

**CIVIL ENGINEERING REPORT
INCORPORATING
WATER CYCLE MANAGEMENT
STRATEGY**

SSD 10436

**CSR ESTATE STAGE 2 MASTERPLAN
HORSLEY PARK NSW**

Prepared For:
**ESR Australia
Level 29
20 Bond Street
SYDNEY NSW 2000**

Prepared by:
**Costin Roe Consulting
Level 1, 8 Windmill Street
WALSH BAY NSW 2000**

Rev: D

DOCUMENT VERIFICATION

| | |
|-----------------------|--|
| Project Title | CSR Estate Stage 2 Masterplan |
| Document Title | Civil Engineering Report Incorporating Water Cycle Management Strategy |
| Project No. | Co12990.05 |
| Description | SSD report for future industrial estate (incorporating RTS) |
| Client Contact | Mr Paul Jewiss, ESR |

| | Name | Signature |
|--------------------|-----------------------|------------------|
| Prepared by | Terry Fong | |
| Checked by | Mark Wilson | |
| Issued by | Mark Wilson | |
| File Name | 12990.05-02d.rpt.docx | |

Document History

| Date | Revision | Issued to | No. Copies |
|---------------|-----------------|---------------------|-------------------|
| 20 Mar. 2020 | DRAFT | Mr Paul Jewiss, ESR | PDF |
| 30 Mar. 2020 | A | Mr Paul Jewiss, ESR | PDF |
| 24 June. 2020 | B | Mr Paul Jewiss, ESR | PDF |
| 16 July 2020 | C | Mr Paul Jewiss, ESR | PDF |
| 20 Oct 2020 | D | Mr Paul Jewiss, ESR | PDF |
| | | | |

TABLE OF CONTENTS

| | | |
|------------|---|-----------|
| 1 | INTRODUCTION & SCOPE | 4 |
| 2 | SITE DESCRIPTION AND PROPOSED DEVELOPMENT | 6 |
| 2.1 | Site Description | 6 |
| 2.2 | Proposed Development | 7 |
| 2.3 | CSR Estate Development Discussion | 7 |
| 3 | EARTHWORKS & FOUNDATIONS | 10 |
| 3.1 | Site Geography | 10 |
| 3.2 | Estate Earthworks | 10 |
| 3.3 | Site Earthworks | 11 |
| 3.4 | Groundwater | 11 |
| 3.5 | Embankment Stability | 12 |
| 3.6 | Supervision of Earthworks | 12 |
| 4 | ESTATE ROADS & ACCESS | 13 |
| 6 | WATER CYCLE MANAGEMENT STRATEGY & DRAINAGE METHODOLOGY | 14 |
| 6.1 | Key Areas and Objectives | 14 |
| 6.2 | Existing/ Estate Drainage System | 17 |
| 6.3 | Proposed Development Drainage System | 18 |
| 6.4 | Climate Change | 18 |
| 6.5 | Site Water Balance Objectives | 19 |
| 6.6 | Water Use Management Features | 19 |
| 6.6.1 | Existing | 19 |
| 6.6.2 | Proposed | 19 |
| 6.7 | Water Balance Assessment | 21 |
| 6.7.1 | Internal Base Water Demand | 21 |
| 6.7.2 | Fire Services Base Demand | 21 |
| 6.7.3 | Irrigation Base Water Demand | 21 |
| 6.7.4 | Rainwater Tank Sizing | 22 |
| 6.7.5 | Overall Water Cycle Management | 23 |

| | | |
|-------------|--|-----------|
| 6.8 | Operational Impact Assessment | 23 |
| 7 | WATER QUANTITY MANAGEMENT | 24 |
| 8 | STORMWATER QUALITY CONTROLS | 25 |
| 8.1 | Pollution Target Parameters | 25 |
| 8.2 | Proposed Stormwater Treatment System | 25 |
| 8.3 | Stormwater Quality Modelling | 26 |
| 8.3.1 | Introduction | 26 |
| 8.3.2 | Rainfall Data | 26 |
| 8.3.3 | Rainfall Runoff Parameters | 27 |
| 8.3.4 | Pollutant Concentrations | 27 |
| 8.3.5 | Treatment Nodes | 27 |
| 8.3.6 | Results | 28 |
| 8.3.7 | Modelling Discussion | 29 |
| 8.4 | Stormwater Harvesting | 30 |
| 8.5 | Maintenance and Monitoring | 30 |
| 9 | FLOODING | 36 |
| 10 | EROSION & SEDIMENT CONTROL PLAN | 38 |
| 10.1 | General Conditions | 38 |
| 10.2 | Land Disturbance | 38 |
| 10.3 | Erosion & Sediment Control Conditions | 39 |
| 10.4 | Pollution Control Conditions | 40 |
| 10.5 | Waste Management Conditions | 40 |
| 10.6 | Site Inspection and Maintenance | 40 |
| 11 | SEAR'S, AGENCY RTS ITEMS | 43 |
| 11.1 | SEAR's Response Items | 43 |
| 11.2 | Response to Submissions (RTS) Items | 46 |
| 12 | CONCLUSION | 51 |
| 13 | REFERENCES | 52 |

1 INTRODUCTION & SCOPE

Costin Roe Consulting Pty Ltd has been commissioned by ESR Australia to undertake a *Civil Engineering Report & Water Cycle Management Strategy (WCMS)* to accompany a State Significant Development Application (SSDA) with the NSW Department of Planning, Industry and Environment (DPIE) for the future industrial development of the land. This report presents a civil engineering assessment of a property. The site is located on the southern side of Burley Road, Horsley Park, Sydney, NSW. The proposed development is for the construction of industrial facilities on the four lots present on the site. Each industrial facility comprises a warehouse, office space, provision for truck loading, unloading and circulation, and for passenger vehicle parking. The development will be referred to The CSR Stage 2 Estate (CSRS2E) in this report.

This report provides an assessment of the civil engineering characteristics of the development site and technical considerations of the following aspects:

- Earthworks & geotechnical considerations;
- Roads and Access;
- Water Cycle Management Strategy (WCMS).

The WCMS comprises several key areas of stormwater and water management which are provided below. These key areas have been established with the aim to reduce impacts from the CSRS2E development on the surrounding environment and neighbouring properties and other stages within the ESR Estate. The water cycle management strategy identifies the management measures required to meet the targets set. The key water cycle management areas assessed in this report are:

- Storm Water Quantity;
- Storm Water Quality;
- Water Supply and Reuse;
- Flooding; and
- Erosion and Sediment Control

This engineering analysis is based on the development for industrial warehouse and logistic facilities consistent with industrial estates in the surrounding areas and Masterplan provided by ESR.

A request for SEAR's has been completed by ESR. Reference to **Appendix C** should be made for SSD_10436 SEAR's dated June 2020, and **Section 11** of this report for specific responses to civil engineering and water management related items included in the SEAR's.

Agency's Response to Submissions (RTS) have also been received for SSD_10436 and **Section 11** of this report specifically responds to the civil engineering and water management related items included the Agency's RTS.

The design has been completed in accordance with the *Stormwater Management Strategy* set as part of the approved *CSR Industrial Estate* as documented in Brown Consulting (now Calibre) *Stormwater Concept Plan (Ref: X13044 dated December 2013)*. It is noted

that the adopted Stormwater Management Strategy is consistent with the requirements of the site-specific *Development Control Plan* for the site “*Western City Employment Area – Fairfield City Council Development Control Plan 2016, Lot 1 DP106143, 327-335 Burley Road, Horsley Park*” dated March 2016.

The consent authority the DPIE, however noting due consideration to Fairfield City Council (FCC) requirements and the engineering and policy requirements of FCC, included in their *Stormwater Management Policy September 2017*, have also been considered in the design, where relevant. It is noted that some differences are present in the above noted DCP and current FCC policy. The engineering design has been completed in accordance with the DCP where differing requirements are present.

2 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 Site Description

Lot 1 of DP1228114 is located on the southern side of Burley Road in the suburb of Horsley Park as shown in **Figure 2.1**. In 2013, Development Application DA893.1/2013 was approved. The parcel of land being reviewed as part of this assessment comprises Stage 2 of the original CSR Estate subdivision approval (refer **Section 2.3**).



Figure 2.1. Locality Plan (Nearmap, 2019)

Review of the historical survey information shows that the land had varying levels across the entire site. The highest level on the site, at approximately RL83.00m AHD, is located on the western side of the site and the lowest level, at approximately RL 74.00m AHD, is in the middle portion of the site. It is noted that initial earthworks and grading works have been commenced by CSR for Lot 2 as per Nearmap image update.

Reference should be made to **Section 2.2** for the proposed development works and **Section 2.3** for discussion regarding the CSR Estate Works.

2.2 Proposed Development

The proposed development is for the construction of four (4) industrial buildings over 4 lots, comprising an area of 20.8 Ha. The masterplan layout is shown in **Figure 2.2**.

The masterplan layout shows development lots will vary between 4 Ha and 7.7 Ha in size with buildings varying between approximately 14,400m² to 43,000m² in size.

Developments generally comprise large steel framed warehouse/ distribution type building with associated office space, car parking, fire access roads, truck circulation and truck loading and unloading areas.

Access to all lots would be made via CSR Estate Access Road (refer **Section 2.3**).

Infrastructure works (including bulk earthworks, provision of services, drainage connections, road & intersection construction) are to be completed by CSR under separate FCC approval as discussed in **Section 2.3**.

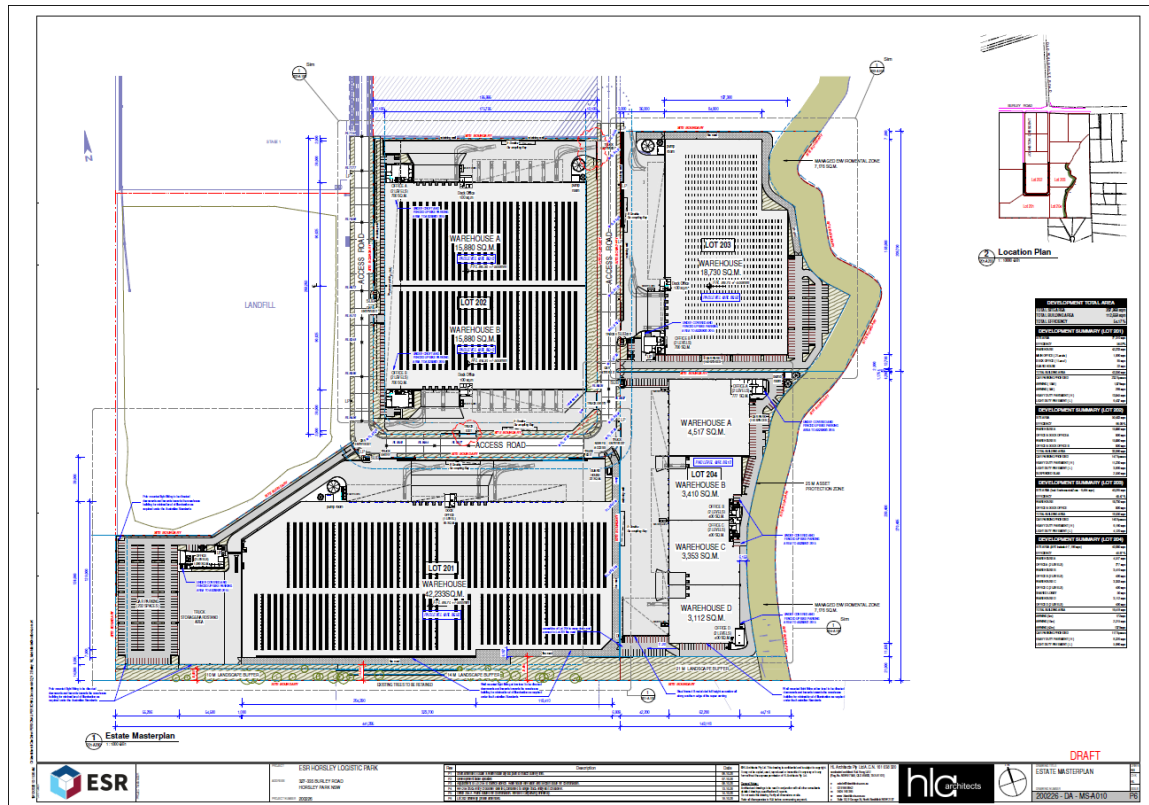


Figure 2.2. Proposed Development

2.3 CSR Estate Development Discussion

DA893.1/2013 was lodged with FCC in December 2013 & approved by the Land and Environment Court in July 2015. The approved DA included the proposed development of the 74.48 Ha estate which is proposed to be constructed in three stages.

Stage 1 has been completed and is currently being developed by others under separate approvals with FCC.

Stages 2 is located in the southern portion of the overall estate and includes the area subject to this application. Stage 3 has not commenced construction and is noted to be outside the scope of this report.

The infrastructure works for Stage 1 and 2 include bulk earthworks and infrastructure servicing construction including estate roadways, trunk drainage and individual drainage connections, water supply, sewer, power and telecommunications.

Bulk Earthworks plans provided by Calibre Group have been applied and approved through a Section 4.55 application with FCC for the infrastructure works (refer **Appendix D**). These works are currently being constructed and will be finalised, or close to be finalised, prior to possession of the development lots by ESR.

The Stage 1 & 2 works will encompass the construction of the proposed 20m wide access road off the Burley Road reserve and a temporary turning head and stormwater infrastructure as shown in **Figure 2.3**. The general arrangement of the handover conditions for Stage 2 are shown in **Figure 2.4**.

The indicative master-planning for the site after the completion of all 3 stages incorporates an access road which loops the site, intersecting with Burley Road & the Reserved Road and provides access to development lots within the site. The new access road and associated intersections will be constructed to FCC requirements and ownership transferred to Fairfield Council. Large development lots will flank either side of the access road. Development lots will vary in size, typically in the order of 1.51 Ha to 13.35 Ha. The final layout will be subject to market demands and the preferred architectural layout. Development lots will be sympathetic to the topography of the land.

The requirements for future developments and sites within the CSR land have been included in the site-specific *Development Control Plan* for the site “*Western City Employment Area – Fairfield City Council Development Control Plan 2016, Lot 1 DP106143, 327-335 Burley Road, Horsley Park*” dated March 2016. These include stormwater management requirements for water quantity and quality as set out in **Sections 7 & 8** of this report.

The Stage 2 to be completed by CSR are documented on Calibre Consulting “*Stage 2A & 2B Subdivision Design*” package 15-001115.13 and these drawings are included for information in **Appendix D**.



Figure 2.3. Lot Layout Plan As Approved Under DA893.1/2013

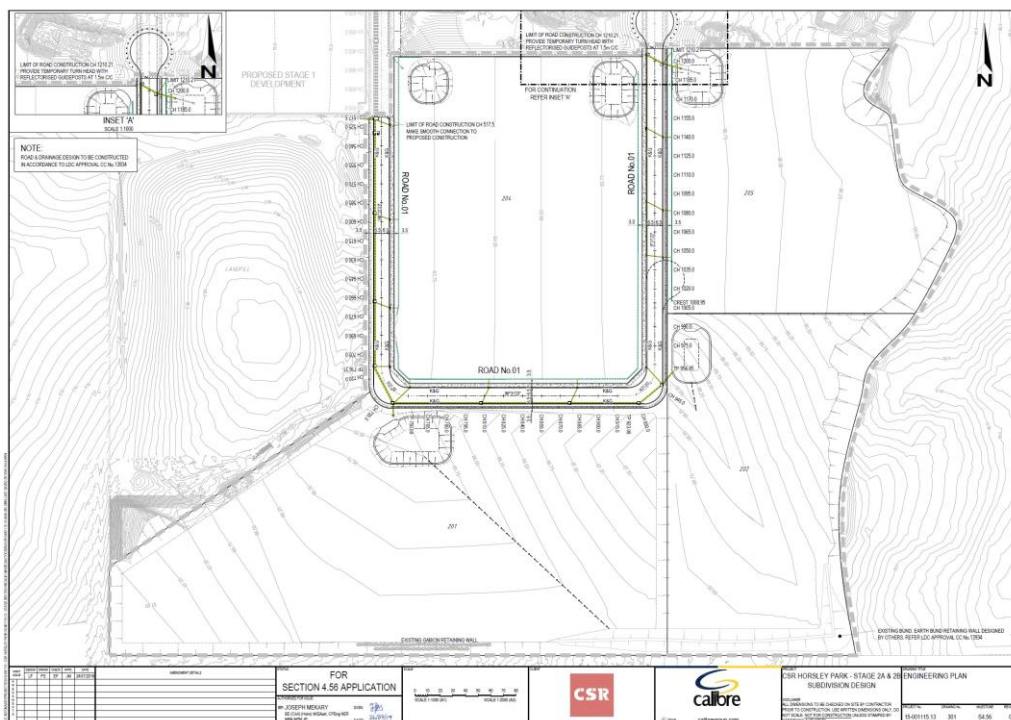


Figure 2.4. Stage 2 Handover Arrangement

3 EARTHWORKS & FOUNDATIONS

3.1 Site Geography

The site has historically (since mid-1970s) been utilised for extractive industry to enable the manufacturing of bricks. Prior to this it is expected that the ground surface once exhibited undulating terrain that was most likely covered in natural bush or grassland. Since the development of the brick manufacturing plant extensive excavation has occurred, reportedly up to 35m deep.

A preliminary geotechnical investigation was performed by Douglas Partners (DP) during October 2013. Furthermore, in the Statement of Environmental Effects for a Subdivision (December 2012) report by Brown Consulting, an analysis of the geotechnical report by Douglas Partners has been undertaken. The following summary is based on information contained in the Brown Consulting Report (December 2015).

“The geotechnical investigation by Douglas Partners was carried out to assess the subsurface conditions, which included a combination of cone penetration and boreholes, in order to provide information on:

- Depth of quarry pits;
- Preliminary extent of quarry pits;
- Composition of back fill material;
- Site preparation and earthworks; and
- Anticipated construction difficulties and potential solutions.

The report identifies several geotechnical constraints to the development on the site including:

- The presence of deep brick pits;
- The partial backfilling of the brick pits with large volumes of uncontrolled filling;
- The presence of many large stockpiles of soil and ripped rock (mostly clay and shale) situated both within the brick pits and scattered across the surrounding site areas; and
- The effects of the kilns on the soils below and surrounding the kilns within the existing brick manufacturing plant.

These geotechnical constraints do not include the existing brick manufacturing facility which includes several large warehouse and office buildings, kilns and areas of hardstand pavements which have not been assessed as part of the preliminary assessment as it was understood that they would be retained for some time in the future.

3.2 Estate Earthworks

Bulk earthworks are currently being performed throughout the Stage 2 development area to facilitate the development of individual development site in the estate for industrial warehouse distribution use. The works have been approved by FCC and are being completed by CSR. The approved design has been documented on Calibre Consulting “*Stage 2A & 2B Subdivision Design*” package 15-001115.13 (refer **Appendix D**).

The earthworks are being undertaken with the objective to provide large flat building pads, facilitate site access & to drain the site stormwater via gravity and to fill previous brick pits and other quarry works associated with CSR activities on the land.

Earthworks being performed for the Stage 2 development area include pads with nominal grading and levels between RL 90.5m AHD to RL 83.5m AHD. Site generally grade from the south-east to north/ north-west of the stage area. Estate Erosion and Sediment Controls have been nominated on the Calibre design package and these measures should remain in place throughout the works period.

Retaining walls are also being constructed on the perimeter of the site to allow for future building works.

These works, as noted, are ongoing and will be finalised prior to development of individual development lots by ESR.

3.3 Site Earthworks

Minor earthworks only will be required as part of the industrial building development works. These works would include final trimming and shaping of the site to suit the detailed architectural site layout, final pavement and coordination of subgrade levels with slab profiles and grading to suit drainage requirements.

Details of earthworks would be provided during detail design/ construction certificate stages of the development. Detailed assessment of the earthworks level will be completed during detailed design stage and some adjustment to the final pad and building floor levels (within +/-500mm of those nominated on masterplan layouts) may be required subject to final geotechnical testing, topsoil assessments and bulking/compaction allowances. It is noted that Lots 201 and 204 have maximum heights as set through Land and Environment Court decision and this is noted to limit any increase in height noted above.

Soil erosion and sediment control measures including sedimentation basins will also be provided for the development – please refer to the Soil and Water Management Plan in **Section 7** of this report.

Any site-specific soil erosion and sediment control measures required to suit the ESR development layout will be performed in accordance with *Landcom Managing Urban Stormwater, Soils and Construction (1998) – The Blue Book*. Please refer to the Soil and Water Management Plan in **Section 10** of this report.

Cut earthworks over the site will be minor, and no major changes or impacts to groundwater is expected because of these works.

3.4 Groundwater

Given the proposed works involve minor changes to the earthworks levels completed as part of separate approvals, the impact on the overall groundwater system as a result of the proposed earthworks over the site is expected to be low.

The effect on impact is considered to meet the requirements of the SEARS and initial responses by the NSW DPI.

3.5 Embankment Stability

To assist in maintaining embankment stability, permanent batter slopes in clay will be no steeper than 3 horizontal to 1 vertical while temporary batters will be no steeper than 2 horizontal to 1 vertical. This is in accordance with the recommended maximum batter slopes for residual clays and shale which are present in the area.

Permanent batters will also be adequately vegetated or turfed which will assist in maintaining embankment stability.

Stability of batters and reinstatement of vegetation shall be in accordance with the submitted drawings and the Soil and Water Management Plan in **Section 10**.

3.6 Supervision of Earthworks

All geotechnical testing and inspections performed during the earthwork's operations will be undertaken to Level 1 geotechnical control, in accordance with AS3798-2007.

4 ESTATE ROADS & ACCESS

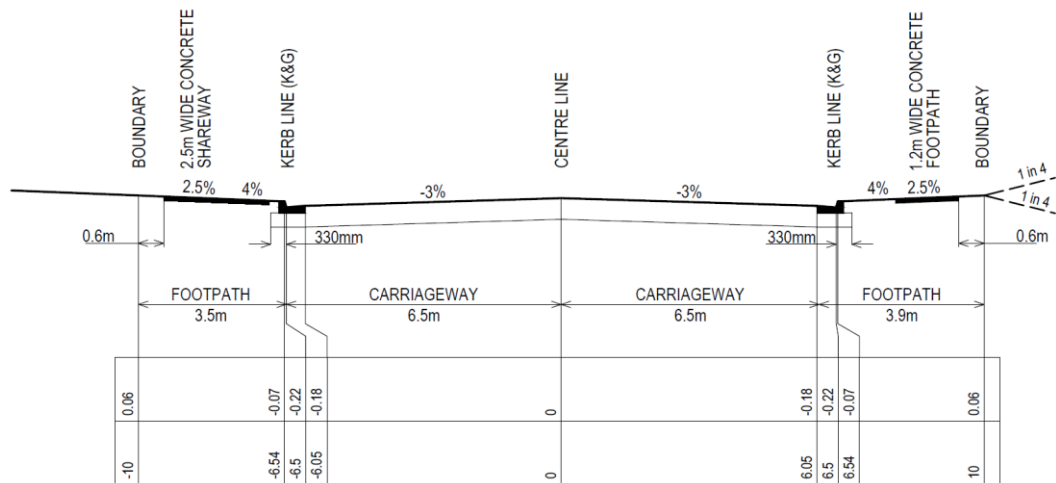
All development lots will gain access off CSR Estate Access Road. The estate road and associated infrastructure is currently being constructed by CSR under separate FCC approvals. This access road is noted to emanate from Reserved Road and Burley Road via a 20m wide internal loop road.

A road reserve width of 20m has been adopted for the estate from the typical local road from Fairfield City Council’s Industrial Development Control Plan and can accommodate the turning paths for industrial vehicles. The local road section includes a 13m wide carriageway and 3.5m footways. The proposed loop road has two access points, creating an intersection with Reserved Road and an intersection on Burley Road. The intersection with Burley Road is positioned to create a four-way intersection with Old Wallgrove Road in accordance with the future regional road.

The road comprises a 13.0m wide crowned carriageway with concrete kerb and gutter and carriageway surface finished with asphaltic concrete as per the requirements of Fairfield City Council. The typical section is shown below.

It is noted that no road construction is proposed as part of this SSDA. Information contained in this section is provided for information only.

Refer to **Appendix D** for Stage 2 road engineering designs currently being constructed by CSR under separate FCC approvals.



TYPICAL CROSS SECTION - ROAD No.01

CH 0 to CH 720 & CH 998.03 to END

SCALE 1:100 (NATURAL)

Figure 4.2. Estate Road – Typical Cross Section (as adopted)

6 WATER CYCLE MANAGEMENT STRATEGY & DRAINAGE METHODOLOGY

6.1 Key Areas and Objectives

Water Cycle Management (WCM) is a holistic approach that addresses competing demands placed on a region's water resources, whilst optimising the social and economic benefits of development in addition to enhancing and protecting the environmental values of receiving waters.

Developing a WCMS at the SSDA stage of the land development process provides guidance on urban water management issues to be addressed for the estate and development as a whole.

This WCMS has been prepared to inform the DPIE and FCC that the development is able to provide and integrate WCM measures into the stormwater management strategy for estate. It presents guiding principles for WCM across the precinct which includes establishing water management targets and identifying management measures required for future building developments to meet these targets, and to confirm consistency with the *Western City Employment Area – Fairfield City Council Development Control Plan 2016, Lot 1 DP106143, 327-335 Burley Road, Horsley Park*.

Several WCM measures have been included in the WCMS and engineering design, which are set out in this report and the attached drawings. The key WCM elements and targets which have been adopted in the design are included in **Table 6.1** following.

| Element | Target | Reference | | | | | | | | | | | | | | | | | | | | |
|-------------------------------------|---|---|------------|------------------------|-----------------------------|------------------|------|---------------------------|-----|--------------------|--|------------------|-----|------------------------|-----|------------------|-----|----------------|-----|--------------------|-----|--|
| Water Quantity | <p>Maintaining or improving the volume of stormwater flows to estate infrastructure from development lots.</p> <p>Storage Requirement (SSR) and Permissible Site Discharge (PSD) based on the individual lot areas as outlined below:</p> <table border="1"> <thead> <tr> <th>Attribute</th> <th>5 year ARI</th> <th>100 year ARI</th> </tr> </thead> <tbody> <tr> <td>PSD* (m³/s/ha)</td> <td>0.15</td> <td>0.28</td> </tr> <tr> <td>SSR* (m³/ha)</td> <td>170</td> <td>290</td> </tr> </tbody> </table> | Attribute | 5 year ARI | 100 year ARI | PSD* (m ³ /s/ha) | 0.15 | 0.28 | SSR* (m ³ /ha) | 170 | 290 | <p>DPI</p> <p><i>Table 3 of Western City Employment Area – Fairfield City Council Development Control Plan 2016, Lot 1 DP106143, 327-335 Burley Road, Horsley Park</i></p> | | | | | | | | | | | |
| Attribute | 5 year ARI | 100 year ARI | | | | | | | | | | | | | | | | | | | | |
| PSD* (m ³ /s/ha) | 0.15 | 0.28 | | | | | | | | | | | | | | | | | | | | |
| SSR* (m ³ /ha) | 170 | 290 | | | | | | | | | | | | | | | | | | | | |
| Water Quality | <p>Load-based pollution reduction targets based on an untreated urbanised catchment for whole of Estate:</p> <table> <tr> <td>Gross Pollutants</td> <td>90%</td> </tr> <tr> <td>Total Suspended Solids</td> <td>85%</td> </tr> <tr> <td>Total Phosphorus</td> <td>65%</td> </tr> <tr> <td>Total Nitrogen</td> <td>45%</td> </tr> <tr> <td>Total Hydrocarbons</td> <td>90%</td> </tr> </table> <p>Load-based pollution reduction targets based on an untreated urbanised catchment for individual lots:</p> <table> <tr> <td>Gross Pollutants</td> <td>90%</td> </tr> <tr> <td>Total Suspended Solids</td> <td>93%</td> </tr> <tr> <td>Total Phosphorus</td> <td>74%</td> </tr> <tr> <td>Total Nitrogen</td> <td>48%</td> </tr> <tr> <td>Total Hydrocarbons</td> <td>90%</td> </tr> </table> | Gross Pollutants | 90% | Total Suspended Solids | 85% | Total Phosphorus | 65% | Total Nitrogen | 45% | Total Hydrocarbons | 90% | Gross Pollutants | 90% | Total Suspended Solids | 93% | Total Phosphorus | 74% | Total Nitrogen | 48% | Total Hydrocarbons | 90% | <p><i>Western City Employment Area – Fairfield City Council Development Control Plan 2016, Lot 1 DP106143, 327-335 Burley Road, Horsley Park</i></p> |
| Gross Pollutants | 90% | | | | | | | | | | | | | | | | | | | | | |
| Total Suspended Solids | 85% | | | | | | | | | | | | | | | | | | | | | |
| Total Phosphorus | 65% | | | | | | | | | | | | | | | | | | | | | |
| Total Nitrogen | 45% | | | | | | | | | | | | | | | | | | | | | |
| Total Hydrocarbons | 90% | | | | | | | | | | | | | | | | | | | | | |
| Gross Pollutants | 90% | | | | | | | | | | | | | | | | | | | | | |
| Total Suspended Solids | 93% | | | | | | | | | | | | | | | | | | | | | |
| Total Phosphorus | 74% | | | | | | | | | | | | | | | | | | | | | |
| Total Nitrogen | 48% | | | | | | | | | | | | | | | | | | | | | |
| Total Hydrocarbons | 90% | | | | | | | | | | | | | | | | | | | | | |
| Flooding | <p>Buildings and road set 500mm above 1% AEP.</p> <p>No affectation to upstream downstream or adjoining properties as a result of development</p> | <p>NSW Floodplain Development Manual.</p> | | | | | | | | | | | | | | | | | | | | |
| Water Supply | <p>Reduce water consumption in non-residential properties by 40% consistent with the BASIX Scheme</p> | <p>FCC Stormwater Policy 2017</p> | | | | | | | | | | | | | | | | | | | | |
| Erosion and Sediment Control | <p>Appropriate erosion and sedimentation control measures must be described in the environmental assessment for all stages of construction to mitigate potential impacts to downstream areas.</p> | <p>Landcom Blue Book Fairfield City Council DPI</p> | | | | | | | | | | | | | | | | | | | | |

Table 6.1. WCM Targets

A summary of the how each of the WCM objectives will be achieved are described below. Reference to the relevant sections of the report should be made for further and technical details relating to the WCM measures:

- *Stormwater Quantity Management (Refer Section 7)*

The intent of this criterion is to reduce the impact of urban development on existing drainage system by limiting post-development discharge within the receiving waters to the pre-development peak, and to ensure no affectation of upstream, downstream or adjacent properties.

Attenuation of stormwater runoff from the development is proposed to be managed via a series of measures provided on-lot for each individual development site.

The intention is for water quantity measures to be provided on each development lot. This will mean that the development can be assessed, approved and constructed without the need for estate level detention basins.

The site storage rate and site discharge rate has been defined for development lots in the estate DCP and allows for post development discharge to be limited to pre-development discharge, and also considers the roadways which do not include attenuation.

Reference to drawings **Co12990.05-SSDA40 to SSDA44** should be made for each of the lot's stormwater management plans. These drawings are provided to demonstrate how the stormwater management objectives can be achieved. It is noted that these drawing are provided for information only and the final system for each individual development would depend on site constraints and final layout. It is noted that although a different system may be adopted, the required stormwater management objectives are to be met for all developments.

Refer to **Section 7** of the document for detailed sizing of detention systems.

- *Stormwater Quality Management (Refer Section 8)*

There is a need to target pollutants that are present in stormwater runoff to minimise the adverse impact these pollutants could have on downstream receiving waters.

The required pollutant reductions are included in **Table 6.1** of this document and MUSIC modelling has been completed to confirm the reduction objectives can be met for the development.

A series of Stormwater quality improvement devises (SQID's) have been incorporated in the design of the estate. The proposed management strategy will include the following measures:

- Development sites will require full on lot treatment. Individual lots will need to design and model stormwater treatment measures (which meet objectives per **Table 6.1**).
- Individual measures have been proposed for each development lot and include treatment trains of gross pollutant traps (GPT's) in the form of pit inserts, proprietary filters and raingardens/ bio-retention. Reference to drawing **Co12990.05-SSDA40** should be made for a typical stormwater development strategy for a typical warehouse site.

Reference to **Section 8** of this document should be made for detailed Stormwater Quality modelling and measures.

- *Flood Management (refer Section 9)*

The proposed development and CSR Estate is noted to be free from any known flooding or overland flow paths. Limited consideration to flooding and/ or overland flow from large rainfall events is required for the development.

- *Water Demand Reduction/ Rainwater Reuse*

Rainwater reuse measures will be provided as part of future building development designs. Rainwater reuse will be required to provide a minimum rainwater tank which reduces demand on non-potable uses by at least 40%. The reduction in demand will target non-potable uses such as toilet flushing and irrigation. Refer to **Section 6.6**.

6.2 Existing/ Estate Drainage System

Lot 1 DP1228114 in which the CSR Estate is located had limited pre-existing formal drainage systems. As part of previous site uses, there was a warehouse facility and a brick quarry surrounded by dams & natural vegetation. The pre-construction site primarily drains to a small tributary of Ropes Creek on the north of the estate, which connects to the main Ropes Creek channel downstream of the Sydney Water Pipeline, approximately 1km northwest of the site.

A trunk drainage system for minor storm events through a conventional pit and pipe system has now been constructed as part of the estate infrastructure and Stage 1 & 2 construction. Multiple lot discharge connection points, in the form of RCP pipe stubs, have been provided as part of the constructed estate drainage system for allowance for discharge and conveyance of individual lot developments. Refer **Section 2.3** and **Appendix D** for the estate drainage layout.

The minor system within the estate roads consists of a piped drainage system which has been designed and constructed to accommodate the 1 in 5-year ARI storm event (Q5), which is the minimum required by Fairfield City Council. Normal industry practice for an industrial facility is that the in-ground pipe system would be designed to cater for the 1 in 20-year ARI storm event (Q20) event to ensure suitable operation of the facility during the majority of storm events. The difference in design ARI's will result in the reduced ability for the site drainage to discharge effectively to the infrastructure drainage system. There is also the potential for surcharging of the site drainage system within the property or at the interface of the site and infrastructure drainage systems during storms in the range of 1 in 5 to 1 in 20-year ARI.

6.3 Proposed Development Drainage System

As per general engineering practice, the client requirements, the guidelines of FCC and the Estate DCP, the proposed stormwater drainage system for the estate development will comprise a minor and major system to safely and efficiently convey collected stormwater run-off from the development to the legal point of discharge.

The minor system is to consist of a piped drainage system which has been designed to accommodate the 1 in 20-year ARI storm event (Q20). This results in the piped system being able to convey all stormwater runoff up to and including the Q20 event. The major system will be designed to cater for storms up to and including the 1 in 100-year ARI storm event (Q100). The major system will employ the use of defined overland flow paths, such as roads and open channels, to safely convey excess run-off from the site.

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, the standards of PCC and accepted engineering practice. Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage. Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication “Australian Rainfall and Runoff” (1988 Edition), Volumes 1 and 2 (AR&R).

Water management measures as set out in **Table 6.1** are to be adopted to address water quality, quantity and re-use requirements are to be considered in the design to ensure that any increase in the detrimental effects of pollution are mitigated, Water Quantity Objectives are met and that the demand on potable water resources is reduced.

The legal point of discharge is a point specified by Council (or other appropriate consent authority) where stormwater from a property can be discharged. The legal point of discharge is usually Council's stormwater infrastructure (where available), the street kerb and channel for smaller developments or downstream receiving waters like an existing stream or gully, lake, pond or waterbody.

Legal discharge for each development lot is to trunk drainage constructed by CSR as described in **Section 2.3** and **Appendix D**. Refer Costin Roe Consulting drawings included in **Appendix A** for site specific drainage layout, stormwater management measures and civil engineering considerations.

6.4 Climate Change

An assessment has been undertaken for the effect of climate change on the development. The assessment takes into consideration potential effect from increased rainfall intensity and sea level rise.

The effect on development has been assessed for a 10% increase in rainfall intensity. This increase is considered representative of potential climate change impacts for the Western Sydney area (being consistent with projected rainfall increases in accordance with the New South Wales Department of Environment and Climate Change (DECC) ‘Floodplain

Risk Management Guideline Practical Consideration of Climate Change' (Table 1, October 2007).

This assessment shows that the proposed stormwater drainage system and stormwater management systems (including the proposed detention system) would have sufficient capacity to manage the increased peak flows and water volume with minor increase in hydraulic grade line and peak water level within the basins. We confirm the increase in rainfall intensities will achieve the required minimum 0.5m freeboard to the proposed building pad levels in relation to local overland flow paths in and around the estate as nominated on the design drawings.

The site is noted to be situated well upstream from any tidally influenced receiving waters including expected potential sea level rise of 0.3m. We confirm the development will not affect or be affected by potential sea level rise due to the distance from the tidal influence river or stream system and/ or the Pacific Ocean.

An assessment on the stormwater on-site detention basin confirms that the current basin design has sufficient capacity to cater for a rainfall intensity increase of 10% from current rainfall intensities.

6.5 Site Water Balance Objectives

A daily site water balance analysis was undertaken to determine the feasibility of the proposed rain and stormwater harvesting scheme and in particular the effects of various storage sizes for stormwater harvesting along with changes to demand.

The water balance utilised flows generated using a simple runoff calculation using historical rainfall data, analysed for various rainfall patterns including dry, mean and wet rainfall years. The purpose for modelling dry, mean and wet years was to assess the performance of various tank sizes given the changes to rainfall patterns.

6.6 Water Use Management Features

6.6.1 Existing

Existing water use features comprise Sydney Water Mains supply.

There are no existing rainwater harvesting systems, or water extractions as the proposed site is currently vacant.

There are no current irrigated landscaped areas.

6.6.2 Proposed

Proposed management measures for water use are as follows:

- Existing Sydney Water mains supply is proposed to be maintained throughout the duration of the proposed site operation;
- Stormwater harvesting throughout rainwater reuse to reduce demand on non-potable water uses;
- Sprinkler water storage via Sydney Water mains.

A concept diagram for the proposed re-use scheme on site is shown in **Figure 6.1** below.

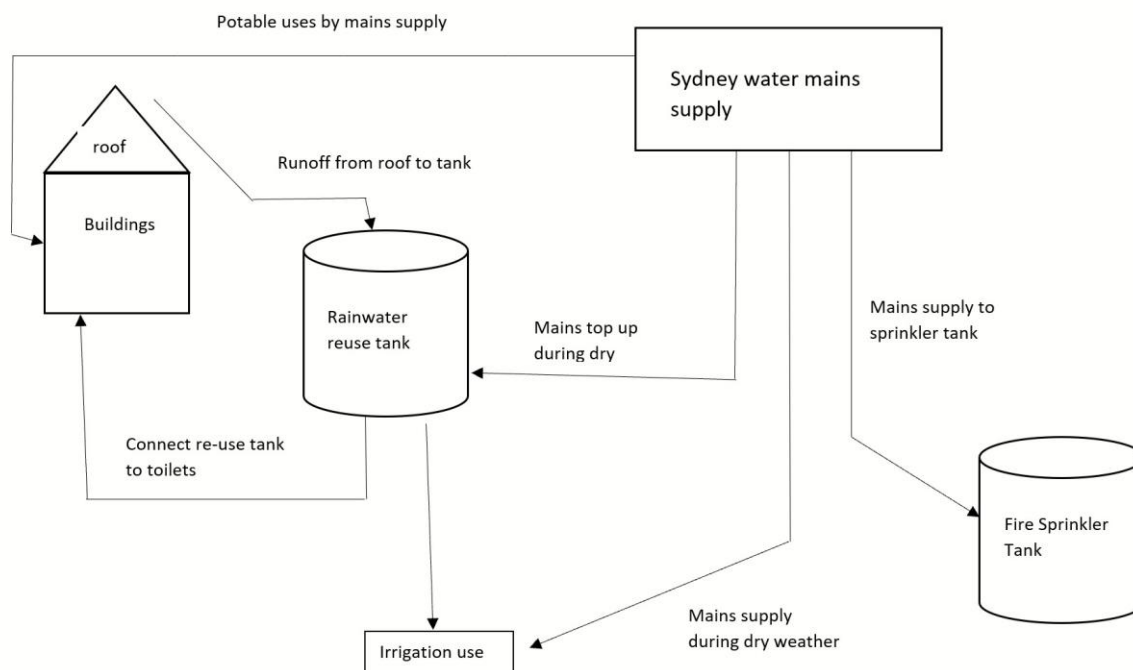


Figure 6.1. Water Cycle Management Schematic

A short description of the expected stormwater harvesting for the development is described below.

Stormwater Harvesting

Stormwater harvesting refers to the collection of stormwater from the developments internal stormwater drainage system for re-use in non-potable applications. Stormwater from the stormwater drainage system can be classified as either rainwater, where the flow is from roof areas only, or stormwater where the flow is from all areas of the development.

Rainwater harvesting is proposed for this development, and rainwater tank sizing will be designed during detail design stage by the hydraulic consultant via a water balance assessment. Rainwater tanks are to be sized with reference to the NSW Department of Environment and Conservation document *Managing Urban Stormwater: Harvesting and Reuse*, using a simple water balance analysis to balance the supply and demand, based on the base water demands and the requirements of Council.

The water balance assessment will be based on local rainfall data and specific utilisation rates for the facility for re-use of non-potable applications. The expected reuse applications include internal uses such as toilet flushing, and external applications including irrigation. The aim is to reduce the water demand for the development by 40% as required in FCC Stormwater Policy 2017.

In general terms the rainwater harvesting system will be comprised the following elements:

- In-line tank for the collection and storage of rainwater.
- Overflow to the in-ground stormwater drainage system sized to cater for the catchment being drained to the tank. This will operate at times when the rainwater storage tank is full so that rainwater can pass through the tank and continue to be discharged via gravity into the stormwater drainage system.
- Rainwater from the storage tank will be pumped for distribution throughout the development in a dedicated non-potable water reticulation system to toilets and external irrigation areas, and any other uses as defined in the Construction Certificate stage of the design.
- Mains top up to Sydney Water system for prolonged periods of dry weather.
- First flush diverter and filters to ensure adequate quality of reuse water.
- Tank material will be steel or polymer and appropriately located to minimise visual impact.

6.7 Water Balance Assessment

6.7.1 Internal Base Water Demand

The proposed development is expected to generate 441 operational jobs. Assuming a two-shift roster, it is expected that there will be 220 employees on site per operational day.

Potable water demand is based on each employee using 25 litres per day for showering and inside tap use.

These rates give the following internal non-potable demand:

| | | |
|---------------|------------|------------|
| Potable Water | 220 People | 5.5 kL/day |
|---------------|------------|------------|

Indoor non-potable water demand has been based on each employee using 15 litres of potable water per day for toilet flushing which is typical of an office environment which uses energy efficient flushing devices.

These rates give the following internal non-potable demand:

| | | |
|-----------------|------------|------------|
| Toilet Flushing | 220 People | 3.3 kL/day |
|-----------------|------------|------------|

6.7.2 Fire Services Base Demand

The four proposed sprinkler tanks for fire services require a storage of 550 kL each. These are expected to be serviced twice yearly, hence total yearly demand of 4400 kL has been allowed.

| | | |
|---------------|--|-------------|
| Fire Services | | 12.1 kL/day |
|---------------|--|-------------|

6.7.3 Irrigation Base Water Demand

External water consumption within each landscaping system varies depending upon the nature of the irrigation system, species of planting, and the prevailing climate. For this

development, the base case outdoor potable water demand has been modelled using a simple rainwater balance. The proposed irrigation system will be a drip-fed system with application rates averaging 10 L/m² (i.e. 10 mm/m²). For the purposes of our analysis the average of this application rate has been used, in conjunction with the application regime shown in **Table 6.2**, to determine the monthly and total yearly demand.

Table 6.2. External Irrigation Application Schedule

| Month | No. of Applications |
|-----------|---------------------|
| January | 12 |
| February | 12 |
| March | 10 |
| April | 9 |
| May | 8 |
| June | 4 |
| July | 4 |
| August | 4 |
| September | 8 |
| October | 9 |
| November | 10 |
| December | 12 |

The above regime for the landscaped area for the site gives the following yearly outdoor water demands:

| | | |
|----------------------|-------------------------|--------------|
| Proposed Development | Area=3500m ² | 3570 kL/year |
| | | 9.8 kL/day |

6.7.4 Rainwater Tank Sizing

The use of rainwater reduces the mains water demand and the amount of stormwater runoff. By collecting the rainwater run-off from roof areas, rainwater tanks provide a valuable water source suitable for flushing toilets and landscape irrigation.

Rainwater tanks have been designed, using a simple water balance calculation to balance the supply and demand, based on the calculated base water demands and proposed roof catchment areas. Allowances in the calculation have been made for efficiency of collection, absorption/ evaporation losses.

Table 6.3. Rainwater Reuse Requirements

| Lot | Roof Catchment to Rainwater Tank (m ²) | Tank Size (kL) | Predicted Non-Potable Demand Reduction (%) |
|-----|--|----------------|--|
| 201 | 8950 | 77 | 40 |
| 202 | 8360 | 50 | 40 |

| | | | |
|-----|------|----|----|
| 203 | 5150 | 40 | 40 |
| 204 | 3370 | 40 | 40 |

The water balance assessment predicts 40% reduction in non-potable will be met for the developments with the provision of rainwater tanks as specified in **Table 6.3** above.

We note that the final configuration and sizing of the rainwater tanks is subject to detail design considerations and optimum site utilisation.

6.7.5 Overall Water Cycle Management

The following **Table 6.4** shows overall water cycle and each water source.

Table 6.4. Overall Water Cycle

| Area | Daily Demand (kL/ Day) | |
|-----------------|------------------------|-----------|
| | Via Harvesting/ Reuse | Via Mains |
| Internal | 1.32 | 7.48 |
| External | 3.92 | 5.88 |
| Fire | - | 12.1 |
| Total | 5.24 | 25.46 |

6.8 Operational Impact Assessment

Rainwater harvesting is proposed to reduce demand on non-potable applications.

An existing and reliable water supply is available during operations.

Impact on environment from water use is considered to be acceptable.

7 WATER QUANTITY MANAGEMENT

Stormwater attenuation is required to limit post development flow rates to pre-development flow rates. This can be achieved through water quantity management via stormwater detention or “On-site Detention (OSD)”, to ensure the cumulative effect of development does not have a detrimental effect on the existing stormwater infrastructure and watercourses located within their LGA downstream from the site.

As set out in **Table 6.1**, Site Storage Requirement (SSR) and Permissible Site Discharge (PSD) are based on controls included in the site-specific *Development Control Plan* (DCP) for the site “*Western City Employment Area – Fairfield City Council Development Control Plan 2016, Lot 1 DP106143, 327-335 Burley Road, Horsley Park*” dated March 2016.

The requirements for detention as approved are set out in *Table 3 in Section 3.2* of the DCP, as originally formulated in the Stormwater Management Strategy completed by Brown Consulting is for each lot to construct their own detention system with based on the individual lot areas as outlined in excerpt **Table 7.1** below.

| Attribute | 5 year ARI | 100 year ARI |
|-----------------------------|------------|--------------|
| PSD* (m ³ /s/ha) | 0.15 | 0.28 |
| SSR* (m ³ /ha) | 170 | 290 |

Table 7.1-PSD & SSR - Brown Consulting (June 2014) & Table 3 of DCP2016

Attenuation of stormwater runoff from the whole of the development is proposed to be managed through individual OSD systems on development lots. The sizing of the development lot detention systems is noted to account for the road catchments remaining un-attenuated such that the total post-development runoff from the whole of the CSR estate is less than or equal to pre-development runoff as required of the DCP.

Refer to drawings included in **Appendix A** for location and general arrangement of detention systems, and **Table 7.2** below which shows PSD and SSR for each development lot.

| Lot | Area (Ha) | PSD (m3/s) | | SSR (m3) | |
|------------|-----------|------------|-----------|----------|-----------|
| | | 5yr ARI | 100yr ARI | 5yr ARI | 100yr ARI |
| 201 | 7.71 | 1.157 | 2.159 | 1310 | 2235 |
| 202 | 5.04 | 0.756 | 1.411 | 857 | 1462 |
| 203 | 4.02 | 0.603 | 1.126 | 685 | 1166 |
| 204 | 4.0 | 0.60 | 1.12 | 680 | 1160 |

Table 7.2. PSD and SSR for Development Lots

8 STORMWATER QUALITY CONTROLS

8.1 Pollution Target Parameters

There is a need to provide design which incorporates the principles of Water Sensitive Urban Design (WSUD) and to target pollutants that are present in the stormwater to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by FCC.

The requirements for stormwater quality to be performed on a catchment wide basis. These are presented in terms of annual percentage pollutant reductions on a developed catchment and are as follows:

Table 8.1. Estate Pollution Reduction Targets

| | |
|------------------------|-----|
| Gross Pollutants | 90% |
| Total Suspended Solids | 85% |
| Total Phosphorus | 60% |
| Total Nitrogen | 45% |
| Total Hydrocarbons | 90% |
| Free Oil and Grease | 90% |

As set out in **Table 6.1 & 8.2**, target rates for individual sites are greater than the base rates noted above, due to development sites being required to provide offset for untreated portions of the overall estate (e.g. the estate road and any other area which bypass treatment) so that the overall estate achieves the required pollution reductions.

Brown Consulting have used the MUSIC software package to model the water quality treatment, allowing for the untreated roads and other bypass areas, have quoted the required pollution reduction rates as follows:

Table 8.2. Individual Lot Pollution Reduction Targets

| | |
|------------------------|-----|
| Gross Pollutants | 90% |
| Total Suspended Solids | 93% |
| Total Phosphorus | 74% |
| Total Nitrogen | 48% |

8.2 Proposed Stormwater Treatment System

Developed impervious areas of the estate, including roof, hardstand, car parking, roads and other extensive impervious areas are required to be treated by the Stormwater Treatment Measures (STM's). The STM's shall be sized according to the whole catchment area of the development. The STM's for the estate are based on a treatment train approach at the estate level to ensure that all the objectives above are met.

Components of the treatment train for the estate are as follows:

- All development lots will require on-lot treatment measures which meet the load-based percentage requirements noted in **Section 8.1** and **Section 6.1**.
- Lot systems will comprise proprietary filters and pit inserts, in combination with bio-retention basins; and
- A portion of the future building roofs will also provide a level of treatment via rainwater reuse and settlement within the rainwater tank.

The maintenance of the water quality measures (bio-retention and gross pollutant traps) will be made by each lot tenant at no cost or burden to council. Further discussion on maintenance are contained in **Section 8.6** of this document.

8.3 Stormwater Quality Modelling

8.3.1 Introduction

The MUSIC model was chosen to model water quality. This model has been released by the Cooperative Research Centre for Catchment Hydrology (CRCCH) and is a standard industry model for this purpose. MUSIC (the Model for Urban Stormwater Improvement Conceptualisation) is suitable for simulating catchment areas of up to 100 km² and utilises a continuous simulation approach to model water quality.

By simulating the performance of stormwater management systems, MUSIC can be used to predict if these proposed systems and changes to land use are appropriate for their catchments and are capable of meeting specified water quality objectives (CRC 2002). The water quality constituents modelled in MUSIC and of relevance to this report include Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

The pollutant retention criteria included in **Section 6.1 & 8.1** of this report were used as a basis for assessing the effectiveness of the selected treatment trains.

The MUSIC model “12990.05-REV 4.sqz” was set up to examine the effectiveness of the water quality treatment train and to predict if council requirements have been achieved on an estate wide basis and on individual lots respectively. The layout of the MUSIC model is presented in **Appendix B**.

8.3.2 Rainfall Data

Six-minute pluviographic data sourced from the Bureau of Meteorology (BOM) as nominated below. Evapo-transpiration data for the period was sourced from the Sydney Monthly Areal PET data set supplied with the MUSIC software.

| Input | Data Used |
|---------------------------|---|
| Rainfall Station | 67035 Liverpool (Whitlam) |
| Rainfall Period | 1 January 1967 – 31 December 1976 (10 years) |
| Mean Annual Rainfall (mm) | 857 |
| Evapotranspiration | Sydney Monthly Areal PET |
| Model Timestep | 6 minutes |

8.3.3 Rainfall Runoff Parameters

| Parameter | Value |
|-------------------------------------|--------------|
| Rainfall Threshold | 1.40 |
| Soil Storage Capacity (mm) | 170 |
| Initial Storage (% capacity) | 30 |
| Field Capacity (mm) | 70 |
| Infiltration Capacity Coefficient a | 210 |
| Infiltration Capacity exponent b | 4.7 |
| Initial Depth (mm) | 10 |
| Daily Recharge Rate (%) | 50 |
| Daily Baseflow Rate (%) | 4 |
| Daily Seepage Rate (%) | 0 |

8.3.4 Pollutant Concentrations

Pollutant concentrations for source nodes are based on values nominated by Fairfield City Council for industrial land use as per the **Table 8.3**:

| Flow Type | Surface Type | TSS (log ₁₀ values) | | TP (log ₁₀ values) | | TN (log ₁₀ values) | |
|-----------|--------------|--------------------------------|----------|-------------------------------|----------|-------------------------------|----------|
| | | Mean | Std Dev. | Mean | Std Dev. | Mean | Std Dev. |
| Baseflow | Roof | 1.20 | 0.17 | -0.85 | 0.19 | 0.11 | 0.12 |
| | Roads | 1.20 | 0.17 | -1.11 | 0.48 | 0.14 | 0.12 |
| Stormflow | Roof | 1.30 | 0.32 | -0.89 | 0.25 | 0.30 | 0.19 |
| | Roads | 2.43 | 0.32 | -0.30 | 0.25 | 0.34 | 0.19 |

Table 8.3. Pollutant Concentrations

The MUSIC model has been setup with a treatment train approach based on the pollutant concentrations in **Table 8.3** above.

8.3.5 Treatment Nodes

Bio-retention and Generic Treatment nodes have been used in the modelling of the development.

