

CIVIL ENGINEERING REPORT FOR STATE SIGNIFICANT DEVELOPMENT APPLICATION SSD 7155 MOD 6 TOLL EXPANSION

**PRESTONS INDUSTRIAL ESTATE
42B KURRAJONG ROAD
PRESTONS NSW**

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1 INTRODUCTION

1.1 Introduction

Logos Property proposes to develop 42B Kurrajong Road, located in an industrial property on the southern side of Yarrunga Street to the west of Bernera Road in the suburb of Prestons, NSW.

Previous applications for development have been granted over part of the land under NSW Department of Planning and the Environment (DP&E) under SSD 7155 dated 16 February 2016, and construction of two of the buildings (Building 2 & 5) approved under the original application have been completed. A facility for Volvo is near completion, per Mod 3 dated 13 February 2018 included an amended masterplan layout to Building 1B (formerly referred to as Building 1 in the original application) and for a proposed workshop facility for Volvo (Building 1A).

The current Mod 6 modification application is provided to allow for the expansion of the previously construction facility for Toll (Building 5) onto a new parcel of land on the west of the existing Building 5.

1.2 Scope

Costin Roe Consulting Pty Ltd has been commissioned by Logos Property to prepare this *Engineering Report* in support of the proposed *SSD 7155 Mod 6* to be lodged over the site.

This report provides a summary of the design principles and planning objectives for the following civil engineering components of the project:

- Earthworks & Retaining Walls;
- Stormwater Management including stormwater quantity and quality; and
- Erosion & Sediment Control.

The engineering objectives for the development are to create a site which, based on the proposed architectural layout, responds to the topography and site constraints, to provide an appropriate and economical stormwater management system which incorporates best practice in water sensitive urban design consistent with the requirements of council's water quality objectives and the Stormwater Management Strategy for the Preston Industrial Estate approved under the original SSD 7155 application and subsequent modifications.

A set of drawings have been prepared to show the civil elements of a proposed industrial development, modifications to Building 1B and to incorporate as constructed elements relating to the works completed on Buildings 2 and 5, and the Volvo facility. The drawings include proposed finished levels, retaining walls, stormwater drainage layout and water quantity and quality requirements for the development relating to Building 1A. These drawings are for development approval only and subject to change during detail design.

1.3 Authority Jurisdiction

The consent authority is The NSW Department of Planning & Environment as the development is considered a State Significant Development (SSD). However, as the subject site is located within Liverpool City Council (LCC) local government area, the engineering and policy requirements of LCC have also been considered in the design.

The NSW Department of Planning & Environment has provided Secretary's Environmental Assessment Requirements (SEAR's) dated 11 September 2015, Ref: SSD7155. In addition to providing a general summary of civil engineering aspects of the project, this report addresses the Soil and Water components of the SEAR's including flooding impacts, surface water management, on-site detention and treatment, details of erosion and sediment control, details of proposed cut and fill works and measures to minimise the extent of cut to fill and details of any fill to be imported to site.

1.4 Differences Between the Mod 6 Current Application and SSD 7155

This application is for an amendment to SSD 7155 to suit layout changes to the Masterplan approved in the original application dated 16 February 2016, and subsequent Modifications. The main component of the amendment is for the inclusion of a new parcel of land (Lot B DP416483) to facilitate an expansion of the as constructed facility Building 5) for Toll.

This section of the report provides a summary of the engineering components of the development which will change from, or remain consistent with, the approved SSD7155 and SSD7155 Mod 3 development.

Summary of design elements is as follows:

- Development Layout
The development layout differs from the previously approved development application in that the inclusion of a new parcel of land (Lot B DP416483) to facilitate an expansion of the as constructed facility Building 5) for Toll has been made. This site has an area of 2.19 Ha and is located to the west of the existing Building 5. Access to the site will be made for trucks from the recently constructed Walbunga Street, Fire Brigade access from internal Access Road 1 and minor passenger vehicle access from Kurrajong Road.
- Stormwater Management
The Stormwater Management strategy will remain generally consistent with the previously approved development application in terms of providing water quantity management to maintain pre- and post-development flow rates, and water quality management measures which meet councils load based pollution reduction values. An On-site detention tank will be provided the development consistent with site discharge and storage quantity for the contributing catchment. Stormwater quality management is proposed to be met by the use of a treatment train consisting of a system offered by Stormwater360 in their Enviropod Pit Inserts and Stormfilter Cartridges.

