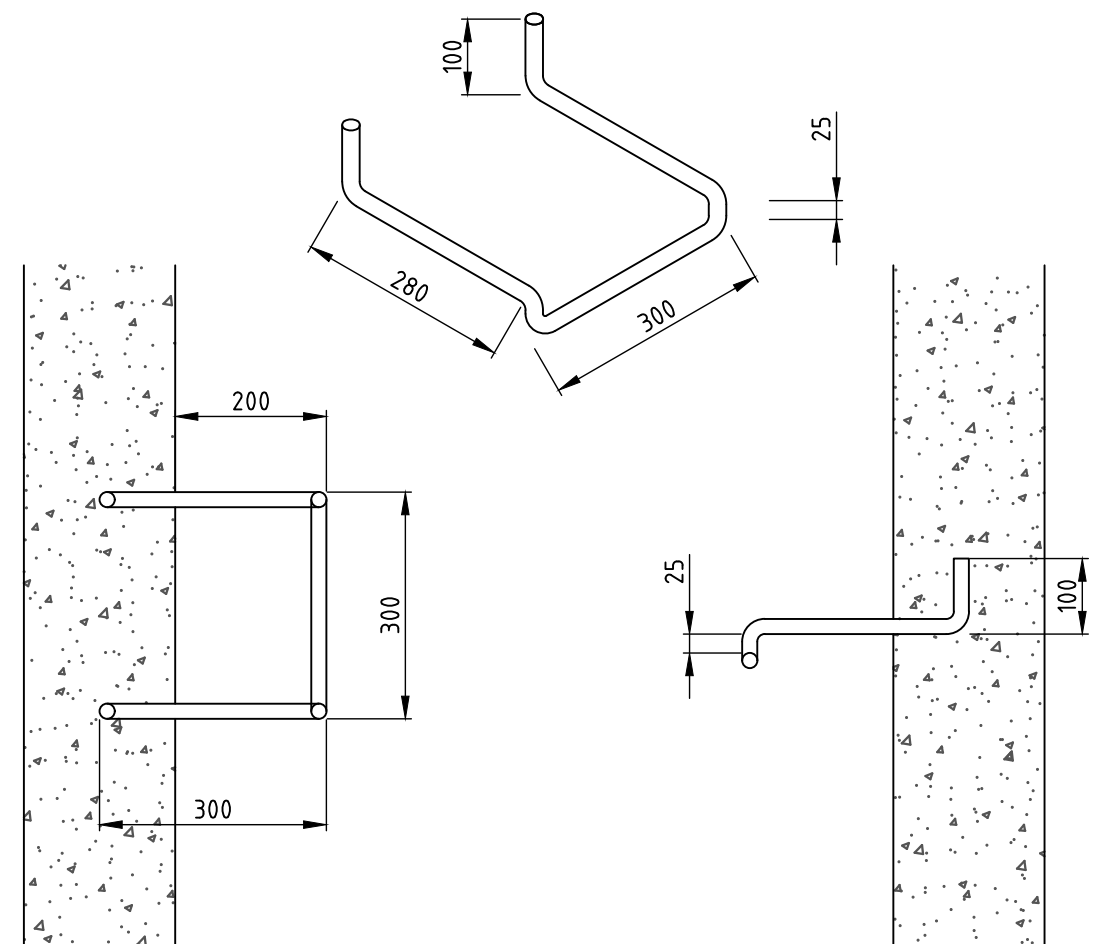
DRAWN: MMAI



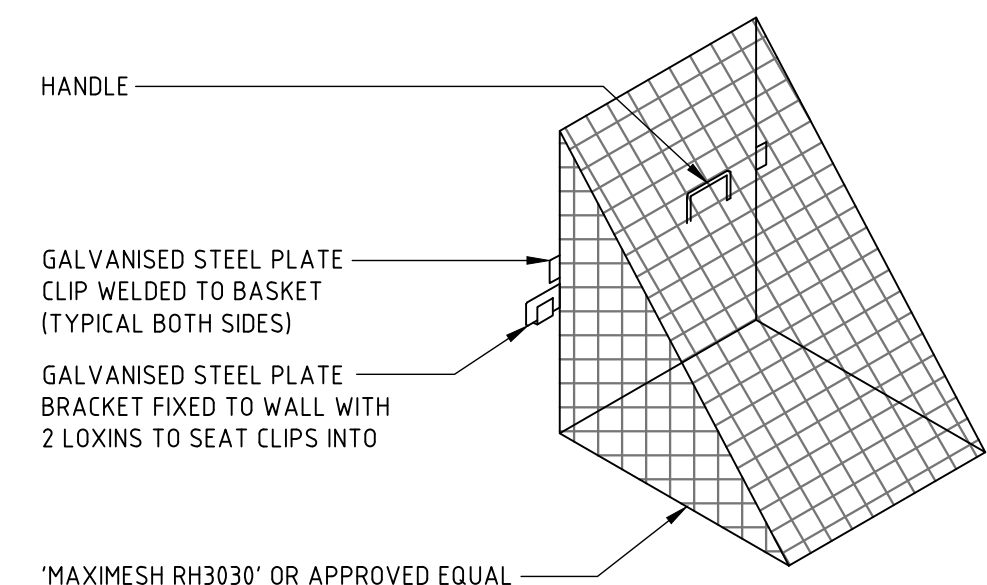
OSD BASE PLAN
SCALE 1:50



SECTION A-A
SCALE 1:50



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



TRASH SCREEN DETAIL
SCALE 1:10

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR CO-ORDINATION	C.B.		S.F.	04.08.21
02	ISSUED FOR DRAFT DEVELOPMENT APPLICATION	M.M.		A.C.	20.01.22