There are three proposed bio-retention basin which will be provided in accordance with industry best practice and the guidelines of the Monash University Facility for Advancing Water Bio-filtration with the following parameters:

Bio-retention System

| Parameter | Value |
|---|-----------------------------|
| <u>Storage Properties</u> | |
| Extended Detention Depth | 300 mm |
| Storage Surface Area | ** m ² (minimum) |
| <u>Filter and Media Properties</u> | |
| Filtration Area | ** m ² |
| Saturated Hydraulic Conductivity | 100 mm/hr |
| Filter Depth | 500 mm |

** Refer drawings for nominated filtration and storage area. Nominated area excludes all pits, scour protection and other structures which may be present in bio-retention basins.

8.3.6 Results

The Tables below show the results of the MUSIC analysis for each lot. The reduction rate is expressed as a percentage and compares the post-development pollutant loads without treatment versus post-development loads with treatment.

Table 8.4. Lot 201 MUSIC analysis results

| | Source | Residual Load | % Reduction | Target Met |
|---------------------------------------|--------|---------------|-------------|------------|
| Total Suspended Solids (kg/yr) | 8240 | 573 | 93 | Y |
| Total Phosphorus (kg/yr) | 17.4 | 4.27 | 75.5 | Y |
| Total Nitrogen (kg/yr) | 123 | 60 | 51.4 | Y |
| Gross Pollutants (kg/yr) | 1410 | 0 | 100 | Y |

Table 8.5. Lot 202 MUSIC analysis results

| | Source | Residual Load | % Reduction | Target Met |
|---------------------------------------|--------|---------------|-------------|------------|
| Total Suspended Solids (kg/yr) | 4230 | 288 | 93.2 | Y |
| Total Phosphorus (kg/yr) | 10 | 2.26 | 77.5 | Y |
| Total Nitrogen (kg/yr) | 82.2 | 39.4 | 52 | Y |
| Gross Pollutants (kg/yr) | 955 | 0 | 100 | Y |

Table 8.6. Lot 203 MUSIC analysis results

| | Source | Residual Load | % Reduction | Target Met |
|---------------------------------------|--------|---------------|-------------|------------|
| Total Suspended Solids (kg/yr) | 3770 | 265 | 93 | Y |
| Total Phosphorus (kg/yr) | 7.98 | 1.85 | 76.9 | Y |
| Total Nitrogen (kg/yr) | 56.2 | 26.6 | 52.6 | Y |
| Gross Pollutants (kg/yr) | 645 | 0 | 100 | Y |

Table 8.7. Lot 204 MUSIC analysis results

| | Source | Residual Load | % Reduction | Target Met |
|---------------------------------------|--------|---------------|-------------|------------|
| Total Suspended Solids (kg/yr) | 2960 | 205 | 93.1 | Y |
| Total Phosphorus (kg/yr) | 6.52 | 1.56 | 76.1 | Y |
| Total Nitrogen (kg/yr) | 48.5 | 23.5 | 51.6 | Y |
| Gross Pollutants (kg/yr) | 558 | 0 | 100 | Y |

These model results indicate that, through the use of the STM's in the treatment train, pollutant load reductions for Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants will meet the load-based pollution reduction requirements.

8.3.7 Modelling Discussion

MUSIC modelling has been performed to assess the effectiveness of the selected treatment trains, at both an estate level and individual lot level, and to ensure that the pollutant retention requirements have been met.

The MUSIC modelling has shown that the proposed treatment train of STM's will provide stormwater treatment which will meet council requirements in an effective and economical manner.

Hydrocarbon removal cannot easily be modelled with MUSIC software. The proposed distribution/ storage facility would be expected to produce low source loadings of hydrocarbons. Potential sources of hydrocarbons would be limited to leaking engine sumps or for accidental fuel spills/leaks and leaching of bituminous pavements (car parking only). The potential for hydrocarbon pollution is low and published data from the CSIRO indicates that average concentrations from Industrial sites are in the order of 10mg/L and we would expect source loading from this site to be near to or below this concentration. Hydrocarbon pollution would also be limited to surface areas which will be treated via bio-retention swales which are predicted to achieve a 90% reduction of this pollutant.

Given the expected low source loadings of hydrocarbons and removal efficiencies of the treatment devices we consider that the requirements of the FCC and the DCP have been met.

8.4 Stormwater Harvesting

Refer to **Section 6.6** for details on the stormwater harvesting system.

8.5 Maintenance and Monitoring

It is important that each component of the water quality treatment train is properly operated and maintained. To achieve the design treatment objectives, an indicative maintenance schedule has been prepared (refer to **Table 8.5** below) to assist in the effective operation and maintenance of the various water quality components.

Note that inspection frequency may vary depending on site specific attributes and rainfall patterns in the area. In addition to the below nominated frequency it is recommended that inspections are made following large storm events.

Table 8.5. Indicative Maintenance Schedule

| MAINTENANCE ACTION | FREQUENCY | RESPONSIBILITY | PROCEDURE |
|--|---|---|---|
| SWALES/ LANDSCAPED AREAS | | | |
| Check density of vegetation and ensure minimum height of 150mm is maintained. Check for any evidence of weed infestation | Six monthly | Maintenance Contractor | Replant and/or fertilise, weed and water in accordance with landscape consultant specifications |
| Inspect swale for excessive litter and sediment build up | Six monthly | Maintenance Contractor | Remove sediment and litter and dispose in accordance with local authorities' requirements. |
| Check for any evidence of channelisation and erosion | Six monthly/ After Major Storm | Maintenance Contractor | Reinstate eroded areas so that original, designed swale profile is maintained |
| Weed Infestation | Three Monthly | Maintenance Contractor | Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required. |
| Inspect swale surface for erosion | Six Monthly | Maintenance Contractor | Replace topsoil in eroded area and cover and secure with biodegradable fabric. Cut hole in fabric and revegetate. |
| BIO-RETENTION BASIN | | | |
| Check all items nominated for SWALES/ LANDSCAPED AREAS above | Refer to SWALES/ LANDSCAPED AREAS section above | Refer to SWALES/ LANDSCAPED AREAS section above | Refer to SWALES/ LANDSCAPED AREAS section above |
| Check for sediment accumulation at inflow points | Six monthly/ After Major Storm | Maintenance Contractor | Remove sediment and dispose in accordance with local authorities' requirements. |
| Check for erosion at inlet or other key structures. | Six monthly/ After Major Storm | Maintenance Contractor | Reinstate eroded areas so that original, designed profile is maintained |

| MAINTENANCE ACTION | FREQUENCY | RESPONSIBILITY | PROCEDURE |
|---|--|--|---|
| Check for evidence of dumping (litter, building waste or other). | Six monthly | Maintenance Contractor | Remove waste and litter and dispose in accordance with local authorities' requirements. |
| Check condition of vegetation is satisfactory (density, weeds, watering, replating, mowing/ slashing etc) | Six monthly | Maintenance Contractor | Replant and/or fertilise, weed and water in accordance with landscape consultant specifications |
| Check for evidence of prolonged ponding, surface clogging or clogging of drainage structures | Six monthly/ After Major Storm 10-15 years | Maintenance Contractor | Remove sediment and dispose in accordance with local authorities' requirements. Replace filter media & planting – refer to appropriately qualified engineer or stormwater specialist |
| Check stormwater pipes and pits | Six monthly/ After Major Storm | Maintenance Contractor | Refer to INLET/ JUNCTION PIT section below. |
| OSD/ BIO-RETENTION BASIN | | | |
| Check all items nominated for SWALES/ LANDSCAPED AREAS above | Refer to SWALES/ LANDSCAPED AREAS section above | Refer to SWALES/ LANDSCAPED AREAS section above | Refer to SWALES/ LANDSCAPED AREAS section above |
| Inspect and remove any blockage from orifice | Six Monthly | Maintenance Contractor/ Owner | Remove grate and screen to inspect orifice. |
| Inspect trash screen and clean | Six Monthly | Maintenance Contractor/ Owner | Remove grate and screen if required to clean it. |
| Inspect flap valve and remove any blockage. | Six Monthly | Maintenance Contractor/ Owner | Remove grate. Ensure flap valve moves freely and remove any blockages or debris. |

| MAINTENANCE ACTION | FREQUENCY | RESPONSIBILITY | PROCEDURE |
|---|------------------|-------------------------------|---|
| Inspect pit sump for damage or blockage. | Six Monthly | Maintenance Contractor/ Owner | Remove grate & screen. Remove sediment/ sludge build up and check orifice and flap valve are clear. |
| Inspect storage areas and remove debris/ mulch/ litter etc likely to block screens/ grates. | Six Monthly | Maintenance Contractor/ Owner | Remove debris and floatable materials. |
| Check attachment of orifice plate and screen to wall of pit | Annually | Maintenance Contractor | Remove grate and screen. Ensure plate or screen mounted securely, tighten fixings if required. Seal gaps if required. |
| Check orifice diameter is correct and retains sharp edge. | Five yearly | Maintenance Contractor | Compare diameter to design (see Work-as-Executed) and ensure edge is not pitted or damaged. |
| Check screen for corrosion | Annually | Maintenance Contractor | Remove grate and screen and examine for rust or corrosion, especially at corners or welds. |
| Inspect overflow weir and remove any blockage | Six monthly | Maintenance Contractor/ Owner | Ensure weir is free of blockage. |
| Inspect walls for cracks or spalling | Annually | Maintenance Contractor | Remove grate to inspect internal walls, repair as necessary. |
| Check step irons | Annually | Maintenance Contractor | Ensure fixings are secure and irons are free from corrosion. |
| RAINWATER TANK | | | |
| Check for any clogging and blockage of the first flush device | Monthly | Maintenance Contractor | First flush device to be cleaned out |
| Check for any clogging and blockage of the tank inlet - leaf/litter screen | Six monthly | Maintenance Contractor | Leaves and debris to be removed from the inlet leaf/litter screen |

| MAINTENANCE ACTION | FREQUENCY | RESPONSIBILITY | PROCEDURE |
|---|------------------------------------|-------------------------------|--|
| Check the level of sediment within the tank | Every two years | Maintenance Contractor | Sediment and debris to be removed from rainwater tank floor if sediment level is greater than the maximum allowable depth as specified by the hydraulic consultant |
| INLET & JUNCTION PITS | | | |
| Inside of pits | Six Monthly | Maintenance Contractor | Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter. |
| Outside of pits | Four Monthly/ After Major Storm | Maintenance Contractor | Clean grate of collected sediment, debris, litter and vegetation. |
| STORMWATER SYSTEM | | | |
| General Inspection of complete stormwater drainage system | Bi-annually | Maintenance Contractor | Inspect all drainage structures noting any dilapidation in structures and carry out required repairs. |
| OSD TANK SYSTEM | | | |
| Inspect and remove any blockage from orifice | Six Monthly | Maintenance Contractor/ Owner | Remove grate and screen to inspect orifice. |
| Inspect trash screen and clean | Six Monthly | Maintenance Contractor/ Owner | Remove grate and screen if required to clean it. |
| Inspect flap valve and remove any blockage. | Six Monthly | Maintenance Contractor/ Owner | Remove grate. Ensure flap valve moves freely and remove any blockages or debris. |
| Inspect pit sump for damage or blockage. | Six Monthly | Maintenance Contractor/ Owner | Remove grate & screen. Remove sediment/ sludge build up and check orifice and flap valve are clear. |
| Inspect storage areas and remove debris/ mulch/ litter etc likely to block screens/ grates. | Six Monthly | Maintenance Contractor/ Owner | Remove debris and floatable materials. |

| MAINTENANCE ACTION | FREQUENCY | RESPONSIBILITY | PROCEDURE |
|---|------------------|-------------------------------|---|
| Check attachment of orifice plate and screen to wall of pit | Annually | Maintenance Contractor | Remove grate and screen. Ensure plate or screen mounted securely, tighten fixings if required. Seal gaps if required. |
| Check orifice diameter is correct and retains sharp edge. | Five yearly | Maintenance Contractor | Compare diameter to design (see Work-as-Executed) and ensure edge is not pitted or damaged. |
| Check screen for corrosion | Annually | Maintenance Contractor | Remove grate and screen and examine for rust or corrosion, especially at corners or welds. |
| Inspect overflow weir and remove any blockage | Six monthly | Maintenance Contractor/ Owner | Ensure weir is free of blockage. |
| Inspect walls for cracks or spalling | Annually | Maintenance Contractor | Remove grate to inspect internal walls, repair as necessary. |
| Check step irons | Annually | Maintenance Contractor | Ensure fixings are secure and irons are free from corrosion. |

9 FLOODING

Consideration to flooding has been made as part of the project assessment.

The South Creek Flood Study, *The Updated South Creek Flood Study*, by Worley Parsons, 8th May 2014 has been utilised to confirm the relationship between known flooding areas and overland flow paths with the development site.

The South Creek Study is a regional study commissioned by Penrith Council in conjunction with Blacktown, Liverpool and Fairfield Councils. The study includes South Creek and associated tributaries, defining flood planning levels and hydraulic hazard zones along the creek, creek floodplain areas and tributaries.

The site is located within the Ropes Creek Catchment to the east of Ropes Creek as shown below in **Figure 9.1** below.

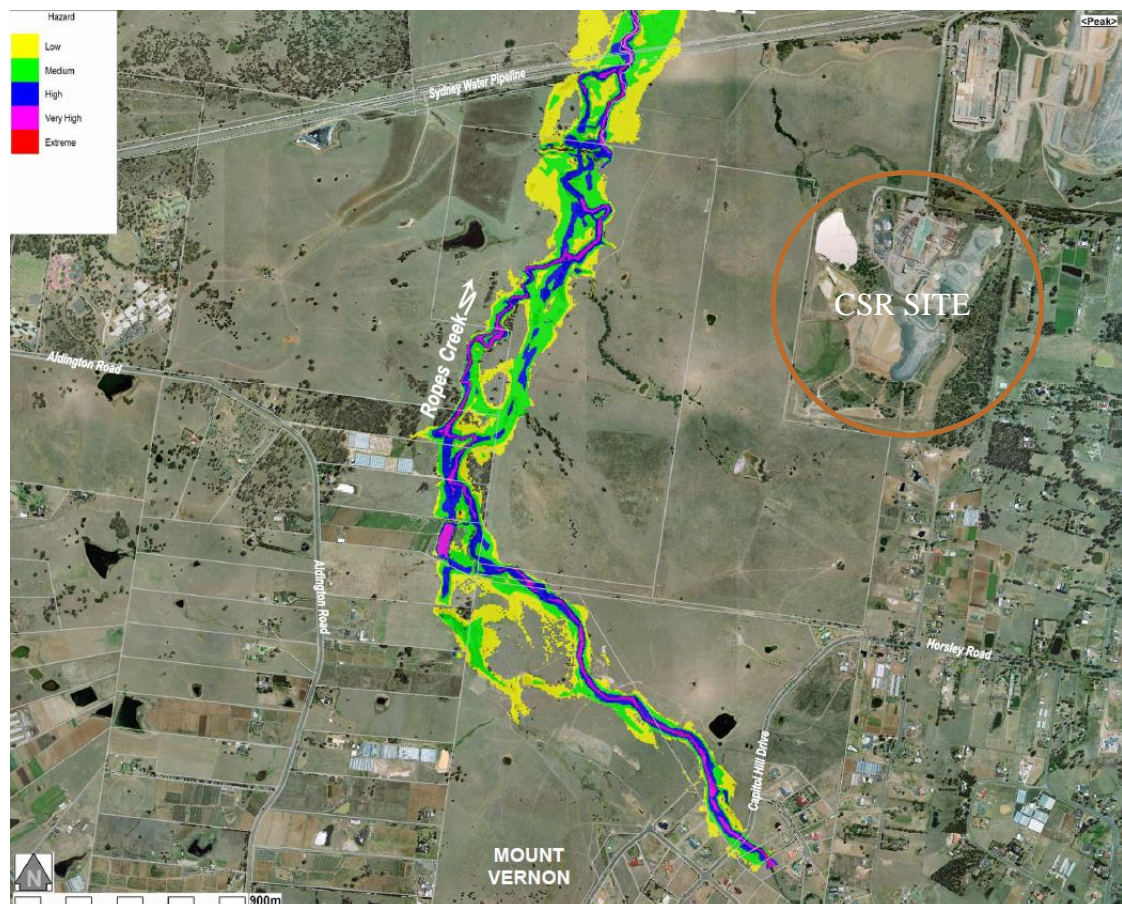


Figure 9.1-Provisional flood hazard mapping for the 1 in 100-year ARI flood. (Source: Worley Parsons)

Using the Fairfield City Council flood planning maps in conjunction with the Worley Parson's South Creek Flood Study, as depicted above in **Figure 9.1**, it can be concluded that the site has a very low risk of flooding affectation from Ropes Creek or other regional flooding. Further that there is no risk that the new development will affect known

overland flow paths or other flood affected areas, given local drainage systems for the development are constructed per the recommendations included in this document.

The survey levels also show that the estate is not affected by any external catchments so flooding from local overland flow is also not considered to be a risk for the estate.

10 EROSION & SEDIMENT CONTROL PLAN

An erosion and sediment control plan (ESCP) is included in drawings **Co12990.00-SSDA20** and **SSDA25**. These plans show the works can proceed without polluting receiving waters. A detailed plan will be prepared after development consent is granted and before works commence.

It is noted that all measures constructed by CSR as part of the estate works would remain operational until ESR take possession of the land, and commence construction. Any modifications to existing ESCP measures would be undertaken to suit the intended construction layout and program, completed per the Landcom document *Managing Urban Stormwater, Soils and Construction (1998)*.

10.1 General Conditions

1. The ESCP is to be read in conjunction with the engineering plans, and any other plans or written instructions that may be issued by the site manager, council inspector or other authorised representative in relation to development at the subject site.
2. Contractors will ensure that all soil and water management works are undertaken as instructed in this report and constructed following the guidelines stated in *Managing Urban Stormwater, Soils and Construction (1998)* and FCC specifications.
3. All subcontractors will be informed by the site manager of their responsibilities in minimising the potential for sedimentation and soil erosion.

10.2 Land Disturbance

1. Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in **Table 10.1**.

| Land Use | Limitation | Comments |
|-------------------------------|--|--|
| Construction areas | Limited to 5 (preferably 2) metres from the edge of any essential construction activity as shown on the engineering plans. | All site workers will clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope), or similar materials. |
| Temporary construction access | Limited to a maximum width of 5 metres | The site manager will determine and mark the location of these zones onsite. All site workers will comply with these restrictions. |
| Remaining lands | Entry prohibited except for essential management works | |

Table 10.1. Limitations to access

10.3 Erosion & Sediment Control Conditions

1. Clearly visible barrier fencing shall be installed as shown on drawing **Co12990.05-SSDA20** and elsewhere at the discretion of the site superintendent to ensure traffic control and prohibit unnecessary site disturbance. Vehicular access to the site shall be limited to only those essential for construction work and they shall enter the site only through the stabilised access points.
2. Soil materials will be replaced in the same order they are removed from the ground. It is particularly important that all subsoils are buried and topsoils (landscaped areas only) remain on the surface at the completion of works.
3. The construction program should be scheduled so that the period of time from starting land disturbance to stabilisation is minimised.
4. Notwithstanding this, schedule works so that the duration from the conclusion of land shaping to completion of final stabilisation is less than 20 working days.
5. Land recently established with grass species will be watered regularly until an effective cover has properly established and plants are growing vigorously. Further application of seed might be necessary later in areas of inadequate vegetation establishment.
6. Where practical, foot and vehicular traffic will be kept away from all recently established areas
7. Earth batters shall be constructed in accordance with the Geotechnical Engineers Report or with as law a gradient as practical but not steeper than:
 - 2H:1V where slope length is less than 7 metres
 - 2.5H:1V where slope length is between 7 and 10 metres
 - 3H:1V where slope length is between 10 and 12 metres
 - 4H:1V where slope length is between 12 and 18 metres
 - 5H:1V where slope length is between 18 and 27 metres
 - 6H:1V where slope length is greater than 27 metres
8. All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event of 1 in 10-year ARI (Q10).
9. During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control. In the event water is not available in enough quantities, soil binders and/or dust retardants will be used, or the surface will be left in a cloddy state that resists removal by wind.

10.4 Pollution Control Conditions

1. Stockpiles will not be located within 5 metres of hazard areas, including likely areas of high velocity flows such as waterways, paved areas and driveways.
2. Sediment fences will:
 - a) Be installed where shown on the drawings, and elsewhere at the discretion of the site superintendent to contain the coarser sediment fraction (including aggregated fines) as near as possible to their source.
 - b) Have a catchment area not exceeding 720 square metres, a storage depth (including both settling and settled zones) of at least 0.6 metres, and internal dimensions that provide maximum surface area for settling, and
 - c) Provide a return of 1 metre upslope at intervals along the fence where catchment area exceeds 720 square meters, to limit discharge reaching each section to 10 litres/second in a maximum 20-year t_c discharge.
3. Sediment removed from any trapping device will be disposed of in locations where further erosion and consequent pollution to down slope lands and waterways will not occur.
4. Water will be prevented from directly entering the permanent drainage system unless it is relatively sediment free (i.e. the catchment area has been permanently landscaped and/or likely sediment has been treated in an approved device). Nevertheless, stormwater inlets will be protected.
5. Temporary soil and water management structures will be removed only after the lands they are protecting are fully stabilised.

10.5 Waste Management Conditions

Acceptable bind will be provided for any concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter. Clearance services are to be provided by the respective contractors at least weekly.

10.6 Site Inspection and Maintenance

1. A self-auditing program will be established based on a check sheet. A site inspection using the check sheet will be made by the site manager:
 - At least weekly;
 - Immediately before site closure; and
 - Immediately following rainfall events in excess of 5mm in any 24-hour period.

The self-audit will include:

- Recording the condition of every sediment control device;
- Recording maintenance requirements (if any) for each sediment control device;

- Recording the volumes of sediment removed from sediment retention systems, where applicable;
 - Recording the site where sediment is disposed; and
 - Forwarding a signed duplicate of the completed Check Sheet to the project manager/developer for their recording.
2. In addition, the site manager will be required to oversee the installation and maintenance of all soil and water management works on the site. The person shall be required to provide a short monthly written report to the superintendent. The responsible person will ensure that:
- The plan is being implemented correctly;
 - Repairs are undertaken as required; and
 - Essential modifications are made to the plan if and when necessary.

The report shall include a certificate that works have been carried out in accordance with the plan.

3. Waste bins will be emptied as necessary. Disposal of waste will be in a manner approved by the Site Superintendent.
4. Proper drainage will be maintained. To this end, drains (including inlet and outlet works) will be checked to ensure that they are operating as intended, especially that:
- No low points exist that can fill and overtop in a large storm event;
 - Areas of erosion are repaired (e.g. lined with a suitable material) and/or velocity of flow is reduced appropriately through construction of small check dams and installing additional diversion upslope; and
 - Blockages are cleared (these might occur because of sediment pollution, sand/soil/spoil being deposited in or too close to them, breached by vehicle wheels, etc.).
5. Sand/soil/spoil materials placed closer than 2 metres from hazard areas will be removed. Such hazard areas include areas of high velocity water flows (e.g. waterways and gutters), paved areas and driveways.
6. Recently stabilised lands will be checked to ensure that erosion hazard has been effectively reduced. Any repairs will be initiated as appropriate.
7. Excessive vegetation growth will be controlled through mowing or slashing.
8. All sediment detention systems will be kept in good working condition. In particular, attention will be given to:
- a) Recent works to ensure they have not resulted in diversion of sediment laden water away from them;
 - b) Degradable products to ensure they are replaced as required; and
 - c) Sediment removal, to ensure the design capacity remains in the settling zone.
9. Any pollutants removed from sediment basins or litter traps will be disposed of in areas where further pollution to down slope lands and waterways should not occur.

10. Additional erosion and/or sediment control works will be constructed as necessary to ensure the desired protection is given to down slope lands and waterways, i.e. make ongoing changes to the plan where it proves inadequate in practice or is subjected to changes in conditions at the work site or elsewhere in the catchment.
11. Erosion and sediment control measures will be maintained in a functioning condition until all earthwork activities are completed and the site fully stabilised.
12. Litter, debris and sediment will be removed from the gross pollutant traps and trash racks as required.

11 SEAR's, AGENCY RTS ITEMS

11.1 SEAR's Response Items

This section of the report covers items relating to the Planning SEAR's, dated 26 March 2020, and associated agency responses for SSD 10436.

We provide specific responses to SEAR's Key Issues *Soil and Water*.

It is noted that the majority of items raised in the SEARs will be managed and addressed via works and approved assessments already undertaken as part of the approved CSR Estate and development infrastructure works already completed. Our response to each SEAR's item considers this.

Further reference to the EIS should be made for confirmation of how the SEAR's have been addressed for non-civil engineering related items.

| <i>No.</i> | <i>Item & Response</i> |
|-------------------------------------|---|
| <i>SEARS Soils and Water</i> | |
| <i>a</i> | <p><i>Justification of the need for any earthworks, detailing the resulting finished ground levels</i></p> <p><u>Response</u></p> <p>With reference to Sections 2 and 3 of this report, and estate infrastructure design drawings included in Appendix D, bulk earthworks are to be undertaken by CRS for the estate based on approvals from FCC.</p> <p>The current development proposes relatively minor earthworks to trim the pads constructed by CSR to suit the proposed building layout, loading and unloading zones, parking areas and other site layout considerations.</p> <p>Proposed finished levels have been shown on design drawings in Appendix A.</p> |
| <i>b</i> | <p><i>A detailed and consolidated site water balance;</i></p> <p><u>Response</u></p> <p>Refer to Sections 6 to 8 of this Engineering Report for site water requirements and management of water quality and quantity, including reuse and water balance considerations.</p> |
| <i>c</i> | <p><i>Details of proposed erosion and sediment controls during construction;</i></p> <p><u>Response</u></p> <p>An Erosion and Sediment Control Plan has been prepared in accordance with Fairfield Council requirements and <i>Managing Urban Stormwater, Soils and Construction "The Blue Book"</i> (Landcom 1998).</p> |

| No. | Item & Response |
|-----------------|---|
| | <p>The proposed erosion sediment controls are consistent with the overall CSR estate approved by FCC.</p> <p>Refer to Section 10 of this <i>Engineering Report for Soil and Water Management</i> requirements and associated Erosion and Sediment Control drawings included in Appendix A.</p> |
| <p><i>d</i></p> | <p><i>Assessment description of potential impacts on surface and groundwater sources (quality and quantity), soil, related infrastructure and watercourse(s);</i></p> <p><u>Response</u></p> <p>Detailed drawings, Co12990.05-SSDA40 to SSDA44, showing the proposed surface and stormwater management systems for the development have been included in Appendix A.</p> <p>Requirements for water quantity management, and water quality management have been discussed in Sections 6 to 8 of this Engineering Report respectively.</p> <p>Proposed stormwater management systems are consistent with the overall CSR DCP. Each site is proposed to provide their own water quantity and quality management system.</p> <p>Reuse of roofwater is also proposed to reduce the demand on non-potable water including toilet flushing and irrigation.</p> <p>It has been confirmed that no watercourses are impacted by the development.</p> <p>It is noted that bulk earthworks are to be undertaken by CRS for the estate based on approvals from FCC. There are no measurable impacts on soils as a result of the proposed development.</p> |
| <p><i>e</i></p> | <p><i>A description of surface and stormwater management measures designed in accordance with relevant policies and guidelines, including drainage design, on-site detention, measures to treat and/or reuse water, and proposed use of potable and non-potable water;</i></p> <p><u>Response</u></p> <p>Detailed drawings, Co12990.05-SSDA40 to SSDA44, showing the proposed surface and stormwater management systems for the development have been included in Appendix A.</p> <p>Requirements for water quantity management, and water quality management have been discussed in Sections 6 to 8 of this Engineering Report respectively.</p> <p>Proposed stormwater management systems are consistent with the overall CSR DCP. Each site is proposed to provide their own water quantity and quality management system.</p> |

| No. | Item & Response |
|-----|--|
| | <p>The site has no identified flooding or overland flow affecting the site, being located toward the top of the catchment. A desktop review is included in this report which confirms the nearest identified overland flow path is located a significant distance from the property. Refer Section 9 of this report.</p> <p>Based on the above, a detailed site-specific flood assessment is not required or proposed to be undertaken for the development.</p> <p>Water use will be required for toilet flushing, hand washing, employee showers, van washing, tote washing and irrigation with supply being made from Sydney Water. Water demand will be supplemented by rainwater harvesting with proposed reduction in non-potable demands of 40%, Fairfield City Council and the NSW Department of Environment and Conservation document <i>Managing Urban Stormwater: Harvesting and Reuse</i>, using a simple water balance analysis to balance the supply and demand.</p> |
| f | <p><i>A description of the proposed erosion and sediment controls during construction and operational phases of the development;</i></p> <p><u>Response</u></p> <p>An Erosion and Sediment Control Plan has been prepared in accordance with Fairfield Council requirements and <i>Managing Urban Stormwater, Soils and Construction “The Blue Book”</i> (Landcom 1998).</p> <p>The proposed erosion sediment controls are consistent with the overall CSR estate approved by FCC.</p> <p>Refer to Section 10 of this <i>Engineering Report for Soil and Water Management</i> requirements and associated Erosion and Sediment Control drawings included in Appendix A.</p> <p>During operational phase a water quality system has been proposed to manage pollutants including sediments. Refer to Section 7 and drawings included in Appendix A</p> |
| g | <p><i>Details of impact mitigation, management and monitoring measures.</i></p> <p><u>Response</u></p> <p>Proposed mitigation and management measures relating to water quantity management, and water quality management have been included in Sections 6 to 8 of this Engineering Report respectively, and drawings included in Appendix A</p> <p>Section 10 of this <i>Engineering Report for Soil and Water Management</i> requirements and associated Erosion and Sediment Control drawings included in Appendix A.</p> |

11.2 Response to Submissions (RTS) Items

This section of the report covers items relating to the Planning RTS and associated agency responses for SSD 10436.

We provide specific responses to SEAR’s Key Issues *Soil and Water*.

It is noted that the majority of items raised in the SEARs will be managed and addressed via works and approved assessments already undertaken as part of the approved CSR Estate and development infrastructure works already completed. Our response to each SEAR’s item considers this.

Further reference to the EIS should be made for confirmation of how the RTS have been addressed for non-civil engineering related items.

| No. | Item and Response |
|---|--|
| Penrith City Council | |
| Stormwater Management Considerations | |
| Item 1.1) | <p><i>It is requested that the assessment and any conditions of the consent Imposed, ensure that all stormwater Is discharged to the north within the site, so as to result in no impact on any adjoining lands within the Penrith Local Government Area.</i></p> <p><u>Response</u></p> <p>Confirming all stormwater discharge for the proposed development is proposed to the north within the site per the approved CSR Estate and development infrastructure works.</p> |
| Water Quality Considerations | |
| Item 1.3) | <p><i>Clause 33L of the WSEA SEPP, requires consideration of (In part) the integration of stormwater management systems into the landscape in a manner that provides multiple benefits, Including water quality protection, stormwater retention and detention, public open space, habitat Improvement and recreational and visual amenity.</i></p> <p><i>The proposed stormwater strategy could be further improved to better align with the objectives of the WSEA SEPP and as such, the Department is requested to consider if the treatment measures and landscape design as currently proposed, is considered to meet the requirements of the above SEPP provisions and the water management principles in the Western City District Plan.</i></p> <p><u>Response</u></p> <p>The stormwater strategy is in accordance with the specific <i>Development Control Plan (DCP)</i> for the site “<i>Western City Employment Area – Fairfield City Council Development Control Plan 2016, Lot 1 DP106143, 327-335 Burley Road, Horsley Park</i>”.</p> |

| No. | Item and Response |
|---|--|
| Landscape Design and Boundary Interface Considerations | |
| <p>Item 1.7)</p> | <p><i>The proposed finished ground level of the car park on Proposed Lot 201 is RL86.00 which is 5m higher than the adjacent spot level to the north western corner of Lot 201 being RL81.00 (as indicated on the landscape drawings). It is noted at that at the south western corner, the natural ground level adjacent is the same as the car park finished level. While cross sectional drawings are provided to the north and south of lot 201, they are not in the locations of the greatest cut and fill. Further a critical interface consideration is to the western property boundary, as a 5m high retaining wall at the north western corner (as indicted by the plan levels) is not a suitable or sympathetic interface outcome.</i></p> <p><i>The plans also provide inadequate detail to confirm the specific dimensional width of the separating landscaping strip between the car park on Proposed Lot 201 and the western property boundary. The planting matrix diagrams suggest a width of 2.0m for Matrix B which is not considered to be sufficient where there is a level difference of 5m proposed. Matrix A on the other hand is 3.0m in width, but seems to be proposed in locations with significantly less level difference. It is requested that this be further considered to ensure that the greater landscaped setback is in the locations of greatest fill and level difference.</i></p> <p><i>If the finished ground levels (up to 5m above neighbouring natural ground levels) are required to achieve suitable stormwater drainage, then stepped and tiered retaining walls should be provided to the interface boundaries so that the landscape design can negate the visual impact of the proposed level difference and retaining walls (as viewed from the adjacent allotment). This would require a widening of the boundary landscape setbacks in these locations to Matrix A at a minimum (not Matrix B) and a resulting reduction / change in the car parking arrangement. Alternatively, it should be demonstrated how a 5.0m level difference can be otherwise treated to ameliorate its impact as viewed from the adjacent land holding.</i></p> <p><i>It is requested that additional cross-sectional drawings in the locations of maximum level difference be requested that better address boundary edge conditions, with landscaping incorporated into tiered retaining walls to ensure that vertical walls of more than 2m on property boundaries, or as visible from neighbouring properties, are avoided.</i></p> <p><i>It should also be noted that separate development applications have been lodged with Penrith City Council for the subdivision of land immediately west and south of this site. Details of the proposed subdivision Tracker under DA19/0785. Should</i></p> <p><u>Response</u></p> <p>Retaining of levels greater than 3.0m are required along the western interface of Lot 201, a tiered retaining system is proposed to ameliorate the visual impact</p> |

| No. | Item and Response |
|--------------------------------|---|
| | <p>of the retaining wall, where possible. The maximum height of any tier of the retaining wall shall be 3.0m. Refer to drawing Co12990.05-SSDA50 & SSDA55.</p> <p>Additional cross-sectional drawing showing locations of maximum level difference has been provided to address boundary edge conditions.</p> |
| Fairfield City Council | |
| Stormwater Drainage | |
| Item 13.3) | <p><i>The existing pipe details including the invert levels within the access road at all stormwater connection points shall be shown on the stormwater plans. The obvert level of the pipe in the access road shall be taken as the tailwater level for the design of OSD system.</i></p> <p><u>Response</u></p> <p>The invert levels of all stormwater connection points within the access road are provided on stormwater plans Co12990.05-SSDA41 to SSDA44.</p> <p>The obvert level of the pipe in the access road shall be taken as the tailwater level for the design of OSD system.</p> |
| Pollution Control Valve | |
| Item 13.8) | <p><i>Prior to the issue of a Construction Certificate, a certificate from a suitably qualified person shall be submitted to the Certifier and Council certifying that the design of the stormwater drainage system will in the event of a pollution incident will contain all pollutants on the property and that all stormwater outlets from the property will contain a vandal resistant remote control valve capable of being closed off from a conspicuous position.</i></p> <p><u>Response</u></p> <p>Stormwater outlets from each lot will contain a vandal resistant remote control valve capable of being closed off from a conspicuous position, as noted on stormwater plans Co12990.05-SSDA41 to SSDA44.</p> |
| Drainage | |
| Item 15.4) | <p><i>Condition 3(c) of the Subdivision Approval requires:</i></p> <p><i>[i]n the 3m lower portion of the setback adjacent to the southern boundary the drainage swale shall be accommodated and existing trees shall be retained unless prior approval of Fairfield City Council has been obtained.</i></p> <p><i>Jacfin is not aware of any approval from Fairfield City Council which has obviated the need for compliance with this condition. It is unclear from the available information whether compliance with this condition will be achieved.</i></p> |

| No. | Item and Response |
|---------------------------------------|---|
| | <p><i>Recent stormwater and drainage issues have resulted in substantial water and material discharges from the Site on to Jacfin's land.</i></p> <p><i>In order for Jacfin to be satisfied such incidents will not occur, please provide design details the stormwater management system proposed for the Site. In addition, details regarding the ongoing management of the structural integrity of the retaining walls and boundary vegetation by ESR is requested.</i></p> <p><u>Response</u></p> <p>Refer to response by ESR/CSR.</p> |
| Details of Boundary Structures | |
| Item 15.6) | <p><i>The masterplan provided for our review indicates that a retaining wall will be provided on the western boundary of the site. However, the materials to be used and the structural design of the wall are not clear. Please provide such details.</i></p> <p><i>In addition, the interim measures to contain the batter fill on the western boundary of the Site should also be provided. The measures should ensure that the batter does not fail, as has occurred in the past, impacting on Jacfin's land.</i></p> <p><i>Please also provide the details of any other structures proposed to be constructed along the common boundary.</i></p> <p><u>Response</u></p> <p>Refer to Co12990.05-SSDA55 for retaining wall details including materials and structural design of retaining walls.</p> <p>Refer to response by CSR for interim measures to contain the batter fill on the western boundary of the site.</p> |
| Jacfin Detailed Submission | |
| Drainage | |
| Item 18.9) | <p><i>Similar to landscaping details the proposal appears to have considered the impact of the works in isolation from the existing site context. The proposal should identify the existing approved drainage arrangements and consider their current effectiveness.</i></p> <p><i>Details of what is proposed for the management of surface water and groundwater near the boundaries should be provided. The Court order and condition 3(c) of DA 893.6/2013 required a drainage swale to be accommodated in the 3m lower portion of the setback adjacent the southern boundary.</i></p> <p><i>The authority to concentrate and discharge stormwater across common boundaries is unclear. While it is appreciated that the subdivision development plans propose drainage be directed inwards within the site, concentrated water discharges off batters along the edge of the site appear to have been occurring.</i></p> |

| No. | Item and Response |
|--|--|
| | <p><i>Additionally, we are instructed that there has been an incidence of a batter failure and deposition of material onto the Jacfin site.</i></p> <p><i>It is only reasonable that the DPIE require the applicant to identify the existing and approved drainage on the site as well as address the overall effectiveness of these systems.</i></p> <p><u>Response</u></p> <p>Refer to response by CSR.</p> |
| <p><i>Detail of structures near common boundary</i></p> | |
| <p><i>Item G9)</i></p> | <p><i>In the previous correspondence to ESR, Jacfin requested additional detail be provided relating to the structures along the common boundary with the Jacfin site. Of particular concern is the fencing and measures to contain the existing batter along the western boundary of Lot 201. It appears that this has not been addressed in the EIS and supporting documents. It is therefore requested that the DPIE request the following documentation:</i></p> <ul style="list-style-type: none"> <i>• Details of final proposed fencing along all common boundaries.</i> <i>• Interim measures to contain the fill batter along western boundary of Lot 201 need to be provided. The batter shows signs of failing which could affect Jacfin land as has occurred in the past.</i> <i>• Final Intention for containing the fill batter along western boundary of Lot 201. The masterplan indicates a wall but details in regard to materials and structural design, including the span of footings in relation to the site boundary, are lacking. There is discrepancy between pit depths on Pit Schedule table on Sheet C40 and stormwater drainage long-sections. Plans are to be amended to be consistent.</i> <p><u>Response</u></p> <ul style="list-style-type: none"> <i>• Refer to architectural plan for proposed fencing requirements.</i> <i>• Refer to response by CSR for interim measures to contain the batter fill on the western boundary of the site.</i> <i>• Refer to Co12990.05-SSDA56 for retaining wall details including materials and structural design of retaining walls. There are no pit depths indicated on stormwater drawings and no issued stormwater drainage long-sections. Reference to Sheet C40 does not form part of the submitted drawings as part of this application.</i> |

12 CONCLUSION

This Civil Engineering Report has been prepared to accompany an SSDA to the NSW DPIE for the development of a 20.8Ha land parcel located within the Stage 2 of the CSR Estate in Horsley Park.

An overview of FCC and DCP requirements for stormwater management and access has been provided to assist in the SSDA submission. Specific mention has been made to on-site detention and water quality requirements as required as part of the *Water Cycle Management Plan* for each development lot.

A strategy for the management of stormwater for the estate has been provided based on the management measures to be provided at both individual lots and at an estate level. This option is in the form of a series of combined detention and water quality basins located at site discharge locations.

We recommend the strategies included in this report are adopted and integrated into future building developments.

13 REFERENCES

- Managing Urban Stormwater: Harvesting and Reuse – 2006 (NSW DEC);
Managing Urban Stormwater: Source Control – 1998 (NSW EPA);
Managing Urban Stormwater: Treatment Techniques – 1997 (NSW EPA);
Managing Urban Stormwater: Soils & Construction – 2004(LANDCOM);
Fairfield City Council – Development Control Plan 2013,
Water Sensitive Urban Design – “Technical Guidelines for Western Sydney” by URS
Australia Pty Ltd, May 2004

Appendix A
Costin Roe Consulting Pty Ltd
SSDA Drawings

ESR HORSLEY LOGISTIC PARK

327-335 BURLEY ROAD, HORSLEY PARK

CIVIL WORKS DRAWINGS FOR SSDA

DRAWING LIST

| DRAWING NO. | DRAWING TITLE |
|-------------------|---|
| Co12990.05-SSDA10 | DRAWING LIST & GENERAL NOTES |
| Co12990.05-SSDA20 | EROSION SEDIMENT CONTROL PLAN |
| Co12990.05-SSDA25 | EROSION SEDIMENT CONTROL PLAN DETAILS |
| Co12990.05-SSDA40 | STORMWATER MANAGEMENT KEY PLAN |
| Co12990.05-SSDA41 | LOT 201 STORMWATER DRAINAGE PLAN |
| Co12990.05-SSDA42 | LOT 202 STORMWATER DRAINAGE PLAN |
| Co12990.05-SSDA43 | LOT 203 STORMWATER DRAINAGE PLAN |
| Co12990.05-SSDA44 | LOT 204 STORMWATER DRAINAGE PLAN |
| Co12990.05-SSDA45 | STORMWATER DRAINAGE DETAILS - SHEET 1 |
| Co12990.05-SSDA46 | STORMWATER DRAINAGE DETAILS - SHEET 2 |
| Co12990.05-SSDA47 | STORMWATER DRAINAGE DETAILS - SHEET 3 |
| Co12990.05-SSDA48 | STORMWATER DRAINAGE DETAILS - SHEET 4 |
| Co12990.05-SSDA50 | FINISHED LEVELS KEY PLAN |
| Co12990.05-SSDA51 | LOT 201 FINISHED LEVELS PLAN |
| Co12990.05-SSDA52 | LOT 202 FINISHED LEVELS PLAN |
| Co12990.05-SSDA53 | LOT 203 FINISHED LEVELS PLAN |
| Co12990.05-SSDA54 | LOT 204 FINISHED LEVELS PLAN |
| Co12990.05-SSDA55 | RETAINING WALL DETAILS & TYPICAL SECTIONS |
| Co12990.05-SSDA61 | LOT 201 OSD TANK DETAILS |
| Co12990.05-SSDA62 | LOT 202 OSD TANK DETAILS |
| Co12990.05-SSDA63 | LOT 203 OSD TANK DETAILS |
| Co12990.05-SSDA64 | LOT 204 OSD TANK DETAILS |

EROSION CONTROL NOTES:

- ALL CONTROL WORK INCLUDING DIVERSION BANKS AND CATCH DRAINS, V-DRAINS AND SILT FENCES SHALL BE COMPLETED DIRECTLY FOLLOWING THE COMPLETION OF THE EARTHWORKS.
- SILT FENCES AND SILT FENCE RETURNS SHALL BE ERECTED CONVEX TO THE CONTOUR TO POND WATER.
 - HAY BALE BARRIERS AND GEOFABRIC FENCES ARE TO BE CONSTRUCTED TO TOE OF BATTER, PRIOR TO COMMENCEMENT OF EARTHWORKS, IMMEDIATELY AFTER CLEARING OF VEGETATION AND BEFORE REMOVAL OF TOP SOIL.
 - ALL TEMPORARY EARTH BERMS, DIVERSION AND SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED AND MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
 - CLEAR WATER IS TO BE DIVERTED AWAY FROM DISTURBED GROUND AND INTO THE DRAINAGE SYSTEM.
 - THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROVIDING ON GOING ADJUSTMENT TO EROSION CONTROL MEASURES AS REQUIRED DURING CONSTRUCTION.
 - ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING, TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE, APPROVED LOCATION.
 - ALL FINAL EROSION PREVENTION MEASURES INCLUDING THE ESTABLISHMENT OF GRASSING ARE TO BE MAINTAINED UNTIL THE END OF THE DEFECTS LIABILITY PERIOD.
 - ALL EARTHWORKS AREAS SHALL BE ROLLED ON A REGULAR BASIS TO SEAL THE EARTHWORKS.
 - ALL FILL AREAS ARE TO BE LEFT WITH A BUND AT THE TOP OF THE SLOPE AT THE END OF EACH DAYS EARTHWORKS. THE HEIGHT OF THE BUND SHALL BE A MINIMUM OF 200mm.
 - ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND HYDROMULCHED WITHIN 10 DAYS OF COMPLETION OF FORMATION.
 - AFTER REVEGETATION OF THE SITE IS COMPLETE AND THE SITE IS STABLE IN THE OPINION OF A SUITABLY QUALIFIED PERSON ALL TEMPORARY WORK SUCH AS SILT FENCE, DIVERSION DRAINS ETC SHALL BE REMOVED.
 - ALL TOPSOIL STOCKPILES ARE TO BE SUITABLY COVERED TO THE SATISFACTION OF THE SITE MANAGER TO PREVENT WIND AND WATER EROSION.
 - ANY AREA THAT IS NOT APPROVED BY THE CONTRACT ADMINISTRATOR FOR CLEARING OR DISTURBANCE BY THE CONTRACTOR'S ACTIVITIES SHALL BE CLEARLY MARKED AND SIGN POSTED, FENCED OFF OR OTHERWISE APPROPRIATELY PROTECTED AGAINST ANY SUCH DISTURBANCE.
 - ALL STOCKPILE SITES SHALL BE SITUATED IN AREAS APPROVED FOR SUCH USE BY THE SITE MANAGER. A 6m BUFFER ZONE SHALL EXIST BETWEEN STOCKPILE SITES AND ANY STREAM OR FLOW PATH. ALL STOCKPILES SHALL BE ADEQUATELY PROTECTED FROM EROSION AND CONTAMINATION OF THE SURROUNDING AREA BY USE OF THE MEASURES APPROVED IN THE EROSION AND SEDIMENTATION CONTROL PLAN.
 - ACCESS AND EXIT AREAS SHALL INCLUDE SHAKE-DOWN OR OTHER METHODS APPROVED BY THE SITE MANAGER FOR THE REMOVAL OF SOIL MATERIALS FROM MOTOR VEHICLES.
 - THE CONTRACTOR IS TO ENSURE RUNOFF FROM ALL AREAS WHERE THE NATURAL SURFACE IS DISTURBED BY CONSTRUCTION, INCLUDING ACCESS ROADS, DEPOT AND STOCKPILE SITES, SHALL BE FREE OF POLLUTANTS BEFORE IT IS EITHER DISPERSED TO STABLE AREAS OR DIRECTED TO NATURAL WATERCOURSES.
 - THE CONTRACTOR SHALL PROVIDE AND MAINTAIN SLOPES, CROWNS AND DRAINS ON ALL EXCAVATIONS AND EMBANKMENTS TO ENSURE SATISFACTORY DRAINAGE AT ALL TIMES WATER SHALL NOT BE ALLOWED TO POND ON THE WORKS UNLESS SUCH PONDING IS PART OF AN APPROVED ESCP / SWMP.

SITE PREPARATION NOTES:

- ALL EARTHWORKS SHALL BE COMPLETED GENERALLY IN ACCORDANCE WITH THE GUIDELINES SPECIFIED BY THE GEOTECHNICAL SPECIFICATIONS PROVIDED BY DOUGLAS PARTNERS (REF 76582.06.R.001) DATED MAY 2016.
- EXISTING LEVELS ARE BASED ON INFORMATION PREPARED BY CALBRE FOR SUBDIVISION STAGES 2A & 2B.
- STRIP ANY TOP SOIL OR DELETERIOUS MATERIAL AND DISPOSE OF FROM SITE OR STORE AS DIRECTED.
- COMPLETE CUT TO FILL EARTHWORKS TO ACHIEVE THE REQUIRED LEVELS AS INDICATED ON THE DRAWINGS WITHIN A TOLERANCE OF +0mm/-10mm THROUGH BUILDING PADS/PAVEMENTS AND +0mm/-20mm ELSEWHERE.
- PREPARE STEEP BATTERS TO RECEIVE FILL BY CONSTRUCTING BENCHING TO FACILITATE FILL PLACEMENT AND COMPACTION.
- AREAS TO RECEIVE FILL (THAT ARE NOT ON BENCHED BATTERS) AND AREAS IN CUT SHALL BE PROOF ROLLED TO IDENTIFY ANY SOFT HEAVING MATERIAL. SOFT MATERIAL SHALL BE BOXED OUT AND REMOVED PRIOR TO FILL PLACEMENT. PROOF ROLLING TO BE INSPECTED BY A GEOTECHNICAL ENGINEER OR THE EARTHWORKS DESIGNER.
- SITE WON FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HLF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HLF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET.
- IMPORTED FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HLF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HLF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET.
- ALL ENGINEERED FILL PARTICLES SHALL BE ABLE TO BE INCORPORATED WITHIN A SINGLE LAYER. FURTHER, LESS THAN 30% OF PARTICLES SHALL BE RETAINED ON THE 37.5 mm SIEVE. ENGINEERED FILL SHALL BE ABLE TO BE TESTED IN ACCORDANCE WITH THE STANDARD COMPACTION METHOD (AS1289.5.4.1) OR HLF TEST METHOD (AS1289.5.7.1). THESE METHODS REQUIRE LESS THAN 20% RETAINED ON THE 37.5 mm SIEVE. WHERE BETWEEN 20% AND 30% OF PARTICLES ARE RETAINED ON THE 37.5 mm SIEVE THE ABOVE TEST METHODS SHALL STILL BE ADOPTED AND TEST REPORTS ANNOTATED APPROPRIATELY. THESE REQUIREMENTS SHOULD BE MET BY THE MATERIAL AFTER PLACEMENT AND COMPACTION.
- ALL THE EARTHWORKS UNDERTAKEN AND THE SUBGRADE CONDITION IN THE CUT AREAS (IN THE STATED PERIOD) ARE DOCUMENTED IN THE REPORTS AND HAVE BEEN UNDERTAKEN IN ACCORDANCE WITH THE SPECIFICATION.
- PRIOR TO ANY EARTHWORKS, EROSION CONTROL AS OUTLINED IN THE EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE COMPLETED.
- EXISTING ROCK, IF ANY, SHALL BE REMOVED BY HEAVY ROCK BREAKING OR RIPPING.
- MATCH EXISTING LEVELS AT BATTER INTERFACE.
- CONTRACTOR TO MATCH EXISTING LEVELS AT THE INTERFACE OF EARTHWORKS AND EXISTING SURFACE AT BATTER LOCATIONS OR WHERE NO RETAINING WALLS ARE PRESENT. ANY DISCREPANCY BETWEEN DESIGN AND EXISTING LEVELS TO BE REFERRED TO THE ENGINEER FOR DIRECTION OR ADJUSTMENTS TO DESIGN LEVELS.

GENERAL NOTES:

- THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANT'S DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER 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 MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT STANDARDS AUSTRALIA CODES AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THE PROJECT SPECIFICATION.
- ALL DIMENSIONS SHOWN SHALL BE VERIFIED BY THE BUILDER ON SITE. ENGINEER'S DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS. ENGINEER'S DRAWINGS ISSUED IN ANY ELECTRONIC FORMAT MUST NOT BE USED FOR DIMENSIONAL SETOUT. REFER TO THE ARCHITECT'S DRAWINGS FOR ALL DIMENSIONAL SETOUT INFORMATION.
- DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING SHALL BE PROVIDED BY THE BUILDER TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.
- UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.
- ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH ACCEPTABLE SAFETY STANDARDS & APPROPRIATE SAFETY SIGNS SHALL BE INSTALLED AT ALL TIMES DURING THE PROGRESS OF THE JOB.

ELECTRONIC INFORMATION NOTES:

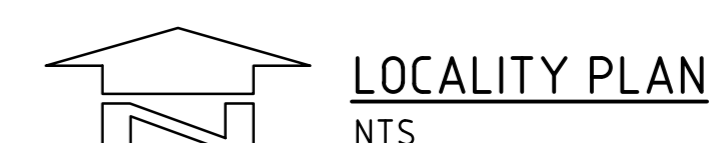
- THE ISSUED DRAWINGS IN HARD COPY OR PDF FORMAT TAKE PRECEDENCE OVER ANY ELECTRONICALLY ISSUED INFORMATION, LAYOUTS OR DESIGN MODELS.
- THE CONTRACTOR'S DIRECT AMENDMENT OR MANIPULATION OF THE DATA OR INFORMATION THAT MIGHT BE CONTAINED WITHIN AN ENGINEER-SUPPLIED DIGITAL TERRAIN MODEL AND ITS SUBSEQUENT USE TO UNDERTAKE THE WORKS WILL BE SOLELY AT THE DISCRETION OF AND THE RISK OF THE CONTRACTOR.
- THE CONTRACTOR IS REQUIRED TO HIGHLIGHT ANY DISCREPANCIES BETWEEN THE DIGITAL TERRAIN MODEL AND INFORMATION PROVIDED IN THE CONTRACT AND/OR DRAWINGS AND IS REQUIRED TO SEEK CLARIFICATION FROM THE SUPERINTENDENT.
- THE ENGINEER WILL NOT BE LIABLE OR RESPONSIBLE FOR THE POSSIBLE ON-GOING NEED TO UPDATE THE DIGITAL TERRAIN MODEL, SHOULD THERE BE ANY AMENDMENTS OR CHANGES TO THE DRAWINGS OR CONTRACT INITIATED BY THE CONTRACTOR.