- Flooding

Previous applications were affected by flooding and overland flow from upstream residential catchments to the south and south-east of the estate. Management of these upstream flows required a trunk drainage system and overland flow path between Kurrajong Road and Bernera Road. This system has now been constructed and no modifications are required as part of this application.

Additional flood consideration on the north-west corner of the property, in and around the intersection of Kookaburra Road North, and Yarrunga Street have been addressed in the Mod3 application documents and are associated with the near complete construction of the Volvo facility. The overland flow at the intersection of Kookaburra Road North, and Yarrunga Street is related to flow from Cabramatta Creek and a minor overland flow path and twin 600mm culverts located on the north-west corner of the site.

The current Mod 6 building layout is clear of any overland flow paths or affectation from flooding, and the requirements for management of overland flow and flooding on affected parts of the property have been addressed in previous applications. As such no provisions or requirements for flooding or overland flow management are included in the Mod 6 application.

- Roadworks

No works to external roads are required as part of the current Mod 6 application.

It is noted that new entries are proposed to be accessed from Walbunga Street and Kurrajong Road which are located at the north-west and south-west corners respectively of the development.

The Walbunga Street construction is now complete and has been approved by Liverpool City Council. We understand that the road reserve has also been dedicated to Council and paperwork relating to this is currently being finalised with the Land Titles Office.

2 SITE CHARACTERISTICS

2.1 Site Description

The site areas for the development is approximately 2.19 Ha. The proposed site is rectangular in shape and is zoned to General Industrial land under the Liverpool City Council LEP as shown in **Figure 2.1**.

The site is bounded on the north by future Building 1 (refer Mod 7 documents), on the east by constructed Warehouse 5, on the south by Kurrajong Road, on the west by currently under construction industrial development and also Walbunga Street.

The adjacent Buildings 2, 3 and 5, to the east and south east of the site, have now been constructed as per the approval by NSW Department of Planning and the Environment (DP&E) under SSD 7155 dated 16 February 2016.

Falls over the site are generally from east to west at grades of 3-4%. A naturally gully, associated with run-off from a small dam is present on the northern end of the western boundary. The highest level on the site is RL 47.25m AHD at the north-east corner and the lowest is RL 40.5m at the northern portion of the western boundary. Levels on Kurrajong Road vary from RL 43.5m AHD at the eastern side of the property to RL 43.05m AHD on the west.



Figure 2.1 Locality Plan (Source: Nearmap 17 July 2018)

Infrastructure works including bulk earthworks and stormwater management measures have been completed on part of the land as part of the construction works for Lots 34 and 43 in DP2359.

Access to the site will be currently available off Kurrajong Road and proposed primary access will be from Walbunga Street.

The site is located within the bounds of Liverpool City Council (LCC), therefore the engineering requirements of the LCC apply.