CLIENT

flower power

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SCALE 1:50 @ A1
SCALE 1:10 @ A1

0.0 0.5 1.0 1.5 2.0 2.5m
0.0 0.1 0.2 0.3 0.4 0.5m

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PROJECT

**FLOWER POWER
277 MONA VALE ROAD,
TERREY HILLS NSW**

DRAWING TITLE

OSD DETAILS

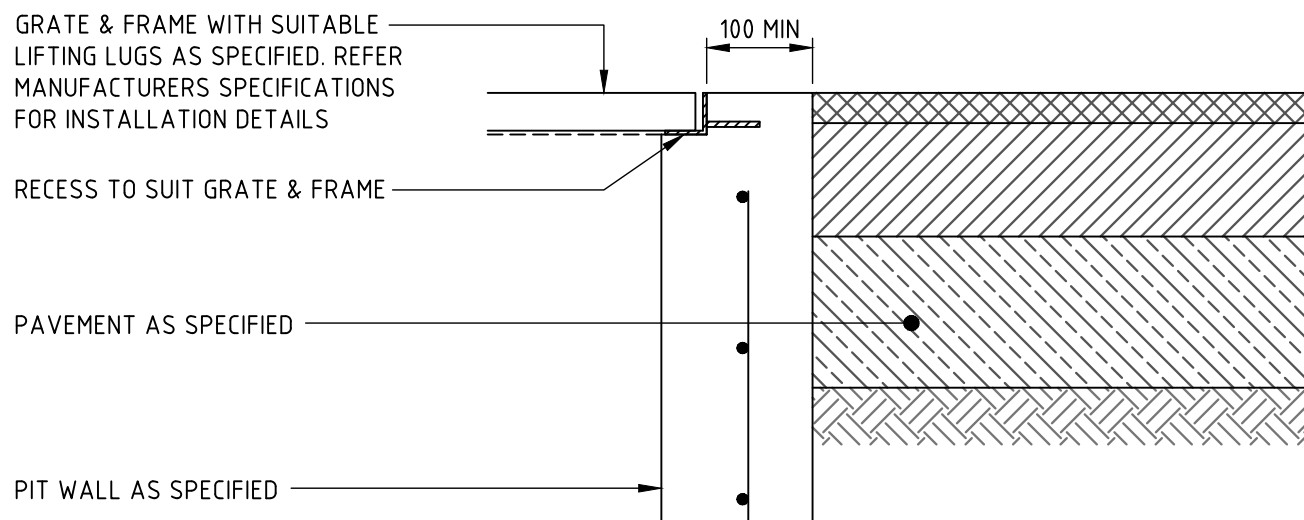
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211979