STORMWATER DRAINAGE NOTES:

- ALL STORMWATER WORKS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3500.3:2003 PLUMBING AND DRAINAGE, PART 3: STORMWATER DRAINAGE.
- THE MINOR (PIPED) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 20 YEAR ARI STORM EVENT AND THE MAJOR (OVERLAND) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 100 YEAR ARI STORM EVENT.
- ALL FINISHED PAVEMENT LEVELS SHALL BE AS INDICATED ON FINISHED LEVELS PLANS SSDA51 & SSDA54.
- PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN.
- EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE.
- ALL STORMWATER PIPES Ø375 OR GREATER SHALL BE CLASS 2 (WITH HS2 SUPPORT) REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE.
- ALL PIPES UP TO AND INCLUDING Ø300 TO BE uPVC GRADE S8 UNO.
- PIPE CLASS NOMINATED ARE FOR IN-SERVICE LOADING CONDITIONS ONLY. CONTRACTOR IS TO MAKE ANY NECESSARY ADJUSTMENTS REQUIRED FOR CONSTRUCTION CONDITIONS.
- ALL CONCRETE PITS GREATER THAN 1000mm DEEP SHALL BE REINFORCED USING N12-200 EACH WAY CENTERED IN WALL AND BASE. LAP MINIMUM 300mm WHERE REQUIRED. ALL CONCRETE FOR PITS SHALL BE F_c≥25 MPa. PRECAST PITS MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
- IN ADDITION TO ITEM 6 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm.
- PIPES SHALL BE LAID AS PER PIPE LAYING DETAILS. PARTICULAR CARE SHALL BE TAKEN TO ENSURE THAT THE PIPE IS FULLY AND EVENLY SUPPORTED. RAM AND PACK FILLING AROUND AND UNDER BACK OF PIPES AND PIPE FAUCETS, WITH NARROW EDGED RAMPERS OR OTHER SUITABLE TAMPING DETAILS.
- CONCRETE PIPES UNDER, OR WITHIN THE ZONE OF INFLUENCE OF PAVED AREAS SHALL BE LAID USING HS2 TYPE SUPPORT, AS A MINIMUM, IN ACCORDANCE WITH AS 3725. AGGREGATE BACKFILL SHALL NOT BE USED FOR PIPE BEDDING AND OR HAUNCH/SIDE SUPPORT.
- WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED Ø100 uPVC TO EACH SIDE OF PIPE.
- ALL SUBSOIL DRAINAGE LINES SHALL BE Ø100 SLOTTED uPVC WITH APPROVED FILTER WRAP LAID IN 300mm WIDE GRANULAR FILTER UNLESS NOTED OTHERWISE. LAY SUBSOIL LINES TO MATCH FALLS OF LAND AND/OR 1 IN 200 MINIMUM. PROVIDE CAPPED CLEANING EYE (RODDING POINT) AT UPSTREAM END OF LINE AND AT 30m MAX. CTS. PROVIDE SUBSOIL LINES TO ALL PAVEMENT / LANDSCAPED INTERFACES, TO REAR OF RETAINING WALLS (AS NOMINATED BY STRUCTURAL ENGINEER) AND AS SHOWN ON PLAN.
- ALL PIPE GRADES 1 IN 200 MINIMUM UNO.
- PROVIDE STEP IRONS IN PITS DEEPER THAN 1000mm.
- MIN. 600 COVER TO PIPE OBVERT BENEATH ROADS & MIN. 400 COVER BENEATH LANDSCAPED AND PEDESTRIAN AREAS.
- PIT COVERS IN TRAFFICABLE PAVEMENT SHALL BE CLASS D 'HEAVY DUTY', THOSE LOCATED IN NON-TRAFFICABLE AREAS SHALL BE CLASS B 'MEDIUM DUTY' U.N.O.
- PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
- DOWN PIPES (DP) TO BE AS PER HYDRAULIC ENGINEERS DETAILS WITH CONNECTOR TO MATCH DP SIZE U.N.O. ON PLAN. PROVIDE CLEANING EYE AT GROUND LEVEL.
- PIPE LENGTHS NOMINATED ON PLAN OR LONGSECTIONS ARE MEASURED FROM CENTER OF PITS TO THE NEAREST 0.5m AND DO NOT REPRESENT ACTUAL LENGTH. THE CONTRACTOR IS TO ALLOW FOR THIS.

FINISHED LEVELS PLAN NOTES:

- LEVELS DATUM IS A.H.D.
- ALL CONTOUR LINES & SPOT LEVELS INDICATE FINISHED PAVEMENT LEVELS U.N.O. ON PLAN.
- THE MAJOR CONTOUR INTERVAL IS 0.5m
- THE MINOR CONTOUR INTERVAL IS 0.1m.
- MINIMUM PAVEMENT GRADE IS TO BE 1:100 (1%).
- MAXIMUM PAVEMENT GRADE IS TO BE 1:20 (5%) IN CARPARKING AREAS AND 1:25 (4%) ELSEWHERE.
- MAXIMUM RAMP GRADES ARE TO BE 1:12 (8.3%) U.N.O. ON PLAN
- PROVIDE MINIMUM 3.0m LONG TRANSITION WHERE CHANGES GRADE EXCEED 1:20 (5%).
- PERMANENT BATTER SLOPES ARE TO HAVE A MAXIMUM GRADE OF 1V:3H.
- ALL BATTER SLOPES WITH GRADES AT OR EXCEEDING 1V:6H ARE TO BE TURFED IMMEDIATELY, OR APPROPRIATE EROSION CONTROL IS TO BE PROVIDED TO THE SATISFACTION OF THE ENGINEER.
- ALL FOOTPATHS ARE TO FALL AWAY FROM THE BUILDING AT 2.5% NOMINAL GRADE.
- ALL PAVEMENTS ARE TO BE SET AT 50mm BELOW THE FINISHED FLOOR LEVEL OF THE WAREHOUSE AND OFFICE AREAS.



LOCALITY PLAN
NTS

FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-------------------------|----------|-------|------------|------|-------|
| REVISED AS CLOUDED | 14.10.20 | E | | | |
| REVISED AS CLOUDED | 19.06.20 | D | | | |
| REVISED AS CLOUDED | 12.06.20 | C | | | |
| ISSUED FOR SSD APPROVAL | 30.03.20 | B | | | |
| ISSUED FOR INFORMATION | 20.03.20 | A | | | |

| ARCHITECT | CLIENT | PROJECT |
|-----------|--------|---------|
| | | |



| DESIGNED | DRAWN | DATE | CHECKED | SCALE | CAD REF. |
|----------|-------|--------|---------|-------|----------|
| TF | JB | 19 MAR | XC | A0 | AS SHOWN |

| | |
|------------|--|
| PROJECT | ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION |
| CLIENT | ESR |
| CONTRACTOR | CONSTIN ROE CONSULTING |
| CONTRACT | 327-335 BURLEY ROAD, HORSLEY PARK, 2175 |
| CAD REF. | LOT2990.05-SSDA10 |

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Wahib Bay, Sydney NSW 2000
Tel: (02) 9251-7889 Fax: (02) 9241-3721
email: mail@costinroe.com.au

Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

| DRAWING TITLE | DRAWING NO. | ISSUE |
|------------------------------|-------------------|-------|
| DRAWING LIST & LOCALITY PLAN | Co12990.05-SSDA10 | E |

SEDIMENTATION BASIN NOTE:

FOR SEDIMENT & EROSION CONTROL DETAILS REFER TO DRAWING C012990.05-SSDA25.

SEDIMENTATION BASIN SIZING BASED ON RECOMMENDATIONS OF 'SOILS AND CONSTRUCTION, MANAGING URBAN STORMWATER-THE BLUE BOOK'. CAPACITY BASED UPON 5 DAY RAINFALL DEPTH AT 85th PERCENTILE INTENSITY FOR FAIRFIELD (315mm).

SEDIMENT BASIN 1:
 CATCHMENT AREA = 7.73ha
 REQUIRED BASIN VOLUME = 1,825m³
 BASE DIMENSION (LxB) = 18.0m x 32.0m
 TOP DIMENSION (LxB) = 30.0m x 44.0m
 MAX SIDE SLOPE = 1V:3H
 DEPTH = 2.0m
 PROVIDED BASIN VOLUME = 1,845m³

SEDIMENT BASIN 2:
 CATCHMENT AREA = 6.225ha
 REQUIRED BASIN VOLUME = 1,470m³
 BASE DIMENSION (LxB) = 15.0m x 30.0m
 TOP DIMENSION (LxB) = 27.0m x 42.0m
 MAX SIDE SLOPE = 1V:3H
 DEPTH = 2.0m
 PROVIDED BASIN VOLUME = 1,532m³

SEDIMENT BASIN 3:
 CATCHMENT AREA = 9.21ha
 REQUIRED BASIN VOLUME = 2,175m³
 BASE DIMENSION (LxB) = 20.0m x 36.0m
 TOP DIMENSION (LxB) = 32.0m x 48.0m
 MAX SIDE SLOPE = 1V:3H
 DEPTH = 2.0m
 PROVIDED BASIN VOLUME = 2,205m³

SEDIMENT BASIN 4:
 CATCHMENT AREA = 5.69ha
 REQUIRED BASIN VOLUME = 1,344m³
 BASE DIMENSION (LxB) = 14.0m x 28.0m
 TOP DIMENSION (LxB) = 26.0m x 40.0m
 MAX SIDE SLOPE = 1V:3H
 DEPTH = 2.0m
 PROVIDED BASIN VOLUME = 1,380m³

SEDIMENT BASIN 5:
 CATCHMENT AREA = 10.44ha
 REQUIRED BASIN VOLUME = 2,466m³
 BASE DIMENSION (LxB) = 21.0m x 40.0m
 TOP DIMENSION (LxB) = 33.0m x 52.0m
 MAX SIDE SLOPE = 1V:3H
 DEPTH = 2.0m
 PROVIDED BASIN VOLUME = 2,504m³

SEDIMENTATION BASINS TO COLLECT RUN-OFF IN EXTREME RAINFALL EVENTS. COLLECTED RUN-OFF TO BE ASSESSED BY A QUALIFIED LABORATORY FOR DOUSING RATES OF ALUM OR GYPSUM TO ENSURE COAGULATION OF SEDIMENTS PRIOR TO WATER BEING DISCHARGED TO COUNCIL STORMWATER SYSTEM.

EACH BASIN IS TO HAVE A MARKER PLACED AS PER THE DETAIL TO INDICATE WHEN SEDIMENT IS TO BE REMOVED. REMOVED SEDIMENT IS TO BE CLASSED AND DEWATERED PRIOR TO REMOVAL FROM SITE.

ALLOWANCE TO BE MADE DURING BENCHING OF SITE TO ENSURE RUN-OFF IS DIRECTED TO SEDIMENTATION BASINS.

NOTES:

1. ASSUME TYPE D SOIL (CLAY/SILTY CLAY)
2. ASSUME GROUP D SOIL (HIGH PLASTICITY AND SHRINK/SWELL PROPERTIES)
3. $C_v = 0.5$ & LENGTH TO WIDTH RATIO OF 2 (MIN.)
 SOIL TYPE TO BE ASSESSED BY A GEOTECHNICAL ENGINEER

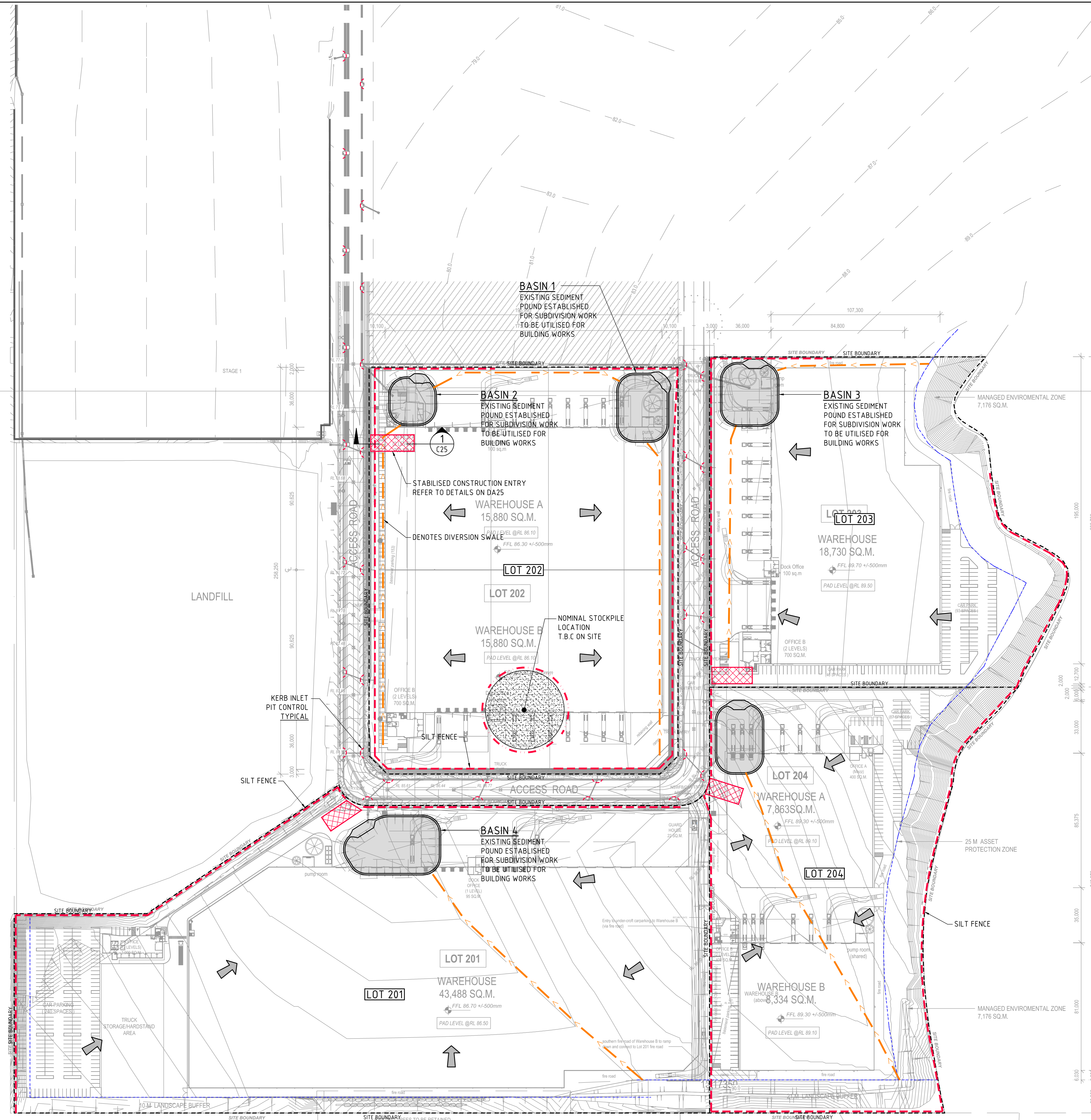
POND DEWATERING NOTES:

1. DRAIN PONDS OF WATER & DISCHARGE CLEAN WATER TO STORMWATER DRAINAGE SYSTEM (AS PER NOTES 2 & 3) - REFER TO STORMWATER PLAN FOR LOCATIONS.
2. DEWATERING TO BE PERFORMED IN SUCH A MANNER AS TO REMOVE CLEAN WATER WITHOUT REMOVING OR DISTURBING SILT, SEDIMENT OR OTHER ORGANIC MATERIAL FROM THE BASE OF THE PONDS.
3. DISCHARGE OF WATER FROM PONDS TO HAVE A PH RANGE OF 6.5-8.5 AND TSS < 50mg/L. PONDS TO BE DOSED WITH GYPSUM (APPROX. 30mg PER CUBIC METRE) TO ACCELERATE SETTLEMENT OF SUSPENDED SOLIDS.
4. REMOVE ALL SILT, ORGANIC AND WATER LOGGED MATERIAL FROM BASE OF POND (NOM. DEPTH 0.5-1.0m) AND DISPOSE OF IN ACCORDANCE WITH THE ACCEPTABLE PRACTICE.
5. EXPOSE NATURAL SITE SOILS AND COMPACT SUBGRADE IN ACCORDANCE WITH THE SITE PREPARATION NOTES (REFER DRG. SSDA10) REMOVING ANY SOFT ZONES AS REQ'D.
6. PLACE AND COMPACT FILL AS PER SITE PREPARATION NOTES ON DRAWING SSDA10.
7. INFORMATION PROVIDED ON THIS DRAWING SHALL BE USED TO GUIDE THE DEVELOPMENT OF THE CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN THAT SHALL BE IMPLEMENTED DURING CONSTRUCTION.

LEGEND:

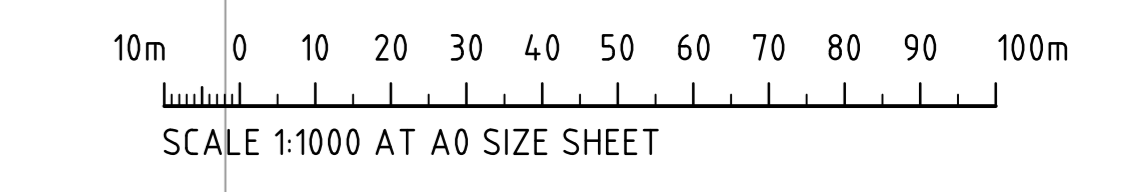
PROVIDE 1m RETURNS TO SILT FENCE AT 30m MAX. INTERVALS. TYPICAL (N.S.O.P.)

- DENOTES DIVERSION DRAIN
- DENOTES SILT FENCE WITH CATCH DRAIN
- DENOTES SILT FENCE ONLY
- DENOTES OVERLAND FLOW PATH
- DENOTES CONSTRUCTION ENTRY



EROSION SEDIMENT CONTROL PLAN
 SCALE 1:1000

EROSION & SEDIMENT CONTROL NOTES:
 REFER TO DRAWING SSDA10 FOR EROSION & SEDIMENT CONTROL NOTES



FOR SSD APPROVAL

| REVISIONS | DATE | ISSUE | AMENDMENTS |
|-------------------------------|----------|-------|------------|
| ISSUED FOR NEW ARCHITECTURALS | 12.06.20 | C | |
| ISSUED FOR SSD APPROVAL | 30.03.20 | B | |
| ISSUED FOR INFORMATION | 20.03.20 | A | |
| AMENDMENTS | DATE | ISSUE | AMENDMENTS |

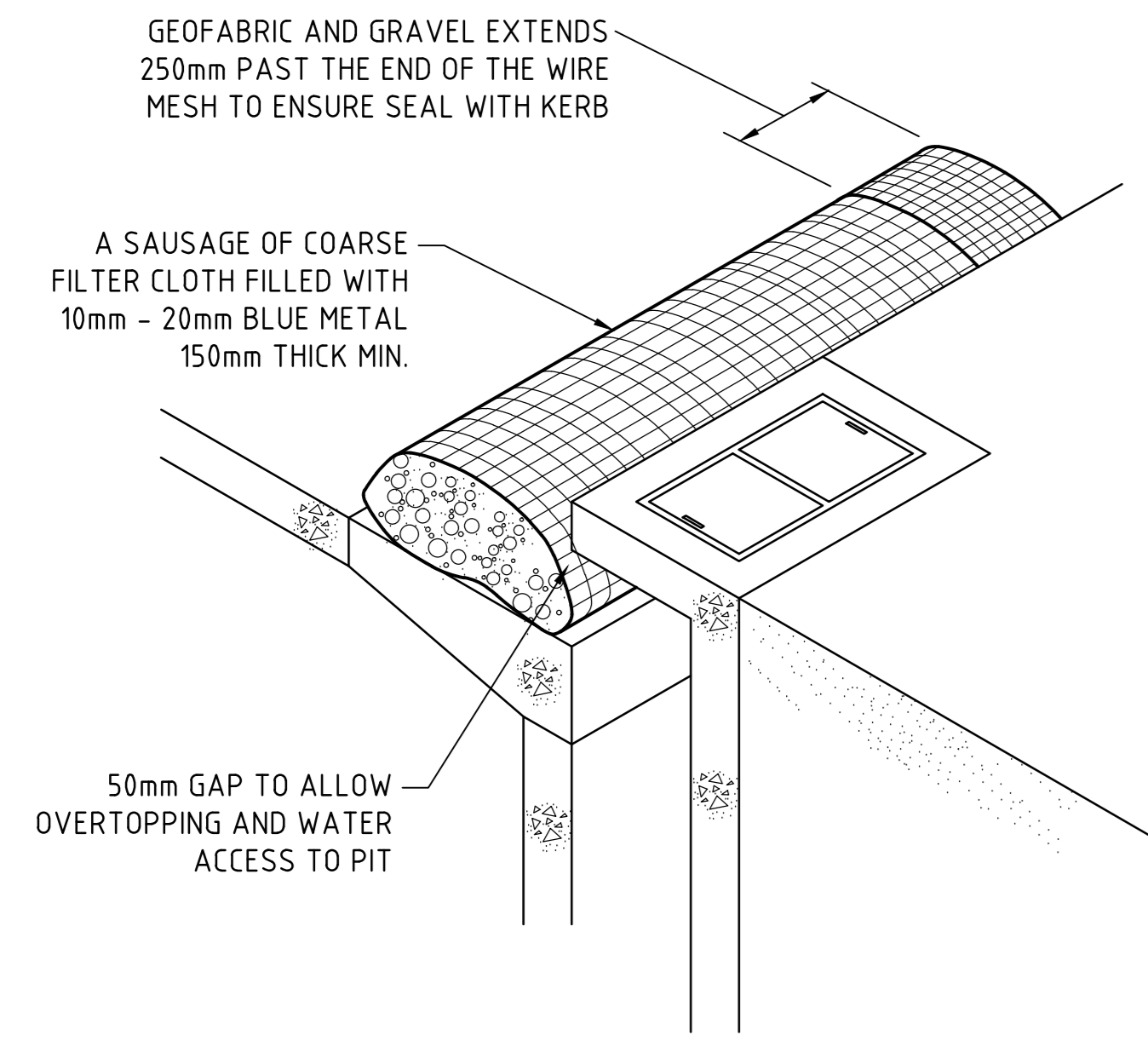
| PROJECT | CLIENT | ARCHITECT |
|--|--------|-----------|
| ESR HORSELY LOGISTICS PARK DEVELOPMENT APPLICATION | ESR | |

PROJECT: ESR HORSELY LOGISTICS PARK DEVELOPMENT APPLICATION
 327-335 BURLEY ROAD, HORSELY PARK, 2175

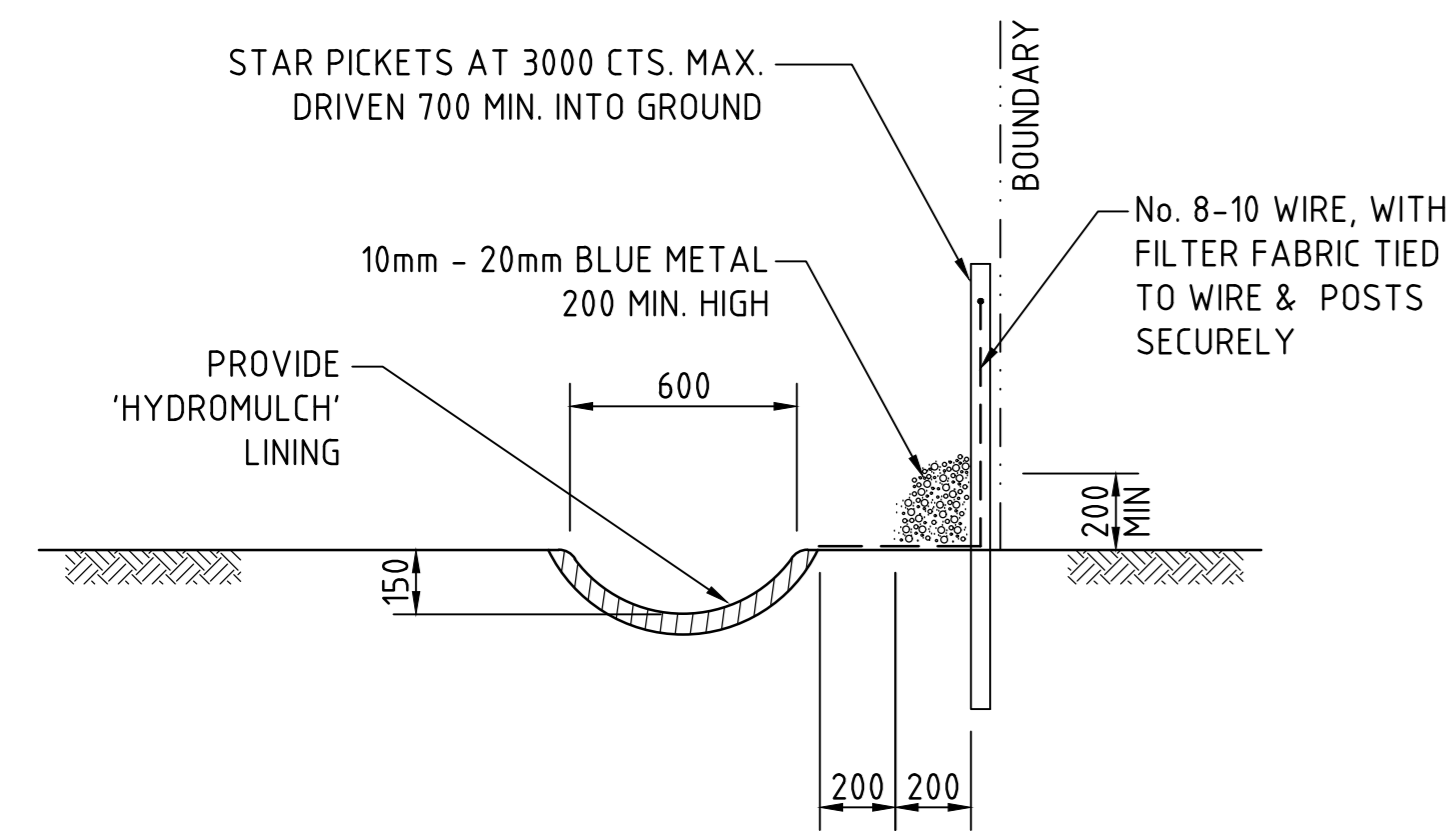
Costin Roe Consulting Pty Ltd.
 Consulting Engineers
 Level 1, 9 Windmill Street
 Walsh Bay, Sydney NSW 2000
 Tel: (02) 9251-7899 Fax: (02) 9241-3721
 email: mail@costinroe.com.au

Costin Roe Consulting
 PRECISION | COMMUNICATION | ACCOUNTABILITY

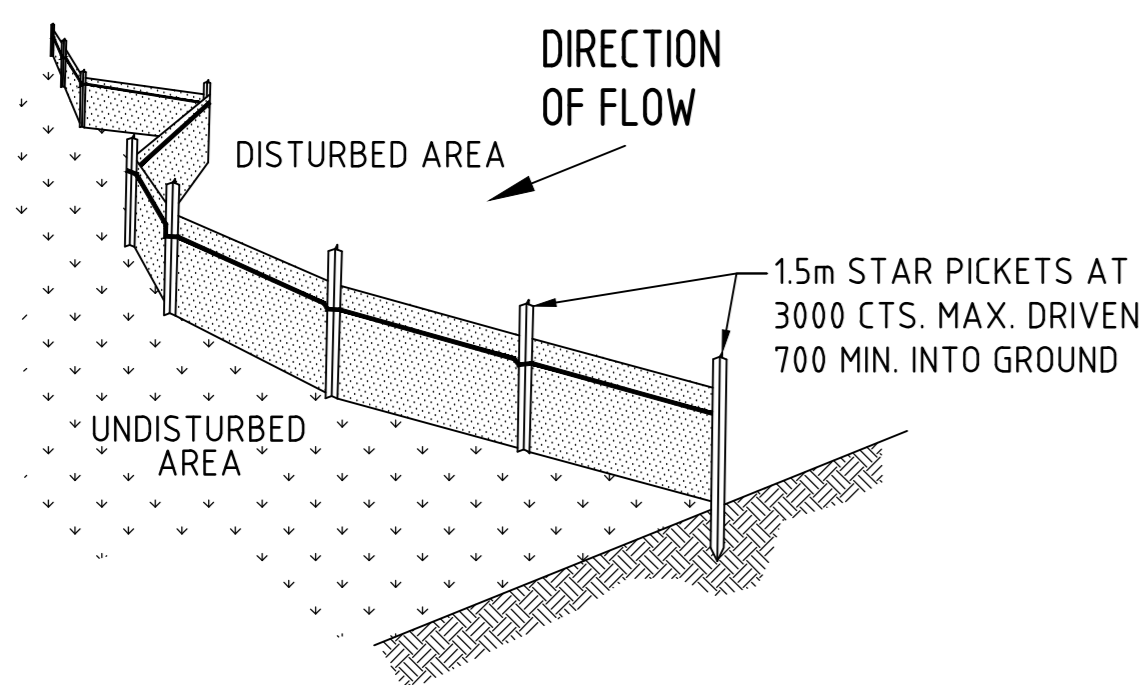
| DRAWING TITLE | ISSUE |
|-------------------------------|-------|
| EROSION SEDIMENT CONTROL PLAN | C |



KERB INLET CONTROL
N.T.S.

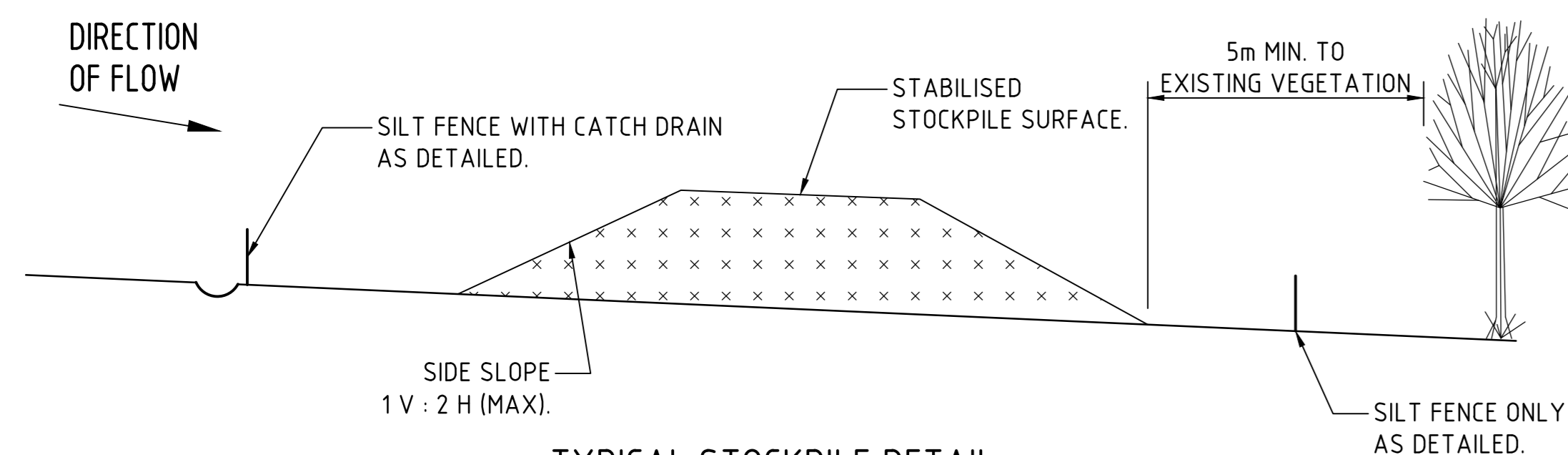


TYPICAL OPEN DRAIN & SILT FENCE
SCALE 1:20



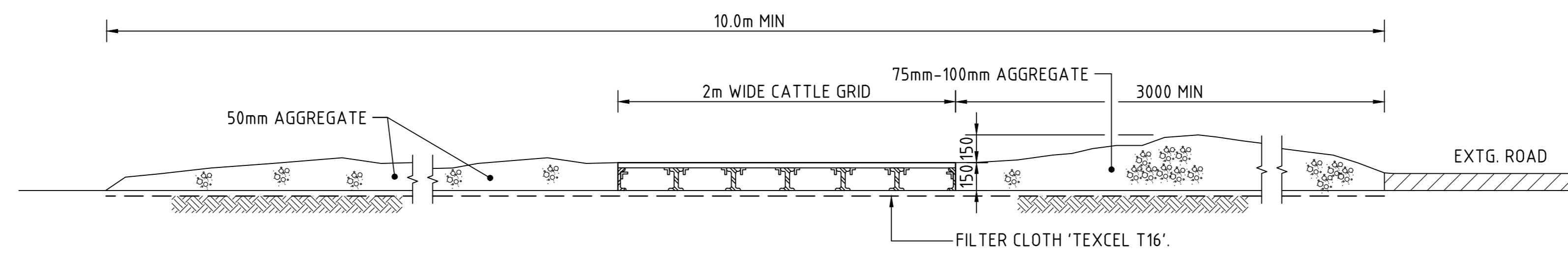
TYPICAL SILT FENCE DETAIL
N.T.S.

NOTE: PROVIDE 1m RETURNS AT 30m INTERVALS. TYPICAL

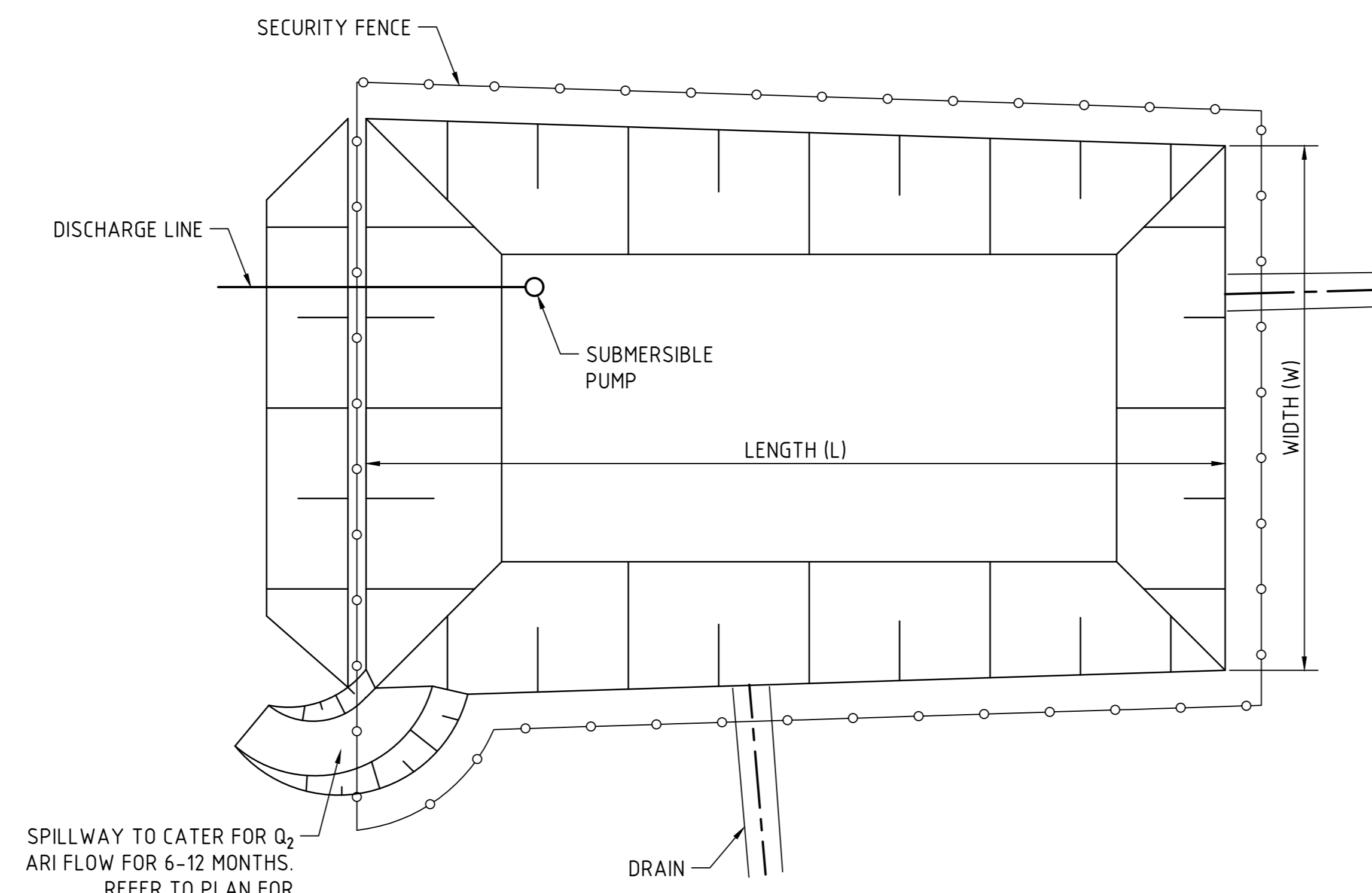


TYPICAL STOCKPILE DETAIL
N.T.S.

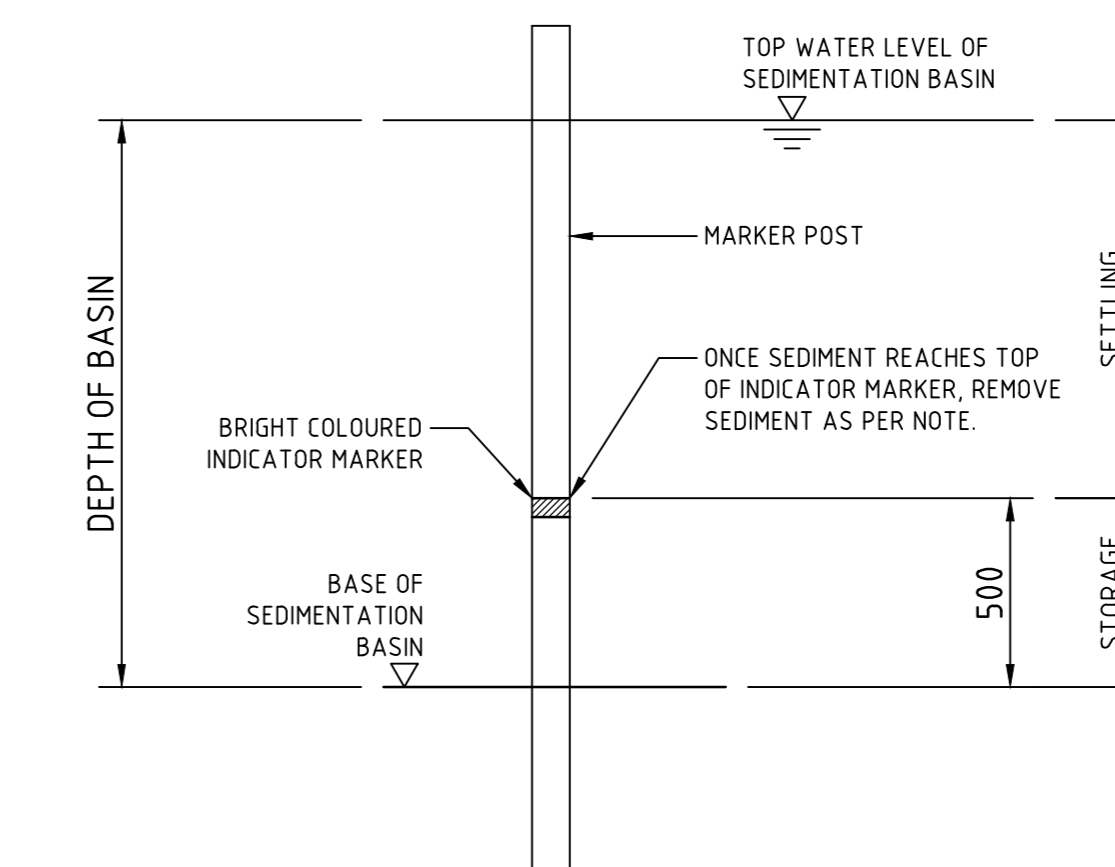
- STOCKPILE NOTES**
1. PLACE ALL STOCKPILES IN LOCATIONS MORE THAN 5m FROM EXISTING VEGETATION, ROADS & HAZARD AREAS.
 2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT ELONGATED MOUNDS. SIDE SLOPE TO BE 1V:2H MAX.
 3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
 4. WHERE STOCKPILES ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE USING WOOD CHIP MULCH - 16 TONNE/Ha.
 5. CONSTRUCT SILT FENCE WITH CATCH DRAIN ON UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES & SILT FENCE ONLY 1 TO 2m DOWNSLOPE AS SHOWN.



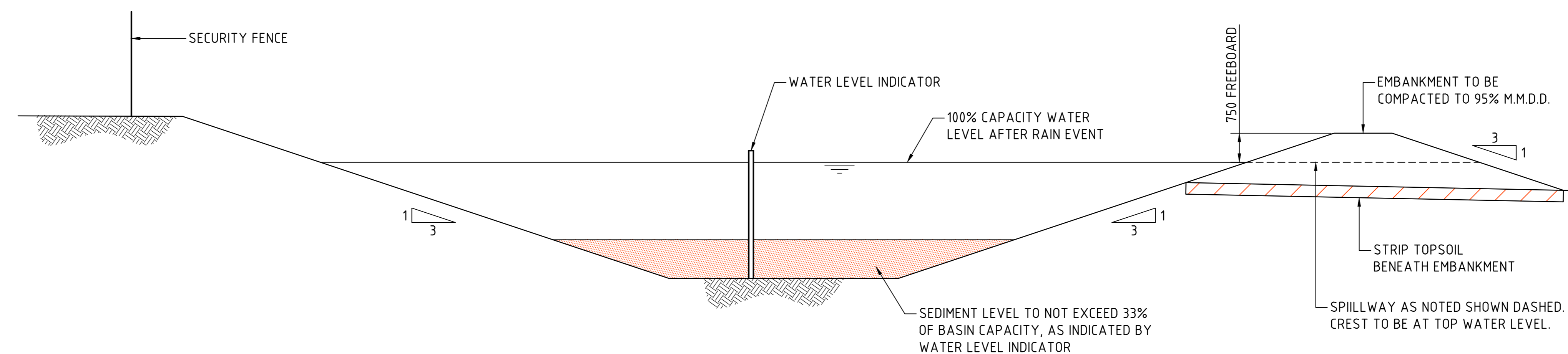
SECTION 1:20 1 : STABILISED CONSTRUCTION ENTRANCE 'TRUCK SHAKER'



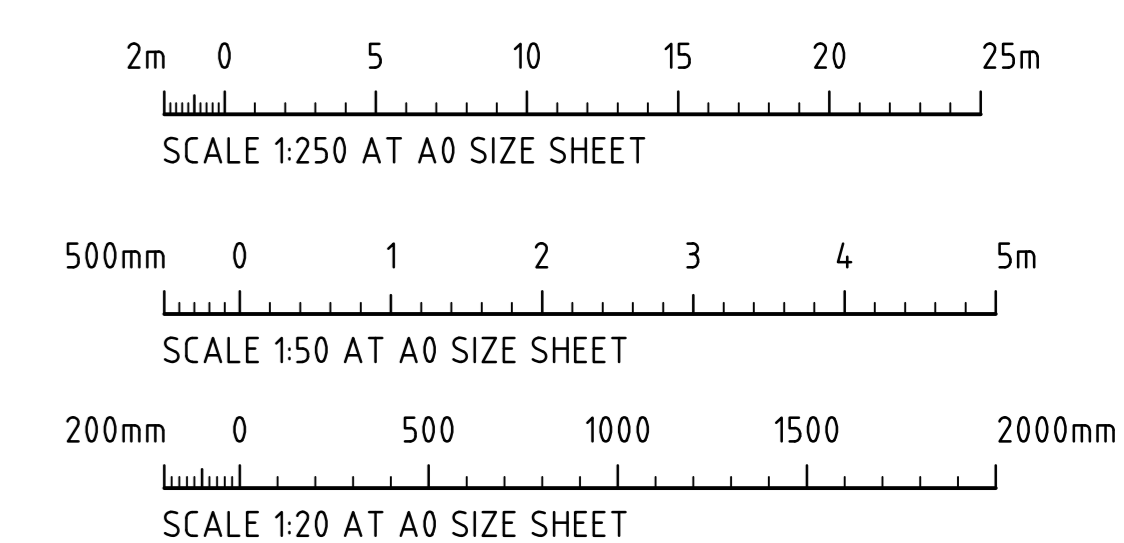
TYPICAL SEDIMENT CONTROL POND PLAN
SCALE 1:250



SEDIMENT STORAGE MARKER
SCALE 1:20



TYPICAL SEDIMENT CONTROL BASIN SECTION
SCALE 1:50



FOR SSD APPROVAL

| ISSUED FOR SSD APPROVAL | 30.03.20 | B | AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-------------------------|----------|---|------------|------|-------|------------|------|-------|
| ISSUED FOR INFORMATION | 20.03.20 | A | | | | | | |

ARCHITECT

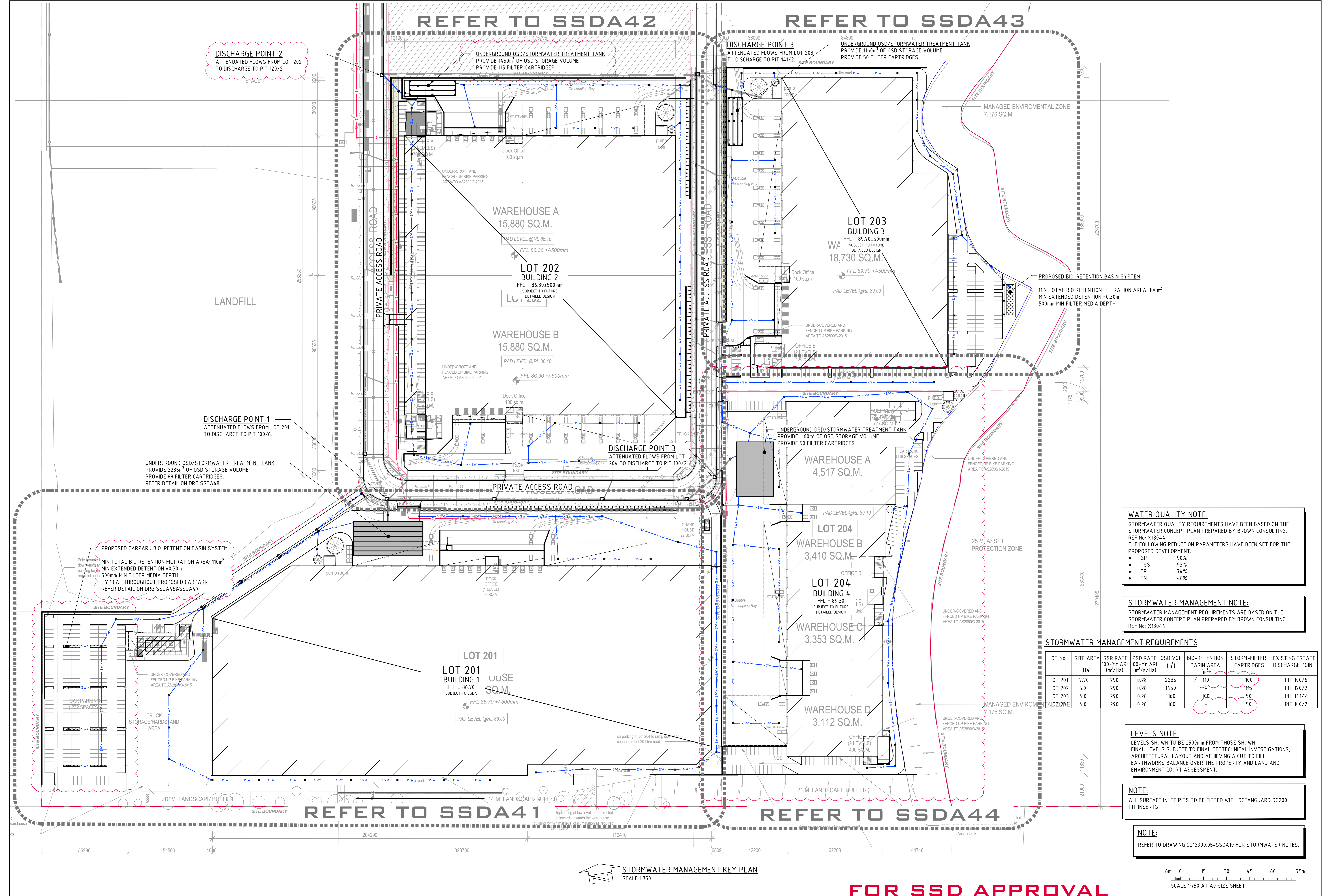
CLIENT
ESR

PROJECT
ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2175

COSTIN ROE CONSULTING AUSTRALIA
Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 9 Windmill Street
Wahib Bay, Sydney NSW 2000
Tel: (02) 9251-7899 Fax: (02) 9241-3721
email: mail@costinroe.com.au

Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
EROSION SEDIMENT CONTROL PLAN DETAILS
DRAWING No. **Co12990.05-SSDA25** ISSUE **B**



DISCHARGE POINT 2
ATTENUATED FLOWS FROM LOT 202
TO DISCHARGE TO PIT 120/2

UNDERGROUND OSD/STORMWATER TREATMENT TANK
PROVIDE 1450m³ OF OSD STORAGE VOLUME
PROVIDE 115 FILTER CARTRIDGES.

DISCHARGE POINT 3
ATTENUATED FLOWS FROM LOT 203
TO DISCHARGE TO PIT 141/2.

UNDERGROUND OSD/STORMWATER TREATMENT TANK
PROVIDE 1160m³ OF OSD STORAGE VOLUME
PROVIDE 50 FILTER CARTRIDGES.

LANDFILL

DISCHARGE POINT 1
ATTENUATED FLOWS FROM LOT 201
TO DISCHARGE TO PIT 100/6.

UNDERGROUND OSD/STORMWATER TREATMENT TANK
PROVIDE 2235m³ OF OSD STORAGE VOLUME
PROVIDE 88 FILTER CARTRIDGES.
REFER DETAIL ON DRG SSSA48.

PROPOSED CARPARK BIO-RETENTION BASIN SYSTEM
MIN TOTAL BIO RETENTION FILTRATION AREA: 110m²
MIN EXTENDED DETENTION = 0.30m
500mm MIN FILTER MEDIA DEPTH
TYPICAL THROUGHOUT PROPOSED CARPARK
REFER DETAIL ON DRG SSSA46&SSA47

PROPOSED BIO-RETENTION BASIN SYSTEM
MIN TOTAL BIO RETENTION FILTRATION AREA: 100m²
MIN EXTENDED DETENTION = 0.30m
500mm MIN FILTER MEDIA DEPTH

WATER QUALITY NOTE:
STORMWATER QUALITY REQUIREMENTS HAVE BEEN BASED ON THE STORMWATER CONCEPT PLAN PREPARED BY BROWN CONSULTING. REF No: XT304.4.
THE FOLLOWING REDUCTION PARAMETERS HAVE BEEN SET FOR THE PROPOSED DEVELOPMENT:

- GP 90%
- TSS 93%
- TP 74%
- TN 4.8%

STORMWATER MANAGEMENT NOTE:
STORMWATER MANAGEMENT REQUIREMENTS ARE BASED ON THE STORMWATER CONCEPT PLAN PREPARED BY BROWN CONSULTING. REF No: XT304.4.

STORMWATER MANAGEMENT REQUIREMENTS

| LOT No. | SITE AREA (Ha) | SSR RATE 100-Yr ARI (m ³ /Ha) | PSD RATE 100-Yr ARI (m ³ /s/Ha) | OSD VOL (m ³) | BIO-RETENTION BASIN AREA (m ²) | STORM-FILTER CARTRIDGES | EXISTING ESTATE DISCHARGE POINT |
|---------|----------------|--|--|---------------------------|--|-------------------------|---------------------------------|
| LOT 201 | 7.70 | 290 | 0.28 | 2235 | 110 | 100 | PIT 100/6 |
| LOT 202 | 5.0 | 290 | 0.28 | 1450 | 115 | 115 | PIT 120/2 |
| LOT 203 | 4.0 | 290 | 0.28 | 1160 | 100 | 50 | PIT 141/2 |
| LOT 204 | 4.0 | 290 | 0.28 | 1160 | - | 50 | PIT 100/2 |

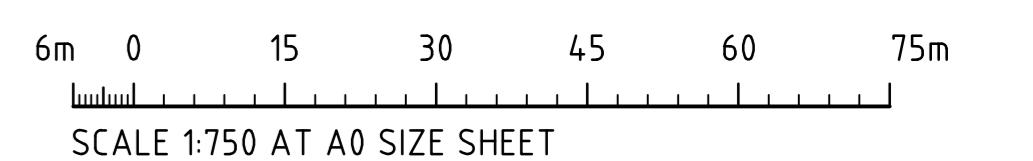
LEVELS NOTE:
LEVELS SHOWN TO BE ±500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY AND LAND AND ENVIRONMENT COURT ASSESSMENT.

NOTE:
ALL SURFACE INLET PITS TO BE FITTED WITH OCEANGUARD OG200 PIT INSERTS

NOTE:
REFER TO DRAWING C012990.05-SSDA10 FOR STORMWATER NOTES.