DRAWING NUMBER
DA6.01

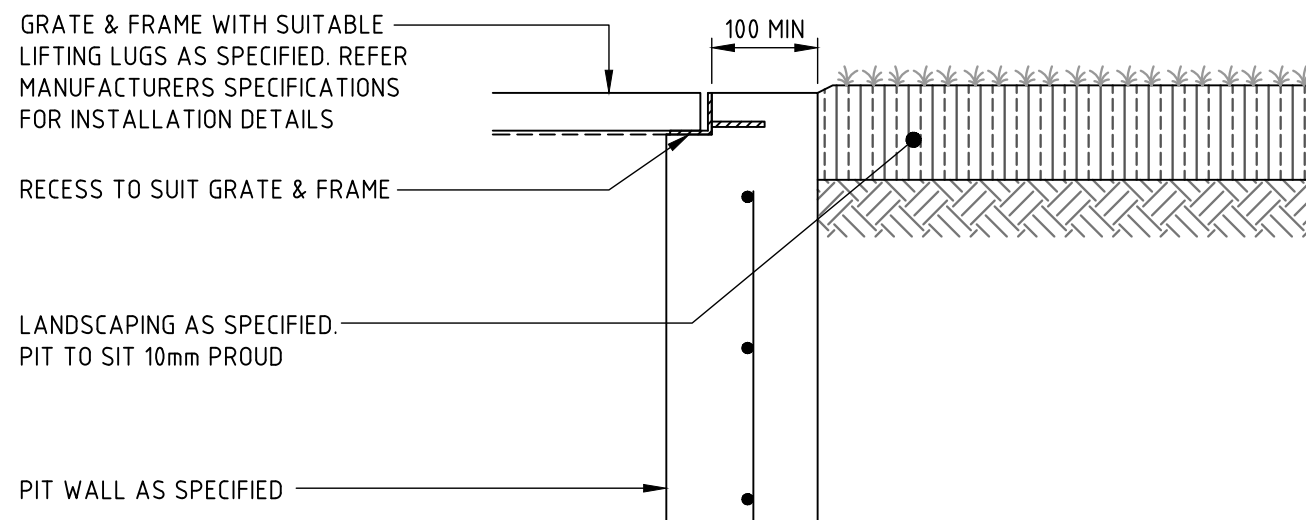
REVISION
02

DRAWING SHEET SIZE = A1

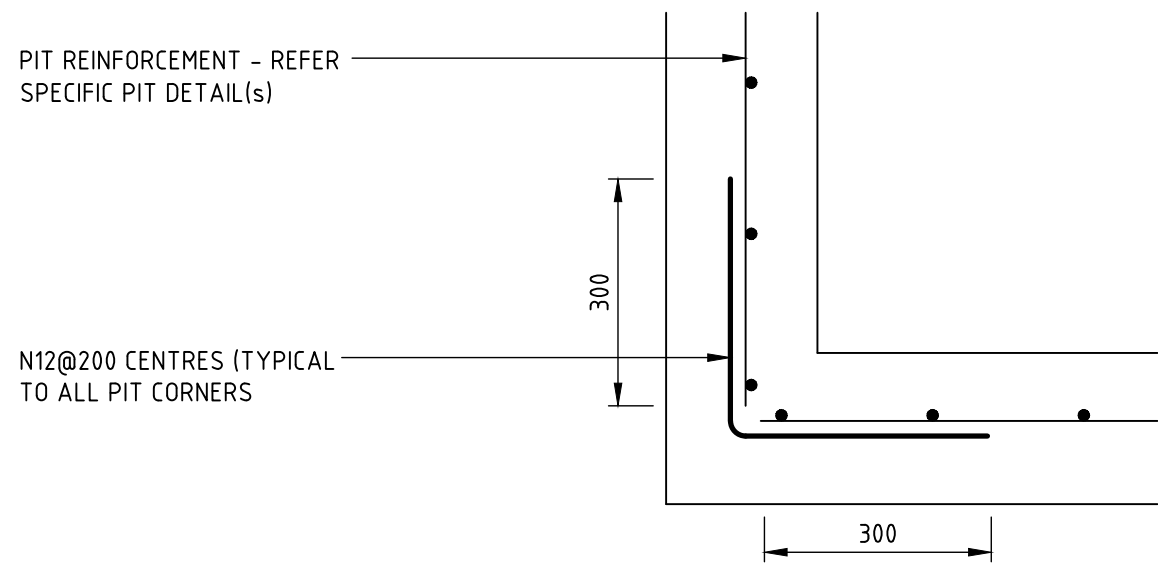
DESIGNED: J GRINSELL
JOB MANAGER: S FRYER
VERIFIER:
DRAWN: MMAI



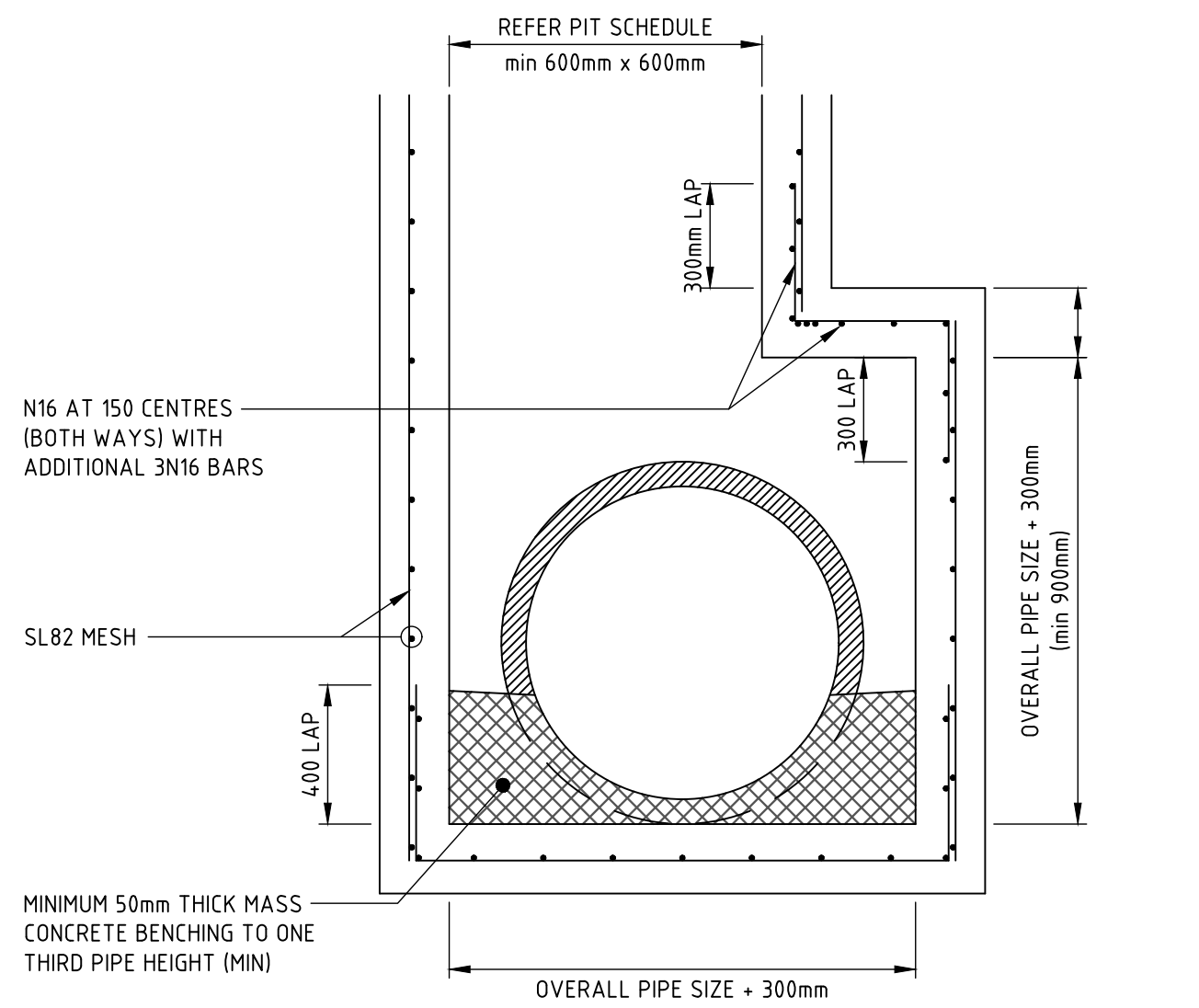
PIT INTERFACE - DETAIL 'A'
SCALE 1:10



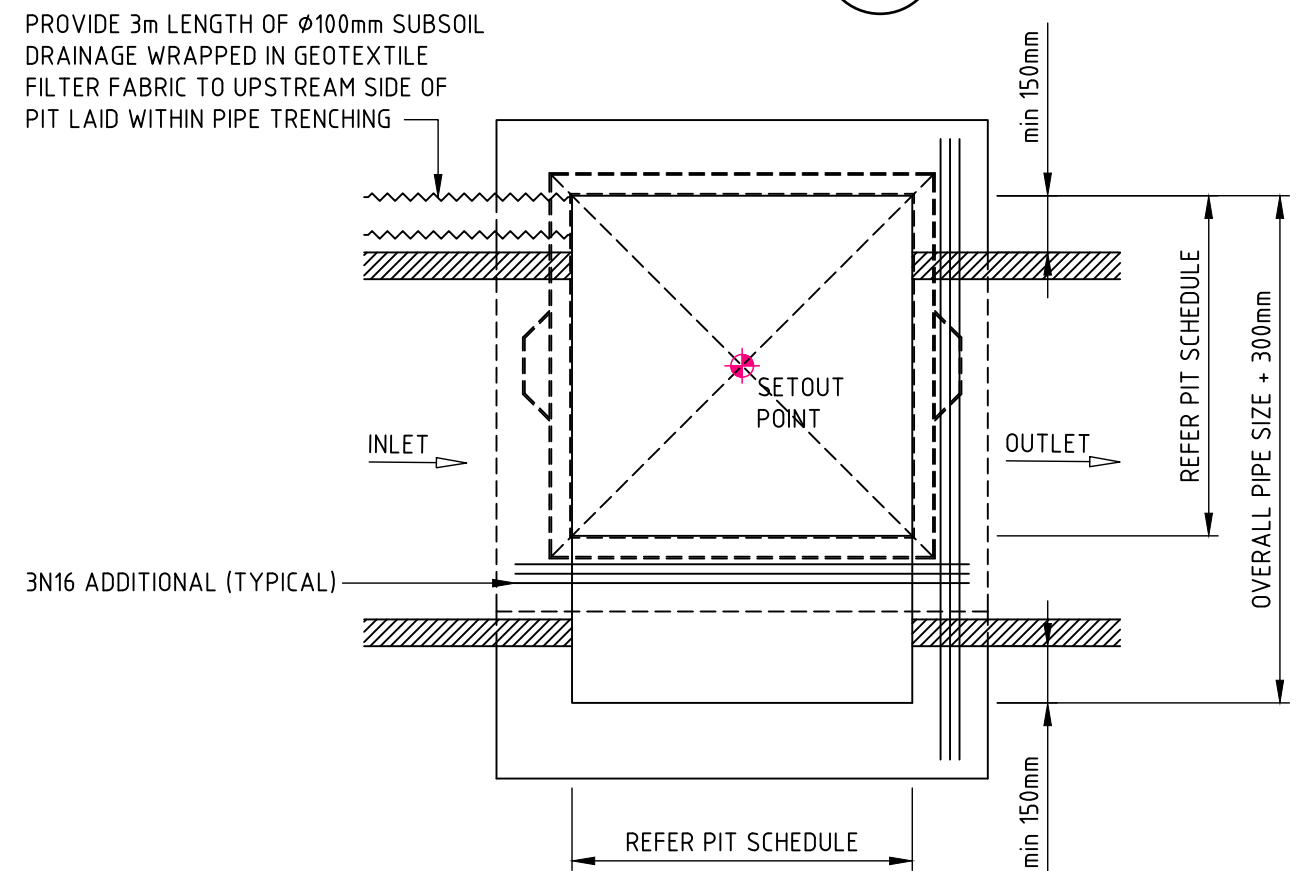
PIT INTERFACE - DETAIL 'B'
SCALE 1:10



PIT INTERFACE (PLAN VIEW)
APPLICABLE TO ALL STORMWATER DRAINAGE STRUCTURES
SCALE 1:10

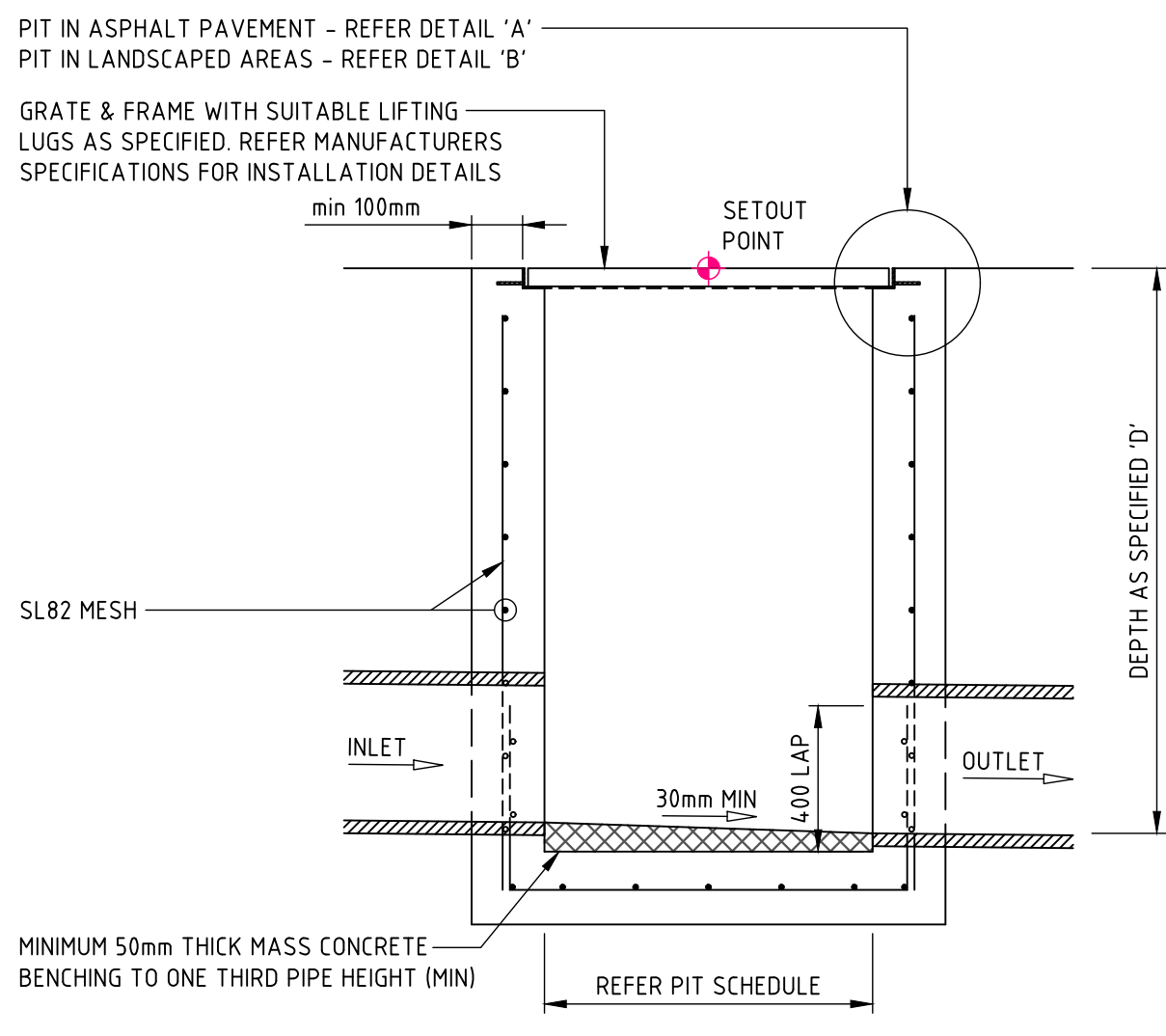


SECTION 1
SCALE 1:20

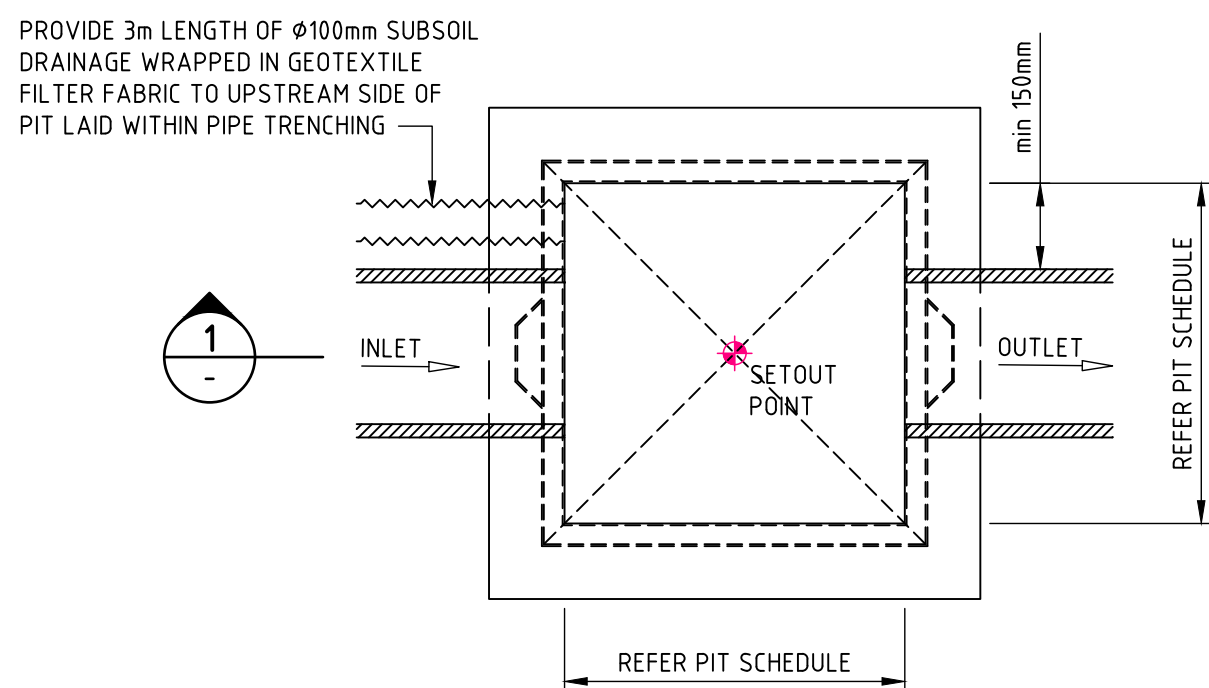