STORMWATER MANAGEMENT KEY PLAN
SCALE 1:750

FOR SSD APPROVAL



| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|--------------------------------|----------|-------|------------|------|-------|
| REVISED AS CLOUDED | 14.10.20 | E | | | |
| REVISED AS CLOUDED | 24.06.20 | D | | | |
| REVISED FOR NEW ARCHITECTURALS | 12.06.20 | C | | | |
| ISSUED FOR SSD APPROVAL | 30.03.20 | B | | | |
| ISSUED FOR INFORMATION | 20.03.20 | A | | | |

ARCHITECT

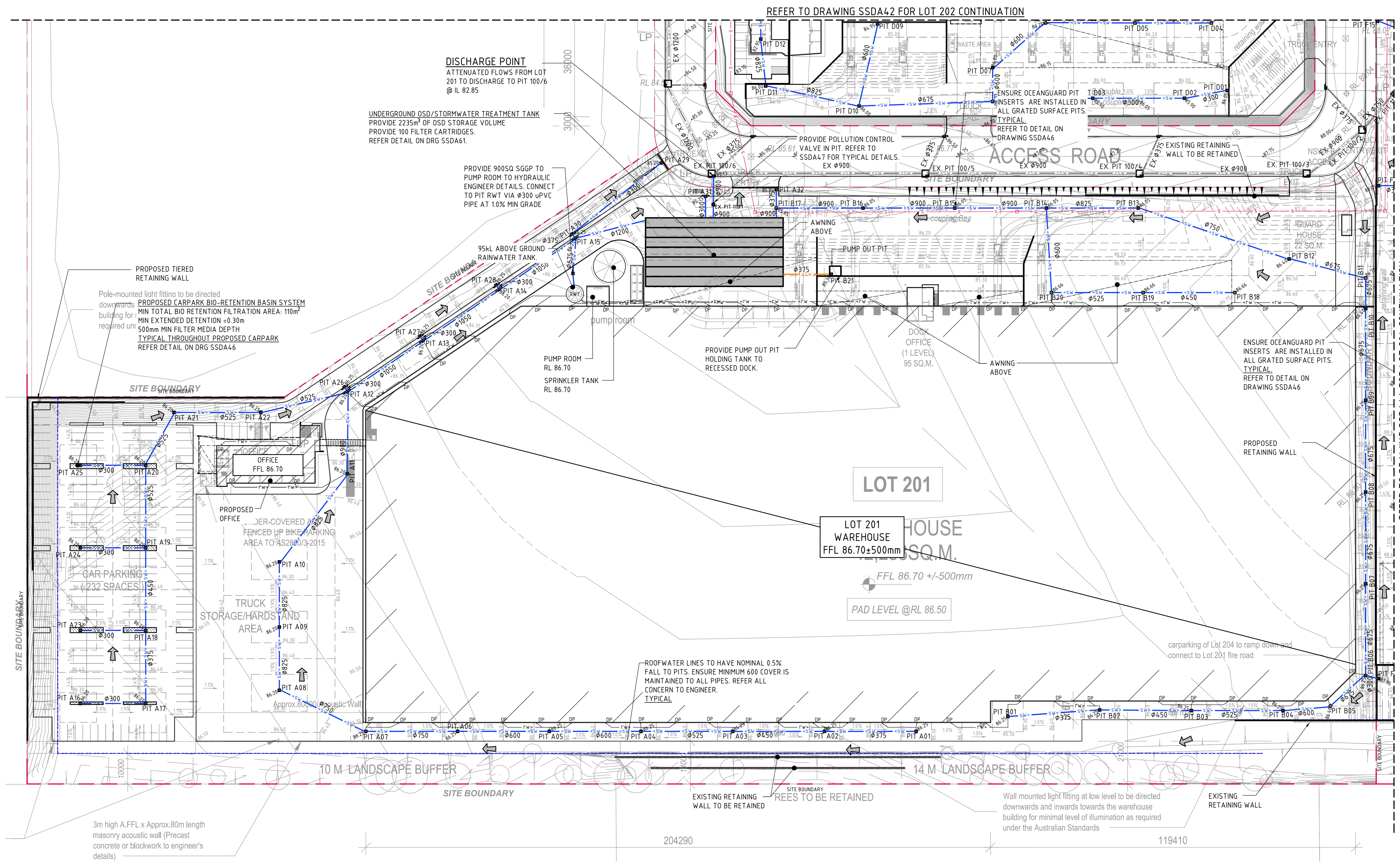
CLIENT

PROJECT
ESR
ESR HORSLEY LOGISTICS PARK
DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2115

CONSULTANT
Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 9 Windmill Street
Wahia Bay, Sydney NSW 2000
Tel: (02) 9251-7899 Fax: (02) 8241-3721
email: mail@costinroe.com.au

Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
STORMWATER MANAGEMENT KEY PLAN
DRAWING No: C012990.05-SSDA40



PIT SCHEDULE - NETWORK A

| PIT No. | GRATE RL | TYPE | SIZE | COMMENT |
|---------|----------|------|-----------|---------|
| PIT A01 | 86.25 | SGGP | 900x900 | - |
| PIT A02 | 86.25 | SGGP | 900x900 | - |
| PIT A03 | 86.25 | SGGP | 900x900 | - |
| PIT A04 | 86.25 | SGGP | 900x900 | - |
| PIT A05 | 86.25 | SGGP | 900x900 | - |
| PIT A06 | 86.25 | SGGP | 900x900 | - |
| PIT A07 | 86.25 | SGGP | 900x900 | - |
| PIT A08 | 86.20 | SGGP | 1200x1200 | - |
| PIT A09 | 86.20 | SGGP | 1200x1200 | - |
| PIT A10 | 86.20 | SGGP | 1200x1200 | - |
| PIT A11 | 86.20 | SGGP | 1200x1200 | - |
| PIT A12 | 86.20 | KIP | 1500x1500 | - |
| PIT A13 | 86.20 | KIP | 1500x1500 | - |
| PIT A14 | 86.20 | KIP | 1500x1500 | - |
| PIT A15 | 86.20 | KIP | 1500x1500 | - |
| PIT A16 | 86.20 | SGGP | 900x900 | - |
| PIT A17 | 86.20 | SGGP | 900x900 | - |
| PIT A18 | 86.20 | SGGP | 900x900 | - |
| PIT A19 | 86.20 | SGGP | 900x900 | - |
| PIT A20 | 86.20 | SGGP | 900x900 | - |
| PIT A21 | 86.20 | SGGP | 900x900 | - |
| PIT A22 | 86.25 | SGGP | 900x900 | - |
| PIT A23 | 86.20 | SGGP | 900x900 | - |
| PIT A24 | 86.20 | SGGP | 900x900 | - |
| PIT A25 | 86.20 | SGGP | 900x900 | - |
| PIT A26 | 86.25 | KIP | 900x900 | - |
| PIT A27 | 86.25 | KIP | 900x900 | - |
| PIT A28 | 86.25 | KIP | 900x900 | - |
| PIT A29 | 85.20 | SGGP | 900x900 | - |
| PIT A30 | 86.25 | KIP | 900x900 | - |
| PIT A31 | 85.75 | KIP | 900x900 | - |
| PIT A32 | 85.80 | SGGP | 900x900 | - |

PIT SCHEDULE - NETWORK B

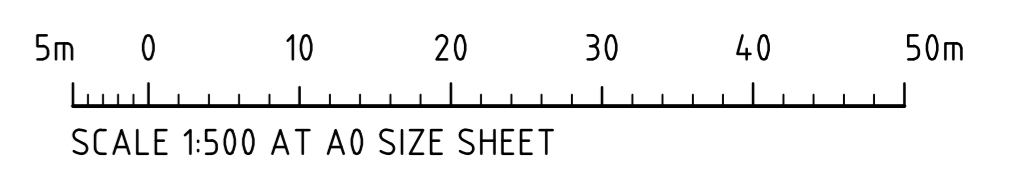
| PIT No. | GRATE RL | TYPE | SIZE | COMMENT |
|---------|----------|------|-----------|--------------|
| PIT B01 | 86.25 | SGGP | 900x900 | - |
| PIT B02 | 86.25 | SGGP | 900x900 | - |
| PIT B03 | 86.25 | SGGP | 900x900 | - |
| PIT B04 | 86.25 | SGGP | 900x900 | - |
| PIT B05 | 86.40 | SJP | 900x900 | - |
| PIT B06 | 86.25 | SGGP | 900x900 | - |
| PIT B07 | 86.25 | SGGP | 900x900 | - |
| PIT B08 | 86.25 | SGGP | 900x900 | - |
| PIT B09 | 86.25 | SGGP | 900x900 | - |
| PIT B10 | 86.40 | SGGP | 900x900 | - |
| PIT B11 | 86.70 | SJP | 900x900 | - |
| PIT B12 | 86.40 | SGGP | 900x900 | - |
| PIT B13 | 86.05 | SGGP | 1200x1200 | - |
| PIT B14 | 86.05 | SGGP | 1200x1200 | - |
| PIT B15 | 86.05 | SGGP | 1200x1200 | - |
| PIT B16 | 86.05 | SGGP | 1200x1200 | - |
| PIT B17 | 85.85 | SJP | 1200x1200 | - |
| PIT B18 | 86.66 | SJP | 900x900 | - |
| PIT B19 | 86.66 | SJP | 900x900 | - |
| PIT B20 | 86.66 | SJP | 900x900 | - |
| PIT B21 | 85.20 | SGGP | 900x900 | PUMP OUT PIT |

LEGEND:
LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY CALIBRE CONSULTING DATED 10.11.17.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- PROPOSED DRAINAGE LINE
- PROPOSED DRAINAGE LINE WITH NON RETURN VALVE
- EXISTING DRAINAGE LINE
- ROOFWATER DOWNPIPE (INDICATIVE)
- ROOFWATER LINE
- SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- ASSET PROTECTION ZONE BOUNDARY

LEVELS NOTE:
LEVELS SHOWN TO BE ±500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY AND LAND AND ENVIRONMENT COURT ASSESSMENT.



LOT 201 STORMWATER DRAINAGE PLAN
SCALE 1:500

FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|--------------------------------|----------|-------|------------|------|-------|
| ARCHITECTURAL LAYOUT REVISED | 28.10.20 | E | | | |
| REVISED AS CLOUDED | 14.10.20 | D | | | |
| REVISED FOR NEW ARCHITECTURALS | 12.06.20 | C | | | |
| ISSUED FOR SSD APPROVAL | 30.03.20 | B | | | |
| ISSUED FOR INFORMATION | 20.03.20 | A | | | |

ARCHITECT



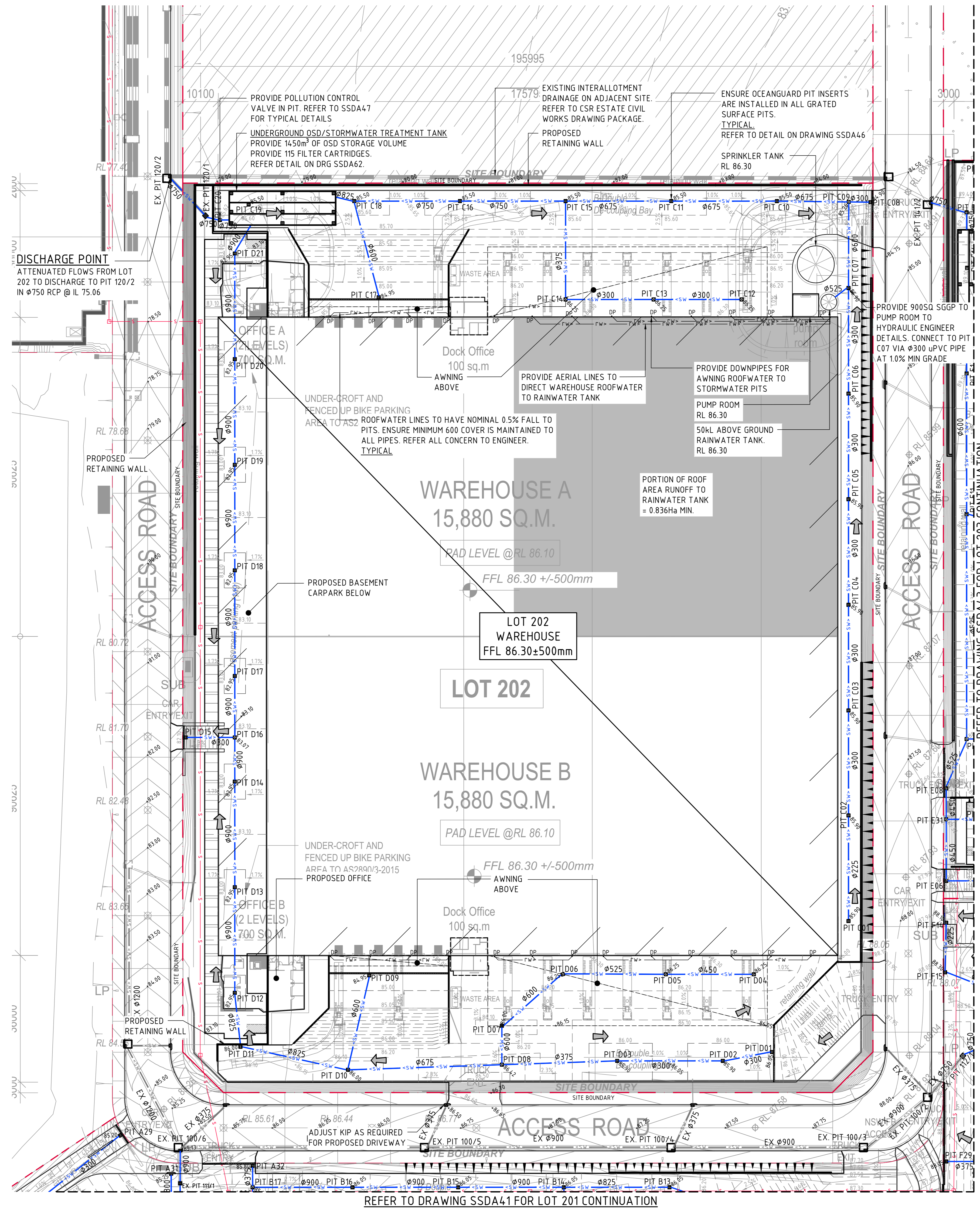
PROJECT
ESR HORSLEY LOGISTICS PARK
DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2175

CLIENT
Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Wahbi Bay, Sydney NSW 2000
Tel: (02) 8251-7899 Fax: (02) 8241-3721
email: mail@costinroe.com.au



DRAWING TITLE
LOT 201
STORMWATER DRAINAGE PLAN
DRAWING No. Co12990.05-SSDA41

PRECISION | COMMUNICATION | ACCOUNTABILITY



PIT SCHEDULE - NETWORK C

| PIT No. | GRATE RL | TYPE | SIZE | COMMENT |
|---------|----------|------|-----------|---------|
| PIT C01 | 85.90 | SGGP | 900x900 | - |
| PIT C02 | 85.90 | SGGP | 900x900 | - |
| PIT C03 | 85.90 | SGGP | 900x900 | - |
| PIT C04 | 85.90 | SGGP | 900x900 | - |
| PIT C05 | 85.90 | SGGP | 900x900 | - |
| PIT C06 | 85.90 | SGGP | 900x900 | - |
| PIT C07 | 85.90 | SGGP | 900x900 | - |
| PIT C08 | 84.90 | SGGP | 900x900 | - |
| PIT C09 | 85.26 | SJP | 900x900 | - |
| PIT C10 | 85.50 | SGGP | 900x900 | - |
| PIT C11 | 85.50 | SGGP | 900x900 | - |
| PIT C12 | 86.25 | SJP | 900x900 | - |
| PIT C13 | 86.25 | SJP | 900x900 | - |
| PIT C14 | 86.25 | SJP | 900x900 | - |
| PIT C15 | 85.50 | SGGP | 900x900 | - |
| PIT C16 | 85.50 | SGGP | 900x900 | - |
| PIT C17 | 84.95 | SGGP | 900x900 | - |
| PIT C18 | 85.50 | SGGP | 1200x1200 | - |
| PIT C19 | 85.50 | SGGP | 900x900 | - |
| PIT C20 | 85.62 | SGGP | 900x900 | - |

PIT SCHEDULE - NETWORK D

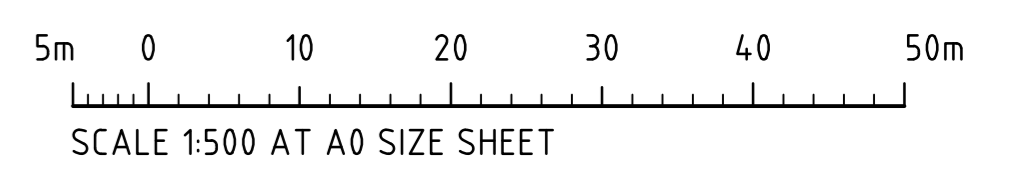
| PIT No. | GRATE RL | TYPE | SIZE | COMMENT |
|---------|----------|------|-----------|---------|
| PIT D01 | 86.05 | SGGP | 900x900 | - |
| PIT D02 | 85.90 | SGGP | 900x900 | - |
| PIT D03 | 85.90 | SGGP | 900x900 | - |
| PIT D04 | 86.25 | SJP | 900x900 | - |
| PIT D05 | 86.25 | SJP | 900x900 | - |
| PIT D06 | 86.25 | SJP | 900x900 | - |
| PIT D07 | 86.00 | SGGP | 900x900 | - |
| PIT D08 | 86.42 | SJP | 900x900 | - |
| PIT D09 | 84.95 | SGGP | 900x900 | - |
| PIT D10 | 86.00 | SGGP | 1200x1200 | - |
| PIT D11 | 86.00 | SGGP | 1200x1200 | - |
| PIT D12 | 82.95 | SGGP | 1200x1200 | - |
| PIT D13 | 82.95 | SGGP | 1200x1200 | - |
| PIT D14 | 82.95 | SGGP | 1200x1200 | - |
| PIT D15 | 82.10 | SGGP | 1200x1200 | - |
| PIT D16 | 83.07 | SJP | 1200x1200 | - |
| PIT D17 | 82.95 | SGGP | 1200x1200 | - |
| PIT D18 | 82.95 | SGGP | 1200x1200 | - |
| PIT D19 | 82.95 | SGGP | 1200x1200 | - |
| PIT D20 | 82.95 | SGGP | 1200x1200 | - |
| PIT D21 | 82.95 | SGGP | 1200x1200 | - |

LEGEND:
LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY CALIBRE CONSULTING DATED 10.11.17.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- PROPOSED DRAINAGE LINE
- EXISTING DRAINAGE LINE
- ROOFWATER DOWNPIPE (INDICATIVE)
- ROOFWATER LINE
- SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- ASSET PROTECTION ZONE BOUNDARY

LEVELS NOTE:
LEVELS SHOWN TO BE ±500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY AND LAND AND ENVIRONMENT COURT ASSESSMENT.



LOT 202 STORMWATER DRAINAGE PLAN
SCALE 1:500

FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|------------------------------|----------|-------|------------|------|-------|
| ARCHITECTURAL LAYOUT REVISED | 28.10.20 | E | | | |
| REVISED AS CLOUDED | 20.10.20 | D | | | |
| REVISED AS CLOUDED | 14.10.20 | C | | | |
| REVISED AS CLOUDED | 24.06.20 | B | | | |
| ISSUED FOR SSD APPROVAL | 17.06.20 | A | | | |

| ARCHITECT | CLIENT | PROJECT | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-----------|--------|--|--------|-------|------------|------|-------|
| | | ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION | MAR 19 | | | | |



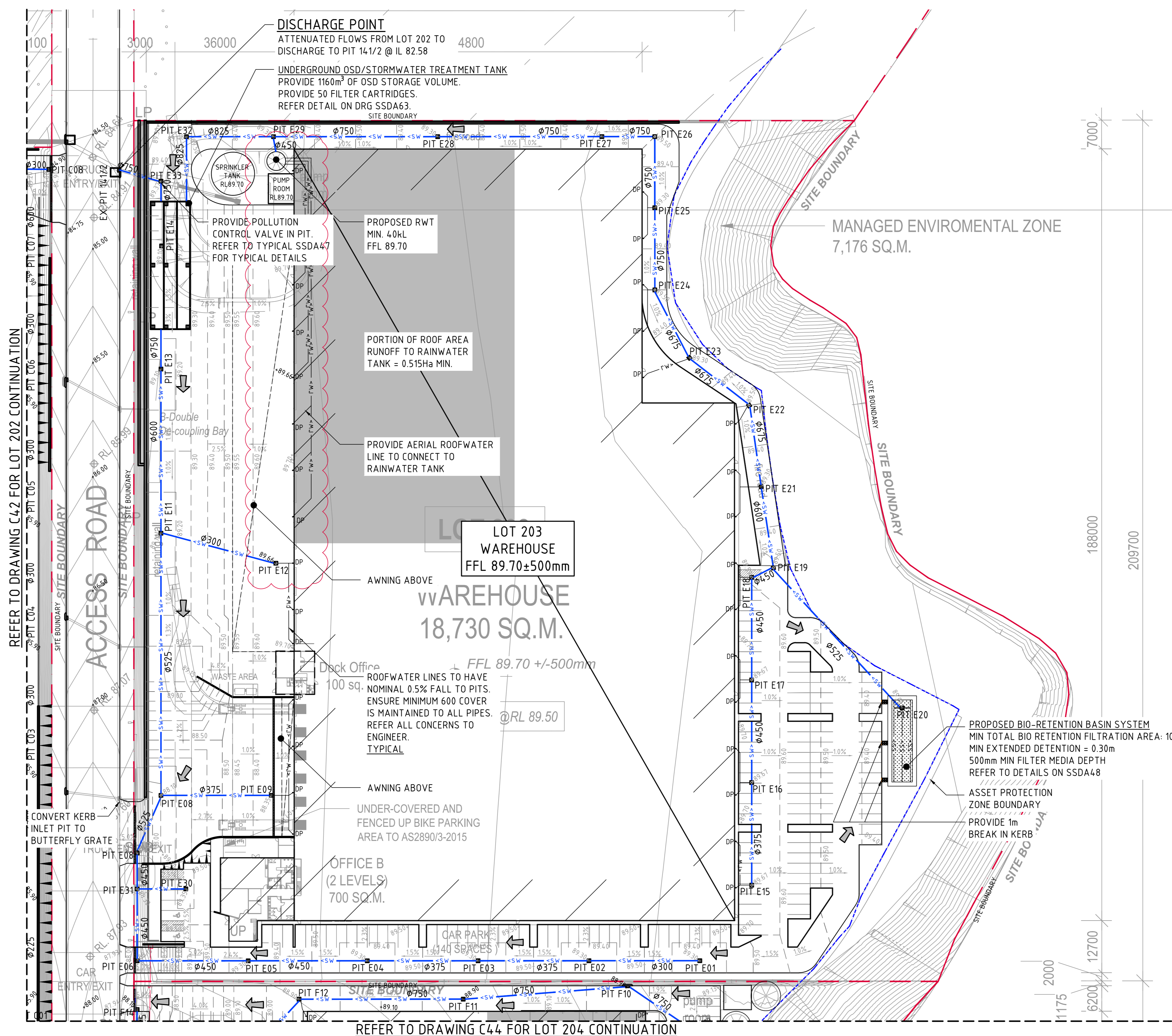
PROJECT
ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2175

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Wahlab Bay, Sydney NSW 2000
Tel: (02) 8251-7899 Fax: (02) 8241-3721
email: mail@costinroe.com.au

Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

| DRAWING TITLE | ISSUE |
|----------------------------------|-------------------|
| LOT 202 STORMWATER DRAINAGE PLAN | E |
| DRAWING No | Co12990.05-SSDA42 |



PIT SCHEDULE - LOT 203

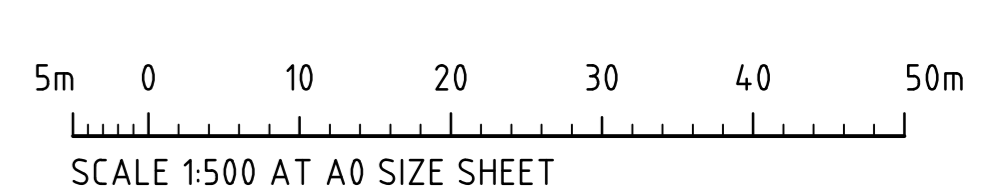
| PIT No. | GRATE RL | TYPE | SIZE | COMMENT |
|---------|----------|------|-----------|-----------------|
| PIT E01 | 89.30 | SGGP | 900x900 | - |
| PIT E02 | 89.30 | SGGP | 900x900 | - |
| PIT E03 | 89.30 | SGGP | 900x900 | - |
| PIT E04 | 89.30 | SGGP | 900x900 | - |
| PIT E05 | 89.30 | SGGP | 900x900 | - |
| PIT E06 | 88.13 | SGGP | 900x900 | - |
| PIT E07 | 87.80 | SGGP | 900x900 | - |
| PIT E08 | 88.10 | SJP | 900x900 | - |
| PIT E09 | 88.35 | SGGP | 900x900 | - |
| PIT E10 | 89.10 | SGGP | 900x900 | - |
| PIT E11 | 89.10 | SGGP | 900x900 | - |
| PIT E12 | 89.66 | SJP | 900x900 | - |
| PIT E13 | 89.10 | SGGP | 900x900 | - |
| PIT E14 | 89.10 | SGGP | 900x900 | - |
| PIT E15 | 89.67 | SJP | 900x900 | - |
| PIT E16 | 89.67 | SJP | 900x900 | - |
| PIT E17 | 89.67 | SJP | 900x900 | - |
| PIT E18 | 89.59 | SJP | 900x900 | - |
| PIT E19 | 89.50 | SJP | 900x900 | - |
| PIT E20 | 89.00 | SGGP | 900x900 | BASIN INLET PIT |
| PIT E21 | 89.30 | SGGP | 900x900 | - |
| PIT E22 | 89.50 | SJP | 900x900 | - |
| PIT E23 | 89.30 | SGGP | 900x900 | - |
| PIT E24 | 89.50 | SJP | 900x900 | - |
| PIT E25 | 89.30 | SGGP | 900x900 | - |
| PIT E26 | 89.50 | SJP | 900x900 | - |
| PIT E27 | 89.30 | SGGP | 900x900 | - |
| PIT E28 | 89.30 | SGGP | 900x900 | - |
| PIT E29 | 89.30 | SGGP | 1200x1200 | - |
| PIT E30 | 89.35 | SGGP | 900x900 | - |
| PIT E31 | 88.30 | SJP | 900x900 | - |
| PIT E32 | 89.48 | SGGP | 1200x1200 | - |
| PIT E33 | 89.37 | SGGP | 900x900 | CUT OFF VALVE |

LEGEND:
LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY CALIBRE CONSULTING DATED 10.11.17.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- PROPOSED DRAINAGE LINE
- PROPOSED DRAINAGE LINE WITH NON RETURN VALVE
- EXISTING DRAINAGE LINE
- ROOFWATER DOWNPIPE (INDICATIVE)
- ROOFWATER LINE
- SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- ASSET PROTECTION ZONE BOUNDARY

LEVELS NOTE:
LEVELS SHOWN TO BE ±500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY AND LAND AND ENVIRONMENT COURT ASSESSMENT.



REFER TO DRAWING C42 FOR LOT 202 CONTINUATION

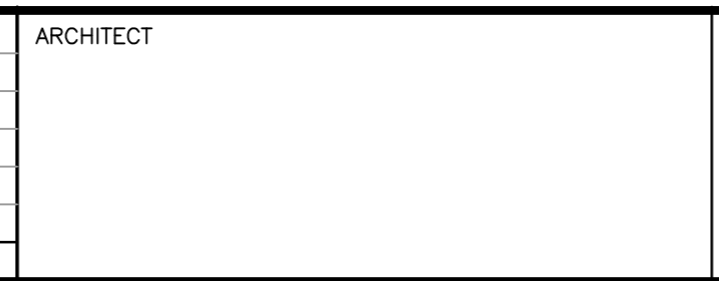
REFER TO DRAWING C44 FOR LOT 204 CONTINUATION

LOT 203 STORMWATER DRAINAGE PLAN
SCALE 1:500

FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-------------------------|----------|-------|------------|------|-------|
| REVISED AS CLOUDED | 28.10.20 | C | | | |
| REVISED AS CLOUDED | 14.10.20 | B | | | |
| ISSUED FOR SSD APPROVAL | 12.06.20 | A | | | |

| ARCHITECT | CLIENT | PROJECT | CLIENT |
|-----------|--------|--|--------|
| | | ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION | ESR |



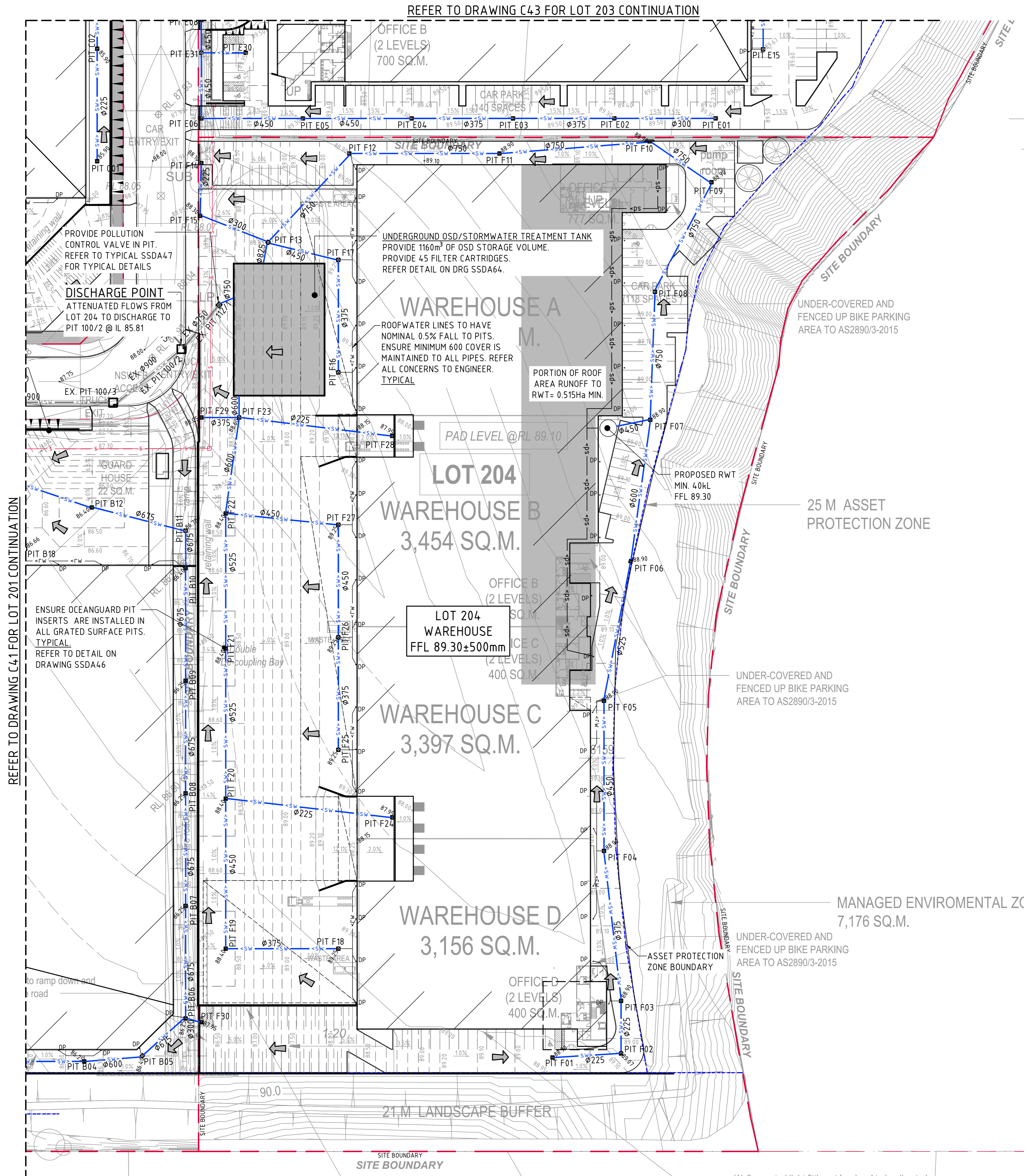
PROJECT
ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2115

PROJECT
ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2115

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 9 Windmill Street
Wahib Bay, Sydney NSW 2000
Tel: (02) 8251-7899 Fax: (02) 8241-3721
email: mail@costinroe.com.au

Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
LOT 203 STORMWATER DRAINAGE PLAN
DRAWING No. Co12990.05-SSDA43



PIT SCHEDULE - NETWORK F

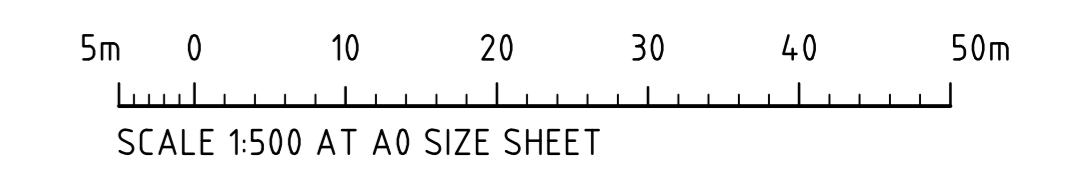
| PIT No. | GRATE RL | TYPE | SIZE | COMMENT |
|---------|----------|------|-----------|---------|
| PIT F01 | 88.90 | SGGP | 900x900 | - |
| PIT F02 | 89.07 | SJP | 900x900 | - |
| PIT F03 | 88.90 | SGGP | 900x900 | - |
| PIT F04 | 88.90 | SGGP | 900x900 | - |
| PIT F05 | 88.90 | SGGP | 900x900 | - |
| PIT F06 | 88.90 | SGGP | 900x900 | - |
| PIT F07 | 88.90 | SGGP | 900x900 | - |
| PIT F08 | 88.90 | SGGP | 900x900 | - |
| PIT F09 | 88.90 | SGGP | 900x900 | - |
| PIT F10 | 88.90 | KIP | 900x900 | - |
| PIT F11 | 88.90 | SGGP | 900x900 | - |
| PIT F12 | 88.90 | SGGP | 1200x1200 | - |
| PIT F13 | 88.85 | SJP | 1200x1200 | - |
| PIT F14 | 88.10 | SGGP | 900x900 | - |
| PIT F15 | 88.30 | SGGP | 900x900 | - |
| PIT F16 | 89.25 | SJP | 900x900 | - |
| PIT F17 | 89.25 | SJP | 900x900 | - |
| PIT F18 | 89.25 | SJP | 900x900 | - |
| PIT F19 | 88.40 | SGGP | 900x900 | - |
| PIT F20 | 88.40 | SGGP | 900x900 | - |
| PIT F21 | 88.40 | SGGP | 900x900 | - |
| PIT F22 | 88.40 | SGGP | 900x900 | - |
| PIT F23 | 88.60 | SJP | 900x900 | - |
| PIT F24 | 87.95 | SGGP | 900x900 | - |
| PIT F25 | 89.25 | SJP | 900x900 | - |
| PIT F26 | 89.25 | SJP | 900x900 | - |
| PIT F27 | 89.25 | SJP | 900x900 | - |
| PIT F28 | 87.95 | SGGP | 900x900 | - |
| PIT F29 | 88.05 | SGGP | 900x900 | - |
| PIT F30 | 88.10 | SGGP | 900x900 | - |

LEGEND:
LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY CALIBRE CONSULTING DATED 10.11.17.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- PROPOSED DRAINAGE LINE
- EXISTING DRAINAGE LINE
- ROOFWATER DOWNPIPE (INDICATIVE)
- ROOFWATER LINE
- SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- ASSET PROTECTION ZONE BOUNDARY

LEVELS NOTE:
LEVELS SHOWN TO BE ±500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY AND LAND AND ENVIRONMENT COURT ASSESSMENT.



LOT 204 STORMWATER DRAINAGE PLAN
SCALE 1:500

FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-------------------------------------|----------|-------|------------|------|-------|
| ARCHITECTURAL LAYOUT REVISED | 28.10.20 | D | | | |
| REVISED AS CLOUED | 26.10.20 | C | | | |
| REVISED TO NEW ARCHITECTURAL LAYOUT | 14.10.20 | B | | | |
| ISSUED FOR SSD APPROVAL | 19.06.20 | A | | | |

| ARCHITECT | CLIENT | PROJECT | DRAWING TITLE |
|-----------|--------|--|----------------------------------|
| | | ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION | LOT 204 STORMWATER DRAINAGE PLAN |



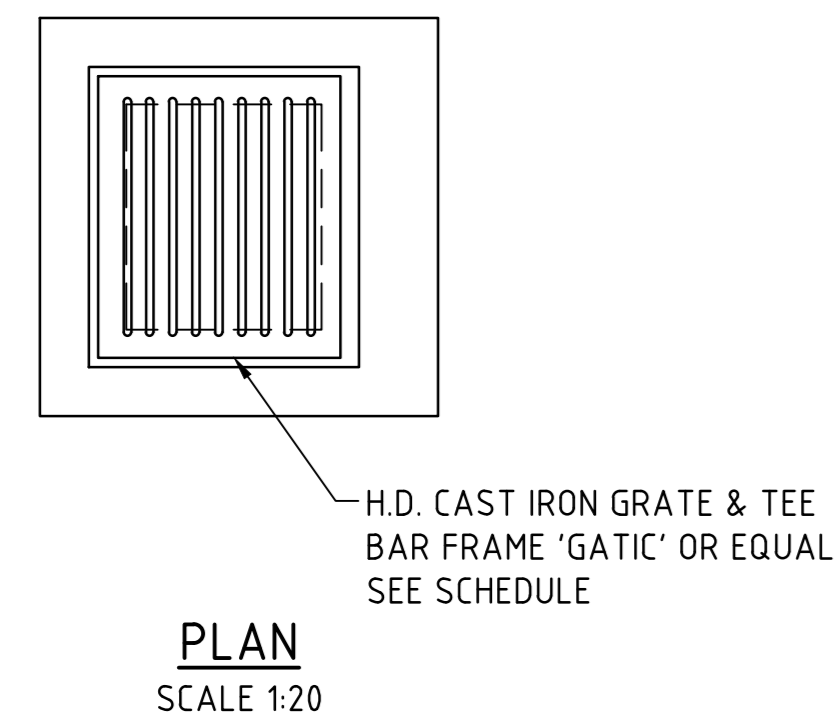
CLIENT: ESR
PROJECT: ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2115

| DESIGNED | DRAWN | DATE | CHECKED | SCALE | CAD REF. |
|----------|-------|--------|---------|-------------|-------------------|
| TF | JB | MAR 19 | XC | A0 AS SHOWN | LOT2990.05-SSDA44 |

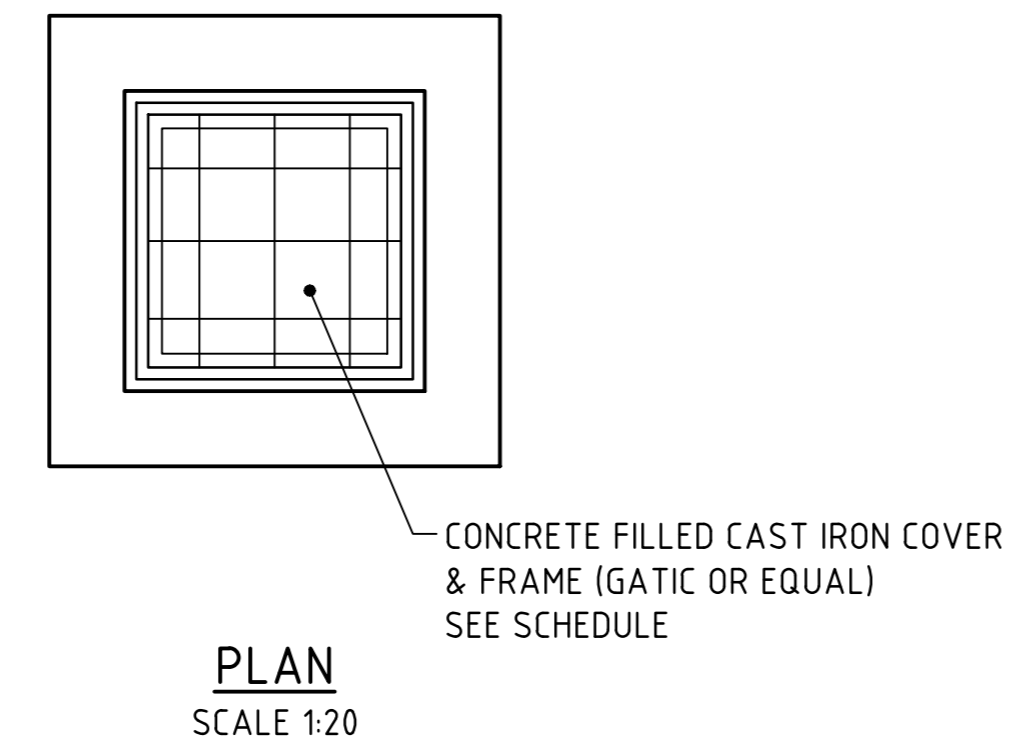
Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 9 Windmill Street
Wahlab Bay, Sydney NSW 2000
Tel: (02) 8551-7899 Fax: (02) 8541-3721
email: mail@costinroe.com.au ©

Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

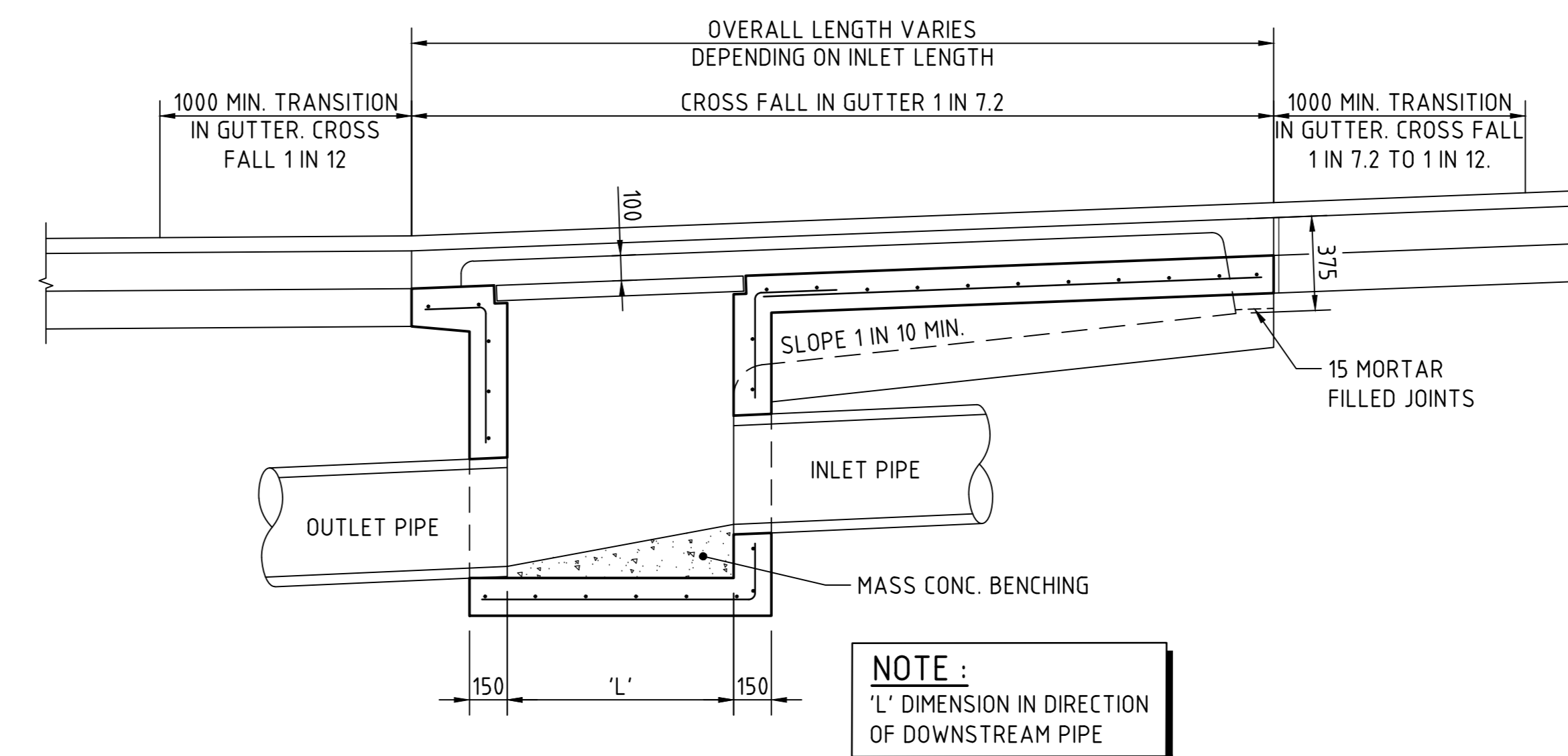
| DRAWING TITLE | DRAWING No. | ISSUE |
|----------------------------------|-------------------|-------|
| LOT 204 STORMWATER DRAINAGE PLAN | Co12990.05-SSDA44 | D |



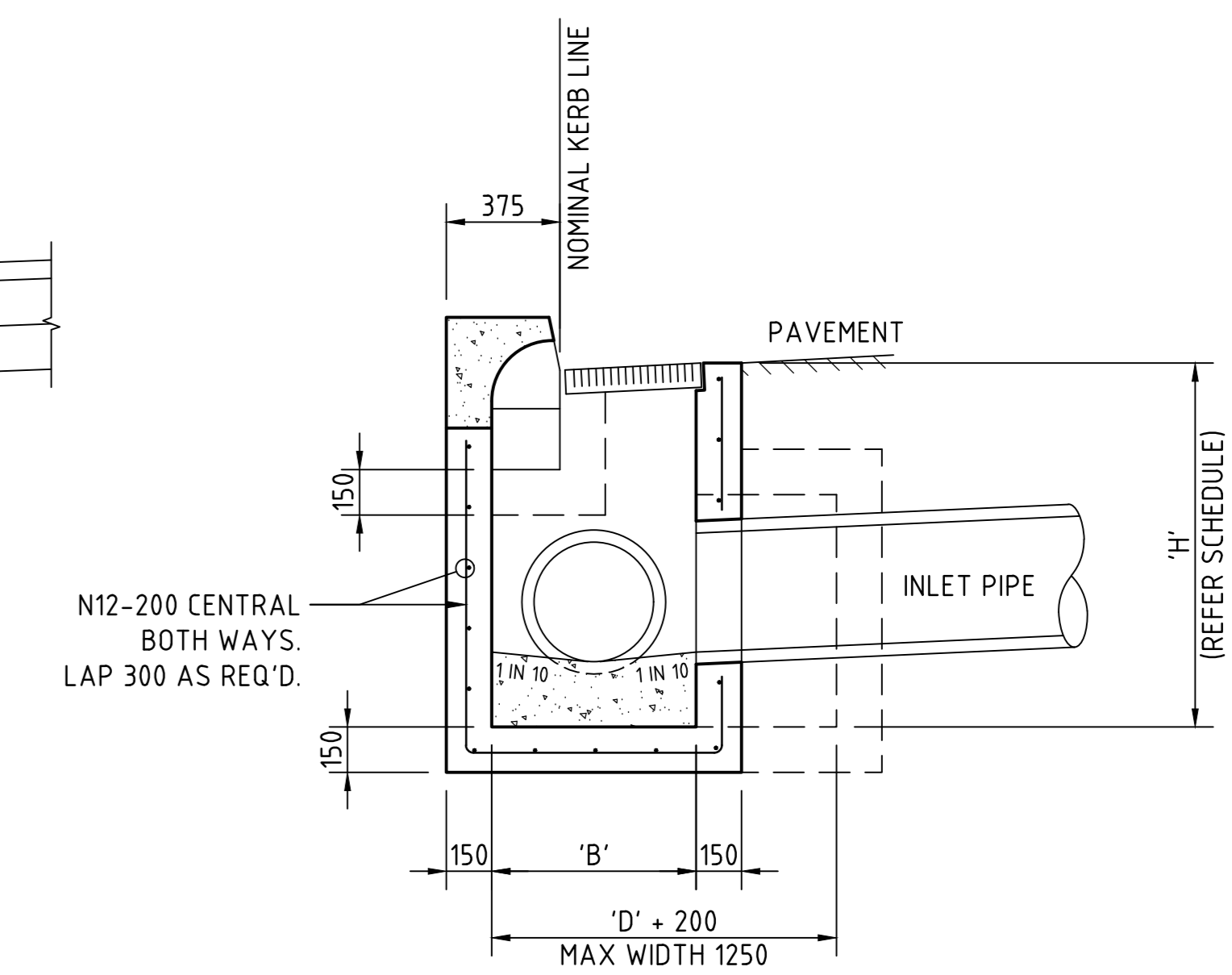
PLAN
SCALE 1:20



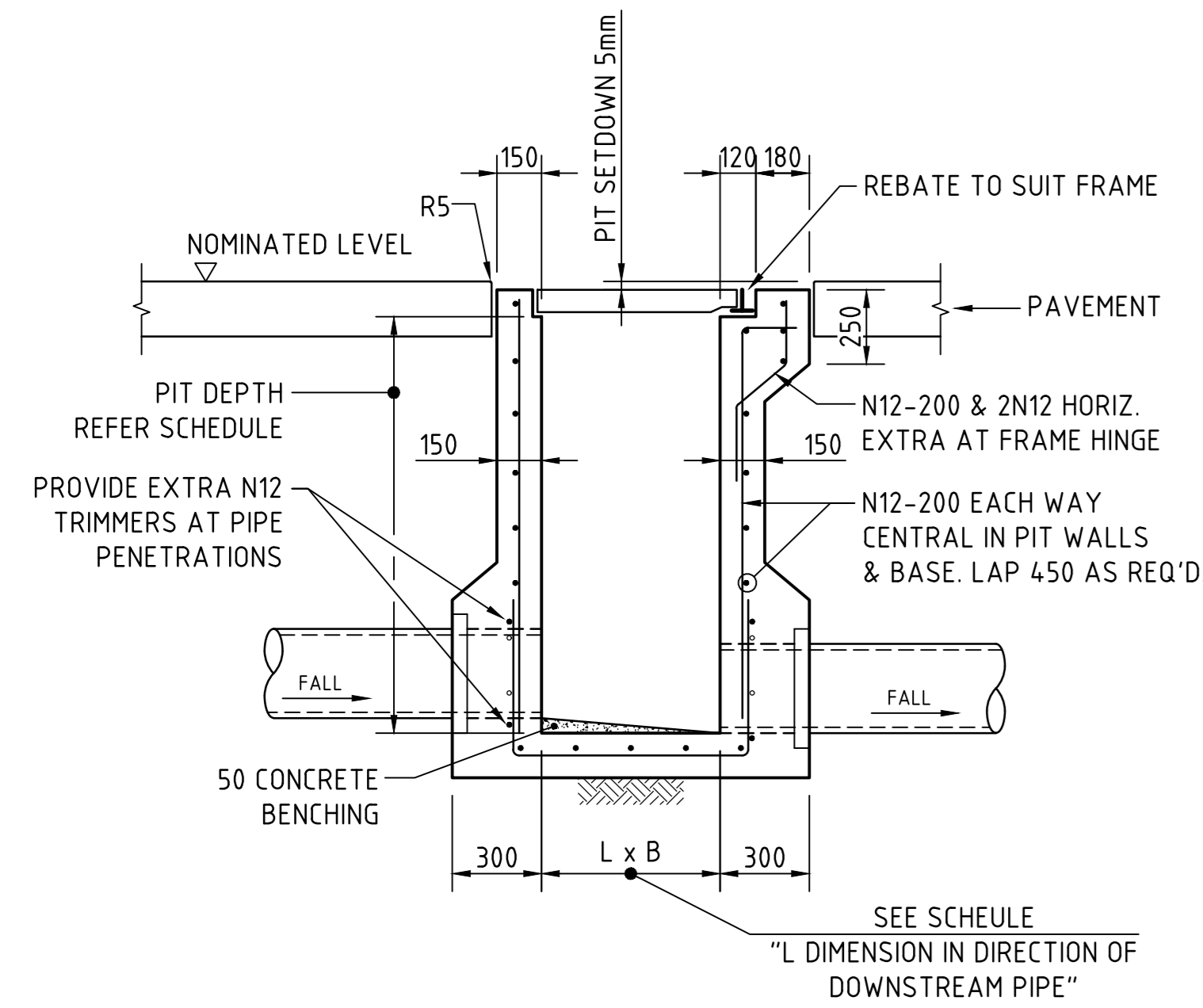
PLAN
SCALE 1:20



LONG SECTION
SCALE 1:20

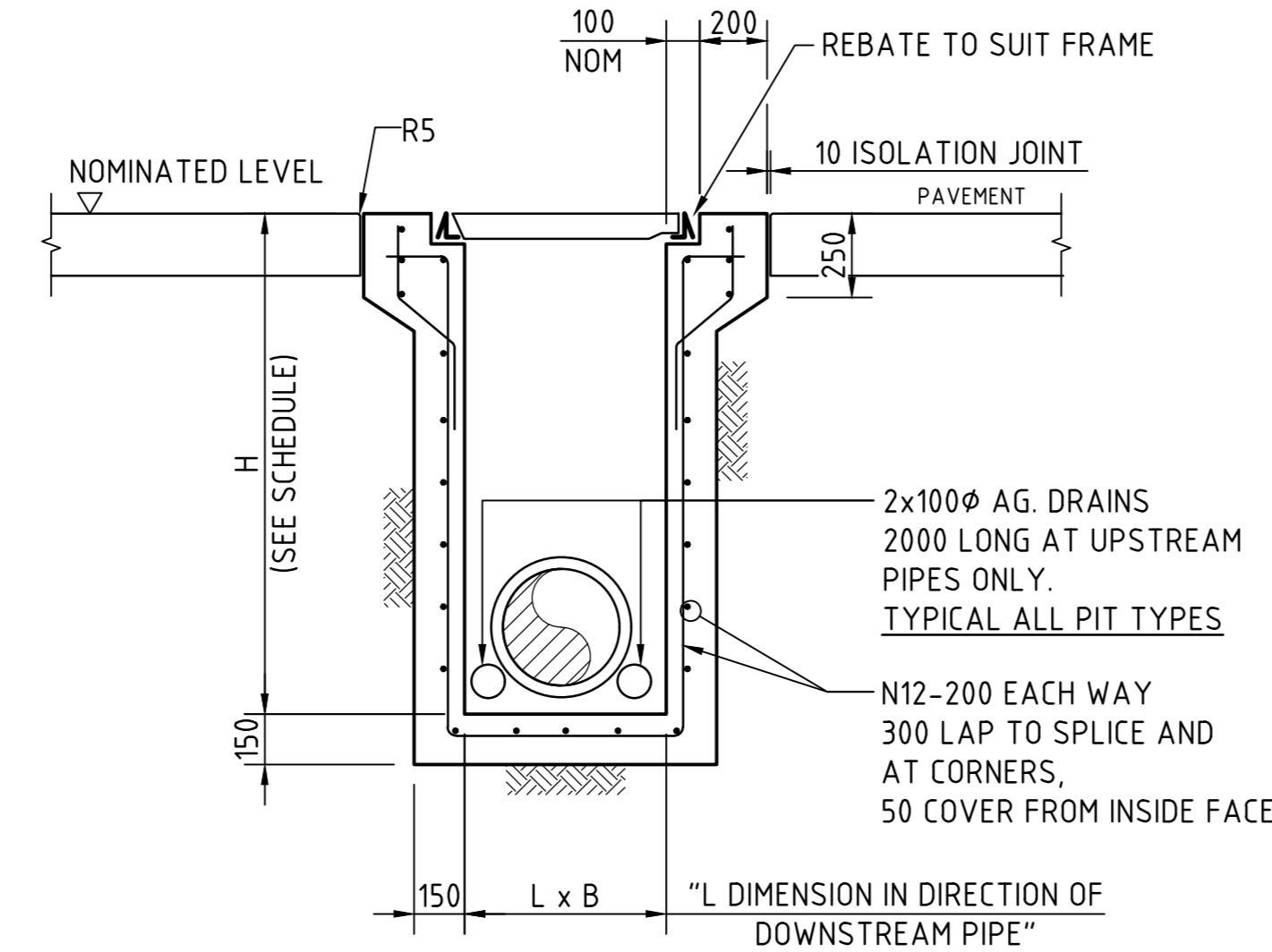


CROSS SECTION
SCALE 1:20



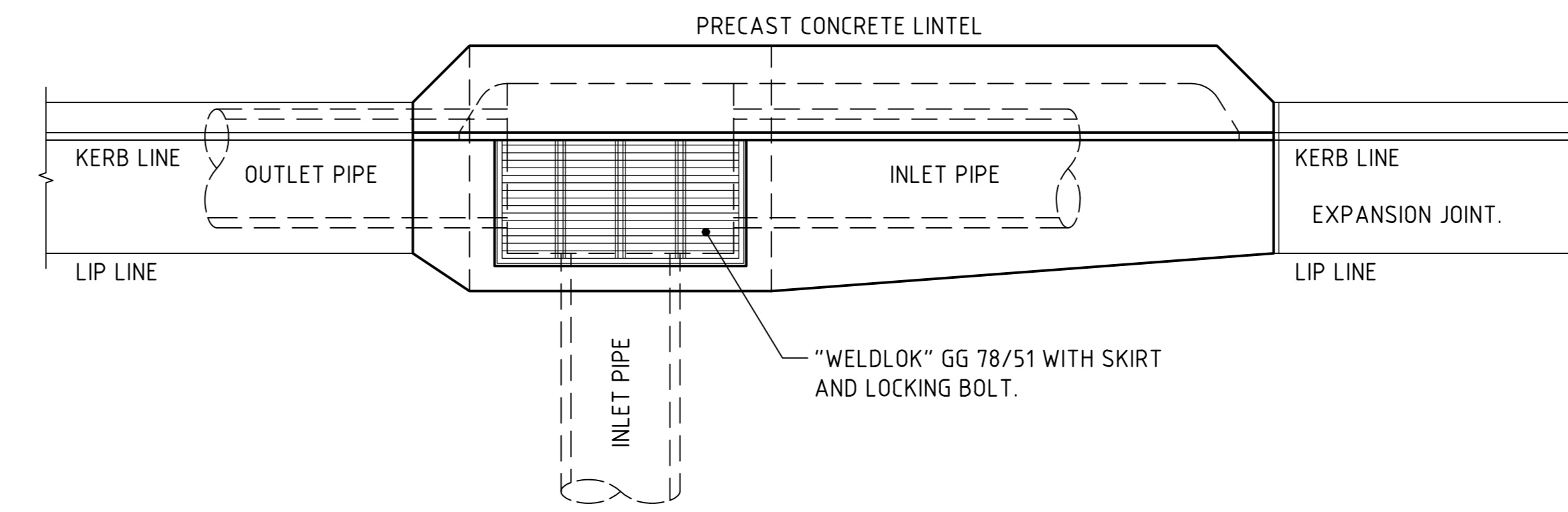
SECTION
SCALE 1:20

SINGLE GRATED GULLY PIT - SGGP



SECTION
SCALE 1:20

SEALED PIT - SP

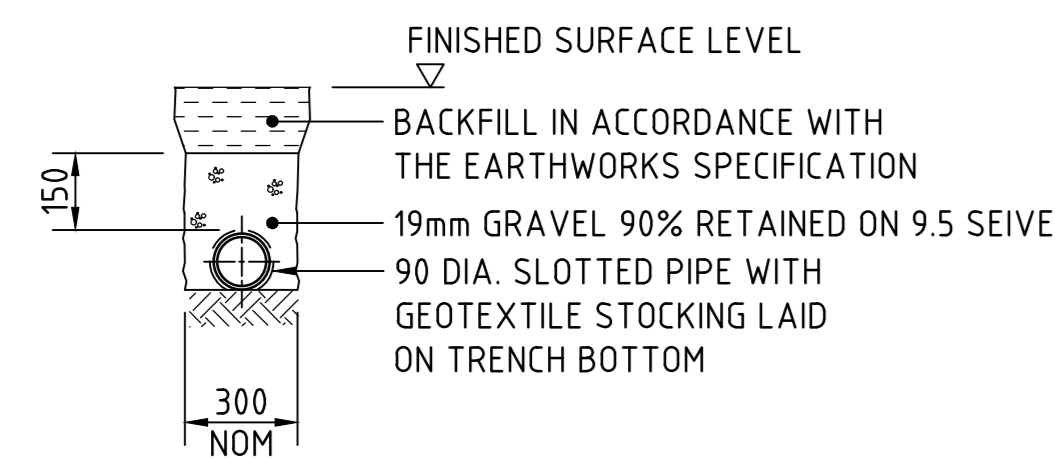


PLAN
SCALE 1:20

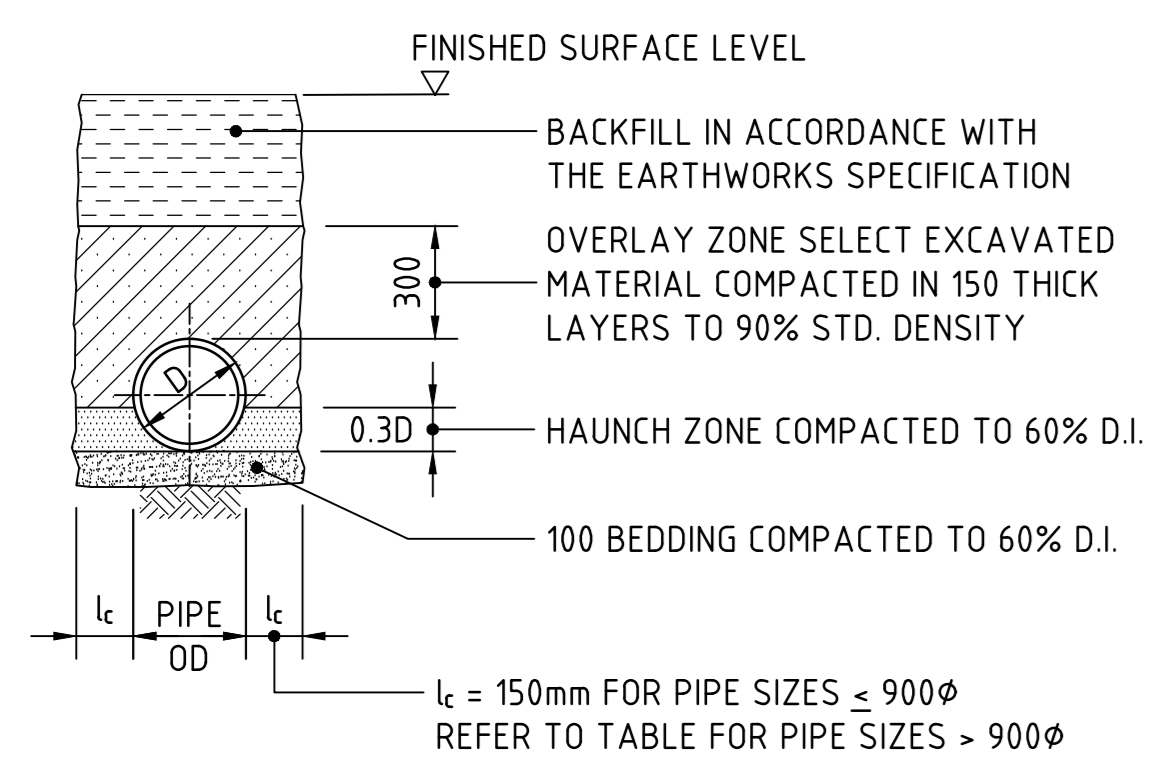
KERB INLET PIT - KIP

| CONCRETE QUALITY | | | | | |
|------------------|-----------------|----------------|-------------|----------------------|----|
| ELEMENT | SUMP (MAX SIZE) | AGGREGATE TYPE | CEMENT TYPE | F _c (MPa) | |
| PIT | 80 | 20 | GP | NIL | 32 |

- NOTE :**
- WHERE GULLY PIT IS LOCATED ON KERB RETURNS OR BULB OF CUL-DE-SACS PROVIDE CURVED PRECAST CONCRETE LINTELS.
 - SAG PITS SHALL HAVE LINTEL PLACED CENTRALLY ABOUT THE GRATE.
 - ALL REINFORCING TO HAVE 30 MIN. CLAR CONCRETE COVER.
 - FOR PITS DEEPER THAN 1200mm CLIMB RAILS SHALL BE PROVIDED.



SUPPORT TO AGRICULTURAL DRAIN
SCALE 1:20

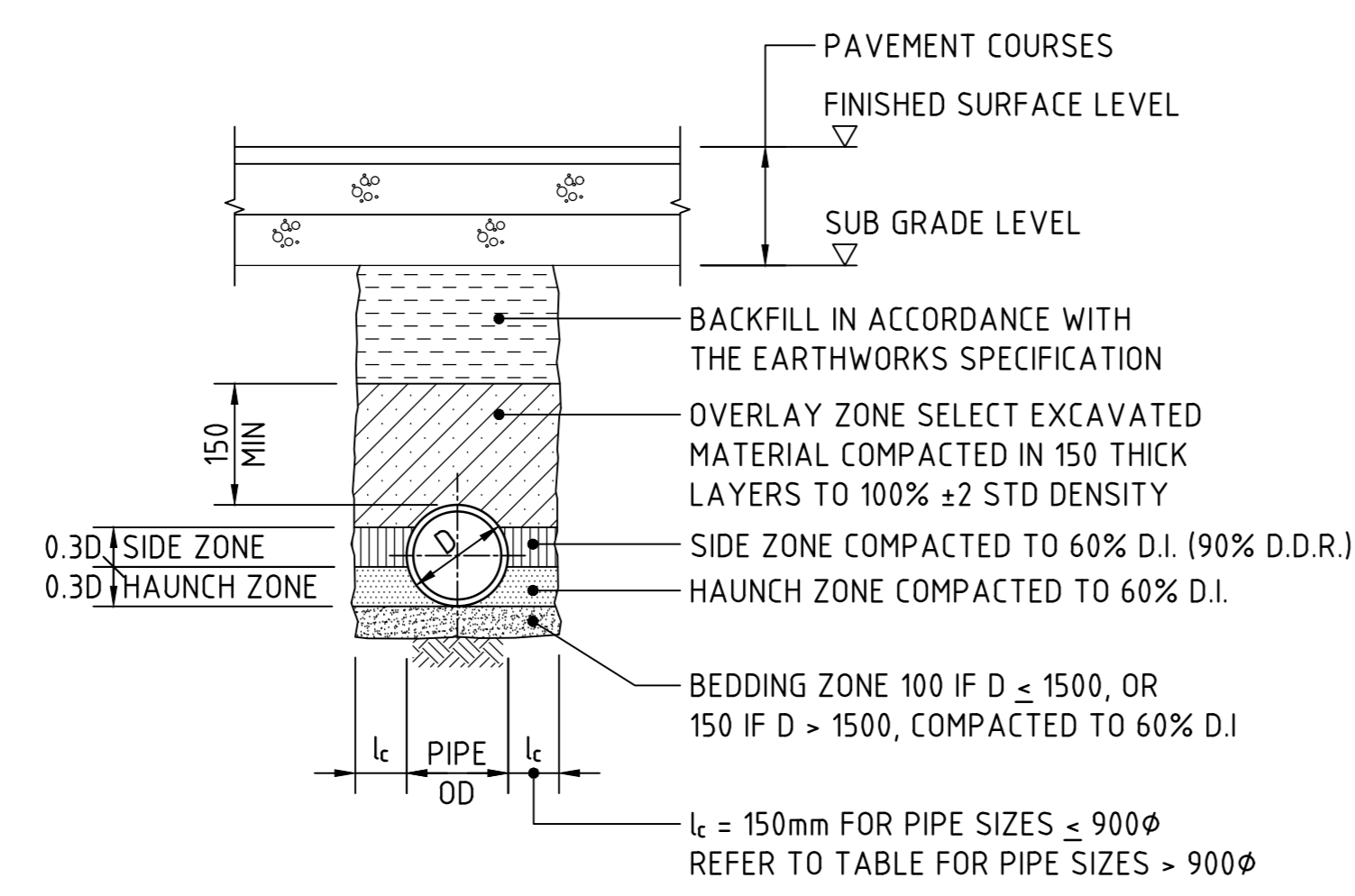


TYPE H1 SUPPORT TO CONCRETE PIPES AT LANDSCAPED AREAS
SCALE 1:20

| BEDDING & HAUNCH MATERIAL GRADING | |
|-----------------------------------|--------------------|
| SIEVE SIZE (mm) | WEIGHT PASSING (%) |
| 19.0 | 100 |
| 2.36 | 100 TO 50 |
| 0.60 | 90 TO 50 |
| 0.30 | 60 TO 10 |
| 0.15 | 20 TO 0 |

| SIDE ZONE WIDTH | |
|-----------------|---------------------|
| PIPE SIZE (mm) | l _c (mm) |
| ≤ 900Ø | 150 |
| 1050Ø | 175 |
| 1200Ø | 200 |
| 1350Ø | 225 |
| 1500Ø | 250 |
| 1650Ø | 275 |
| 1800Ø | 300 |

ENGINEER TO SPECIFY TRENCH WIDTHS FOR PIPE SIZES GREATER THAN 1800Ø

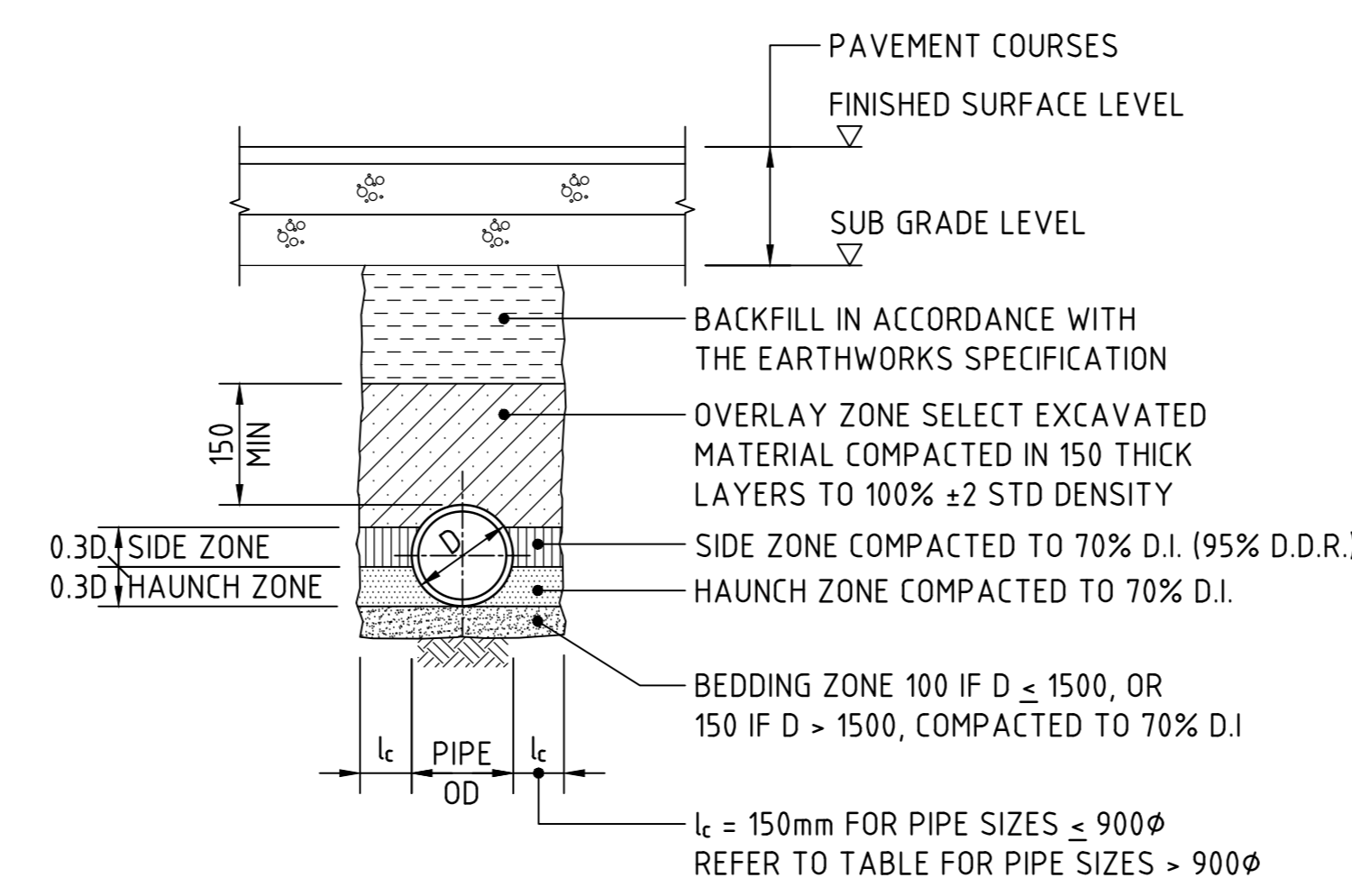


TYPE HS2 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT
SCALE 1:20
D ≤ 1350, MAX FILL = 4.0m
D > 1350, MAX FILL = 3.0m

| BEDDING & HAUNCH MATERIAL GRADING | |
|-----------------------------------|--------------------|
| SIEVE SIZE (mm) | WEIGHT PASSING (%) |
| 19.0 | 100 |
| 2.36 | 100 TO 50 |
| 0.60 | 90 TO 50 |
| 0.30 | 60 TO 10 |
| 0.15 | 25 TO 0 |
| 0.075 | 10 TO 0 |

| SIDE ZONE WIDTH | |
|-----------------|---------------------|
| PIPE SIZE (mm) | l _c (mm) |
| ≤ 900Ø | 150 |
| 1050Ø | 175 |
| 1200Ø | 200 |
| 1350Ø | 225 |
| 1500Ø | 250 |
| 1650Ø | 275 |
| 1800Ø | 300 |

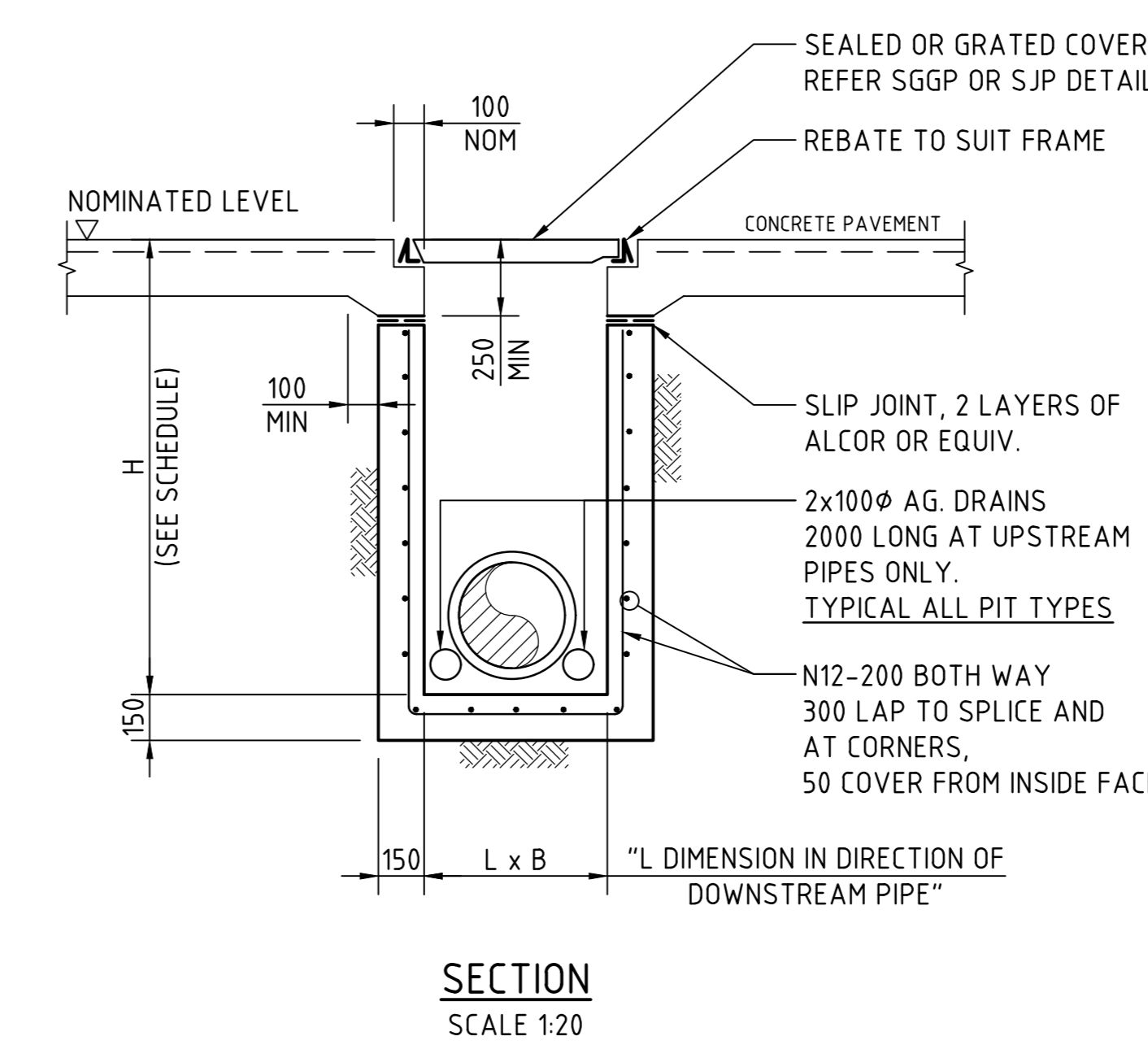
ENGINEER TO SPECIFY TRENCH WIDTHS FOR PIPE SIZES GREATER THAN 1800Ø



TYPE HS3 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT
SCALE 1:20
D ≤ 1050, MAX FILL = 6.0m
D > 1050, MAX FILL = 4.8m

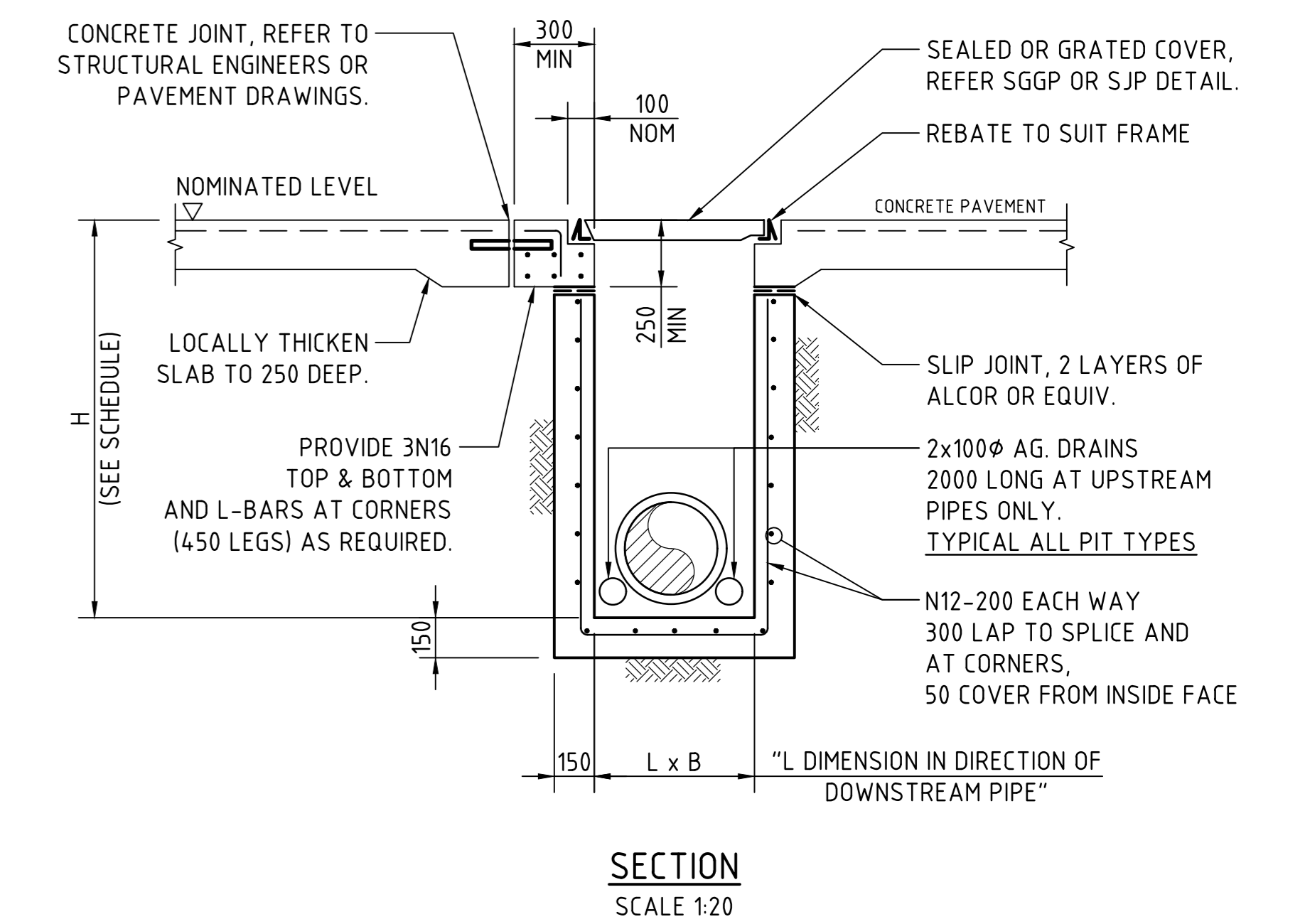
| SIDE ZONE MATERIAL GRADING | |
|----------------------------|--------------------|
| SIEVE SIZE (mm) | WEIGHT PASSING (%) |
| 19.0 | 100 |
| 9.5 | 100 TO 50 |
| 2.6 | 100 TO 30 |
| 0.60 | 50 TO 15 |
| 0.075 | 25 TO 0 |

SELECT FILL MATERIAL IN ACCORDANCE WITH TABLE 1 AS 3725



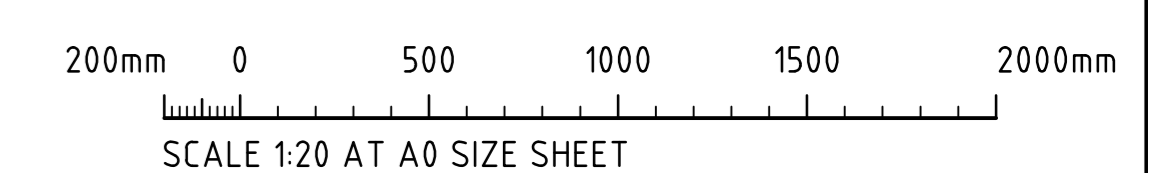
SECTION
SCALE 1:20

SJP/CIS & SGGP/CIS (CAST IN SLAB) PIT DETAIL
GRATE/COVER SUPPORT
CAST-INTO PAVEMENT SLAB
(ADOPT IN CONCRETE PAVEMENTS FOR SGGP's & SJP's, WHERE JOINTS ARE NOT LOCATED WITHIN PROXIMITY OF THE GRATE)

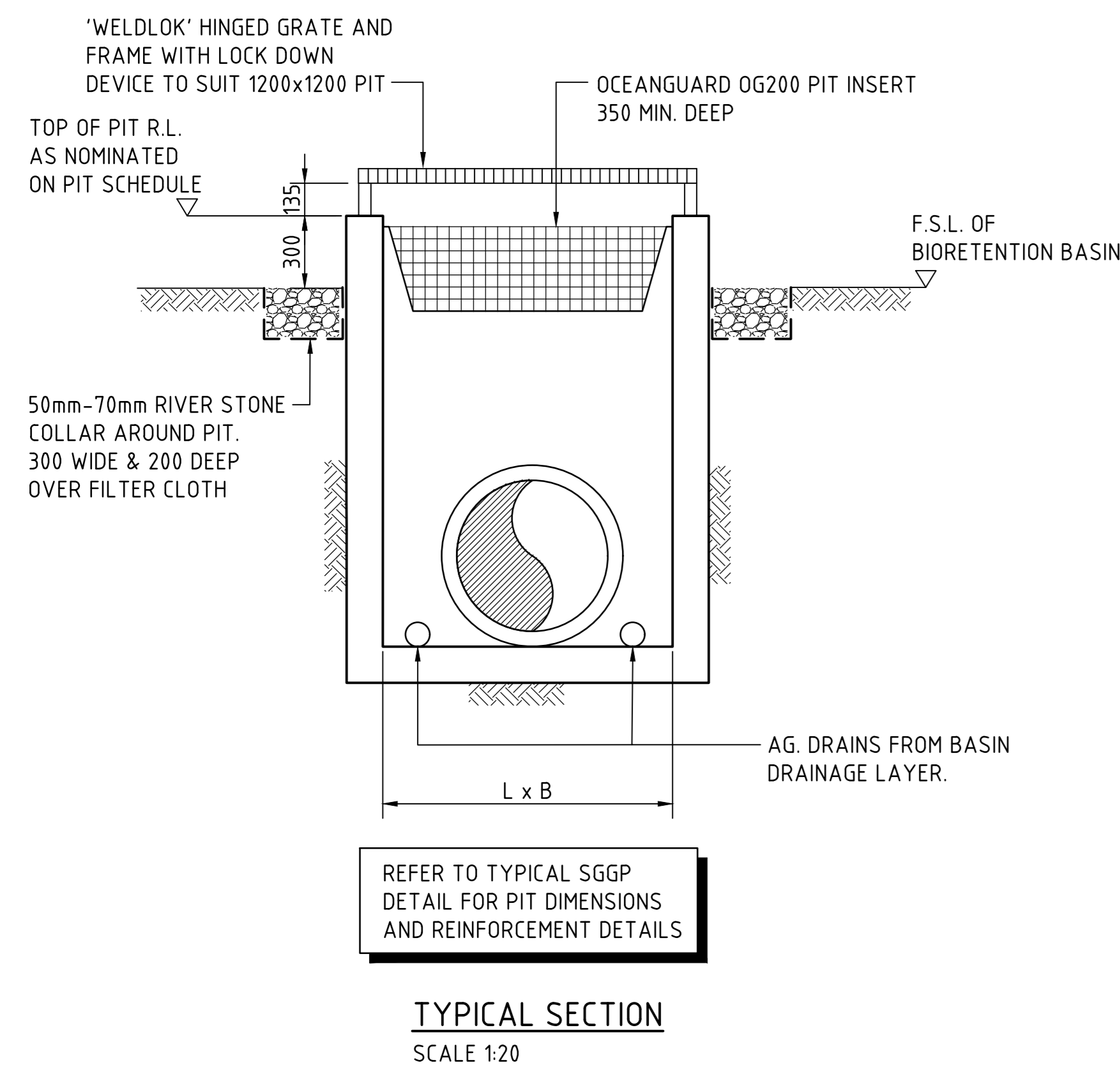


SECTION
SCALE 1:20

SJP/CIS & SGGP/CIS (CAST IN SLAB) PIT DETAIL
GRATE/COVER SUPPORT
CAST-INTO PAVEMENT SLAB
(ADOPT IN CONCRETE PAVEMENT FOR SGGP's & SJP's, WHERE PITS ARE LOCATED IN THE CORNER OF SLAB PANELS OR ADJACENT TO SLAB PANEL JOINTS)

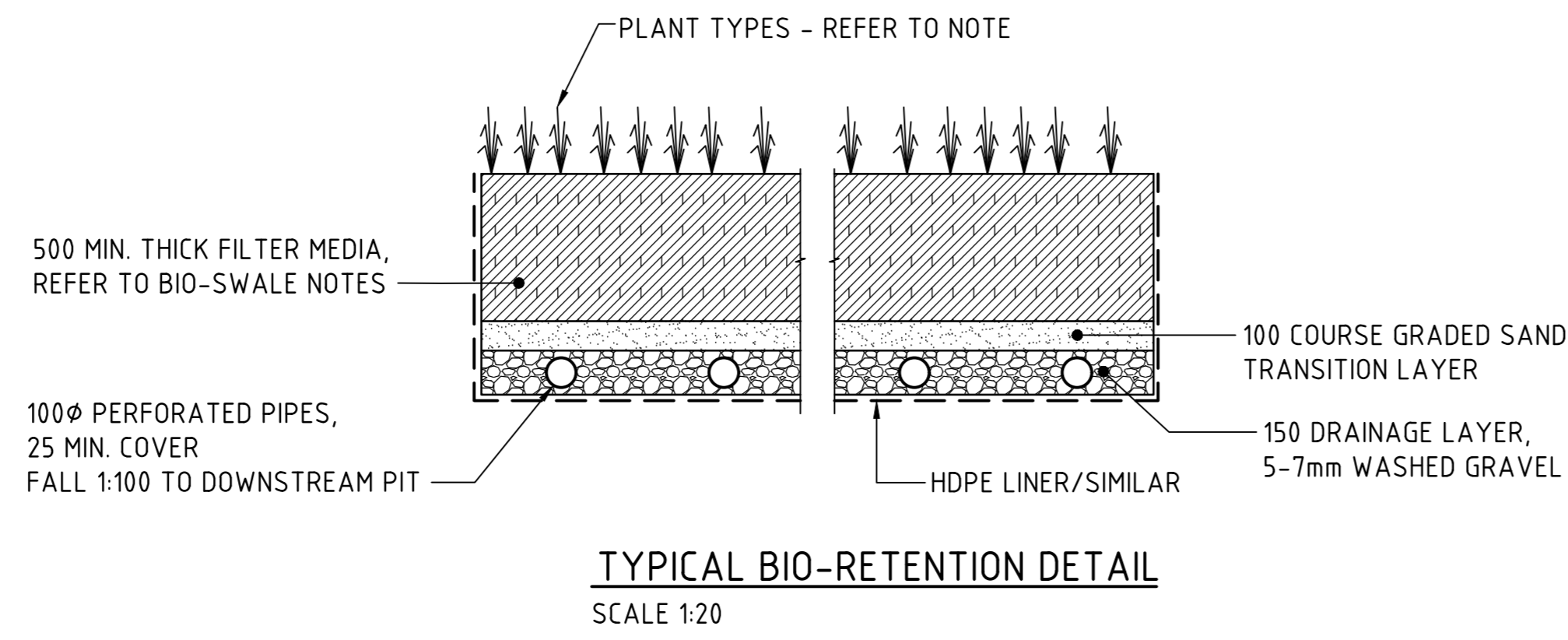


FOR SSD APPROVAL

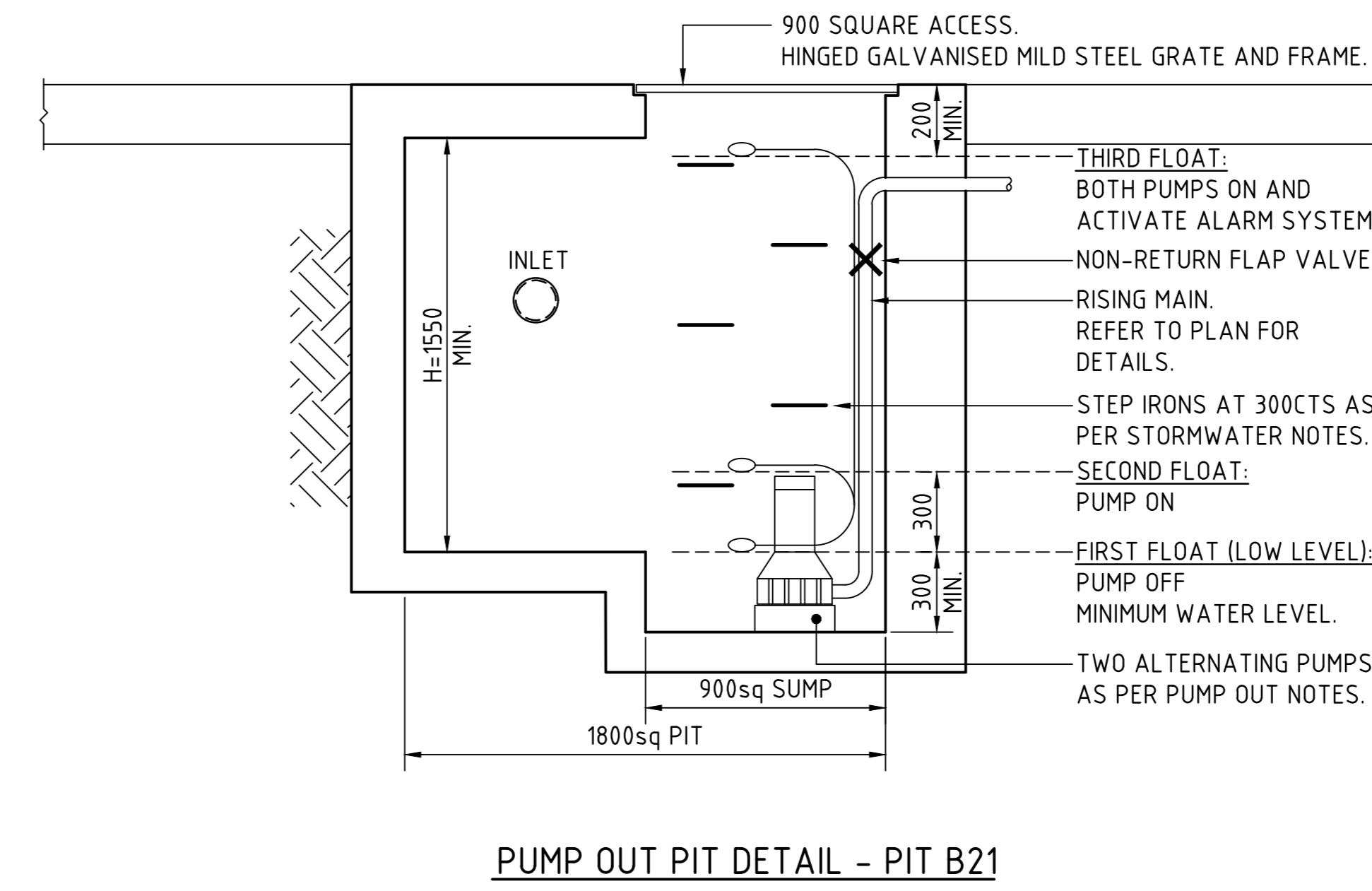


**TYPICAL SECTION
SCALE 1:20**

BASIN INLET PIT - BIP



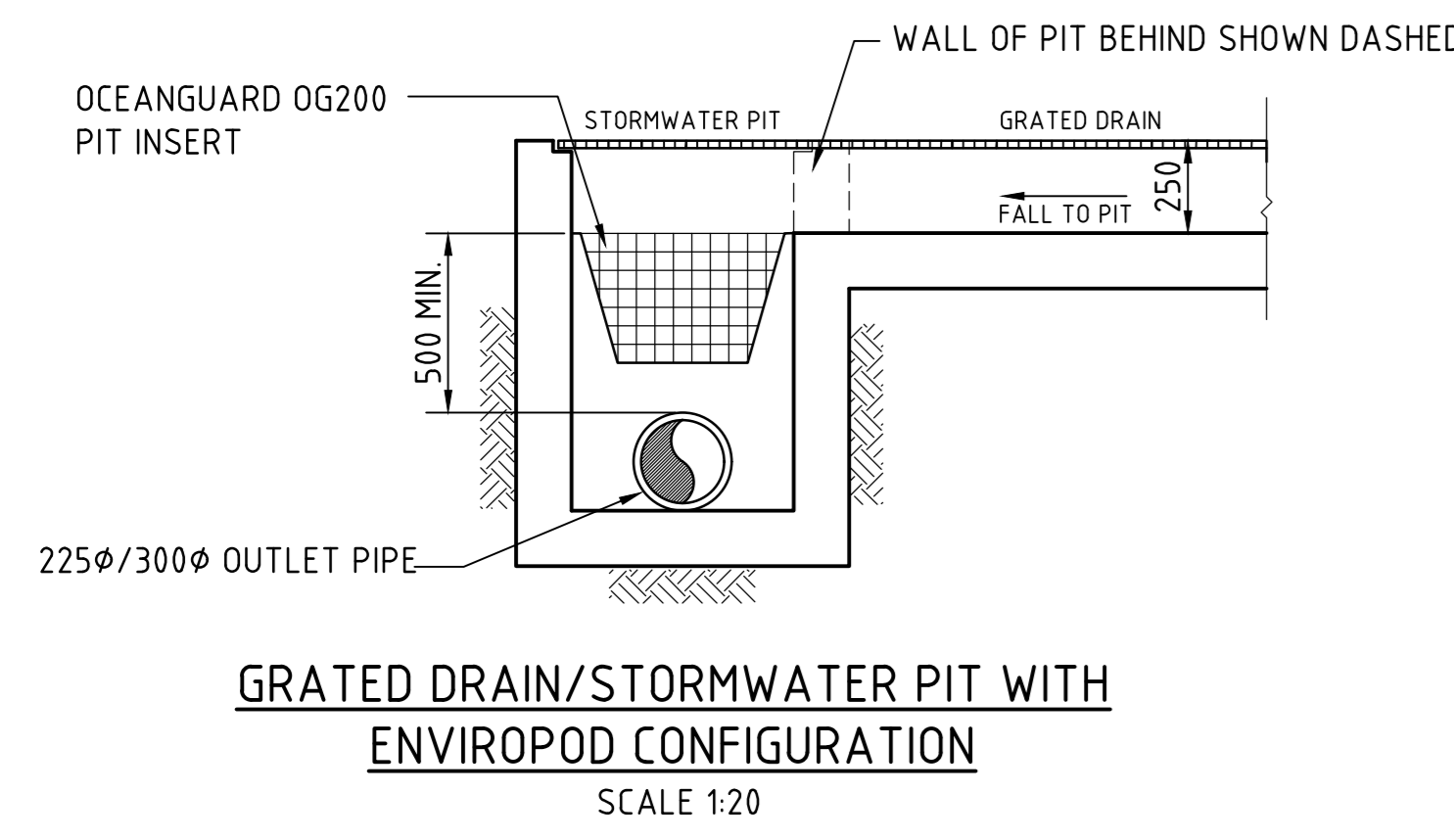
**TYPICAL BIO-RETENTION DETAIL
SCALE 1:20**



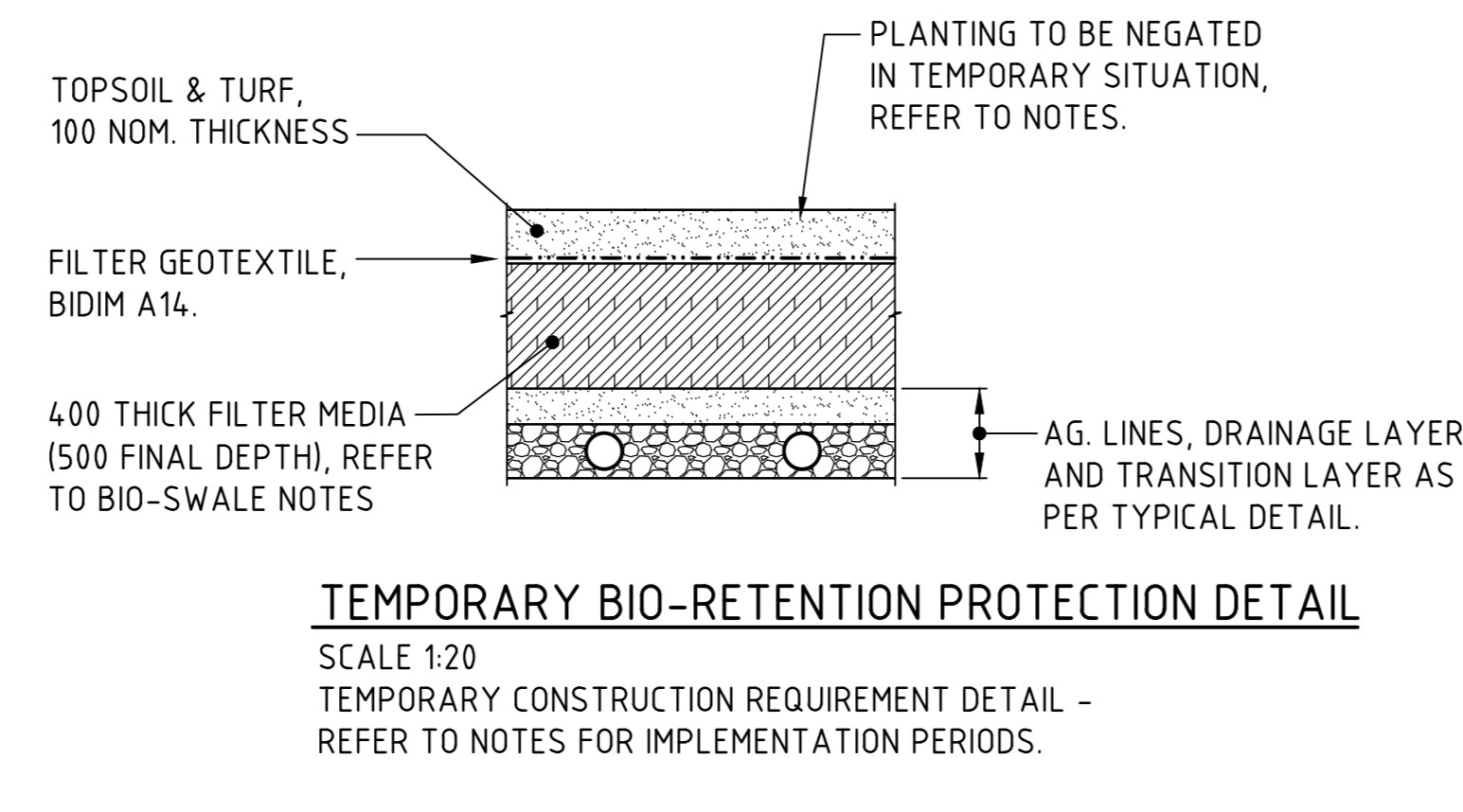
PUMP OUT PIT DETAIL - PIT B21

SCALE 1:20
REFER TYPICAL PIT DETAILS
FOR ALL ITEMS NOT LABELED.

BASEMENT PUMP OUT NOTES:
PUMP SYSTEM IS TO CONSIST OF DUAL ALTERNATING PUMPS. THE PUMP OUT SYSTEM SHALL BE DESIGNED TO BE OPERATED IN THE FOLLOWING MANNER:
Q PUMP = 30 L/s VOLUME = 210 m³ (MIN)
THE PUMPS SHALL BE PROGRAMMED TO WORK ALTERNATIVELY SO AS TO ALLOW BOTH PUMPS TO HAVE AN EQUAL OPERATION LOAD AND PUMP LIFE.
A LOW LEVEL FLOAT SHALL BE PROVIDED TO ENSURE THAT THE MINIMUM REQUIRED WATER LEVEL IS MAINTAINED WITHIN THE SUMP AREA OF THE PIT. IN THIS REGARD THIS FLOAT WILL FUNCTION AS AN OFF SWITCH FOR THE PUMPS.
A SECOND FLOAT SHALL BE PROVIDED AT A HIGHER LEVEL, APPROXIMATELY 300mm ABOVE THE MINIMUM WATER LEVEL, WHEREBY ONE OF THE PUMPS WILL OPERATE AND DRAIN THE PIT TO THE LEVEL OF THE LOW-LEVEL FLOAT.
A THIRD FLOAT SHALL BE PROVIDED AT A HIGH LEVEL, WHICH IS APPROXIMATELY THE TOP LEVEL OF THE PIT. THIS FLOAT SHOULD START THE OTHER PUMP THAT IS NOT OPERATING AND ACTIVATE THE ALARM.
AN ALARM SYSTEM SHALL BE PROVIDED WITH A FLASHING STROBE LIGHT AND A PUMP FAILURE WARNING SIGN WHICH ARE TO BE LOCATED AT THE ENTRANCE TO THE BASEMENT LEVEL. THE ALARM SYSTEM SHALL BE PROVIDED WITH A BATTERY BACK-UP IN CASE OF POWER FAILURE.



**GRATED DRAIN/STORMWATER PIT WITH
ENVIROPD CONFIGURATION
SCALE 1:20**



**TEMPORARY BIO-RETENTION PROTECTION DETAIL
SCALE 1:20
TEMPORARY CONSTRUCTION REQUIREMENT DETAIL -
REFER TO NOTES FOR IMPLEMENTATION PERIODS.**

BIO-RETENTION NOTES:

FILTER MEDIA TO BE LOAMY SAND WITH A PERMEABILITY NOT LESS THAN 200mm/hr. FILTER MEDIA TO BE FREE OF RUBBISH, DELETERIOUS MATERIAL, TOXICANTS, DECLARED PLANTS AND LOCAL WEEDS, AND IS TO NOT BE HYDROPHOBIC.

FILTER MEDIA TO HAVE THE FOLLOWING COMPOSITION RANGE:
CLAY & SILT (<0.05mm) -3%
VERY FINE SAND (0.05-0.15mm) 5-30%
FINE SAND (0.15-0.25mm) 10-30%
MEDIUM TO COARSE SAND (0.25-1.00mm) 40-60%
COARSE SAND (1.0-2.0mm) 7-10%
FINE GRAVEL (2.0-3.4mm) -3%

FILTER MEDIA THAT DOES NOT MEET THE FOLLOWING CRITERIA SHALL BE REJECTED:
a. ORGANIC MATTER CONTENT TO BE IDEALLY WITHIN 1% TO 3% (W/W) AND TO BE NO GREATER THAN 5% (W/W).
b. PH TO BE BETWEEN 5.5 AND 7.5.
c. PHOSPHOROUS CONTENT TO BE NO GREATER THAN 35mg/kg

FILTER MEDIA TO BE ASSESSED BY QUALIFIED HORTICULTURALIST TO ENSURE CAPABILITY OF SUPPORTING PLANT LIFE.

DRAINAGE LAYER TO BE CLEAN GRAVEL 5-7mm.

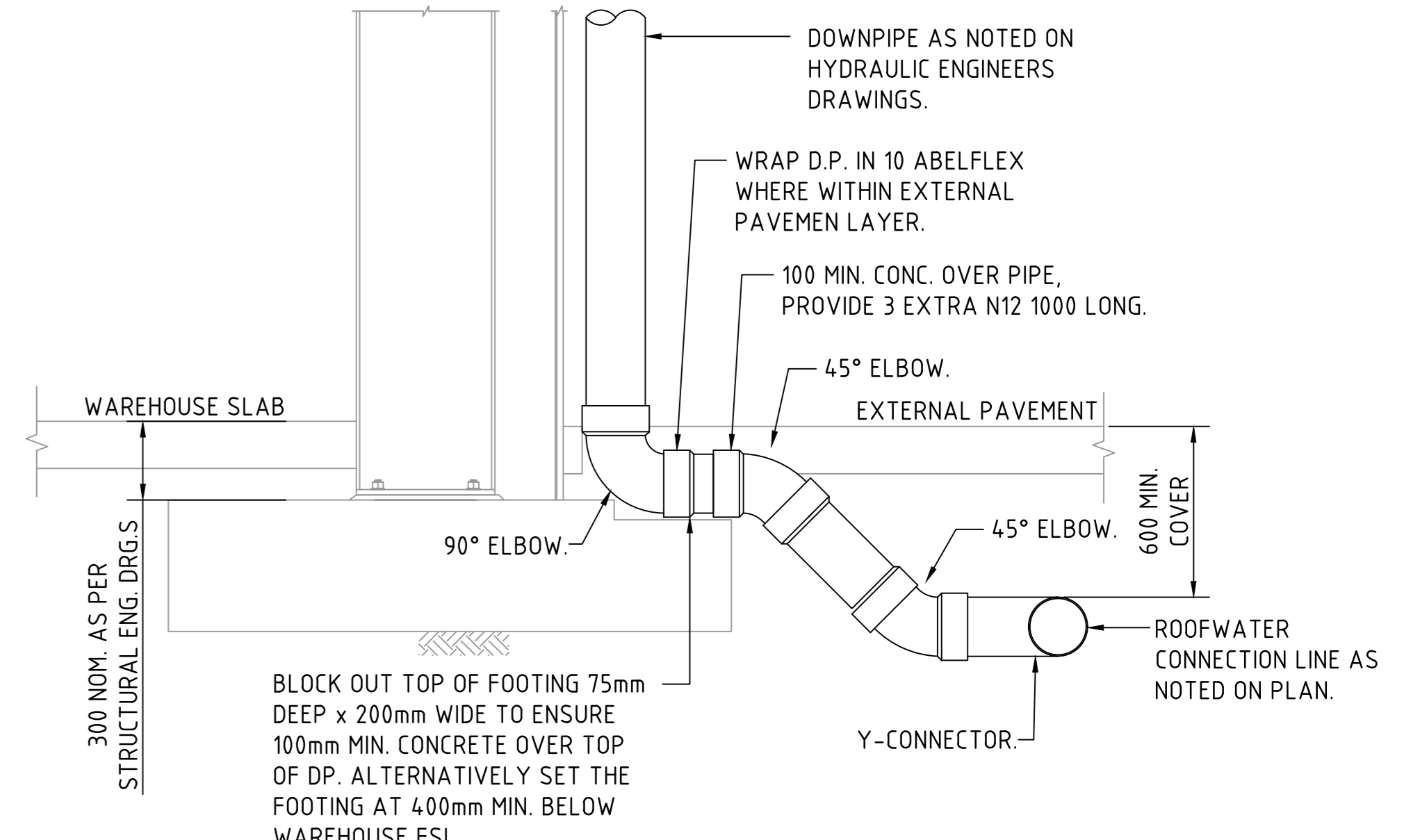
PLANTS TO BE IN ACCORDANCE WITH COUNCIL WSUD HANDBOOK PART 5 - VEGETATION SELECTION GUIDE, WITH A MINIMUM OF SIX DIFFERENT SPECIES.