PLAN
DRAINAGE PIT - EXTENDED CHAMBER

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

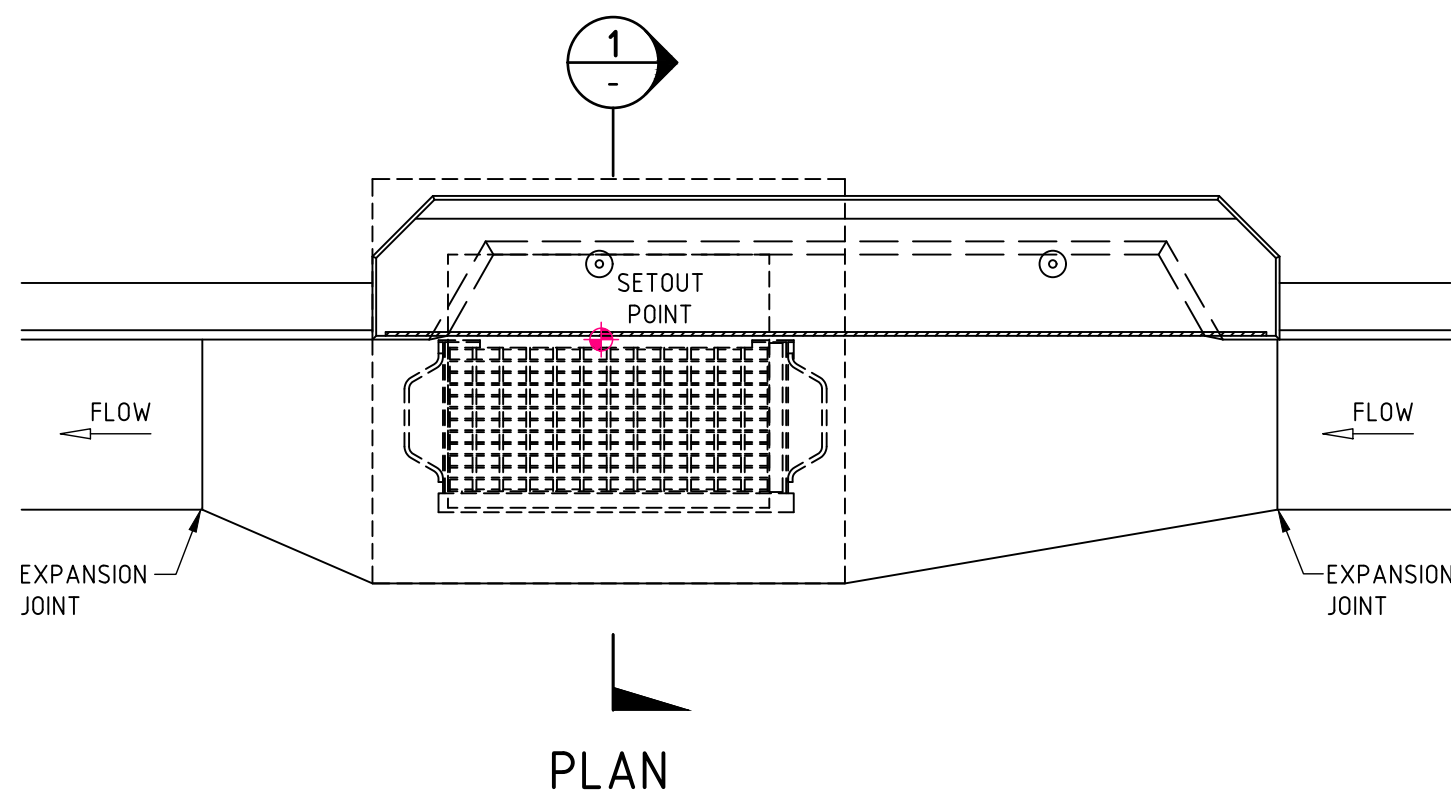


SECTION 1
SCALE 1:20

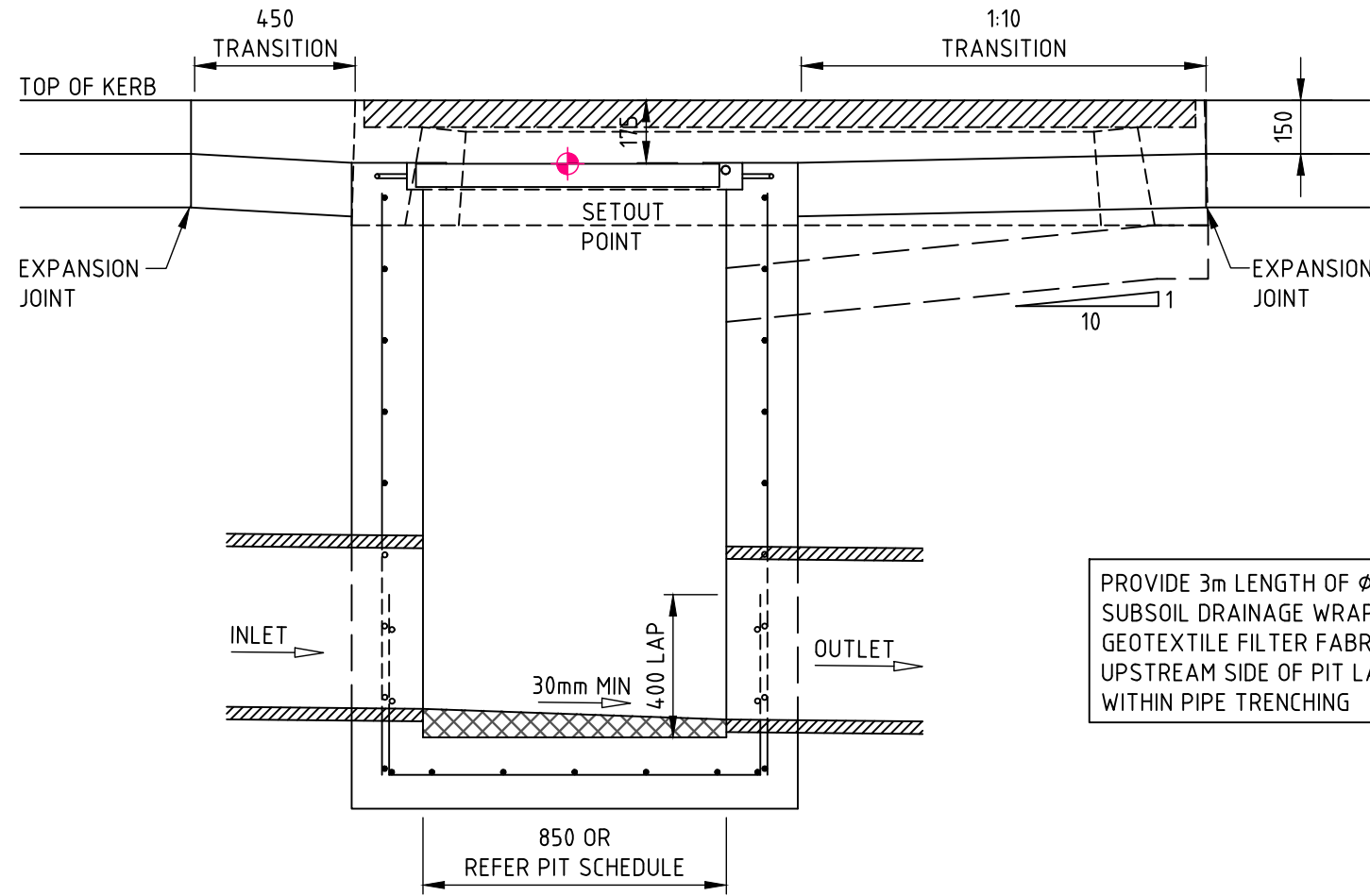


PLAN
SURFACE INLET 'SIP' / JUNCTION PIT 'JP'

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