PROVIDE 100mm TOPSOIL AND TEMPORARY EROSION PROTECTION (JUTEMASTER OR EQUIV) TO SWALE BATTER SLOPES AND ADJACENT LANDSCAPED AREAS. NOTE THAT NO TOPSOIL IS TO BE PLACED OVER FILTRATION MEDIA. PROVIDE SILT FENCE TO TOP OF BANK UNTIL SUCH TIME AS THIS STABILISING AND VEGETATION HAS BEEN COMPLETED.

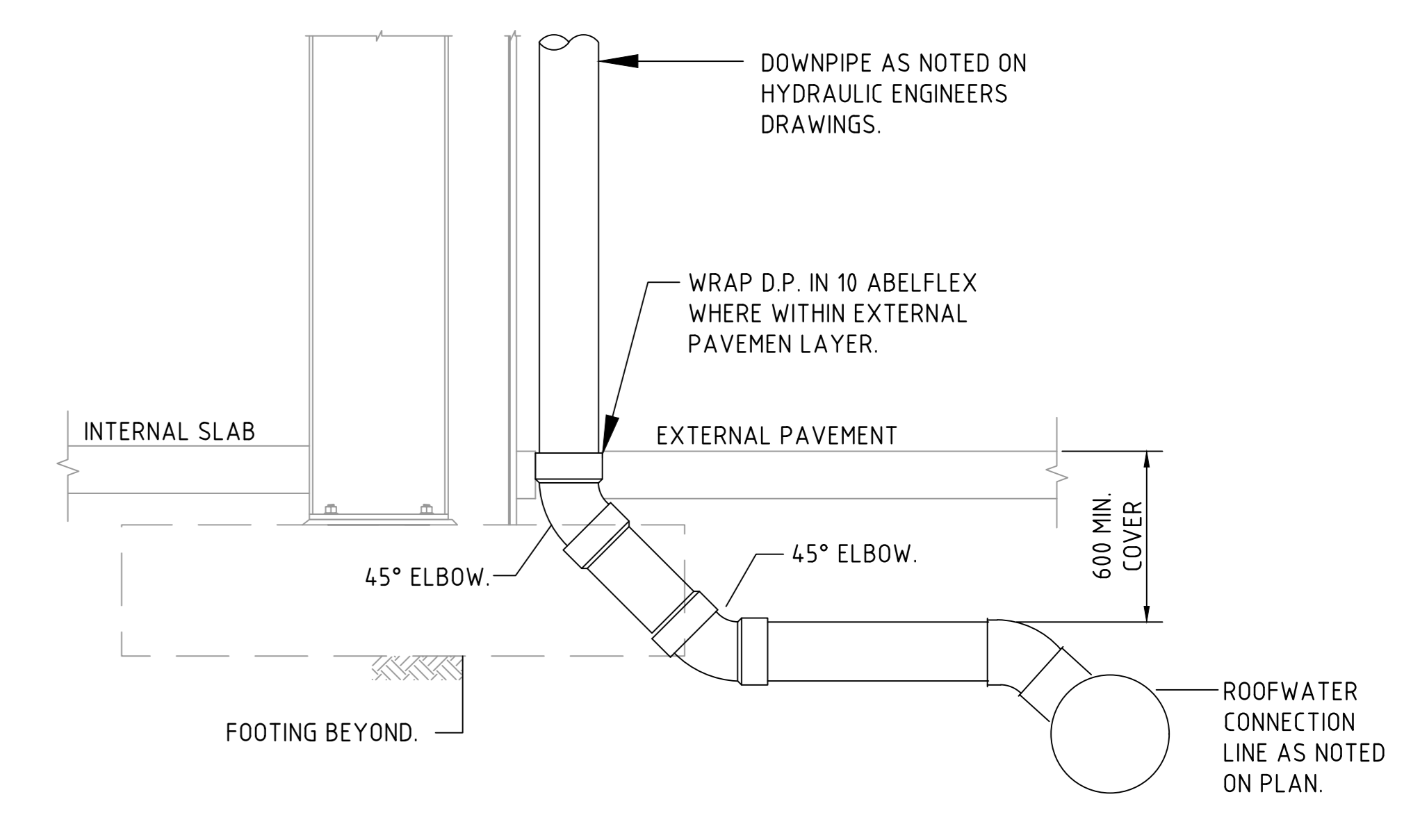
BIO-RETENTION TO BE PARTIALLY INSTALLED, FOLLOWING COMPLETION OF THE ROAD, WITH THE TOP 75-100mm OF FILTER MEDIA REPLACED WITH A FINE TO COARSE SAND UNDERLAIN WITH A GEOTEXTILE LAYER (REFER TO DETAIL). FOLLOWING COMPLETION OF THE UPSTREAM DEVELOPMENT AND SITE STABILISATION, THE SAND IS TO BE REMOVED, REPLACED WITH FILTER MATERIAL AND PLANTED OUT. REFER TO TEMPORARY BIO-BASIN DETAIL.

PRIOR TO PLANTING, THE TOP 100mm OF THE BIORETENTION FILTER MEDIA IS TO BE AMELIORATED WITH APPROPRIATE ORGANIC MATTER, FERTILISER AND TRACE ELEMENTS TO AID PLANT ESTABLISHMENT AS PER THE TABLE BELOW:

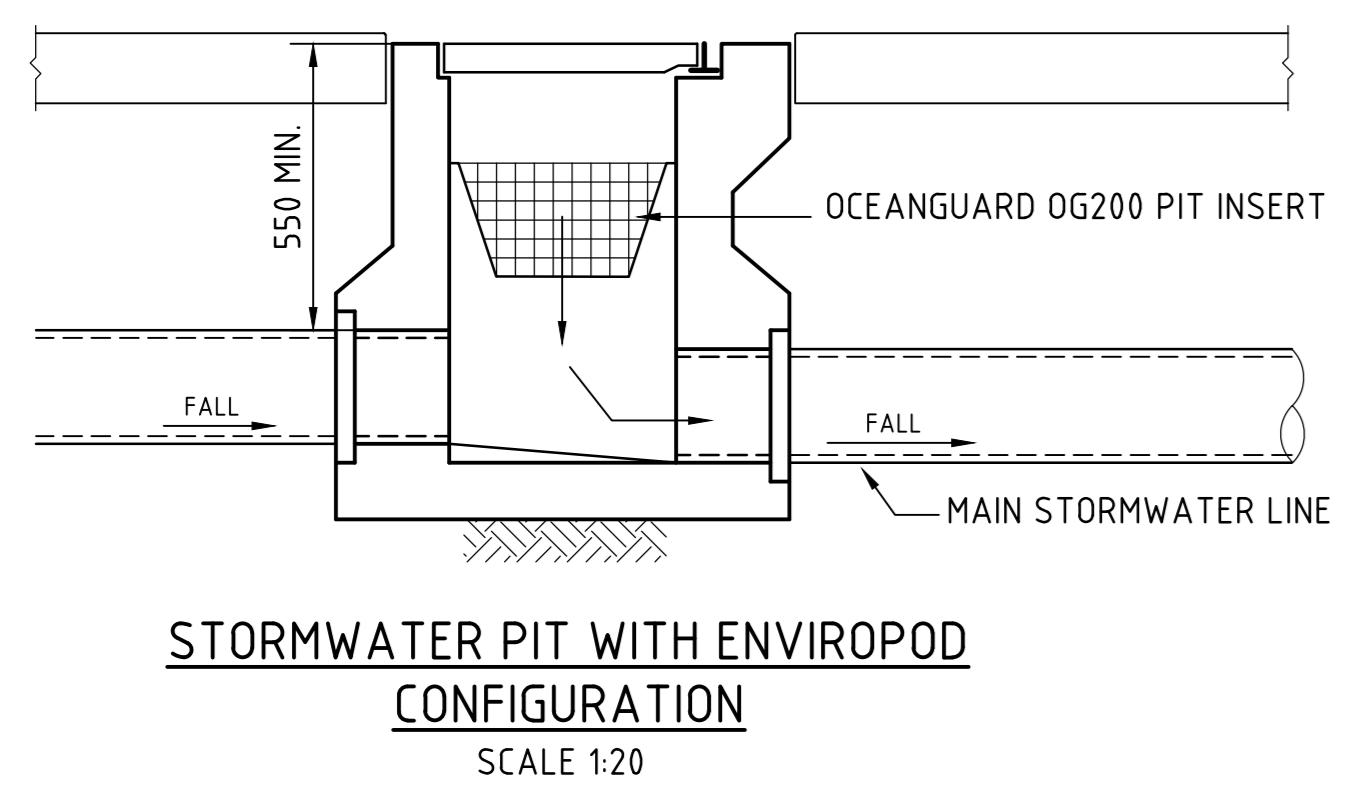
| CONSTITUENT | QUANTITY (kg/m ² OF FILTER AREA) |
|---------------------------------|---|
| GRANULATED POU TRY MANURE FINES | 50 |
| SUPERPHOSPHATE | 2 |
| MAGNESIUM SULPHATE | 3 |
| POTASSIUM SULPHATE | 2 |
| TRACE ELEMENT MIX | 1 |
| FERTILISER NPK (16-4-16) | 6 |
| LIME | 20 |



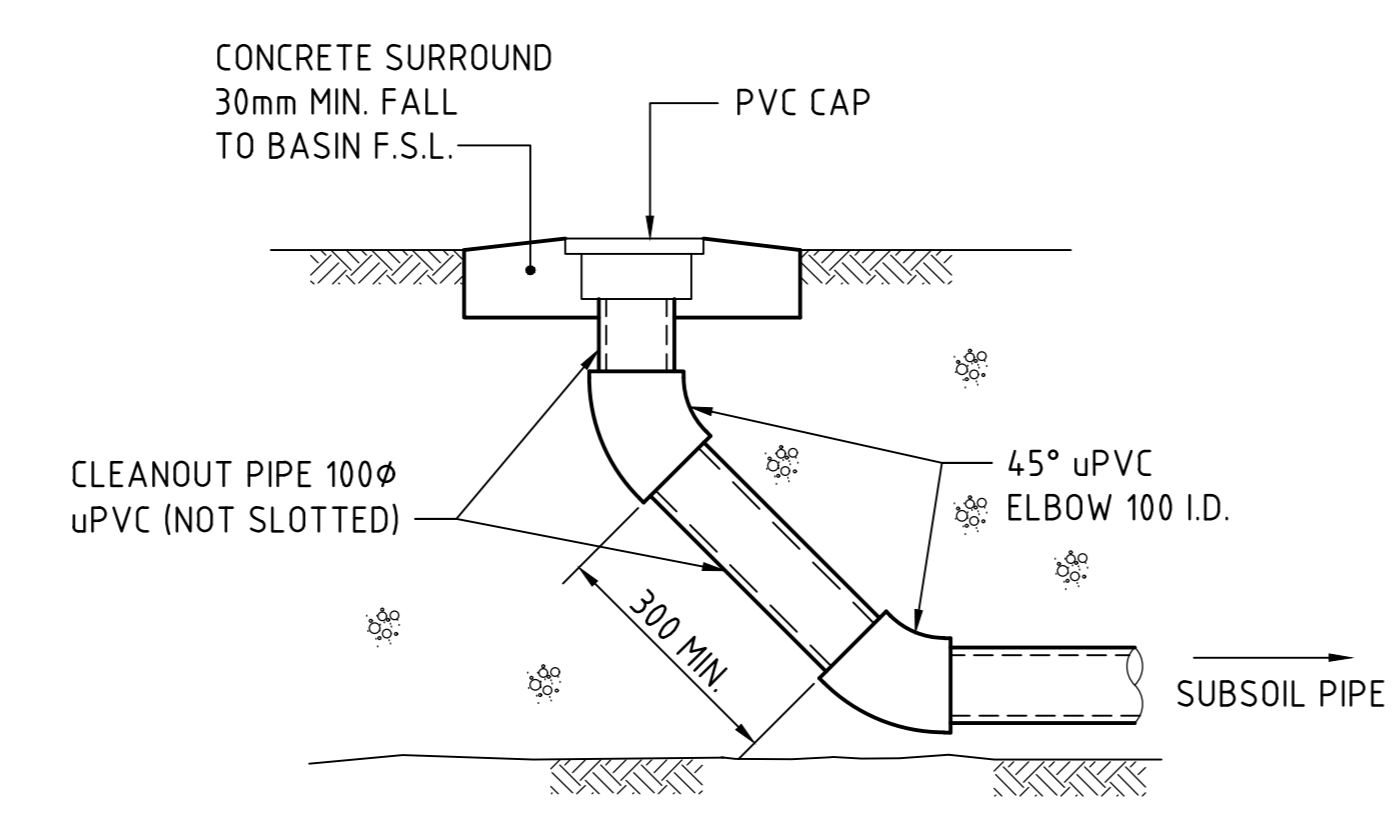
**DOWNPIPE TURN-UP DETAIL A
(AT FOOTING LOCATION)
SCALE 1:20**



**DOWNPIPE TURN-UP DETAIL B
(CLEAR OF FOOTING)
SCALE 1:20**

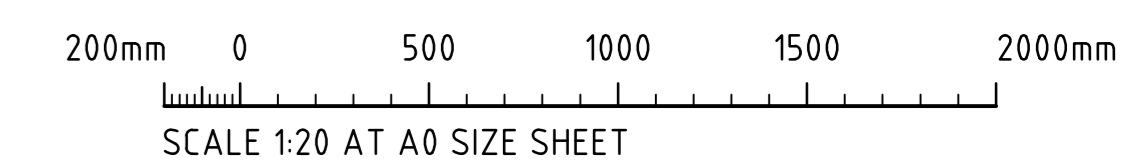


**STORMWATER PIT WITH ENVIROPD
CONFIGURATION
SCALE 1:20**

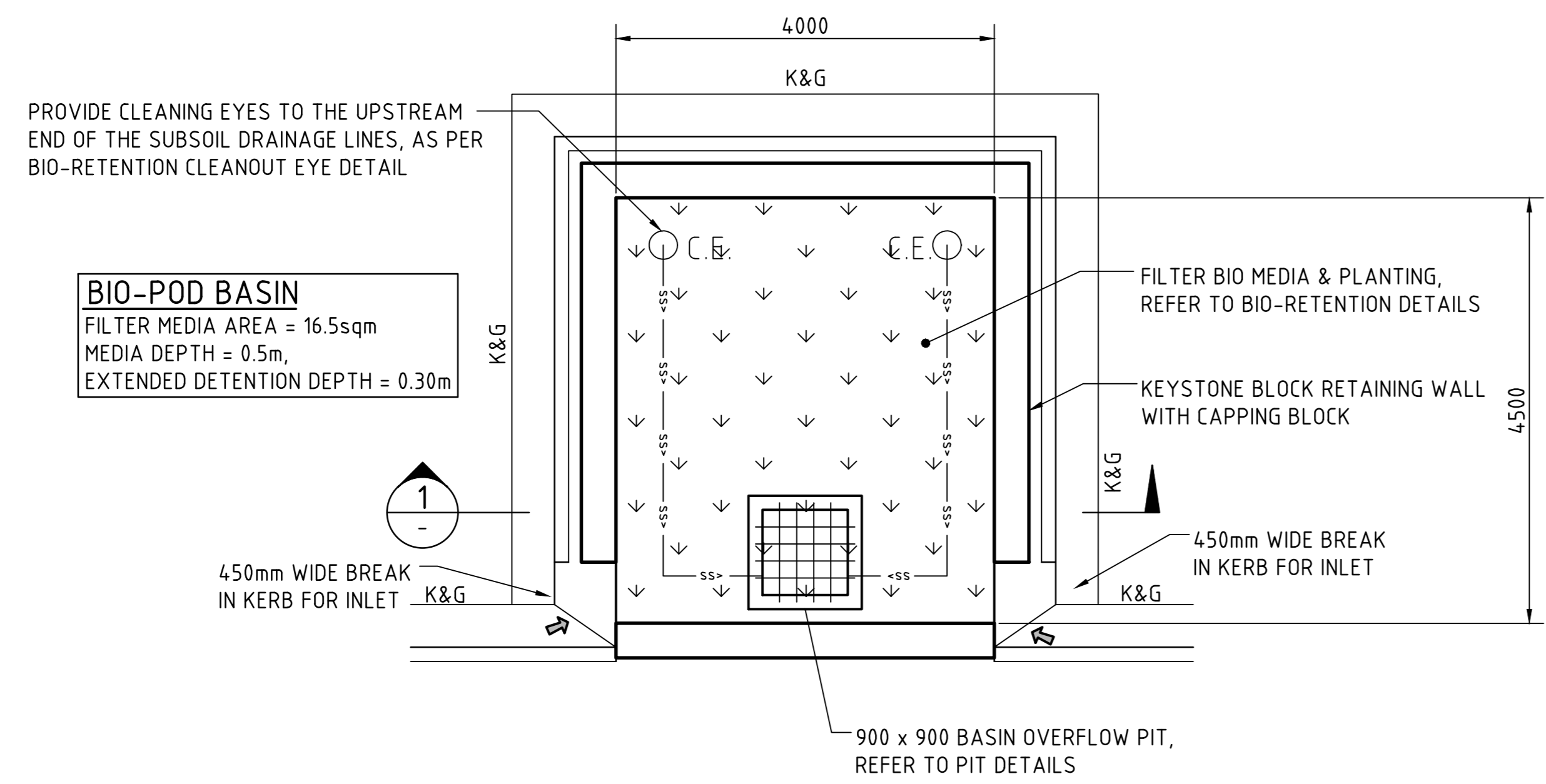


**BIORETENTION CLEANOUT EYE ELEVATION
SCALE 1:20
DENOTED C.E. ON PLAN**

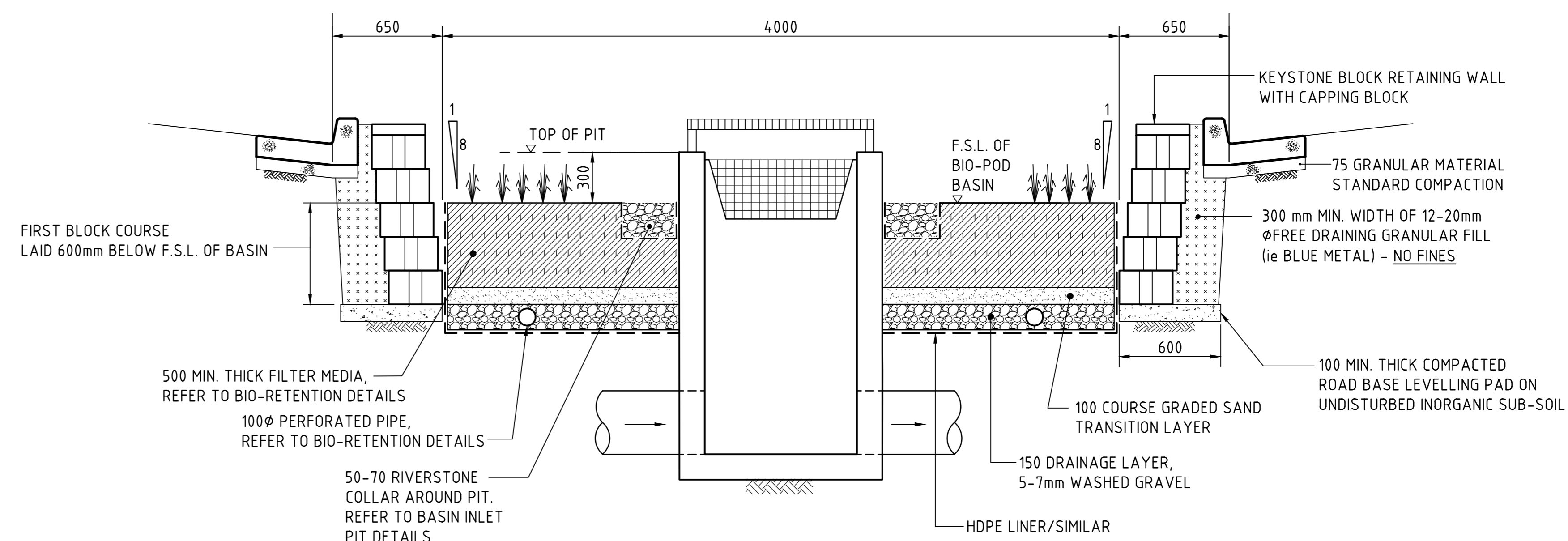
BIO-RETENTION BASIN DETAILS



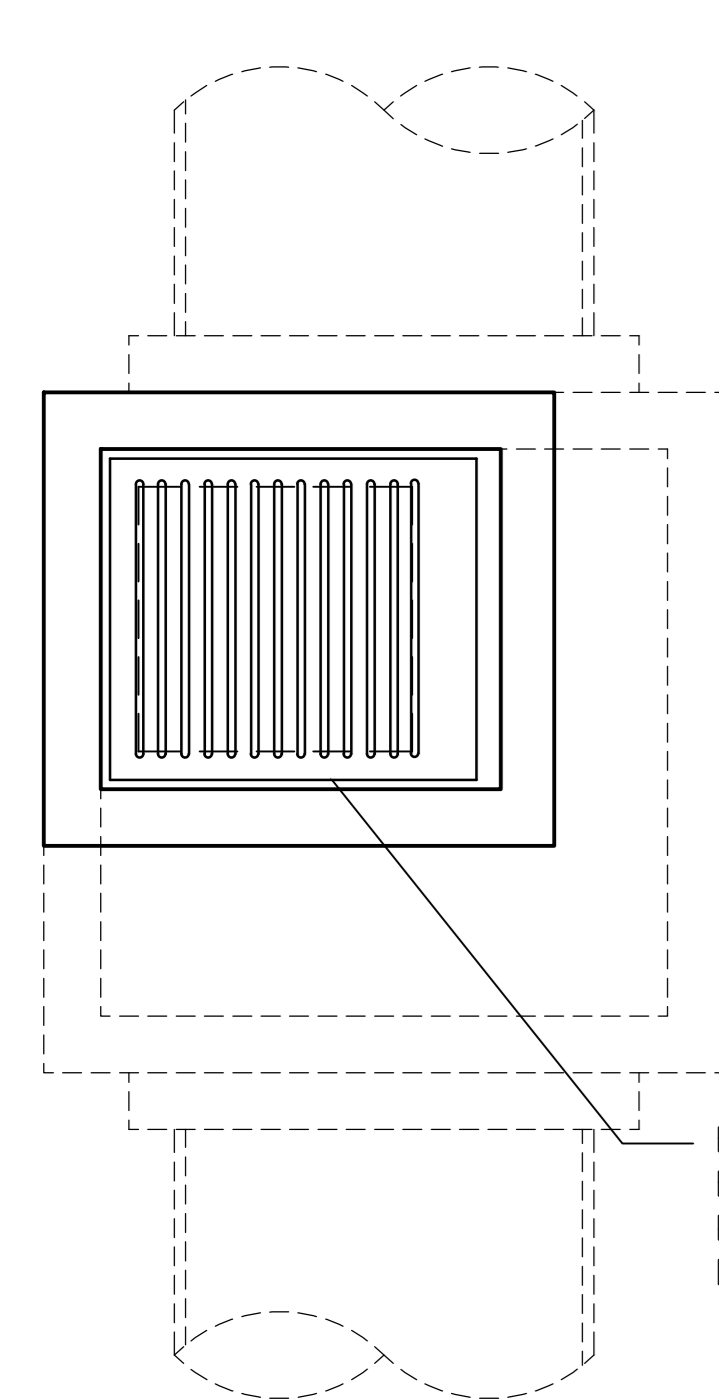
FOR SSD APPROVAL



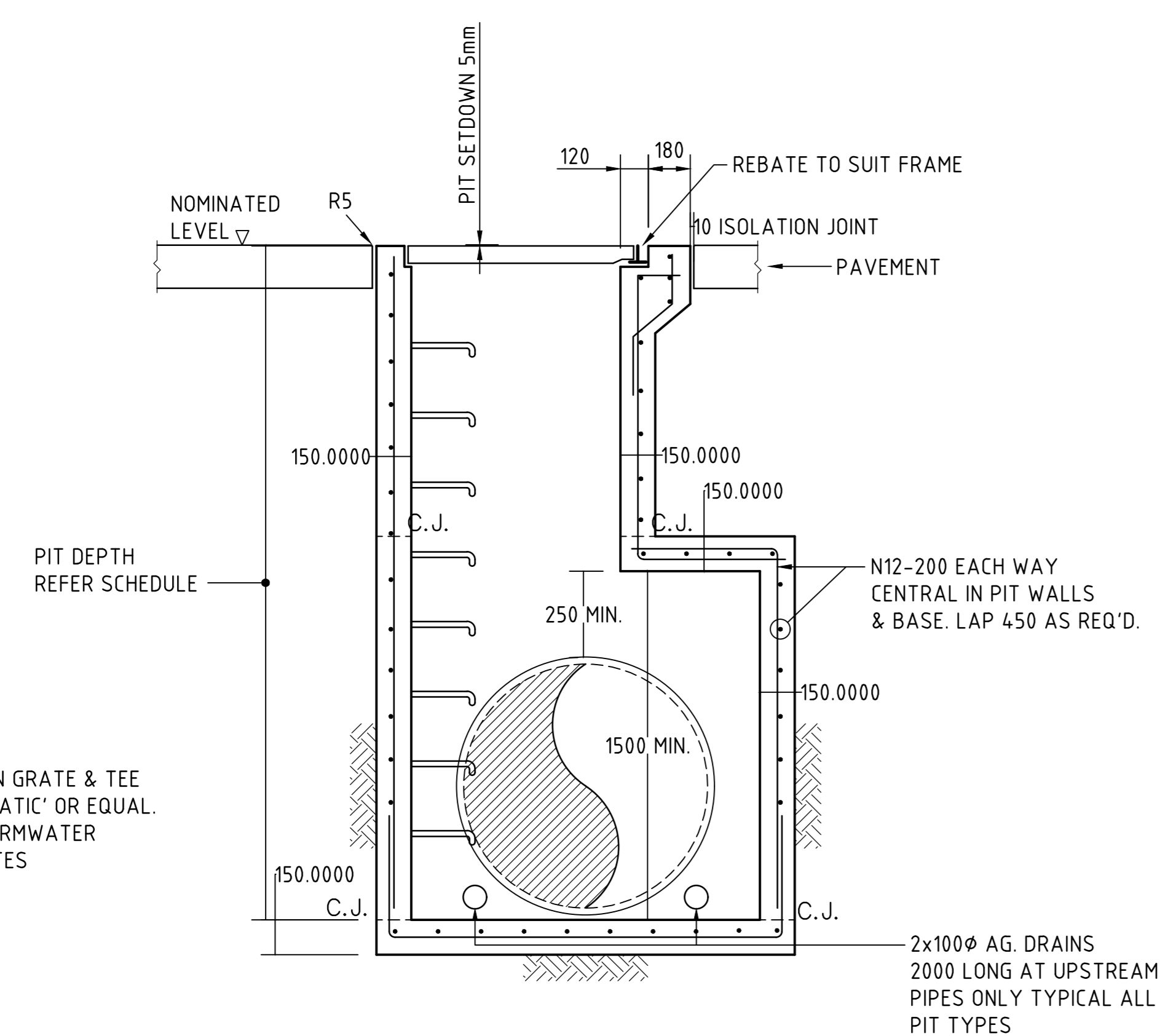
CARPARK BIO-POD BASIN TYPICAL DETAIL
SCALE 150



SECTION 1:20

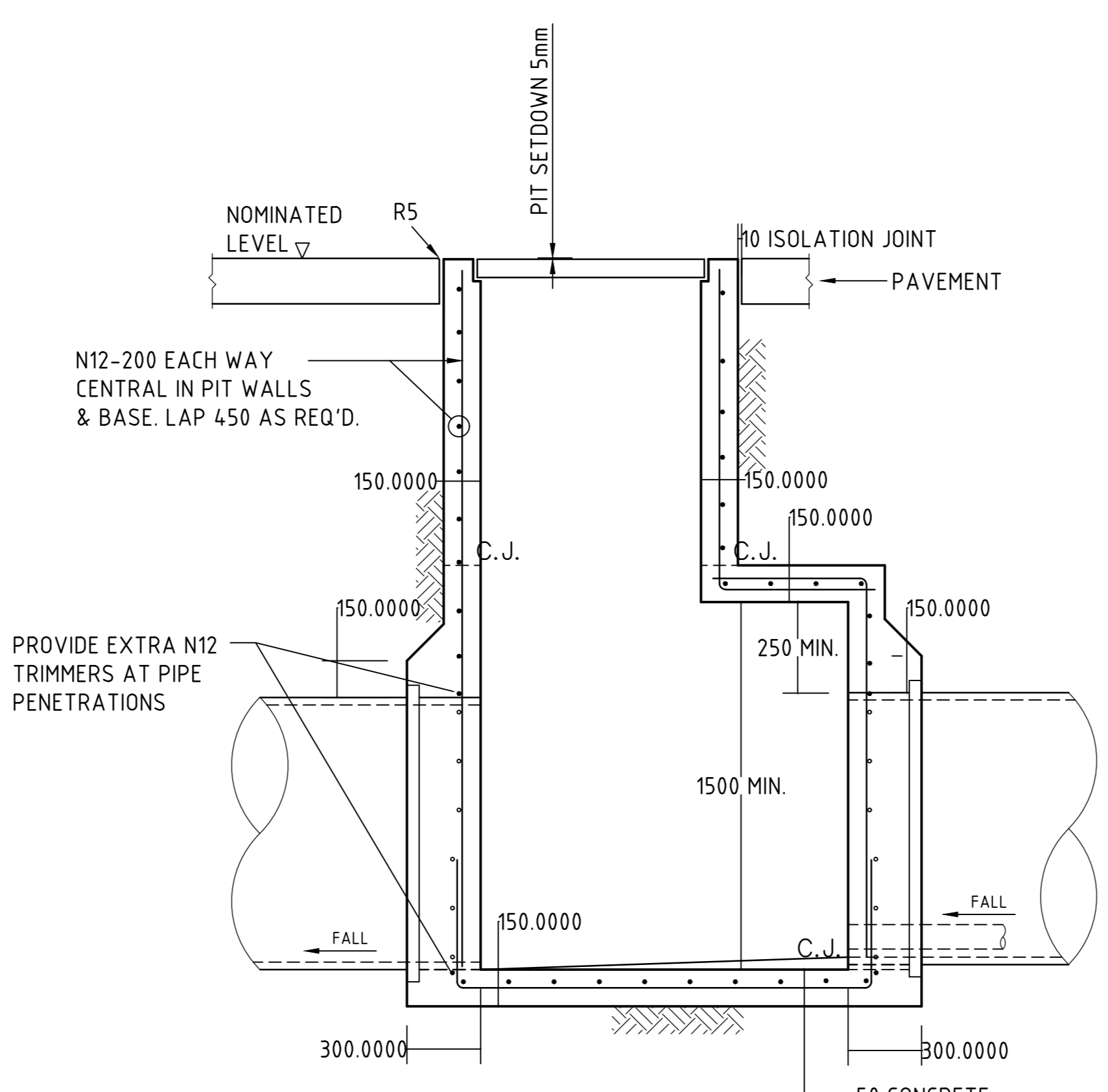


PLAN
SCALE 1:20



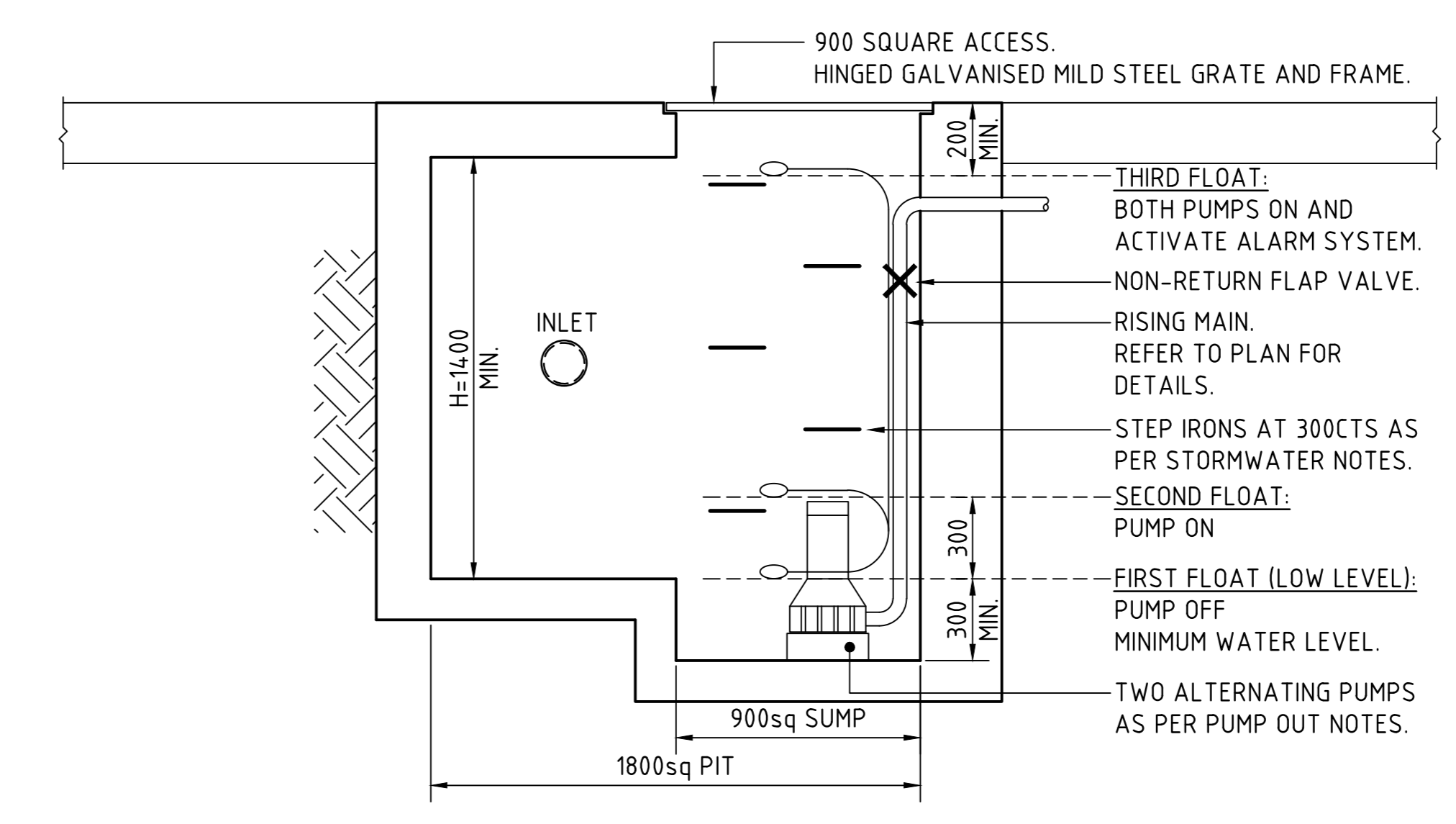
SECTION
SCALE 1:20

TAPERED SINGLE GRATED GULLY PIT - SGGP



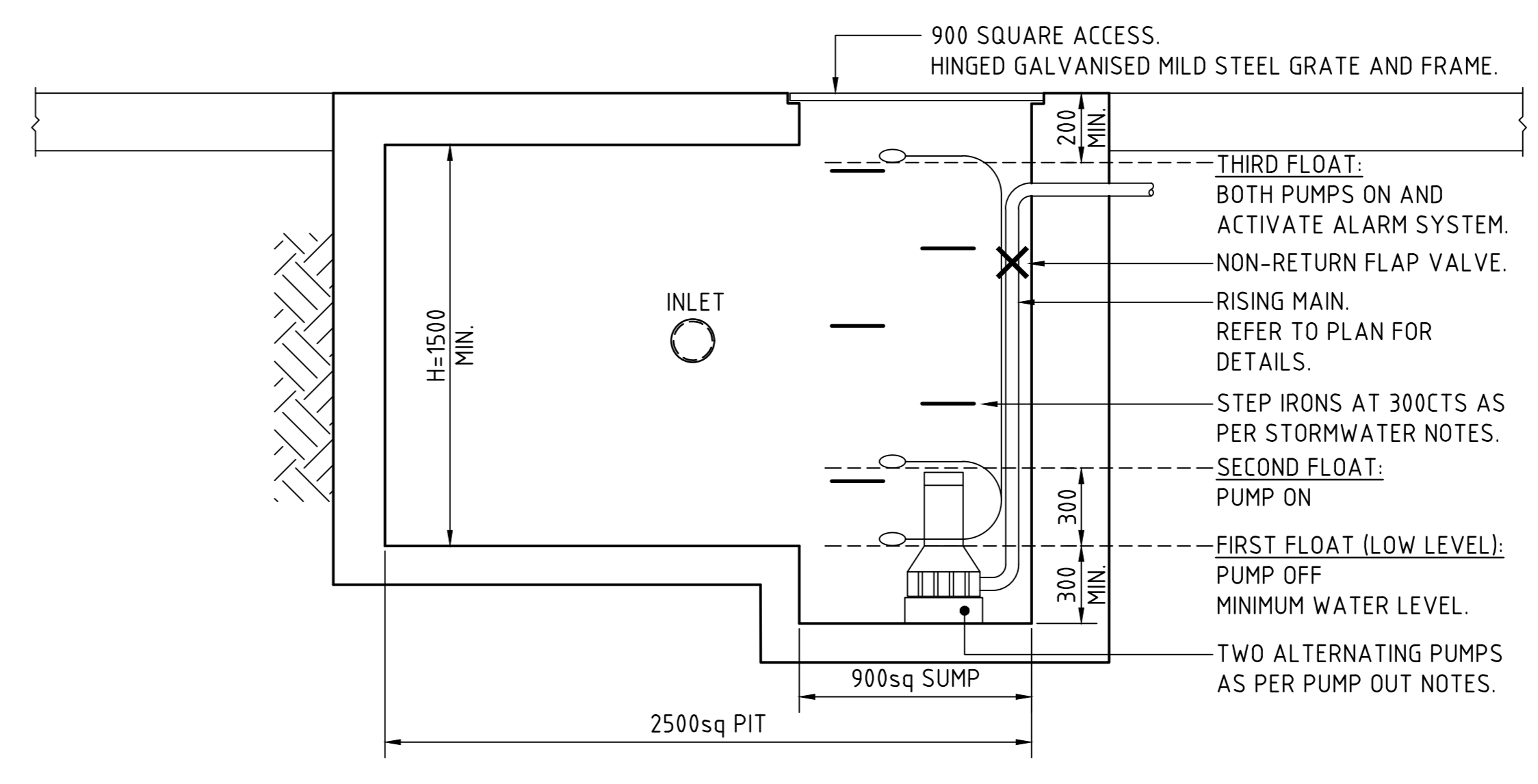
SECTION
SCALE 1:20

TAPERED SINGLE GRATED GULLY PIT - SGGP



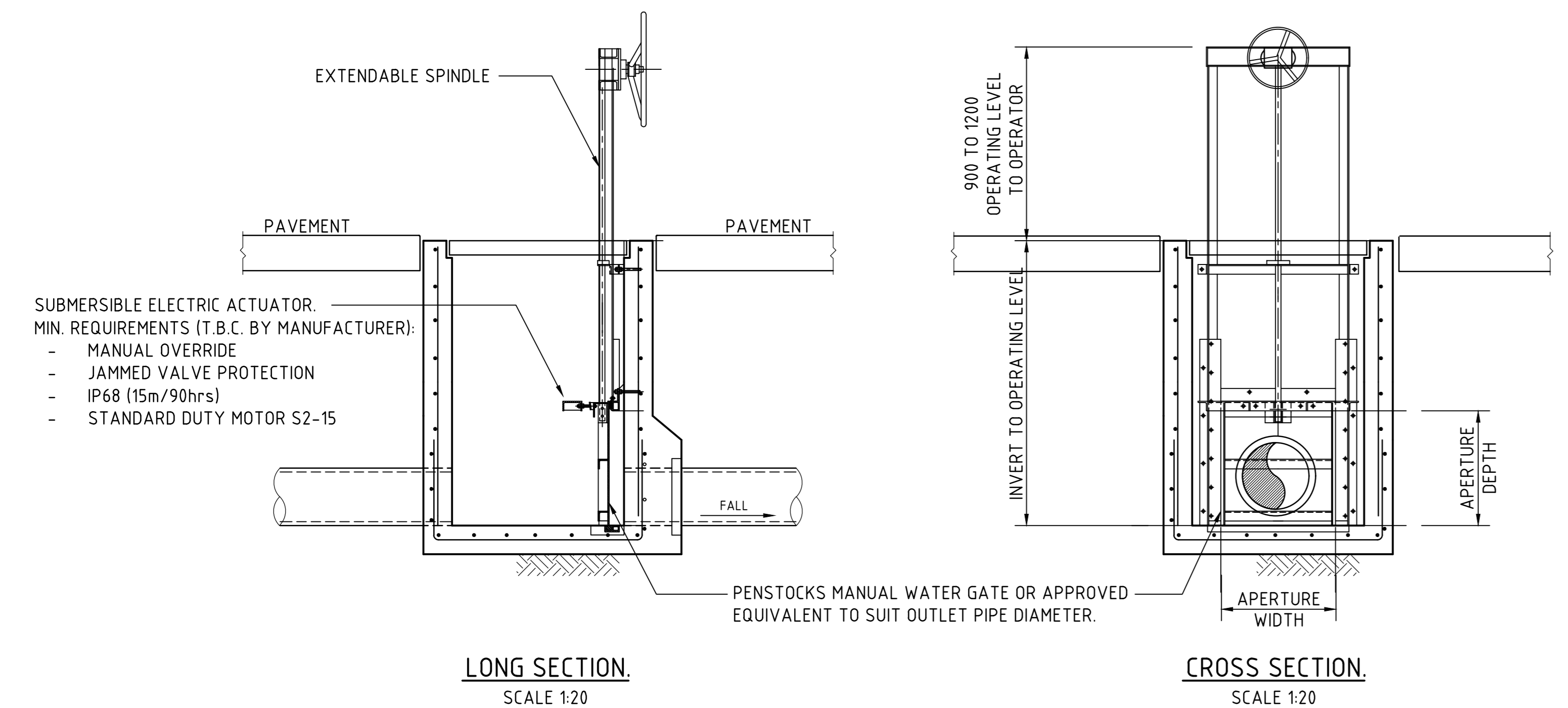
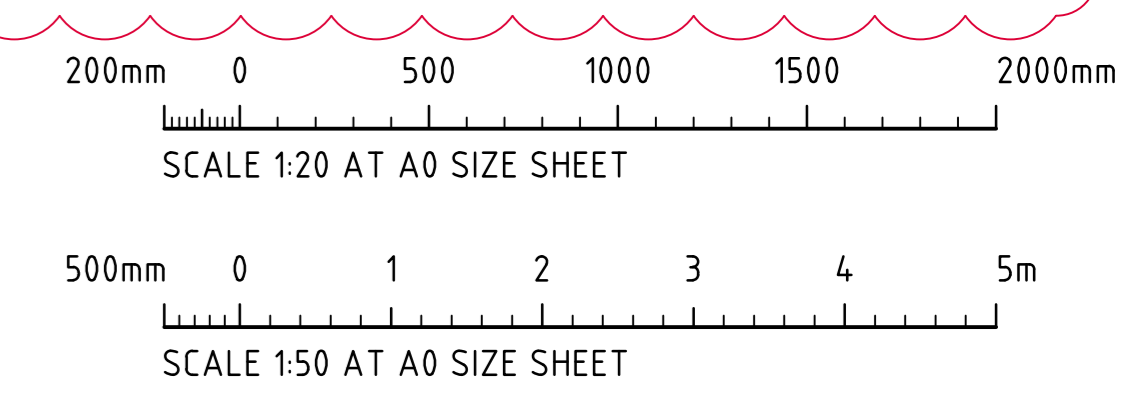
PUMP OUT PIT DETAIL - PIT G15
SCALE 1:20
REFER TYPICAL PIT DETAILS FOR ALL ITEMS NOT LABELED.

BASEMENT PUMP OUT NOTES:
PUMP SYSTEM IS TO CONSIST OF DUAL ALTERNATING PUMPS. THE PUMP OUT SYSTEM SHALL BE DESIGNED TO BE OPERATED IN THE FOLLOWING MANNER:
Q PUMP = 10 L/s VOLUME = 5.0 m³ (MIN.)
THE PUMPS SHALL BE PROGRAMMED TO WORK ALTERNATIVELY SO AS TO ALLOW BOTH PUMPS TO HAVE AN EQUAL OPERATION LOAD AND PUMP LIFE.
A LOW LEVEL FLOAT SHALL BE PROVIDED TO ENSURE THAT THE MINIMUM REQUIRED WATER LEVEL IS MAINTAINED WITHIN THE SUMP AREA OF THE PIT. IN THIS REGARD THIS FLOAT WILL FUNCTION AS AN OFF SWITCH FOR THE PUMPS.
A SECOND FLOAT SHALL BE PROVIDED AT A HIGHER LEVEL, APPROXIMATELY 300mm ABOVE THE MINIMUM WATER LEVEL, WHEREBY ONE OF THE PUMPS WILL OPERATE AND DRAIN THE PIT TO THE LEVEL OF THE LOW-LEVEL FLOAT.
A THIRD FLOAT SHALL BE PROVIDED AT A HIGH LEVEL, WHICH IS APPROXIMATELY THE TOP LEVEL OF THE PIT. THIS FLOAT SHOULD START THE OTHER PUMP THAT IS NOT OPERATING AND ACTIVATE THE ALARM.
AN ALARM SYSTEM SHALL BE PROVIDED WITH A FLASHING STROBE LIGHT AND A PUMP FAILURE WARNING SIGN WHICH ARE TO BE LOCATED AT THE ENTRANCE TO THE BASEMENT LEVEL. THE ALARM SYSTEM SHALL BE PROVIDED WITH A BATTERY BACK-UP IN CASE OF POWER FAILURE.



PUMP OUT PIT DETAIL - PIT H06
SCALE 1:20
REFER TYPICAL PIT DETAILS FOR ALL ITEMS NOT LABELED.

BASEMENT PUMP OUT NOTES:
PUMP SYSTEM IS TO CONSIST OF DUAL ALTERNATING PUMPS. THE PUMP OUT SYSTEM SHALL BE DESIGNED TO BE OPERATED IN THE FOLLOWING MANNER:
Q PUMP = 15 L/s VOLUME = 9.3 m³ (MIN.)
THE PUMPS SHALL BE PROGRAMMED TO WORK ALTERNATIVELY SO AS TO ALLOW BOTH PUMPS TO HAVE AN EQUAL OPERATION LOAD AND PUMP LIFE.
A LOW LEVEL FLOAT SHALL BE PROVIDED TO ENSURE THAT THE MINIMUM REQUIRED WATER LEVEL IS MAINTAINED WITHIN THE SUMP AREA OF THE PIT. IN THIS REGARD THIS FLOAT WILL FUNCTION AS AN OFF SWITCH FOR THE PUMPS.
A SECOND FLOAT SHALL BE PROVIDED AT A HIGHER LEVEL, APPROXIMATELY 300mm ABOVE THE MINIMUM WATER LEVEL, WHEREBY ONE OF THE PUMPS WILL OPERATE AND DRAIN THE PIT TO THE LEVEL OF THE LOW-LEVEL FLOAT.
A THIRD FLOAT SHALL BE PROVIDED AT A HIGH LEVEL, WHICH IS APPROXIMATELY THE TOP LEVEL OF THE PIT. THIS FLOAT SHOULD START THE OTHER PUMP THAT IS NOT OPERATING AND ACTIVATE THE ALARM.
AN ALARM SYSTEM SHALL BE PROVIDED WITH A FLASHING STROBE LIGHT AND A PUMP FAILURE WARNING SIGN WHICH ARE TO BE LOCATED AT THE ENTRANCE TO THE BASEMENT LEVEL. THE ALARM SYSTEM SHALL BE PROVIDED WITH A BATTERY BACK-UP IN CASE OF POWER FAILURE.



CUT-OFF VALVE PIT

- NOTES:**
- PROVIDE CUT-OFF VALVE TO OUTLET PIPE OF PIT AS NOTED ON STORMWATER DRAINAGE PLANS
 - ACTUATOR TO BE CONNECTED TO FIRE SYSTEM TRIP

FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-------------------------|----------|-------|------------|------|-------|
| ISSUED FOR INFORMATION | 23.03.20 | A | | | |
| ISSUED FOR SSD APPROVAL | 30.03.20 | B | | | |
| REVISED AS CLOUDED | 17.06.20 | D | | | |
| REVISED AS CLOUDED | 17.06.20 | E | | | |

ARCHITECT
CLIENT



PROJECT
ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2115

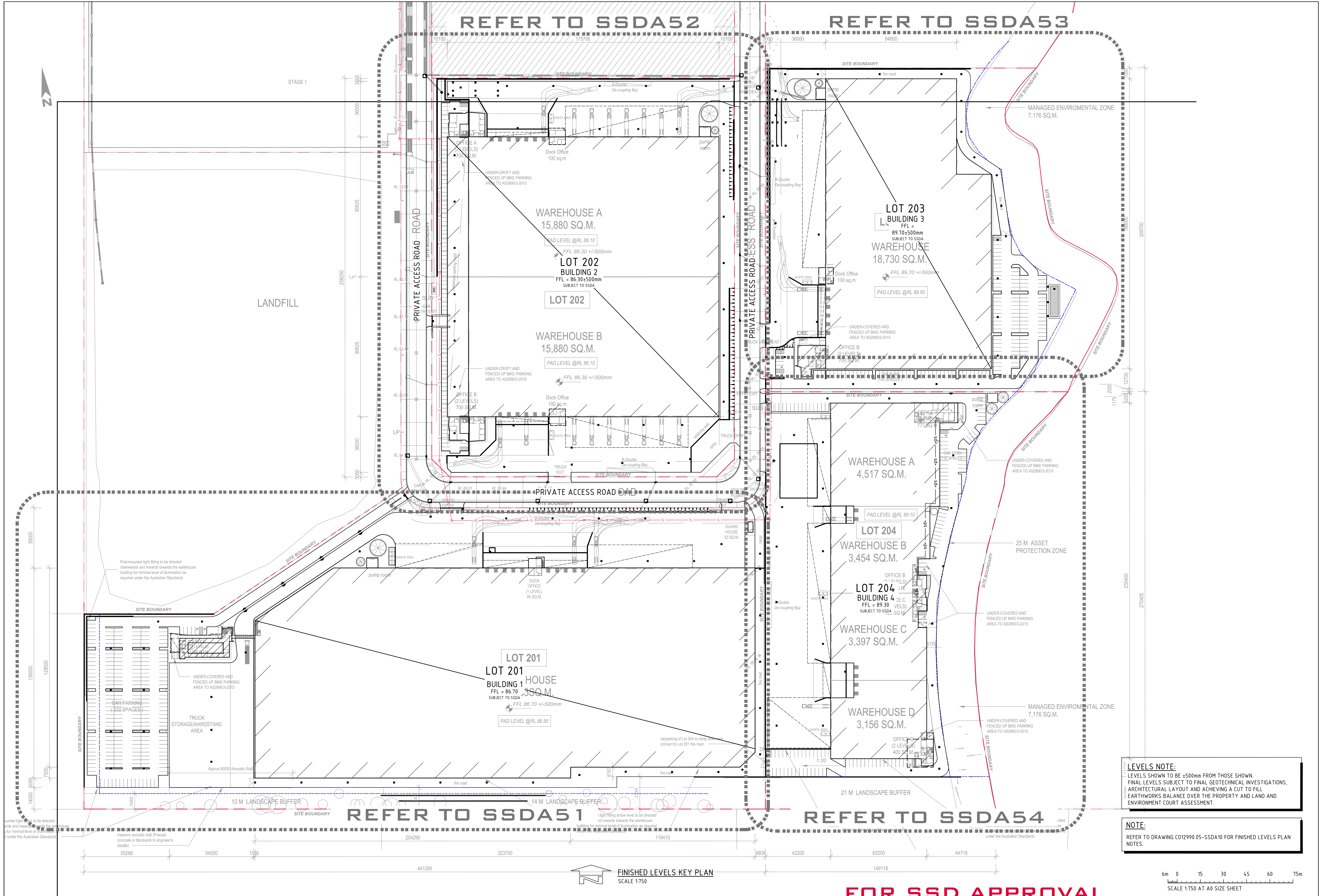
Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Wahlab Bay, Sydney NSW 2000
Tel: (02) 9251-7899 Fax: (02) 9241-3721
email: mail@costinroe.com.au



DRAWING TITLE
STORMWATER DRAINAGE DETAILS SHEET 3
PRECISION | COMMUNICATION | ACCOUNTABILITY
DRAWING No. Co12990.05-SSDA47
ISSUE E

REFER TO SSSDA52

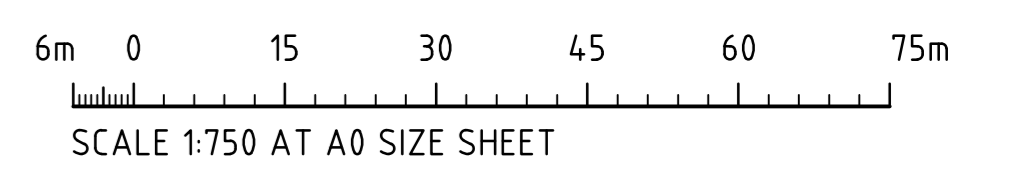
REFER TO SSSDA53



LEVELS NOTE:
 LEVELS SHOWN TO BE ±500mm FROM THOSE SHOWN.
 FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS.
 ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL
 EARTHWORKS BALANCE OVER THE PROPERTY AND LAND AND
 ENVIRONMENT COURT ASSESSMENT.

NOTE:
 REFER TO DRAWING C012990.05-SSDA10 FOR FINISHED LEVELS PLAN
 NOTES.

FINISHED LEVELS KEY PLAN
 SCALE 1:750



FOR SSD APPROVAL

| REVISIONS | DATE | ISSUE | AMENDMENTS |
|-------------------------------------|----------|-------|------------|
| REVISED TO NEW ARCHITECTURAL LAYOUT | 28.10.20 | B | |
| ISSUED FOR SSD APPROVAL | 12.06.20 | A | |
| AMENDMENTS | DATE | ISSUE | AMENDMENTS |

| ARCHITECT | CLIENT |
|-----------|--------|
| | |



PROJECT
 ESR HORSLEY LOGISTICS PARK
 DEVELOPMENT APPLICATION
 327-335 BURLEY ROAD, HORSLEY PARK, 2175

Costin Roe Consulting Pty Ltd.
 Consulting Engineers
 Level 1, 9 Midland Street
 Walsh Bay, Sydney NSW 2000
 Tel: (02) 9251-7899 Fax: (02) 9241-3721
 email: mail@costinroe.com.au

Costin Roe Consulting
 PRECISION | COMMUNICATION | ACCOUNTABILITY

| DRAWING TITLE | DRAWING No | ISSUE |
|--------------------------|-------------------|-------|
| FINISHED LEVELS KEY PLAN | C012990.05-SSDA50 | C |

REFER TO DRAWING SSDA52 FOR LOT 202 CONTINUATION

DISCHARGE POINT
REFER TO DRG SSDA41.

UNDERGROUND OSD/STORMWATER TREATMENT TANK
PROVIDE 2235m³ OF OSD STORAGE VOLUME
REFER DETAIL ON DRG DA41 & DA48.

DISCHARGE POINT
REFER TO DRG SSDA44.

PROPOSED
RETAINING WALL

Pole-mounted light fitting to be directed downwards
PROPOSED CARPARK BIO-RETENTION BASIN SYSTEM
building for MIN TOTAL BIO RETENTION FILTRATION AREA: 110m²
required under building
REFER DETAIL ON DRG DA41 & DA46 & DA47

95KL ABOVE GROUND
RAINWATER TANK.

PUMP ROOM
RL 86.70
SPRINKLER TANK
RL 86.70

1300 DEEP RECESS
DOCK
AWNING ABOVE

DOCK OFFICE
(1 LEVEL)
95 SQ.M.

AWNING ABOVE

PROPOSED
RETAINING WALL
LENGTH = 193.0m
MAX H = 2.4m

LOT 201

LOT 201
WAREHOUSE
FFL 86.70±500mm

HOUSE
SQ.M.

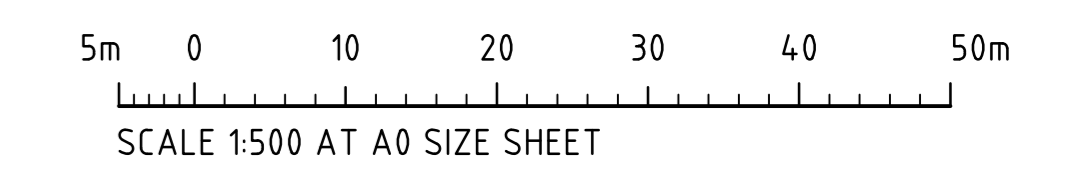
FFL 86.70 +/-500mm
PAD LEVEL @RL 86.50

carparking of Lot 204 to ramp down and connect to Lot 201 fire road

LEGEND:
LEVELS DATUM IS AHD.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- GD, GRATED DRAIN (300w x 225D UNO)
- PROPOSED RETAINING WALL

LEVELS NOTE:
LEVELS SHOWN TO BE ±500mm FROM THOSE SHOWN.
FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS,
ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL
EARTHWORKS BALANCE OVER THE PROPERTY AND LAND AND
ENVIRONMENT COURT ASSESSMENT.



LOT 201 FINISHED LEVELS PLAN - SHEET 1
SCALE 1:500

FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|--------------------------------|----------|-------|------------|------|-------|
| ARCHITECTURAL LAYOUT REVISED | 28.10.20 | E | | | |
| REVISED AS CLOUDED | 14.10.20 | D | | | |
| REVISED FOR NEW ARCHITECTURALS | 12.06.20 | C | | | |
| ISSUED FOR SSD APPROVAL | 30.03.20 | B | | | |
| ISSUED FOR INFORMATION | 20.03.20 | A | | | |

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|------------|------|-------|------------|------|-------|
| | | | | | |
| | | | | | |
| | | | | | |

ARCHITECT

CLIENT



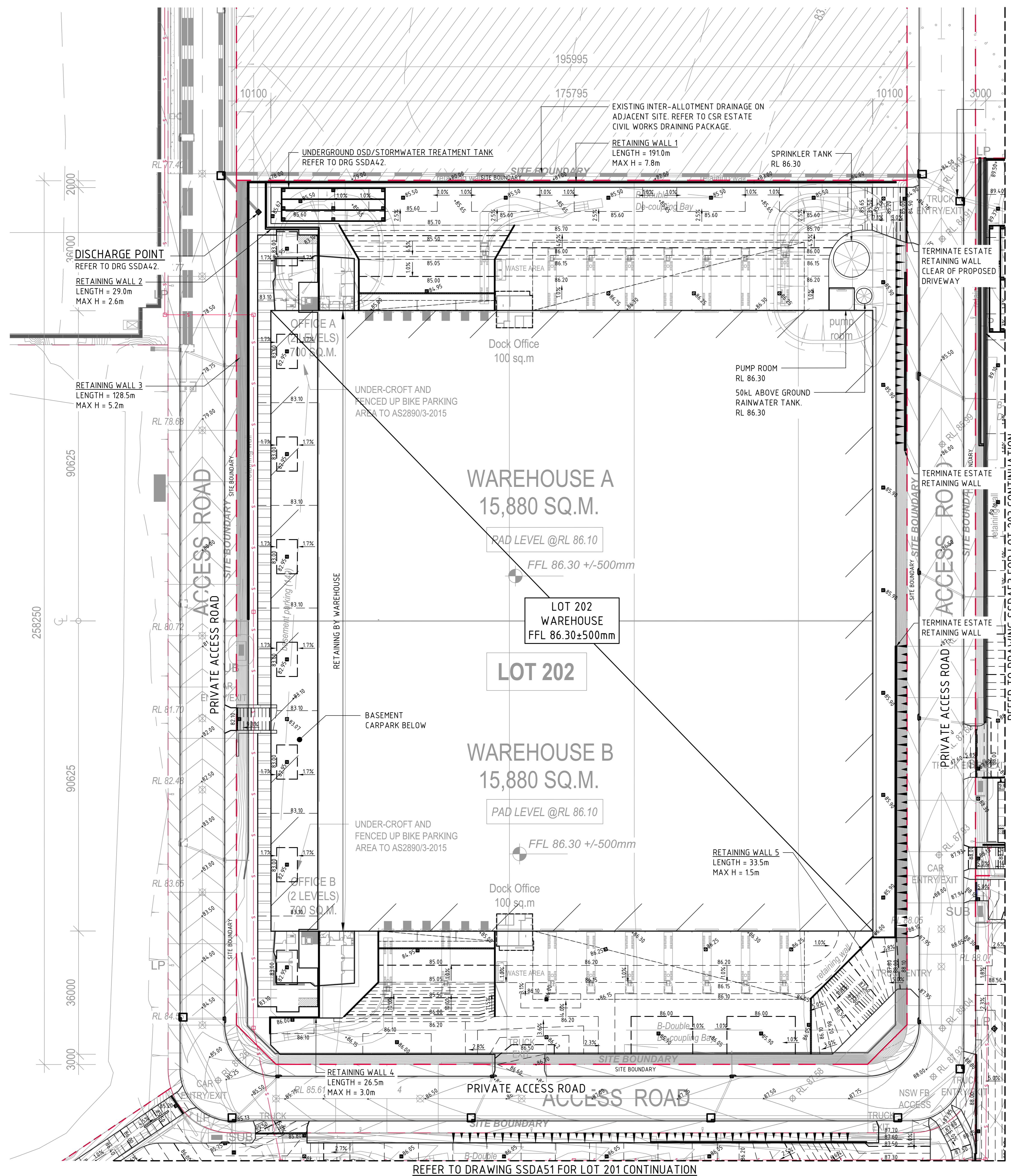
PROJECT
**ESR HORSLEY LOGISTICS PARK
DEVELOPMENT APPLICATION**
327-335 BURLEY ROAD, HORSLEY PARK, 2175



Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 9 Windmill Street
Wahbi Bay, Sydney NSW 2000
Tel: (02) 8251-7899 Fax: (02) 8241-3721
email: mail@costinroe.com.au ©

Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
**LOT 201
FINISHED LEVELS PLAN
SHEET 1**
DRAWING No. **Co12990.05-SSDA51** ISSUE **E**



REFER TO DRAWING SSDA51 FOR LOT 201 CONTINUATION

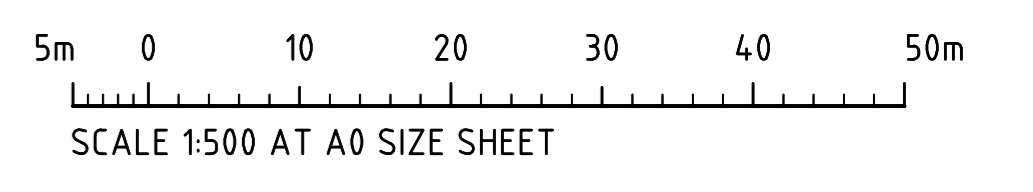
REFER TO DRAWING SSDA53 FOR LOT 203 CONTINUATION

LOT 202 FINISHED LEVELS PLAN - SHEET 1
SCALE 1:500

LEGEND:
LEVELS DATUM IS AHD.

| | |
|--|---|
| | - SGGP, SINGLE GRATED GULLY PIT |
| | - SJP, SEALED JUNCTION PIT |
| | - KIP, KERB INLET PIT |
| | - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS |
| | - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS |
| | - GD, GRATED DRAIN (300W x 225D UNO) |
| | - PROPOSED RETAINING WALL |

LEVELS NOTE:
LEVELS SHOWN TO BE +500mm FROM THOSE SHOWN.
FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS,
ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL
EARTHWORKS BALANCE OVER THE PROPERTY AND LAND AND
ENVIRONMENT COURT ASSESSMENT.



FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-------------------------------------|----------|-------|------------|------|-------|
| ARCHITECTURAL LAYOUT REVISED | 28.10.20 | E | | | |
| REVISED AS CLOUDED | 20.10.20 | D | | | |
| REVISED TO NEW ARCHITECTURAL LAYOUT | 14.7.20 | C | | | |
| REVISED AS CLOUDED | 24.06.20 | B | | | |
| ISSUED FOR INFORMATION | 17.06.20 | A | | | |

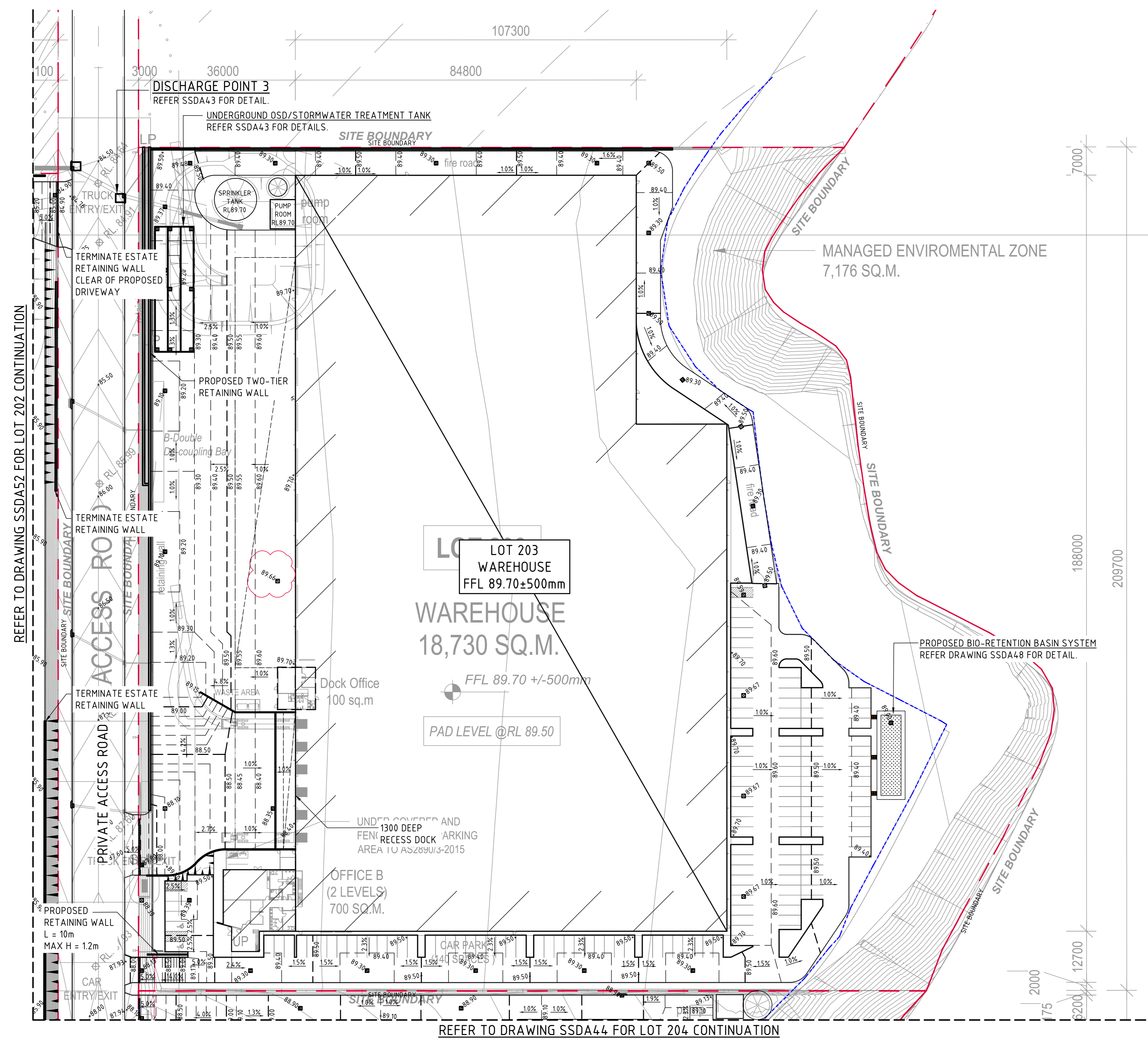
| PROJECT | CLIENT | ARCHITECT |
|--|--------|-----------|
| ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION | ESR | |

| PROJECT | CLIENT | ARCHITECT |
|--|--------|-----------|
| ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION | ESR | |

| PROJECT | CLIENT | ARCHITECT |
|--|--------|-----------|
| ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION | ESR | |

| PROJECT | CLIENT | ARCHITECT |
|--|--------|-----------|
| ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION | ESR | |

| PROJECT | CLIENT | ARCHITECT |
|--|--------|-----------|
| ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION | ESR | |

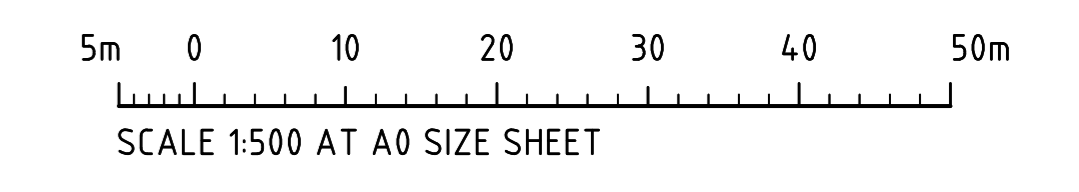


LOT 203 FINISHED LEVELS PLAN
SCALE 1:500

LEGEND:
LEVELS DATUM IS AHD.

| | |
|--|---|
| | - SGGP, SINGLE GRATED GULLY PIT |
| | - SJP, SEALED JUNCTION PIT |
| | - KIP, KERB INLET PIT |
| | - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS |
| | - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS |
| | - GD, GRATED DRAIN (300W x 225D UNO) |
| | - PROPOSED RETAINING WALL |

LEVELS NOTE:
LEVELS SHOWN TO BE ±500mm FROM THOSE SHOWN.
FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS,
ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL
EARTHWORKS BALANCE OVER THE PROPERTY AND LAND AND
ENVIRONMENT COURT ASSESSMENT.



FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-------------------------------------|----------|-------|------------|------|-------|
| ARCHITECTURAL LAYOUT REVISED | 28.10.20 | C | | | |
| REVISED TO NEW ARCHITECTURAL LAYOUT | 14.10.20 | B | | | |
| ISSUED FOR SSD APPROVAL | 12.06.20 | A | | | |

| ARCHITECT | CLIENT | PROJECT |
|-----------|--------|---------|
| | | |



PROJECT
ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2115

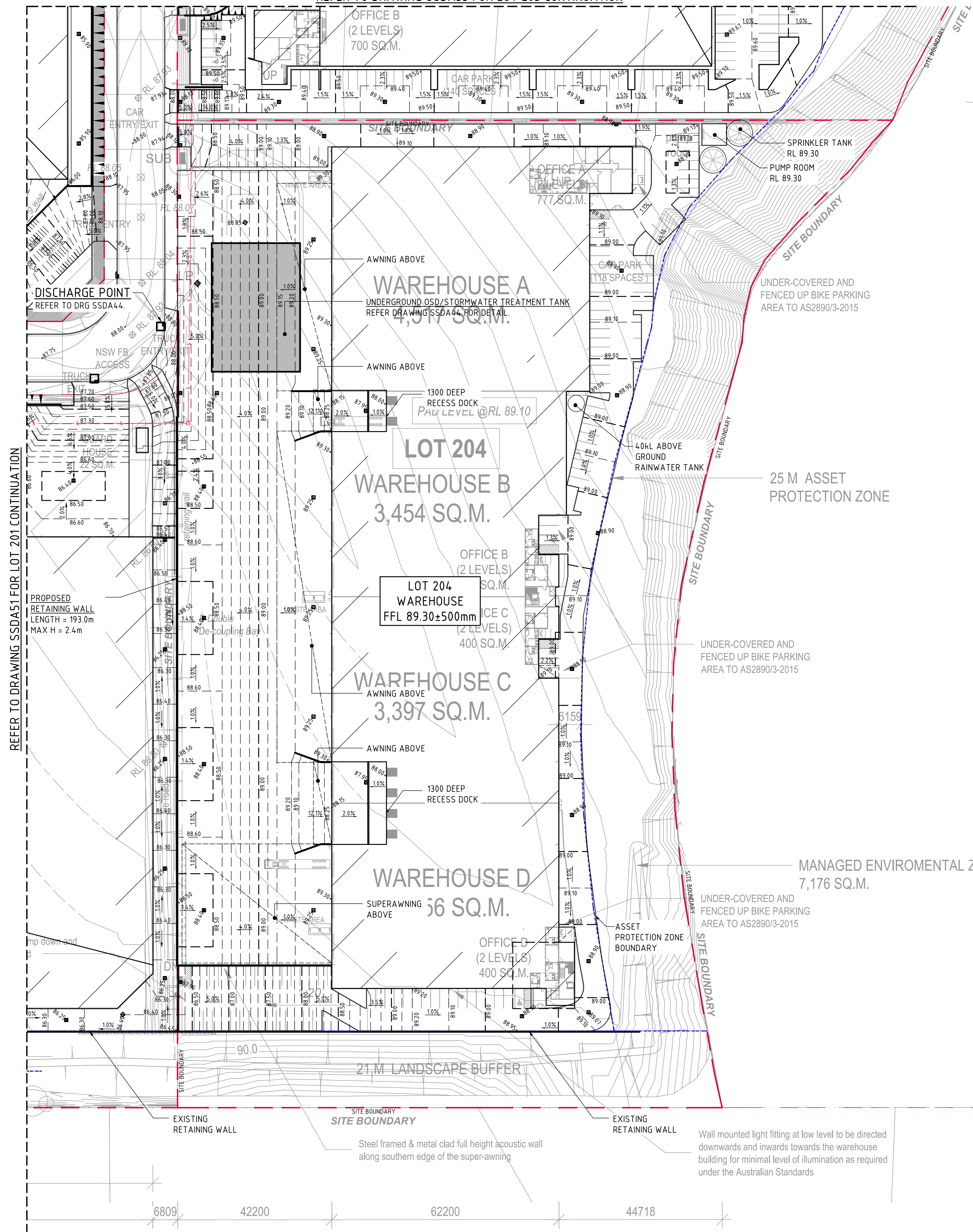
| DESIGNED | DRAWN | DATE | CHECKED | DATE | SCALE | CAD REF. |
|----------|-------|--------|---------|------|-------------|--------------------|
| TF | JB | MAR 19 | XC | | A0 AS SHOWN | LOT2990.05-SSDA5.3 |

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 9 Windmill Street
Wahbi Bay, Sydney NSW 2000
Tel: (02) 8251-7899 Fax: (02) 8241-3721
email: mail@costinroe.com.au ©

Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

| DRAWING TITLE | ISSUE |
|------------------------------|-------|
| LOT 203 FINISHED LEVELS PLAN | C |

REFER TO DRAWING SSDA53 FOR LOT 203 CONTINUATION



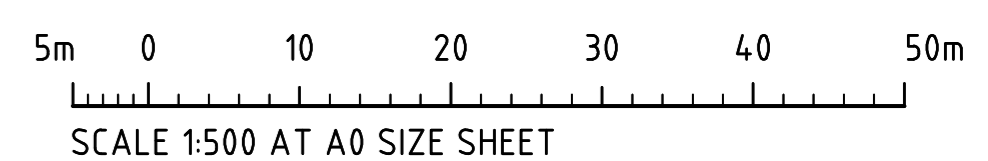
REFER TO DRAWING SSDA51 FOR LOT 201 CONTINUATION

LOT 204 FINISHED LEVELS PLAN - SHEET 1
SCALE 1:500

LEGEND:
LEVELS DATUM IS AHD.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- G.D., GRATED DRAIN (300W x 225D UNO)
- PROPOSED RETAINING WALL

LEVELS NOTE:
LEVELS SHOWN TO BE +500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY AND LAND AND ENVIRONMENT COURT ASSESSMENT.



FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-------------------------------------|----------|-------|------------|------|-------|
| ARCHITECTURAL LAYOUT REVISED | 28.10.20 | D | | | |
| REVISED AS CLOUDED | 26.10.20 | C | | | |
| REVISED TO NEW ARCHITECTURAL LAYOUT | 14.10.20 | B | | | |
| ISSUED FOR INFORMATION | 19.06.20 | A | | | |

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|------------|------|-------|------------|------|-------|
| | | | | | |
| | | | | | |
| | | | | | |

ARCHITECT

CLIENT



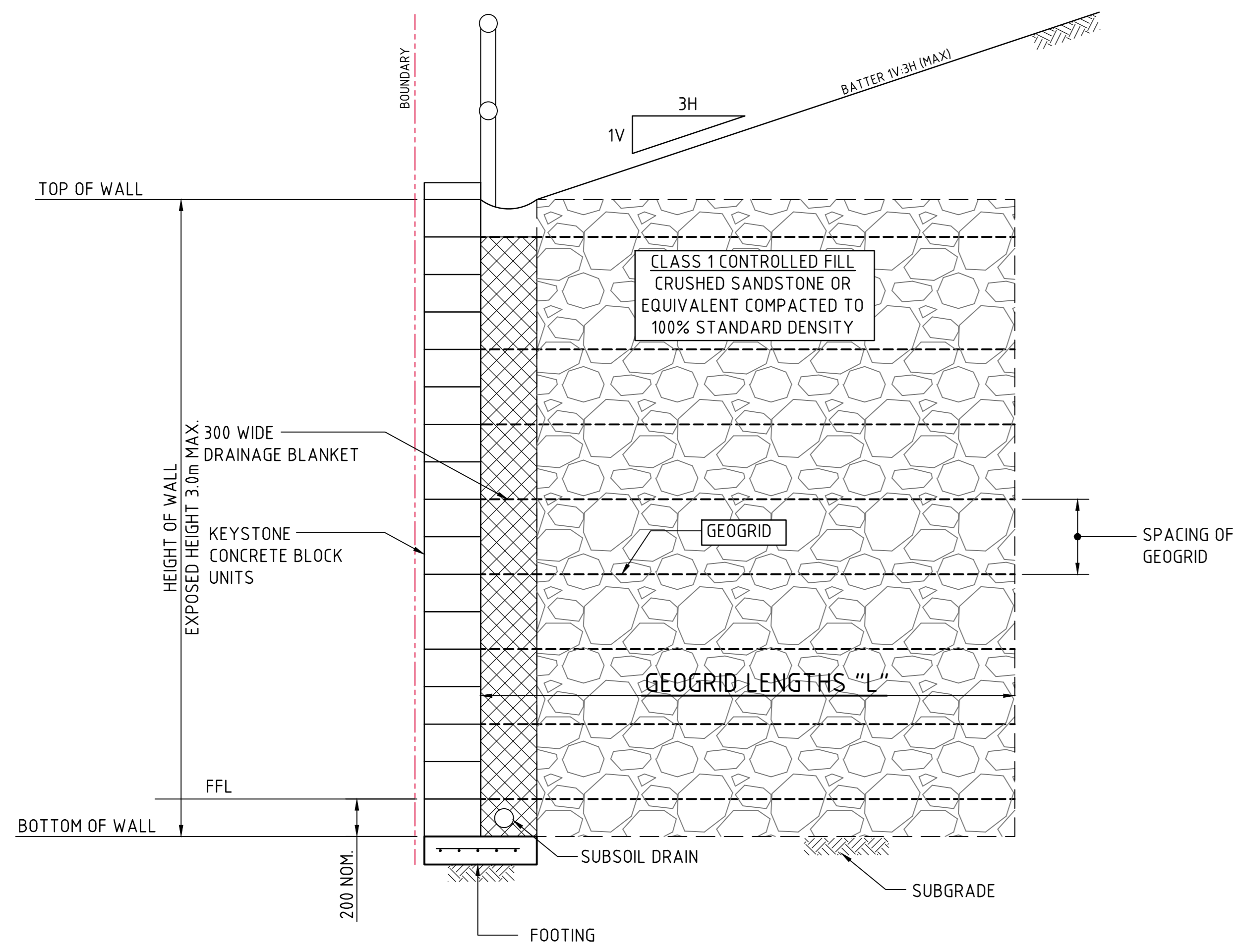
PROJECT
ESR HORSLEY LOGISTICS PARK
DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2175



Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 9 Windmill Street
Wahlab Bay, Sydney NSW 2000
Tel: (02) 8551-7899 Fax: (02) 8541-3721
email: mail@costinroe.com.au ©

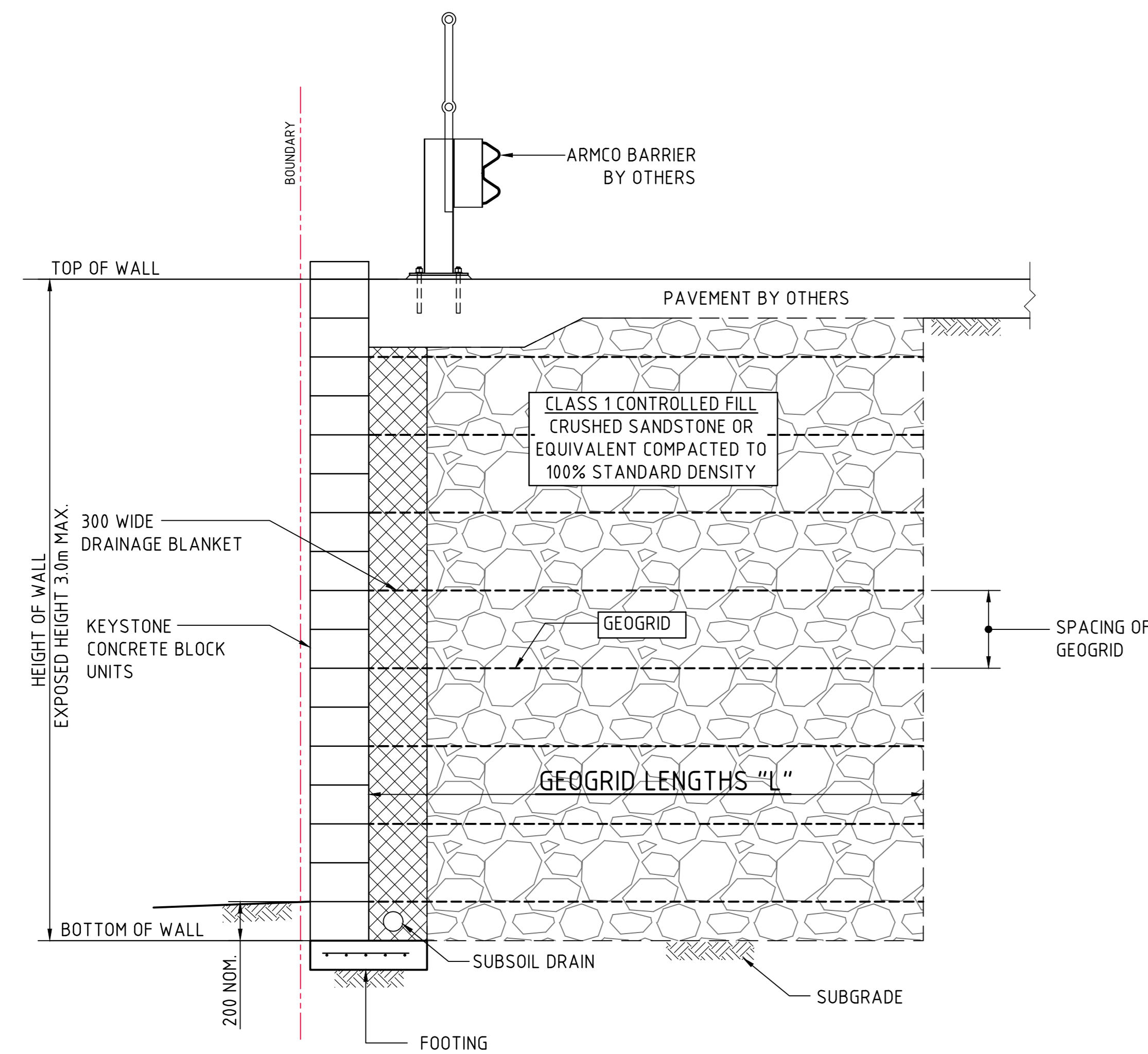
Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
LOT 204
FINISHED LEVELS PLAN
SHEET 4
DRAWING No. Co12990.05-SSDA54
ISSUE D



**RETAINING WALL TYPE 1
(REINFORCED EARTH WALL)**
SCALE 1:20

REINFORCED EARTH RETAINING WALL
STRUCTURAL DESIGN TO D+C CONTRACTOR

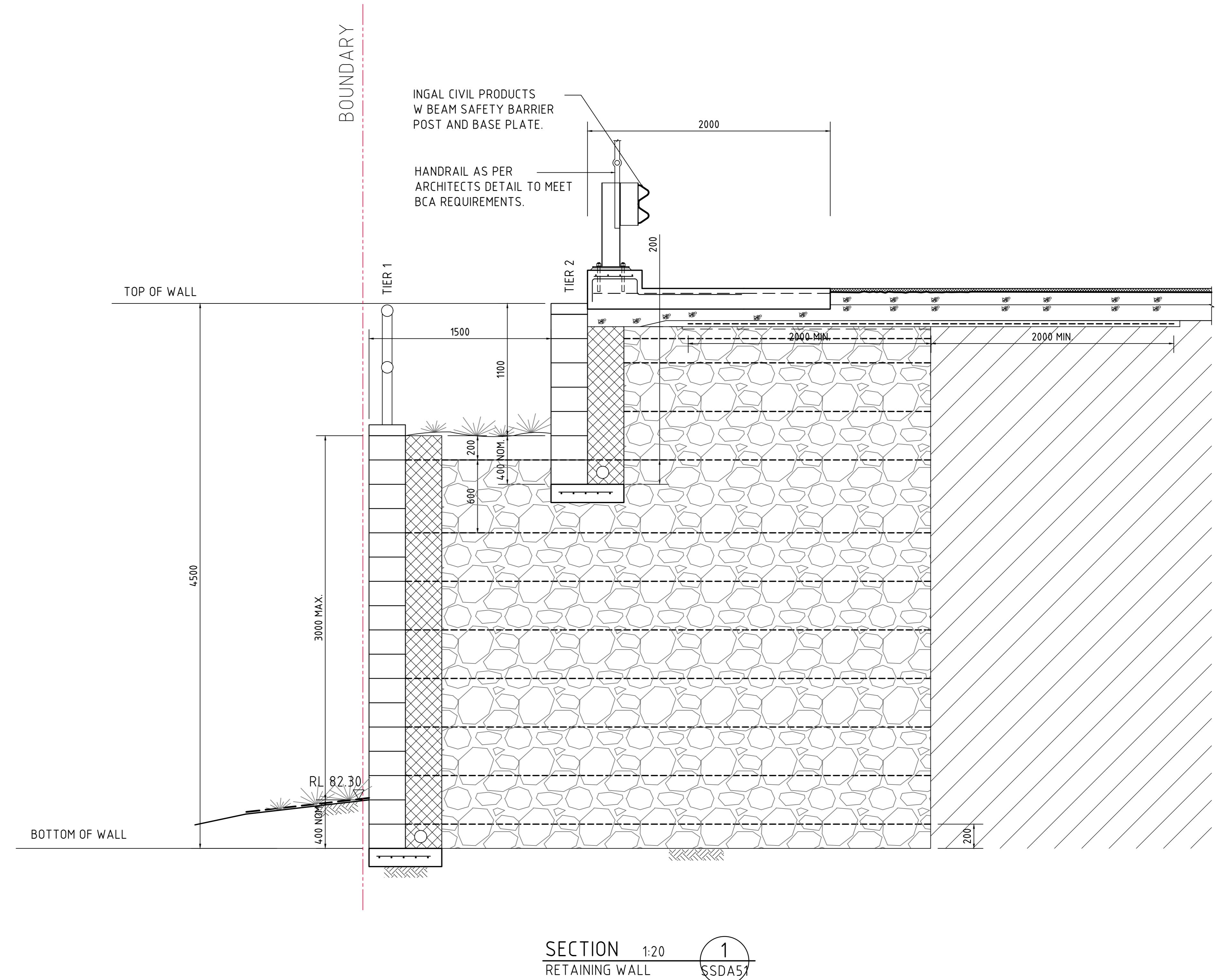


**RETAINING WALL TYPE 2
(REINFORCED EARTH WALL)**
SCALE 1:20

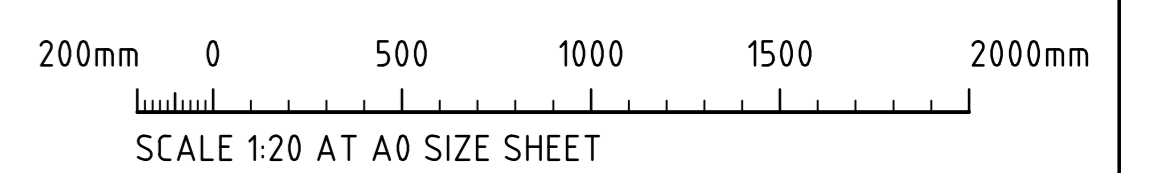
REINFORCED EARTH RETAINING WALL
STRUCTURAL DESIGN TO D+C CONTRACTOR

REINFORCED EARTH RETAINING WALL NOTES:

- ALL COMPONENTS AND INSTALLATION SHALL COMPLY WITH AS4678 AND THE STANDARDS REFERRED TO THEREIN.
- MINIMUM HEIGHT (H) TO GEOGRID REINFORCEMENT LENGTH (L) TO BE 1.0.
- MINIMUM BEARING CAPACITY OF FOUNDATION (BASED ON MINIMUM H/L RATIO OF 1.0) TO BE AS FOLLOWS:
 - H MAX. 2.0m = 100 kPa
 - H MAX. 3.5m = 150 kPa
 - H MAX. 5.0m = 200 kPa
- BEFORE COMMENCEMENT OF CONSTRUCTION THE FOUNDATION SHALL BE INSPECTED AND VERIFIED BY A QUALIFIED GEOTECHNICAL ENGINEER.
- WHERE MINIMUM BEARING IS NOT ACHIEVABLE OR NOT MEETING DESIGN REQUIREMENT, THE FOUNDATION MATERIAL IS TO BE EXCAVATED AND REPLACED WITH APPROVED MATERIAL PLACED IN ACCORDANCE WITH THE FILLING SPECIFICATION TO A MINIMUM COMPACTION OF 100% SMDD AND PLACED WITHIN 2% OF OMC.
- MINIMUM SURCHARGE LOADS TO BE APPLIED AS FOLLOWS U.N.O. ON PLAN:
 - LIVE LOAD = 20 kPa
 - DEAD LOAD = 5 kPa
 - CONSTRUCTION TRAFFIC LIVE LOAD = 10 kPa
- THE GEOGRIDS SHALL BE OF THE TYPE AND INDEX STRENGTH NOMINATED ON THE DRAWINGS. THE MINIMUM GEOGRIDS SHALL BE A SINGLE LENGTH IN THE DIRECTION OF DESIGN TENSION, NOT LAPPED, MAKING PROVISION FOR CONNECTION TO THE FACING ACROSS THE WHOLE WIDTH OF THE FACING AND PROVIDING FOR THE SPECIFIED ANCHORAGE WITHIN THE DESIGNATED ANCHORAGE ZONE. GEOGRIDS SHALL COVER THE WHOLE OF THE PLAN AREA BEHIND THE WALL FOR THE SPECIFIED ANCHORAGE LENGTH AND SHALL BE LAPPED WITH ADJACENT SECTIONS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
- MINIMUM WALL EMBEDMENT AT THE TOE OF THE WALL TO BE 300mm.
- DESIGN LIFE OF STRUCTURE IS TO BE 100 YEARS.
- SELECT BACKFILL MATERIAL WITHIN THE REINFORCED SOIL BLOCK SHALL BE SOUND GRANULAR MATERIAL OF NATURAL OR INDUSTRIAL ORIGIN, NON-EXPANSIVE, FREE FROM ORGANIC OR OTHER DELETERIOUS MATERIAL CONFORMING TO THE PHYSICAL, CHEMICAL AND ELECTROCHEMICAL LIMITS AS SPECIFIED AND SHALL NOT BE SUBJECT TO BREAKDOWN UNDER COMPACTION. THE SELECT BACKFILL MATERIAL IS TO HAVE THE FOLLOWING PARAMETERS:
 - MINIMUM INTERNAL FRICTION, $\phi = 34^\circ$
 - EFFECTIVE COHESION, $c' = 0$ kPa
 - UNIT WEIGHT = 21 kN/m³
 - PH BETWEEN 4 AND 9
- SELECT BACKFILL IS TO BE PLACED AND COMPACTED IN LAYERS NOT MORE THAN 300mm (LOOSE) COMPACTION TO NOT LESS THAN 100% SMDD WILL BE ACHIEVED AND MATERIAL PLACED WITHIN 2% OF OMC. DENSITY TESTING SHALL BE PERFORMED IN EACH COMPACTED LIFT IN ACCORDANCE WITH AS3798.
- PROVIDE A DRAINAGE LAYER DIRECTLY BEHIND THE FACING UNITS IN A MINIMUM 300mm WIDE 12-20mm AGGREGATE LAYER. FACING UNIT VOIDS TO BE FILLED WITH AGGREGATE. PROVIDE 100mm MINIMUM AG. DRAIN IN GEOTEXTILE SOCK AT TOE OF WALL FACING AND CONNECT TO DRAINAGE SYSTEM AT 30m MAX. SPACING.
- THE NEED FOR A CHIMNEY DRAIN OR DRAINAGE AT THE REAR OF THE MASS SOIL BLOCK IS TO BE CONFIRMED ON SITE BY THE GEOTECHNICAL ENGINEER AND DESIGNER FOLLOWING PREPARATION OF THE FOUNDATION AND PRIOR TO CONSTRUCTION OF THE MASS SOIL BLOCK.
- CONSTRUCTION EQUIPMENT WEIGHING MORE THAN 500kg STATIC WEIGHT IS TO BE KEPT BACK 1.5m FROM THE REAR FACE OF THE WALL FACING UNITS. COMPACTION OF THE SELECT FILL MATERIAL WITHIN THE 1.5m STRIP ADJACENT TO THE WALL SHALL BE ACHIEVED BY LIGHT MECHANICAL TAMPERS (VIBRATING PLATE, TRENCH COMPACTOR OR SIMILAR) TO GIVE THE SAME DENSITY AS IN THE REMAINDER OF THE SELECT FILL.
- ALL DESIGN AND CONSTRUCT WALL SYSTEM TO BE COMPLETED IN ACCORDANCE WITH THESE NOTES.
- TOP OF WALL HEIGHTS ARE NOTED TO ALIGN WITH FINISHED PAVEMENT HEIGHTS. THE CONTRACTOR AND THEIR DESIGN AND CONSTRUCT WALLING CONTRACTORS ARE TO ENSURE THAT ALL WALL STRAPS ARE INSTALLED BELOW THE DESIGN EARTHWORKS SUBGRADE. CONTRACTOR TO ALLOW FOR WALL STRAPS TO BE GRADED AWAY FROM THE FACE OF THE WALL OR OTHERWISE INSTALLED TO SUIT EARTHWORKS DESIGN LEVELS AND GRADES.
- DIFFERENTIAL SETTLEMENT NOTE:**
FUTURE BUILDING AND SERVICE DESIGNERS TO CONSIDER DIFFERENTIAL SETTLEMENT OF REINFORCED EARTH WALL BLOCK AND GENERAL FILL AREAS. PARTICULAR ATTENTION TO BE DRAWN TO HEAVILY LOADED AREAS, OR DIFFERING LOADED AREAS (INCLUDING SPRINKLER TANK AND TRUCK PAVEMENT AREAS) AND WHERE SIGNIFICANT CHANGES IN OVERALL WALL HEIGHT OR FILL AMOUNTS ARE EXPERIENCED. IT IS THE RESPONSIBILITY OF THE FUTURE DESIGNERS TO ENSURE APPROPRIATE DESIGN CONSIDERATION TO DIFFERENTIAL SETTLEMENT ARE MADE DEPENDING ON THE DESIGN ELEMENT AND INTERACTION WITH RETAINED ELEMENTS AND GENERAL FILL MATERIAL.



SECTION 1:20
RETAINING WALL



FOR SSD APPROVAL

| ISSUED FOR SSD APPROVAL | 14.10.20 | A | AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-------------------------|----------|---|------------|------|-------|------------|------|-------|
| | | | | | | | | |

| ARCHITECT | CLIENT |
|-----------|--------|
| | |



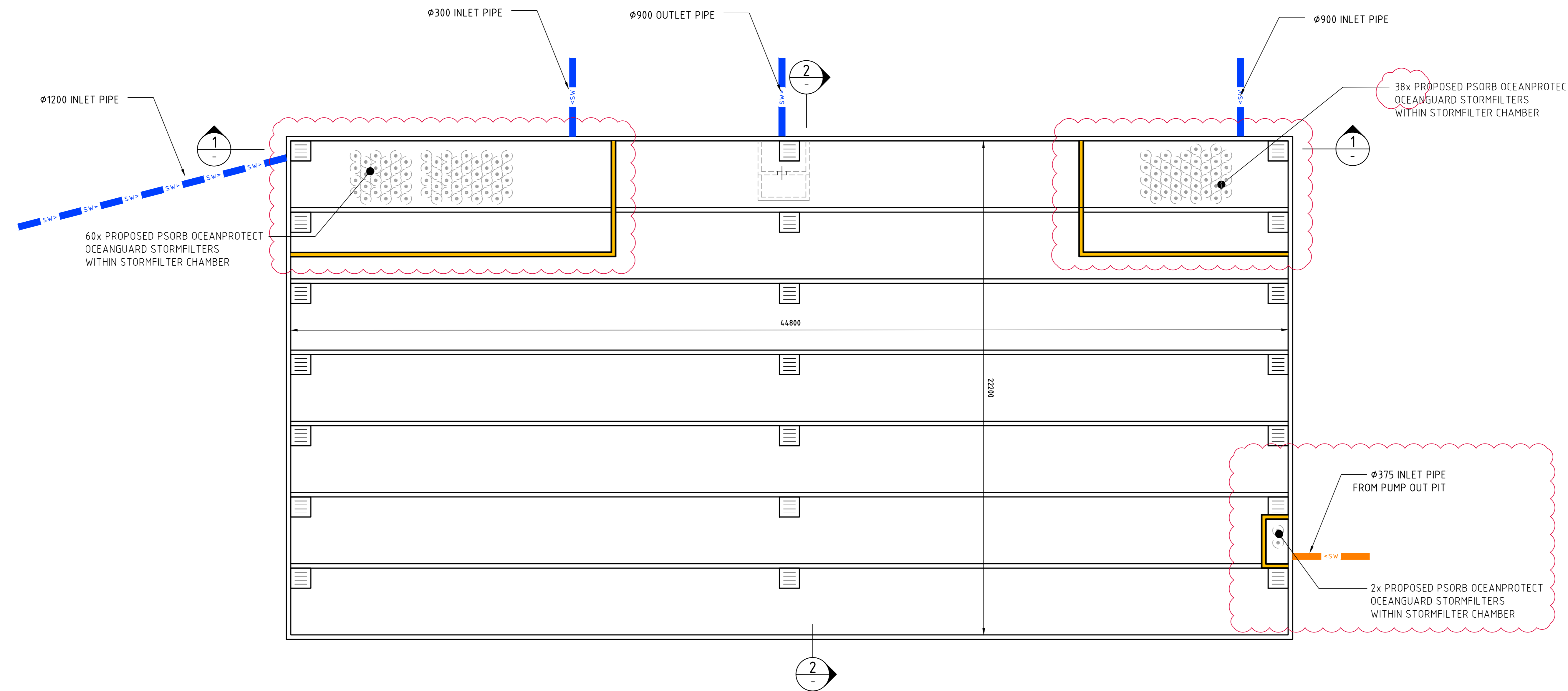
| PROJECT | DESIGNED | DRAWN | DATE | CHECKED | DATE | SCALE | AS SHOWN | CAD REF. |
|--|----------|-------|--------|---------|------|-------|----------|----------|
| ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION | | | MAR 19 | | | A0 | AS SHOWN | |

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Wahlab Bay, Sydney NSW 2000
Tel: (02) 9251-7899 Fax: (02) 9241-3721
email: mail@costinroe.com.au

Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

| DRAWING TITLE | ISSUE |
|---|-------|
| RETAINING WALL DETAILS & TYPICAL SECTIONS | |
| DRAWING No. Co12990.05-SSDA55 | |



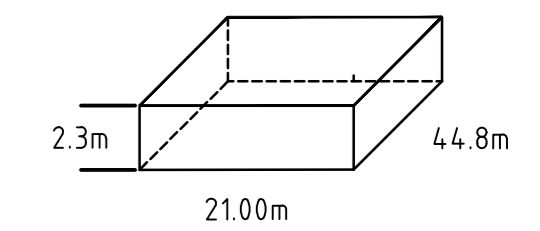
OSD TANK DETAILS

| | |
|--|----------------------|
| SITE AREA | |
| TOTAL SITE AREA | 77,000m ² |
| TOTAL SITE AREA DRAINING TO STORAGE (95% IMPERVIOUS) | 73,150m ² |

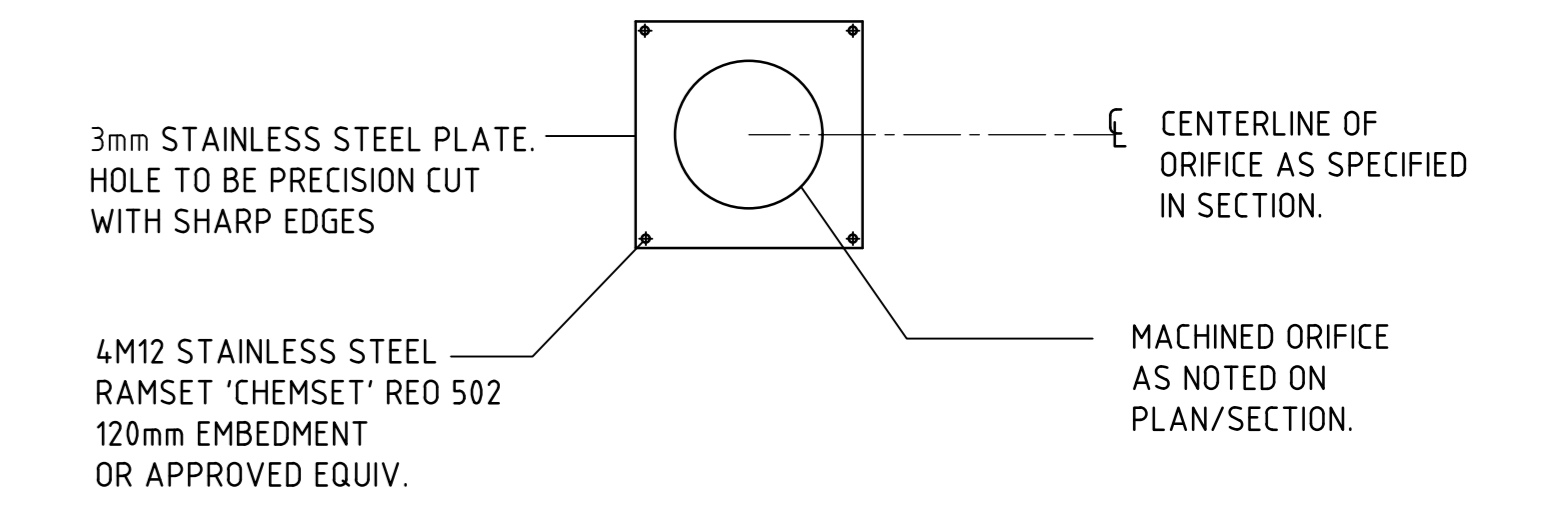
STORAGE

| | |
|-----------------|--------------------|
| VOLUME PROVIDED | 2235m ³ |
|-----------------|--------------------|

INTERNAL TANK DIMENSIONS (INC. HIGH FLOW CHAMBERS)