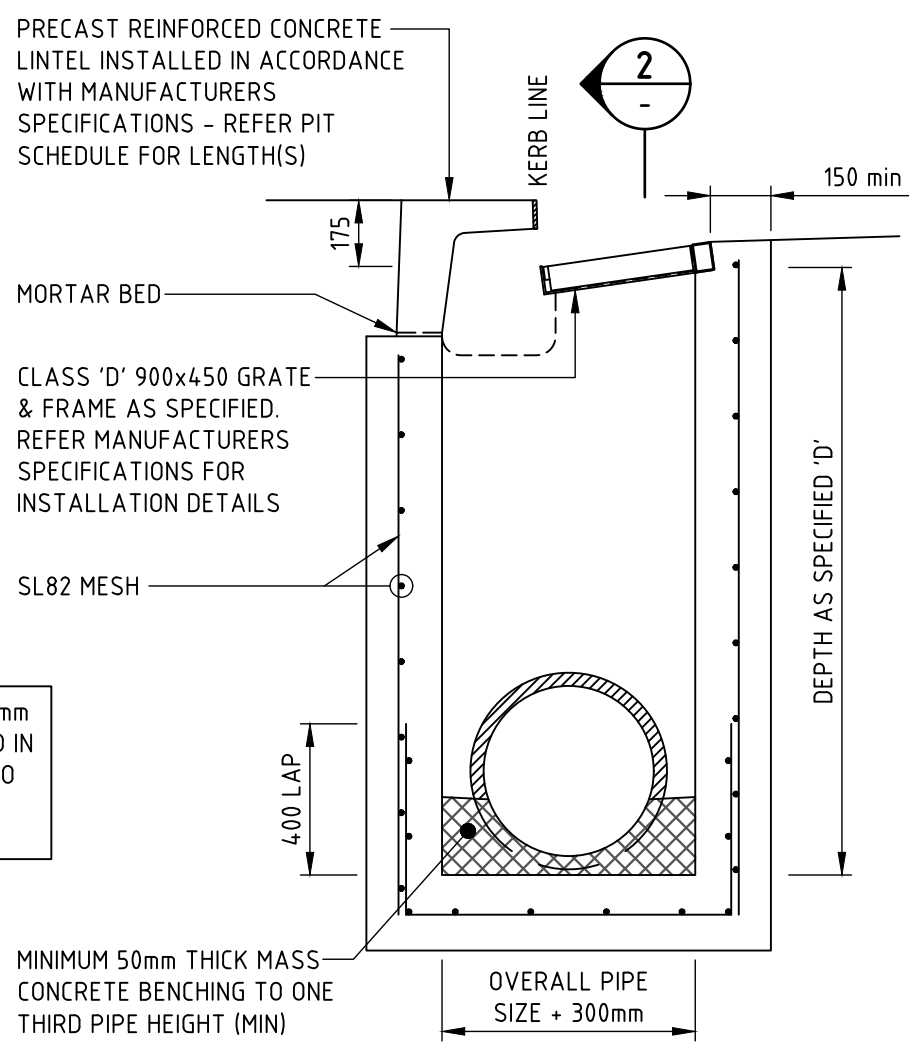
SECTION 2
SCALE 1:20

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

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

REFER EXTENDED CHAMBER PIT DETAIL FOR PIPEWORK IN EXCESS OF Ø450 AND WHERE REQUIRED



SECTION 1
SCALE 1:20

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT DEVELOPMENT APPLICATION	M.M.		A.C.	20.01.22

CLIENT	flower power
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SCALE 1:20 @ A1	0.0 0.2 0.4 0.6 0.8 1.0m
SCALE 1:10 @ A1	0.0 0.1 0.2 0.3 0.4 0.5m

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Email southcoast@northrop.com.au ABRN 81 094 433 100

PROJECT	FLOWER POWER 277 MONA VALE ROAD, TERREY HILLS NSW
---------	--

DRAWING TITLE	DETAILS - SHEET 01
---------------	---------------------------

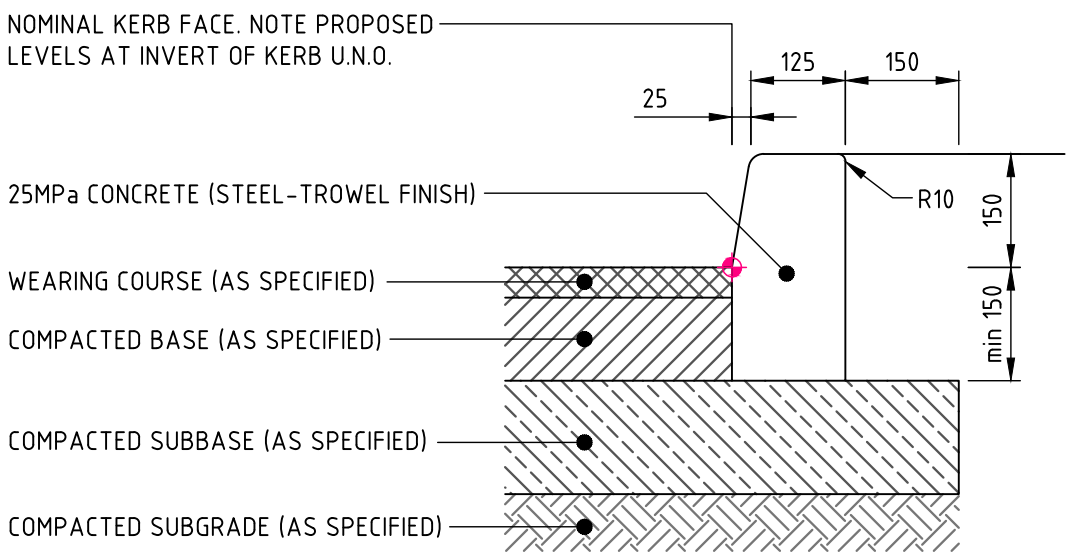
JOB NUMBER	211979
DRAWING NUMBER	DA6.02
REVISION	01
DRAWING SHEET SIZE	A1

VERIFIER:

JOB MANAGER: S.FRYER

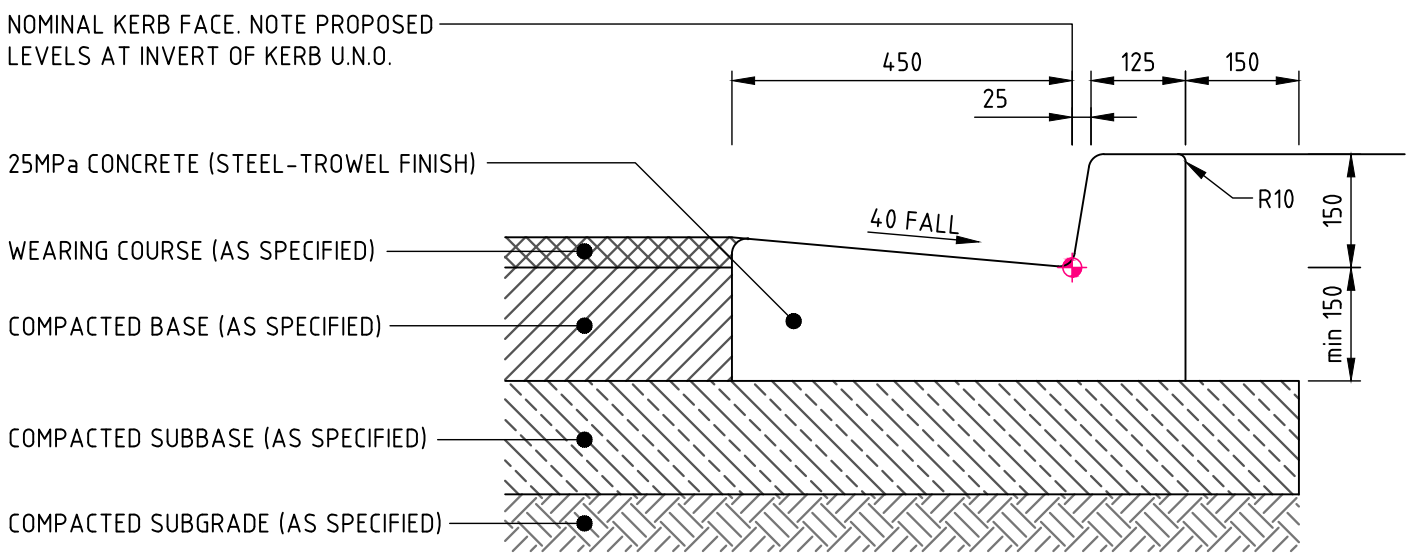
DESIGNED: J.GRINSELL

DRAWN: M.MAI



KERB ONLY 'K0'

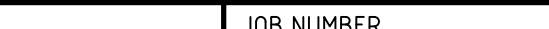
EXPANSION JOINTS @ MAX 12m CTRS / TOOL JOINTS @ MAX 3m CTRS
ALL RADII TO BE 20mm U.N.O.
SCALE 1:10



KERB & GUTTER 'KG'

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

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT	ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.	PROJECT	DRAWING TITLE	JOB NUMBER				
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