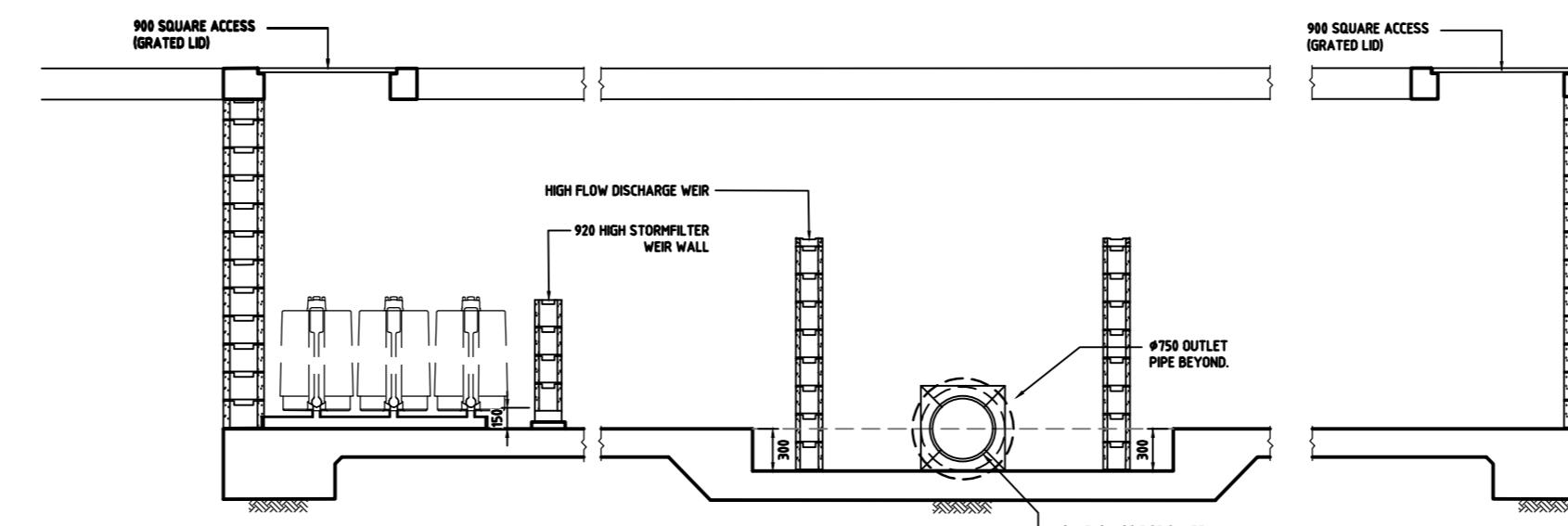


NOTE:
TANK TO BE DESIGNED BY
STRUCTURAL ENGINEER

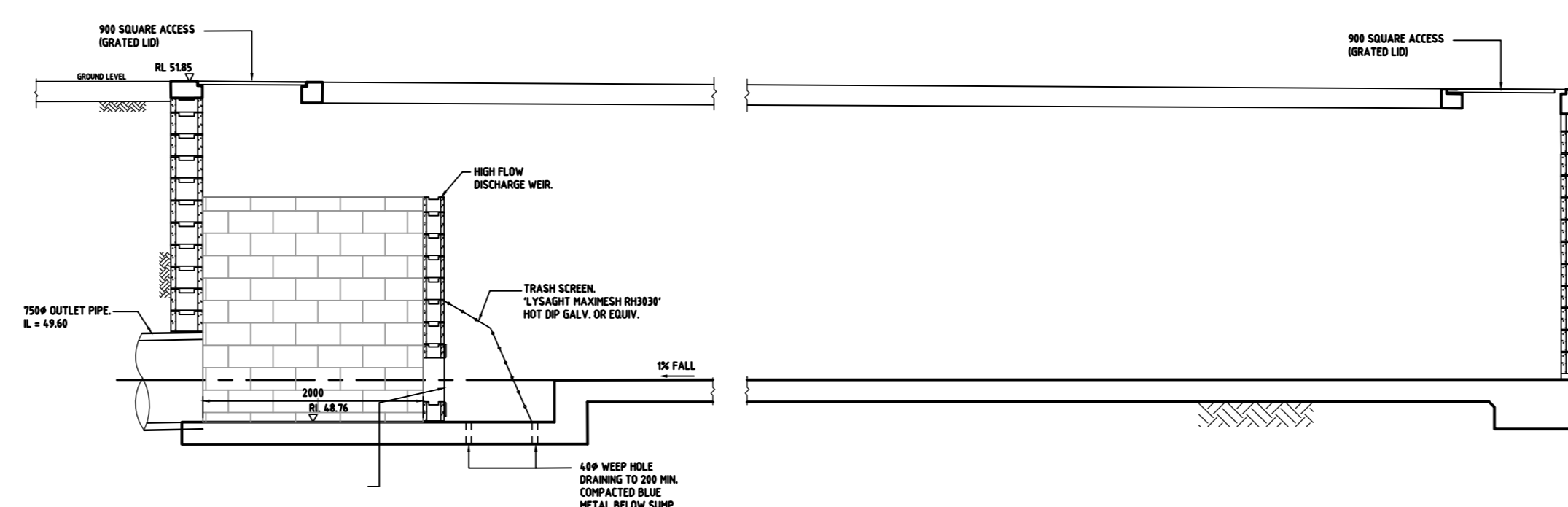


ORIFICE PLATE DETAIL
1:20

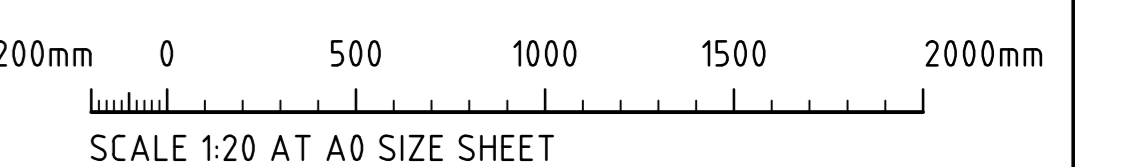
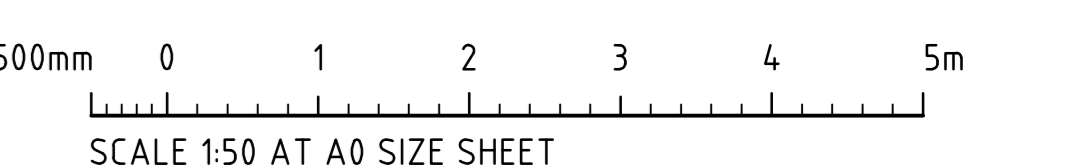
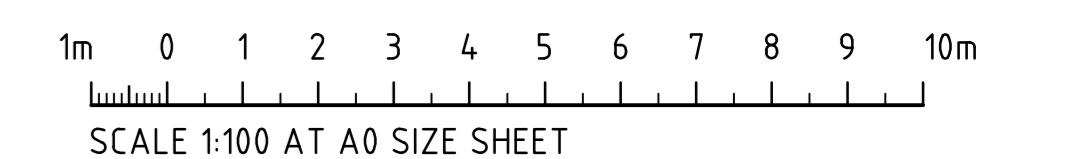
OSD TANK PLAN
1:100



SECTION 1:50 1 : TYPICAL THRU TANK



SECTION 1:50 2 : TYPICAL THRU TANK



FOR SSD APPROVAL

| | | |
|---------------------------------------|----------|-------|
| REVISED AS CLOUDED | 14.10.20 | D |
| DRAWING RENAMED FROM SSDA48 TO SSDA61 | 17.06.20 | C |
| ISSUED FOR SSD APPROVAL | 30.03.20 | B |
| ISSUED FOR INFORMATION | 20.03.20 | A |
| AMENDMENTS | DATE | ISSUE |

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|------------|------|-------|------------|------|-------|
| | | | | | |

ARCHITECT

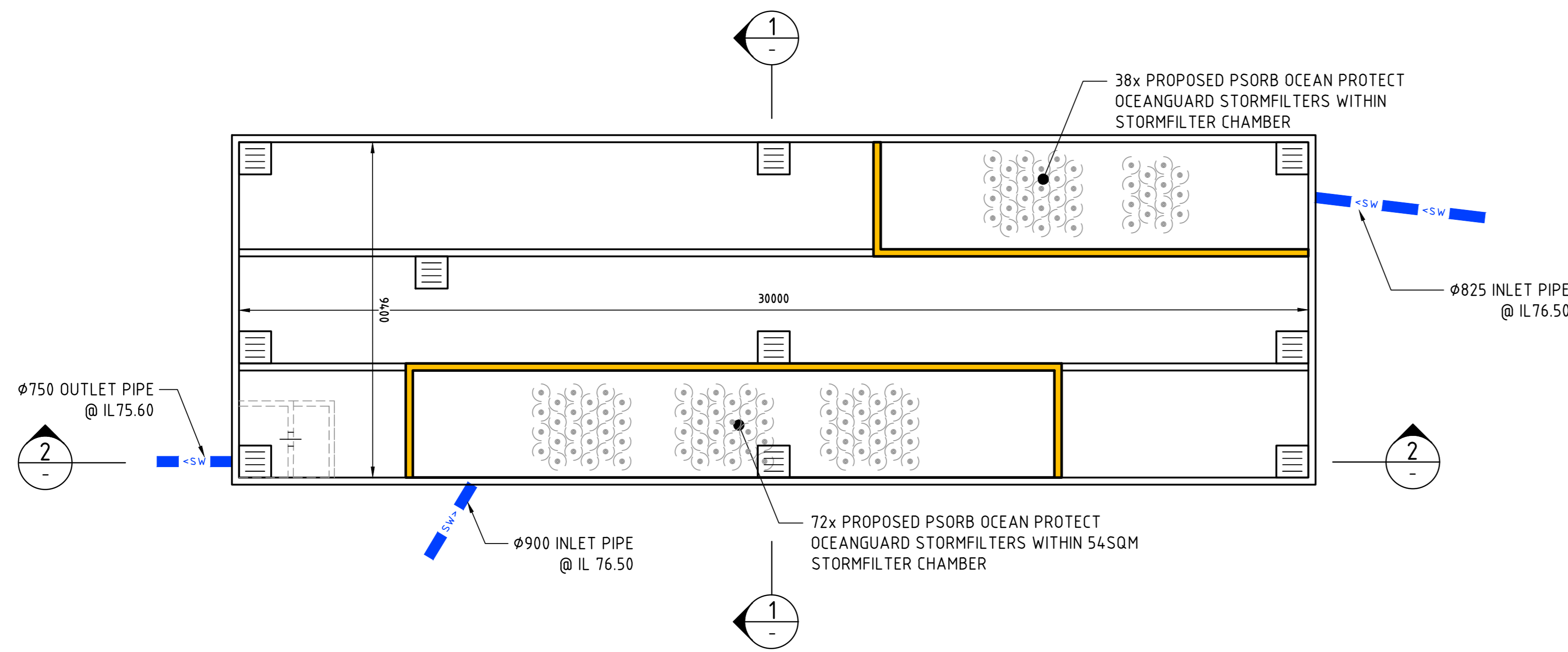
CLIENT
ESR

PROJECT
ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2115

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Wahlab Bay, Sydney NSW 2000
Tel: (02) 9251-7899 Fax: (02) 9241-3721
email: mail@costinroe.com.au

Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
LOT 201 OSD TANK DETAILS
DRAWING No. **Co12990.05-SSDA61** ISSUE **D**

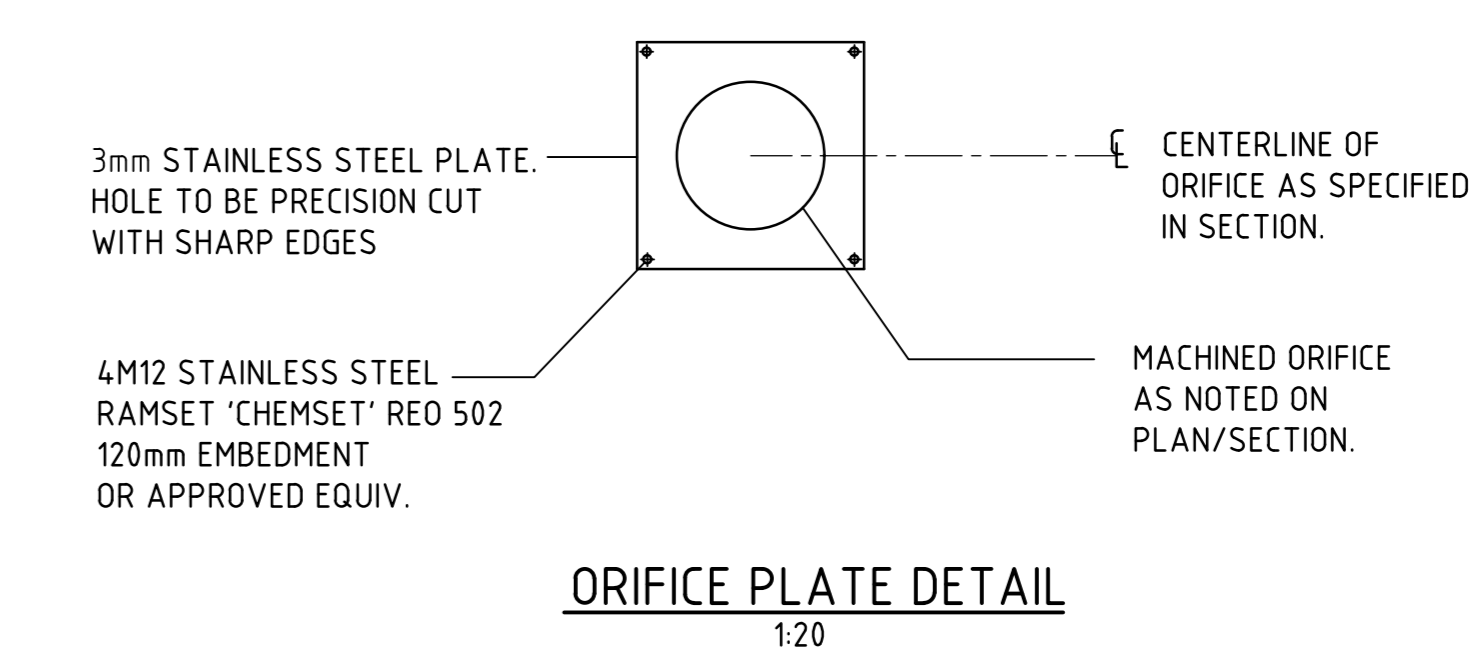


OSD TANK DETAILS

SITE AREA
 TOTAL SITE AREA 50,500m²
 TOTAL SITE AREA DRAINING TO STORAGE (95% IMPERVIOUS) 50,500m²

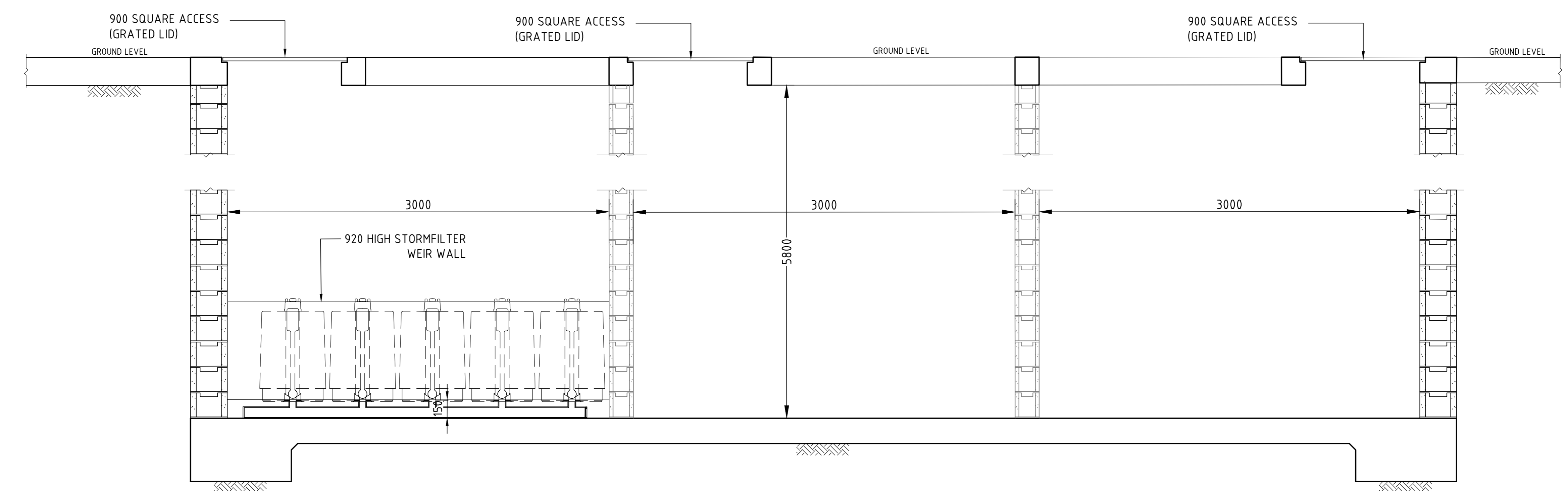
STORAGE

VOLUME PROVIDED 1450m³ MIN.
 INTERNAL TANK DIMENSIONS (INC. HIGH FLOW CHAMBERS)
 5.8m x 9.40m x 30.0m

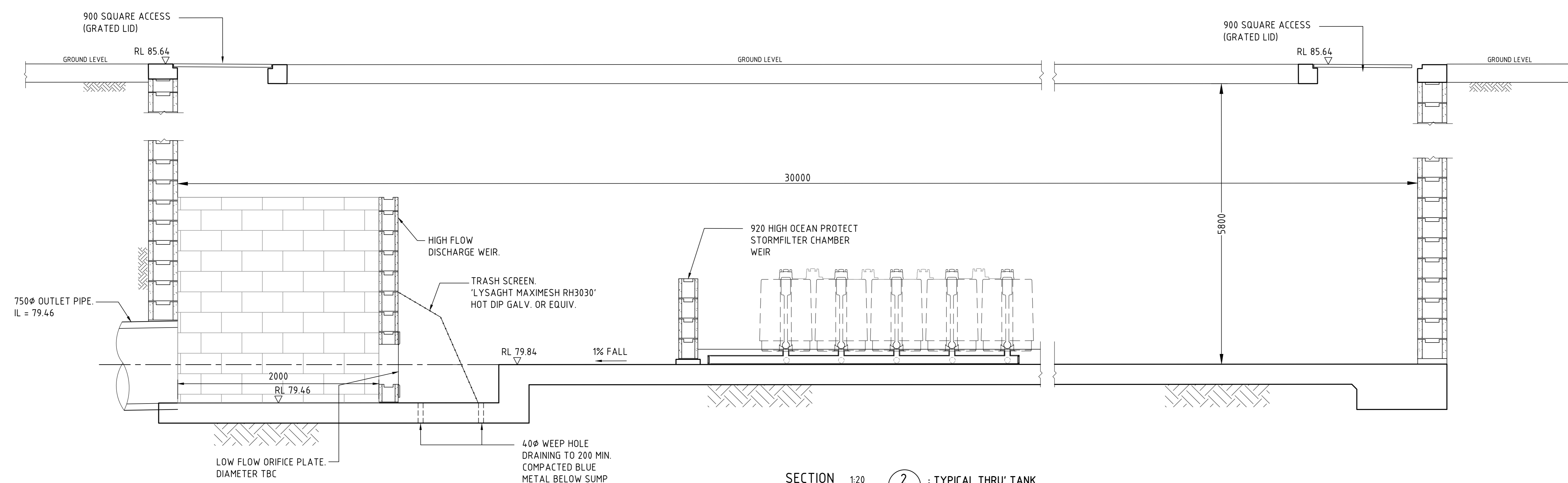


NOTE:
 TANK TO BE DESIGNED BY STRUCTURAL ENGINEER

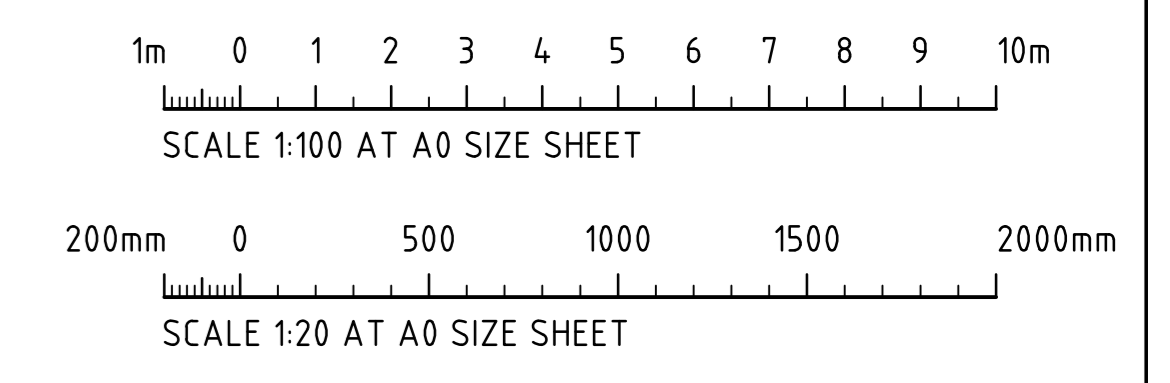
LOT 203 OSD TANK PLAN
 1:100



SECTION 1:20 : TYPICAL THRU' TANK



SECTION 2:20 : TYPICAL THRU' TANK



FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-------------------------|----------|-------|------------|------|-------|
| ISSUED FOR SSD APPROVAL | 17.06.20 | A | | | |

ARCHITECT
 CLIENT

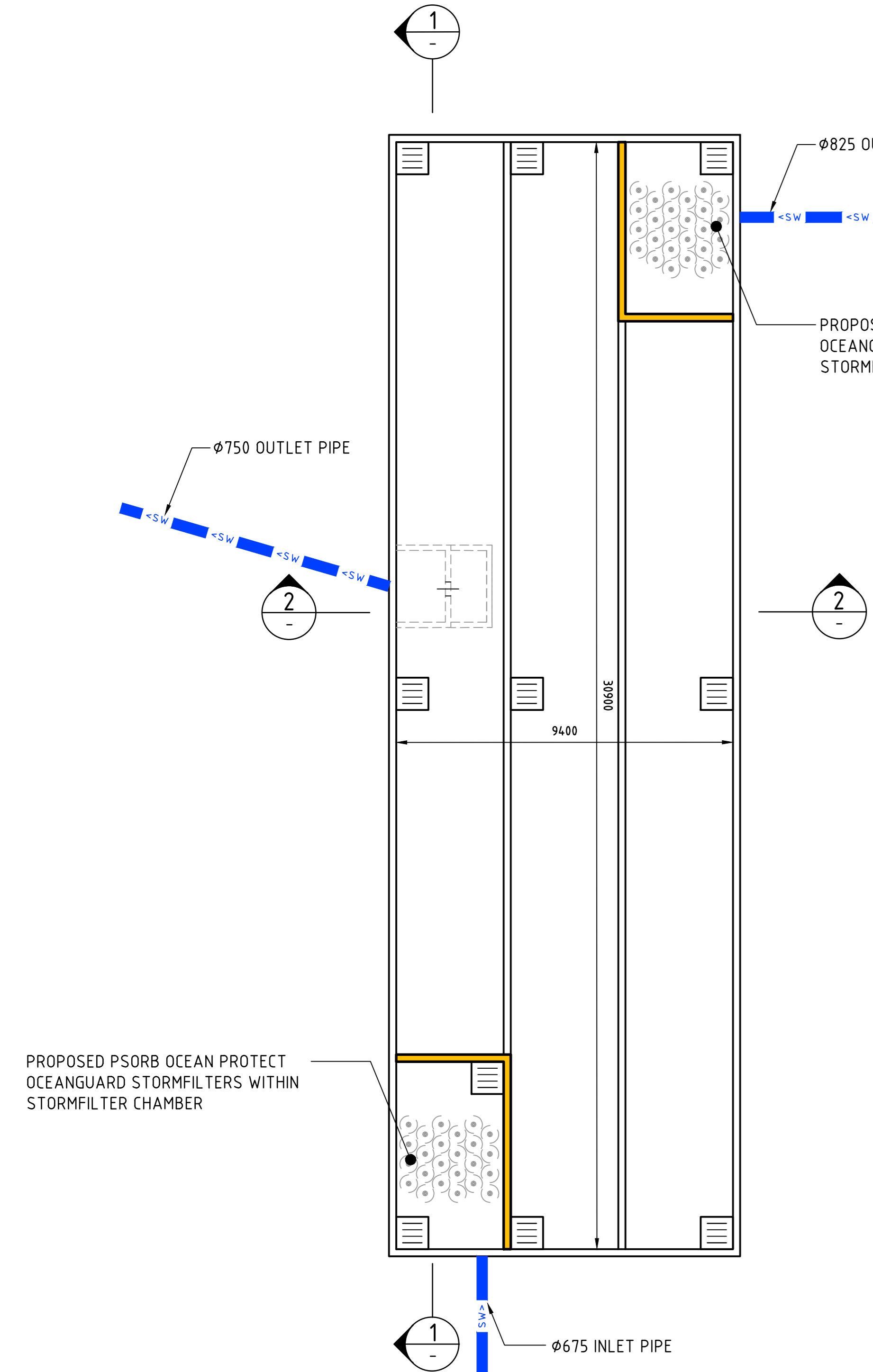


PROJECT
ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION
 327-335 BURLEY ROAD, HORSLEY PARK, 2175

Costin Roe Consulting Pty Ltd.
 Consulting Engineers
 Level 1, 8 Windmill Street
 Walsh Bay, Sydney NSW 2000
 Tel: (02) 9251-7899 Fax: (02) 9241-3721
 email: mail@costinroe.com.au

Costin Roe Consulting
 PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
LOT 202 OSD TANK DETAILS
 DRAWING No. **Co12990.05-SSDA62**



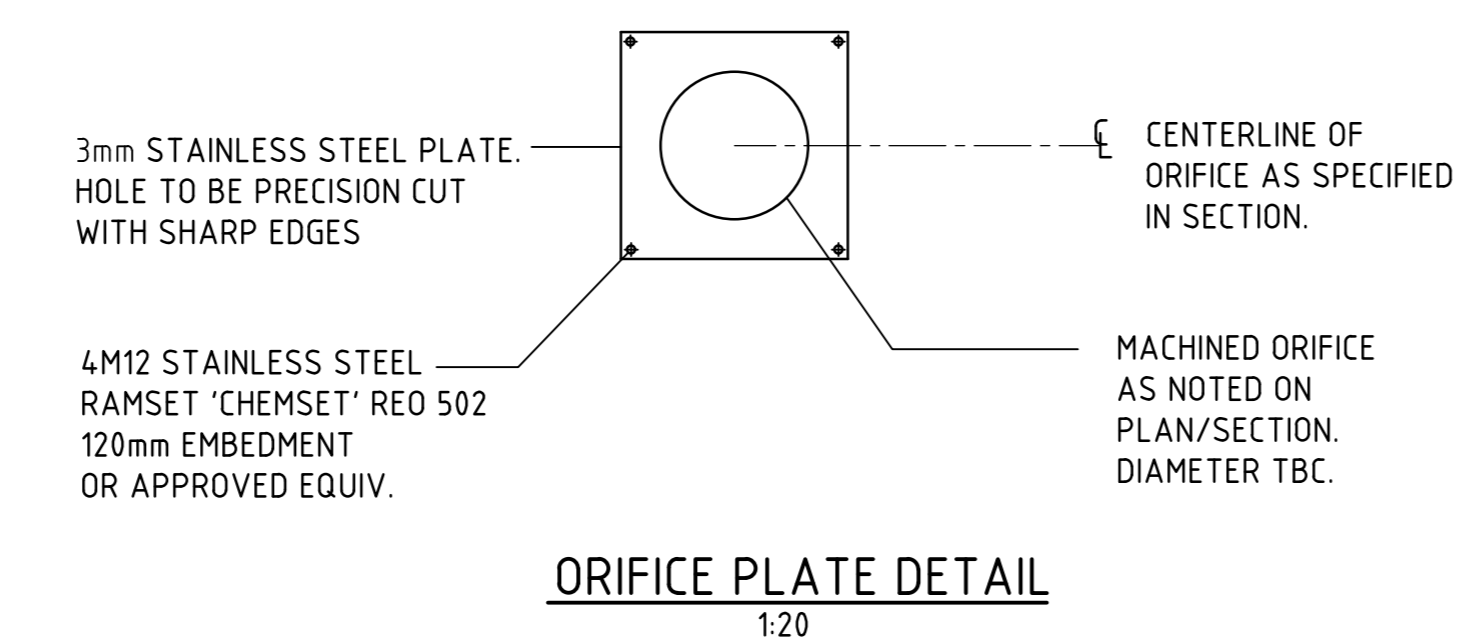
LOT 203 OSD TANK PLAN
1:100

OSD TANK DETAILS
 SITE AREA
 TOTAL SITE AREA 40,295m²
 TOTAL SITE AREA DRAINING TO STORAGE (95% IMPERVIOUS) 33,830m²

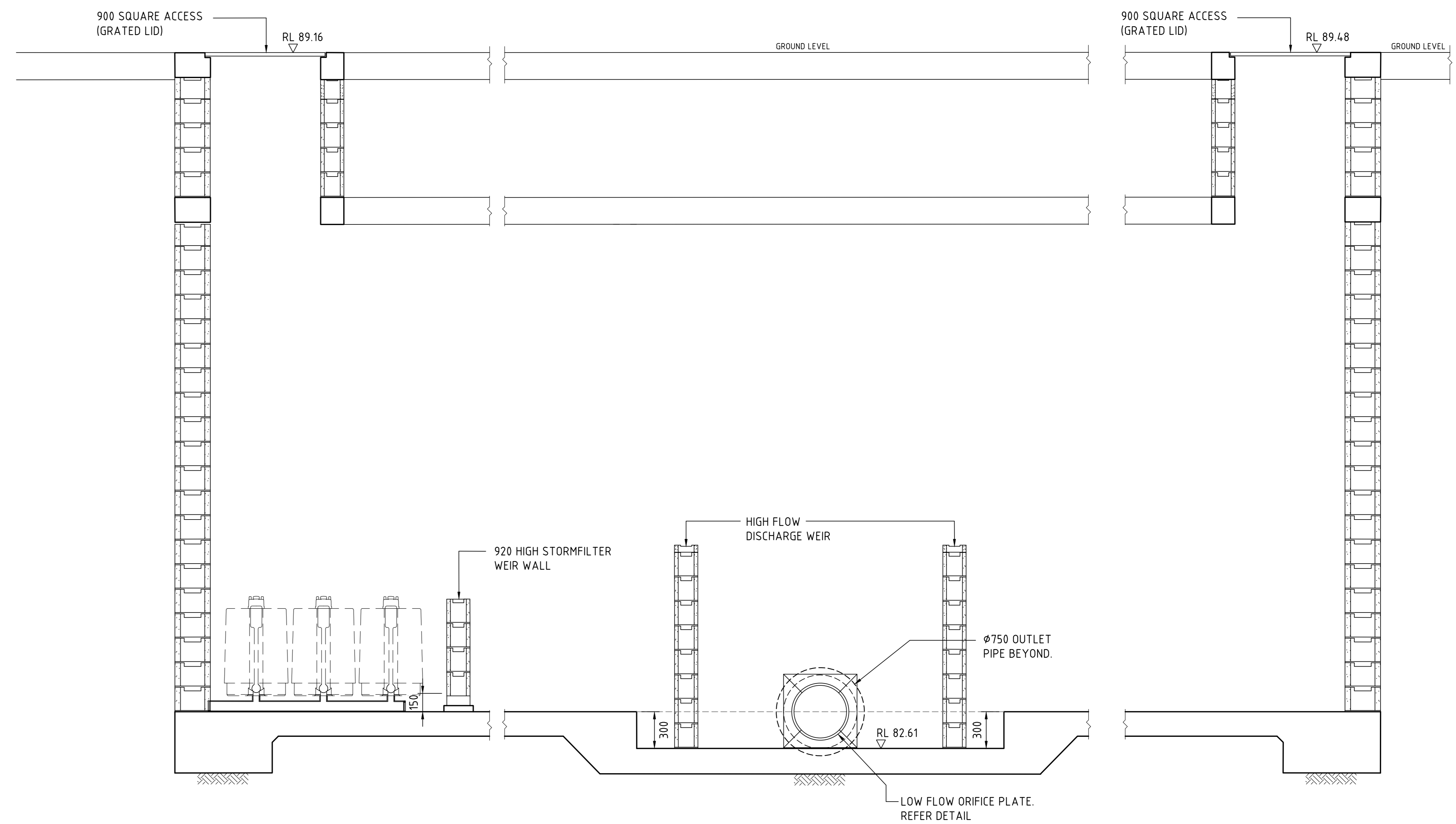
STORAGE
 VOLUME PROVIDED 1160m³

INTERNAL TANK DIMENSIONS (INC. HIGH FLOW CHAMBERS)
 4.0m x 9.4m x 30.9m

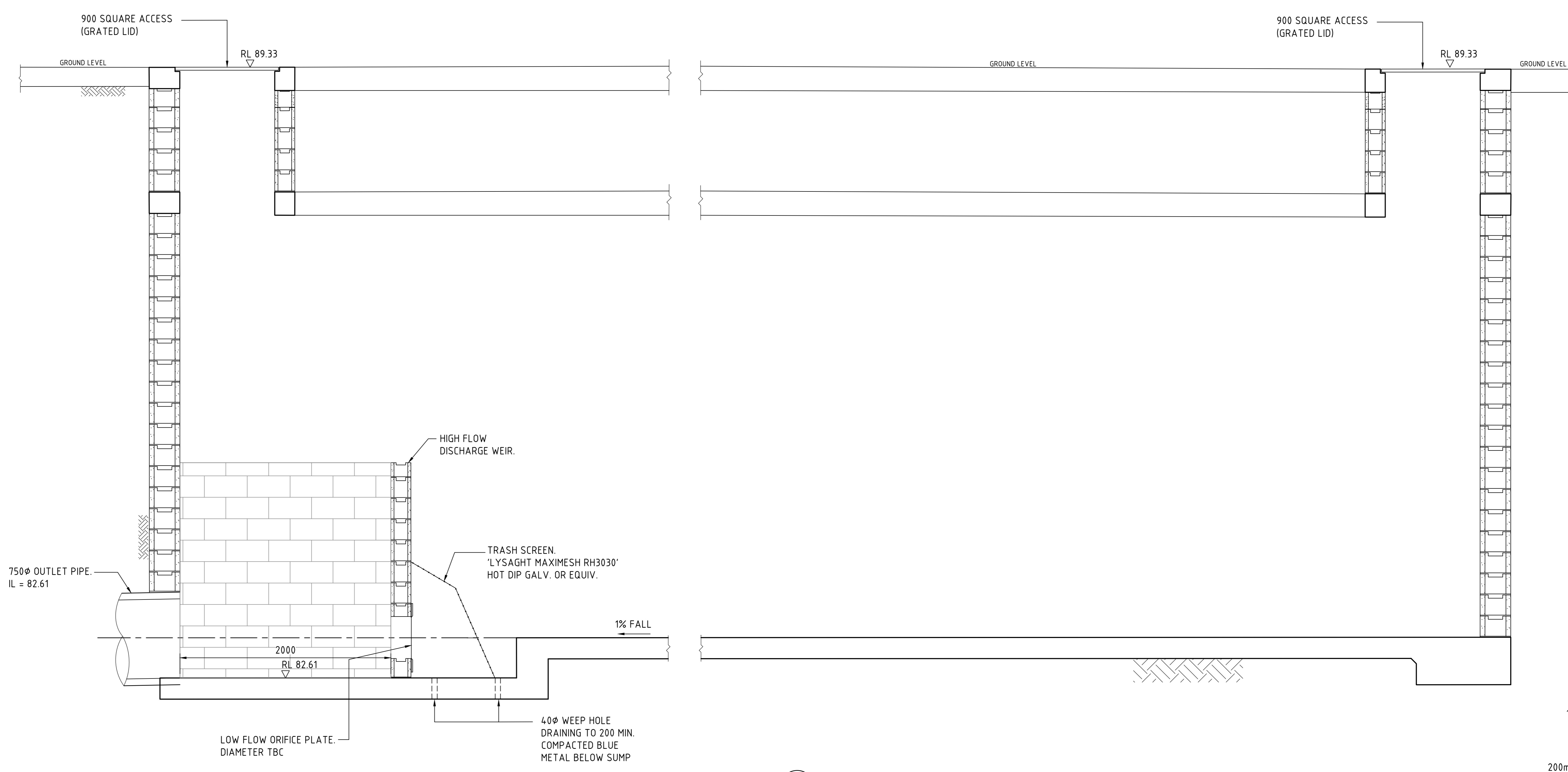
NOTE:
 TANK TO BE DESIGNED BY STRUCTURAL ENGINEER



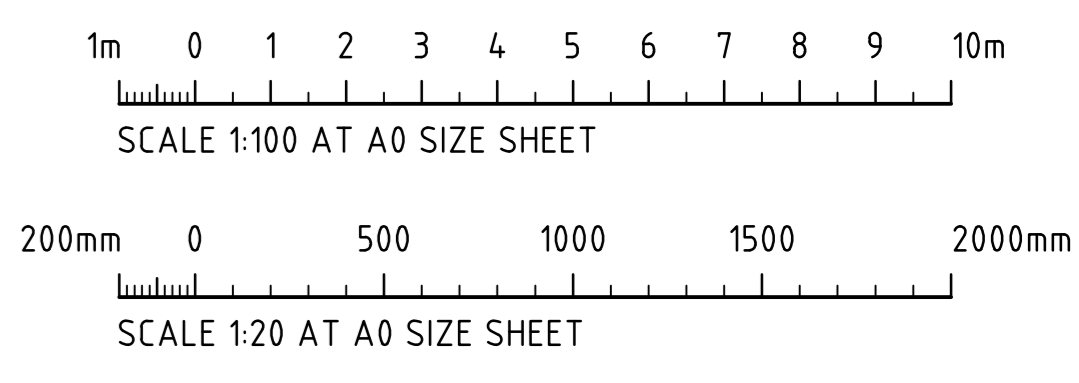
ORIFICE PLATE DETAIL
1:20



SECTION 1:20 1 : TYPICAL THRU' TANK



SECTION 1:20 2 : TYPICAL THRU' TANK



FOR SSD APPROVAL

OSD TANK DETAILS

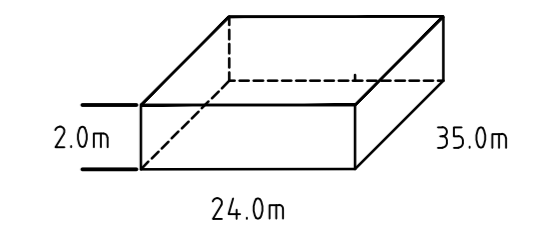
SITE AREA
TOTAL SITE AREA 4,010m²

TOTAL SITE AREA DRAINING TO STORAGE (95% IMPERVIOUS) 1,137m²

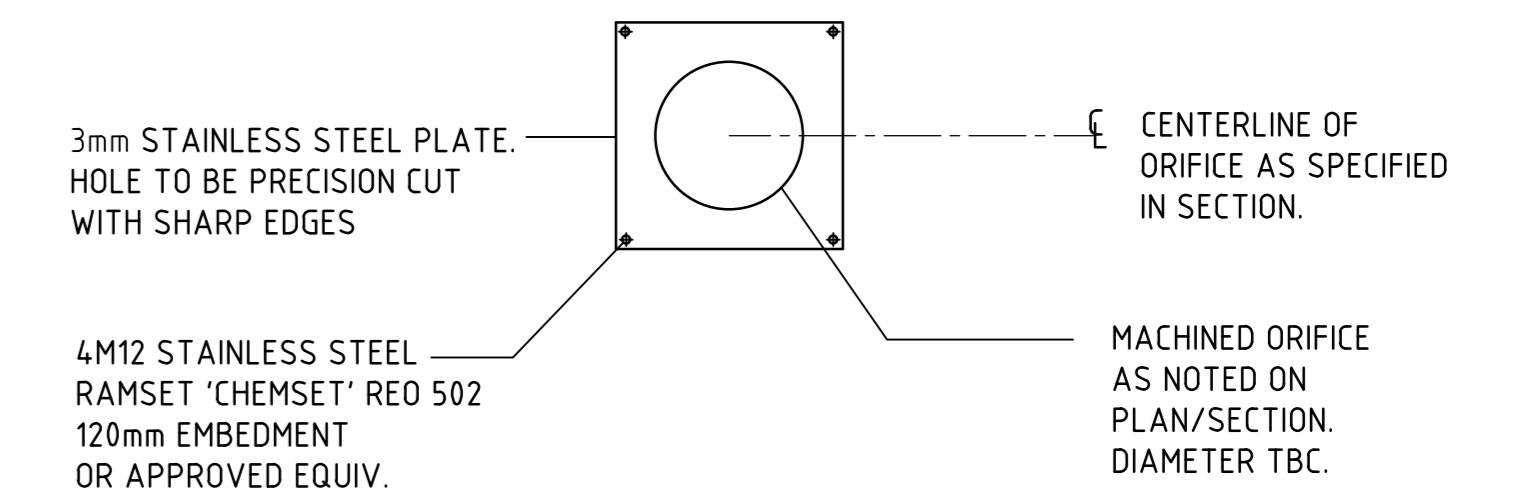
STORAGE

VOLUME PROVIDED 1160m³

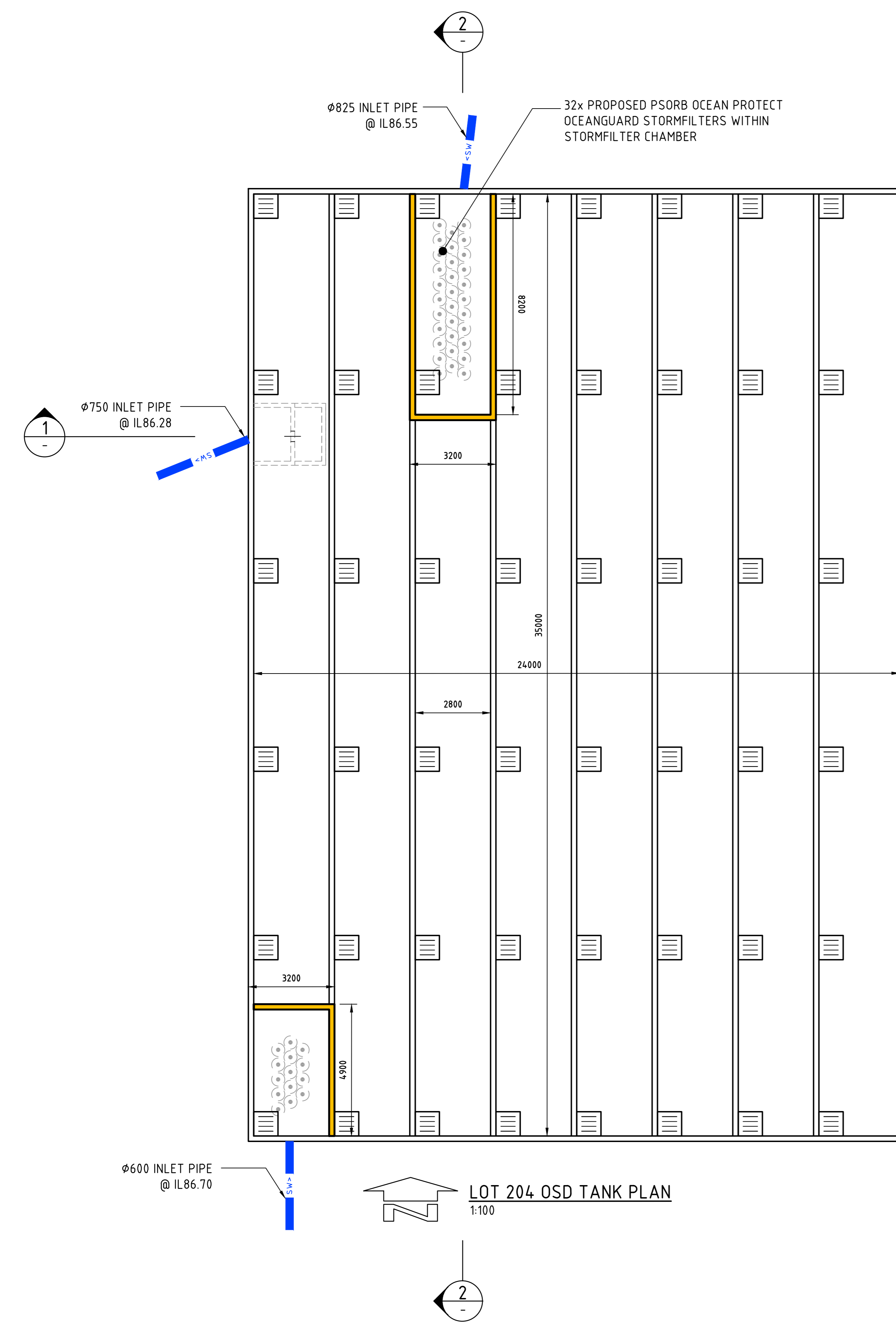
INTERNAL TANK DIMENSIONS (INC. HIGH FLOW CHAMBERS)



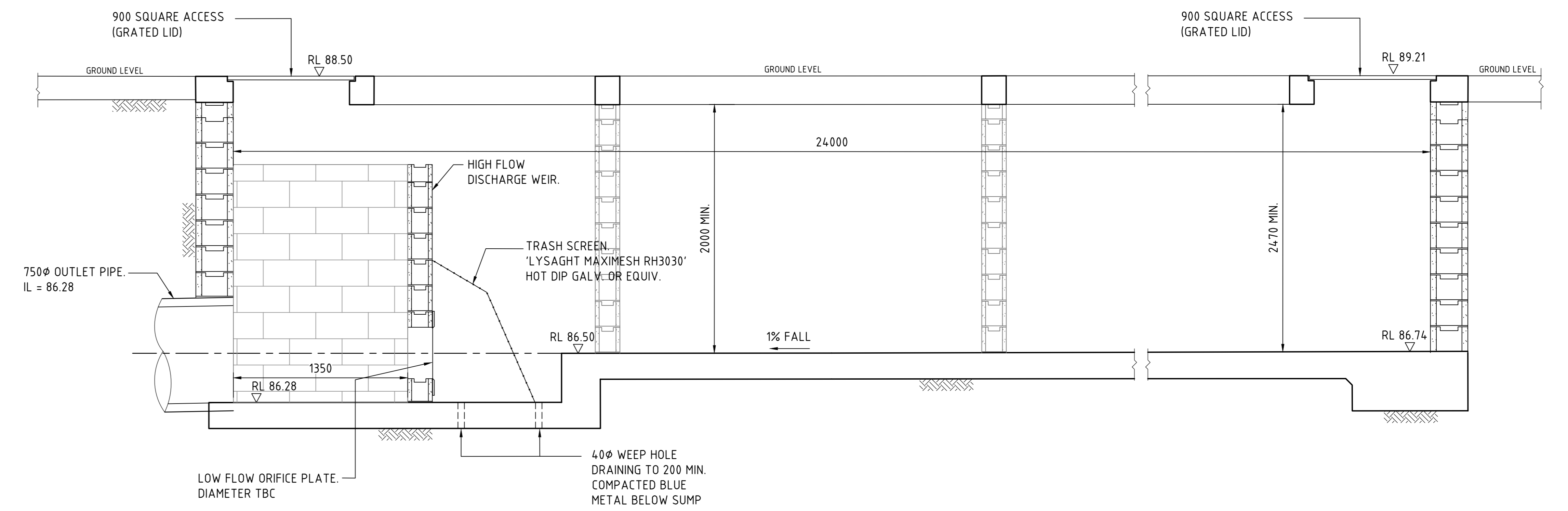
NOTE:
TANK TO BE DESIGNED BY
STRUCTURAL ENGINEER



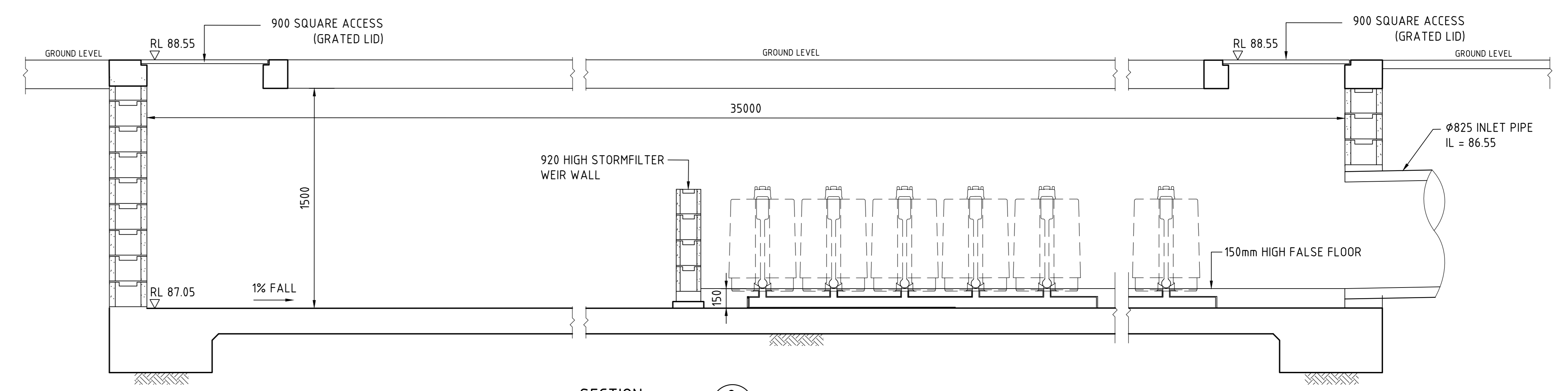
ORIFICE PLATE DETAIL
1:20



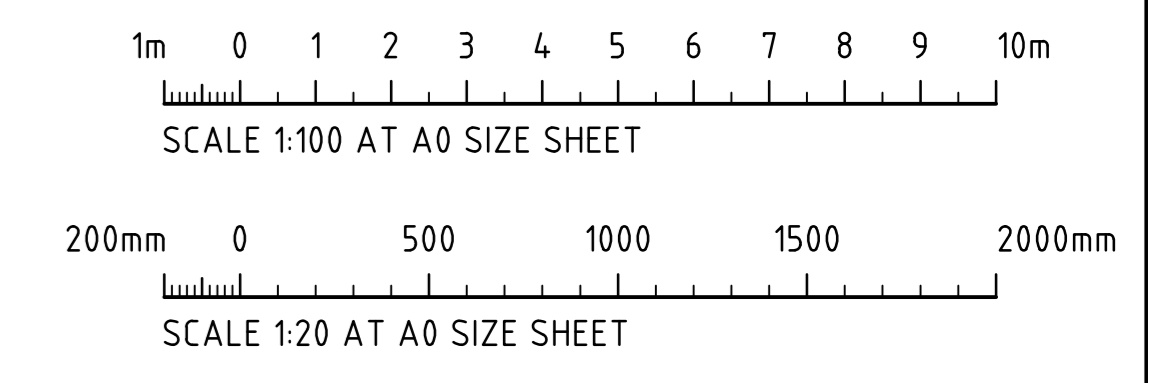
LOT 204 OSD TANK PLAN
1:100



SECTION 120 1 : TYPICAL THRU TANK



SECTION 120 2 : TYPICAL THRU TANK



FOR SSD APPROVAL

| AMENDMENTS | DATE | ISSUE | AMENDMENTS | DATE | ISSUE |
|-------------------------------|----------|-------|------------|------|-------|
| DRAWING RENAMED, TANK REVISED | 14.10.20 | B | | | |
| ISSUED FOR SSD APPROVAL | 19.05.20 | A | | | |

ARCHITECT

CLIENT
ESR

PROJECT
ESR HORSLEY LOGISTICS PARK DEVELOPMENT APPLICATION
327-335 BURLEY ROAD, HORSLEY PARK, 2175

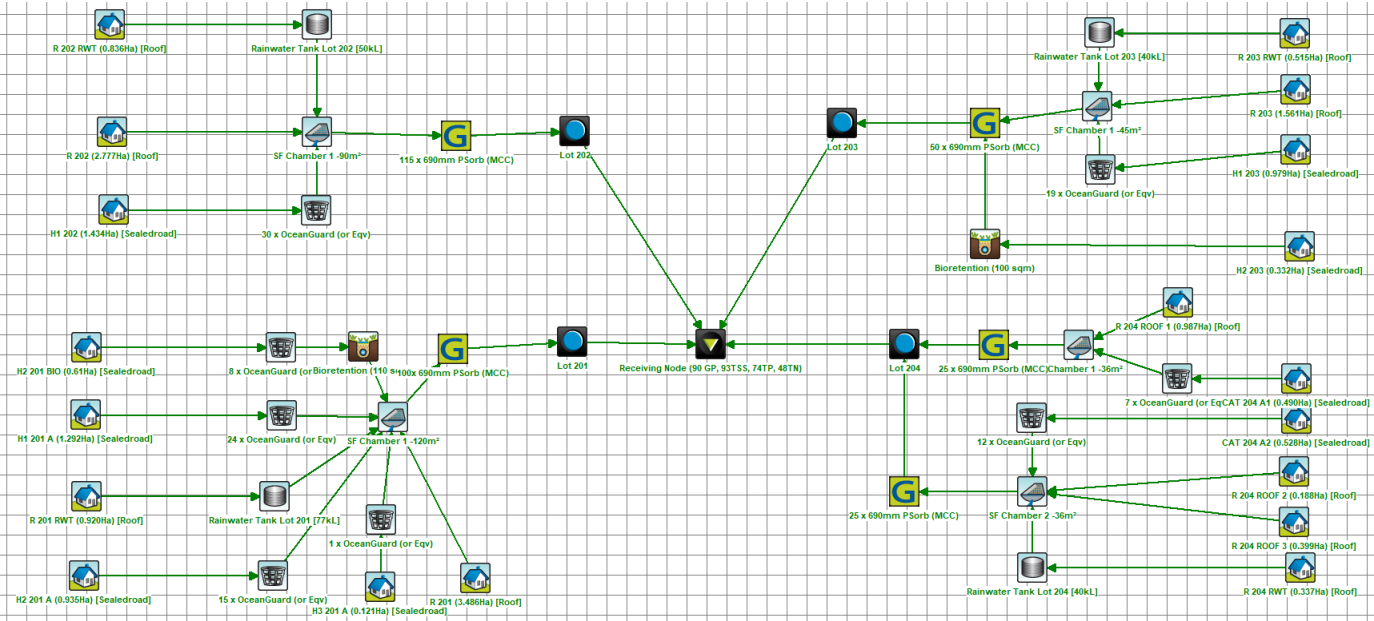
COSTIN ROE CONSULTING AUSTRALIA
Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Wahlab Bay, Sydney NSW 2000
Tel: (02) 9251-7899 Fax: (02) 9241-3721
email: mail@costinroe.com.au

Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
LOT 204 OSD TANK DETAILS
DRAWING No. **Co12990.05-SSDA64** ISSUE **B**

Appendix B

MUSIC Layout & Results



Lot 201 Results

| Treatment Train Effectiveness - Lot 201 | | | |
|---|---------|---------------|-------------|
| | Sources | Residual Load | % Reduction |
| Flow (ML/yr) | 54.1 | 51.6 | 4.6 |
| Total Suspended Solids (kg/yr) | 8240 | 573 | 93 |
| Total Phosphorus (kg/yr) | 17.4 | 4.27 | 75.5 |
| Total Nitrogen (kg/yr) | 123 | 60 | 51.4 |
| Gross Pollutants (kg/yr) | 1410 | 0 | 100 |

Lot 202 Results

| Treatment Train Effectiveness - Lot 202 | | | |
|---|---------|---------------|-------------|
| | Sources | Residual Load | % Reduction |
| Flow (ML/yr) | 36.5 | 35 | 4.2 |
| Total Suspended Solids (kg/yr) | 4230 | 288 | 93.2 |
| Total Phosphorus (kg/yr) | 10 | 2.26 | 77.5 |
| Total Nitrogen (kg/yr) | 82.2 | 39.4 | 52 |
| Gross Pollutants (kg/yr) | 955 | 0 | 100 |

Lot 203 Results

| | Sources | Residual Load | % Reduction |
|---------------------------------------|---------|---------------|-------------|
| Flow (ML/yr) | 24.8 | 23.4 | 5.5 |
| Total Suspended Solids (kg/yr) | 3770 | 265 | 93 |
| Total Phosphorus (kg/yr) | 7.98 | 1.85 | 76.9 |
| Total Nitrogen (kg/yr) | 56.2 | 26.6 | 52.6 |
| Gross Pollutants (kg/yr) | 645 | 0 | 100 |

Lot 204 Results

| | Sources | Residual Load | % Reduction |
|---------------------------------------|---------|---------------|-------------|
| Flow (ML/yr) | 21.4 | 20.4 | 4.8 |
| Total Suspended Solids (kg/yr) | 2960 | 205 | 93.1 |
| Total Phosphorus (kg/yr) | 6.52 | 1.56 | 76.1 |
| Total Nitrogen (kg/yr) | 48.5 | 23.5 | 51.6 |
| Gross Pollutants (kg/yr) | 558 | 0 | 100 |

Appendix C

SSD SEAR's

Appendix D
Calibre Consulting “*Stage 2A & 2B Subdivision Design*”
Reference Package 15-001115.13.