2.2 Proposed Development

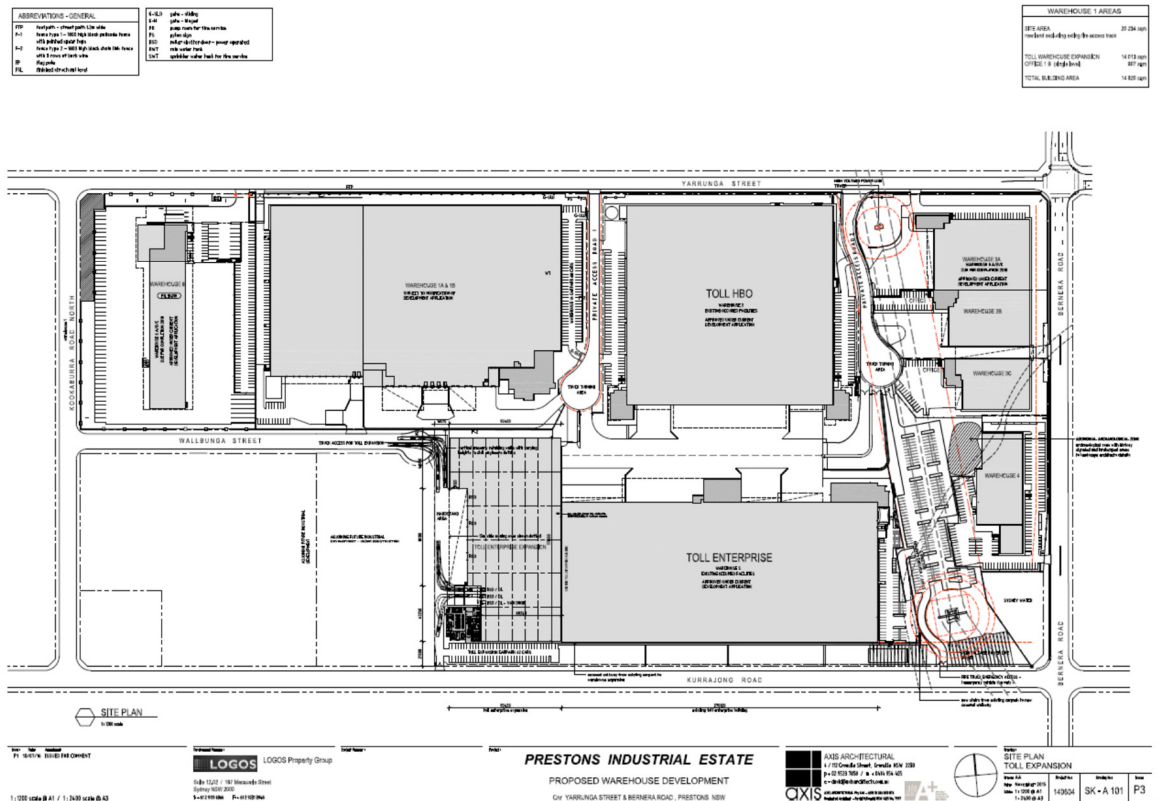
The proposed development on Lot B DP416483 is for a single level warehouse for Toll. The warehouse will be an extension of the constructed Building 5 (also for Toll) with internal access to be provided between the new and existing building via a new roller shutter door on the western end of the existing building.

Office space is proposed on the south-east corner of the building. The dock face, and truck loading areas are located on the west of the facility with parking provided on the southern, Kurrajong Road, site frontage. Perimeter access is available for fire brigade and vehicle circulation.

An indicative layout of the development has been produced by Axis Architecture and can be seen in **Figure 2.2** below.

No external roadworks are required or proposed for the building as part of Mod 6. Primary truck access will be made via the recently completed Walbunga Street. It is noted that the entry via Walbunga Street is a proposed new entry, located at the north-west corner of the development site. The Walbunga Street construction has been approved by Liverpool City Council and we understand the road reserve has also been dedicated to Council and paperwork relating to this is currently being finalised with the Land Titles Office. Passenger vehicles are able to enter via and exit to Kurrajong Road (refer traffic report for details of movements). Fire brigade access is made via the existing internal Access Road 1.

The proposed building is to be set at approximately RL 42.55m to match the existing as constructed level of Building 5. The final level of the building will be subject to detail design and survey confirmation of the as-constructed level of Building 5.



3 SITE WORKS

3.1 Bulk Earthworks

Bulk earthworks will be required for the new building. The objective for the site will be to provide a flat building pad (which matches existing Toll Facility), facilitate site access, and to drain the stormwater system via gravity. Due to the new building needing to match the existing level of Building 5, it is expected that an excess of cut over fill (i.e. export) will be generated.

All geotechnical testing and inspections performed during the earthworks operations will be undertaken to Level 1 geotechnical control, in accordance with AS 3798-1996.

High level earthworks and volume estimates have been completed to confirm the expected earthworks volumes and to obtain an order of magnitude excess cut over fill volume estimate. Earthworks plan and sections have been shown on drawings **Co8753.23-C30, C35 & C36** of **Appendix A**. It is noted that the final pad, and hence building level, will be subject to a detail earthworks assessment during detail design stage and variance of +/-500mm has been noted to the pad and building floor level. The variance in the final level has been provided to ensure that, following the detail earthworks assessment, excess cut or spoil is not required to be exported from the site.

The earthworks volume estimates are as follows:

Cut	- 27,000 m ³
Fill	+ 4,000 m ³
Detailed Excavation	- 1,600 m ³
Cut Bulking	- 1,100 m ³
Balance	- 25,700 m³ (Export required)

The existing surface levels and the proposed levels are as shown on drawing **Co8753.23-C50** of **Appendix A**.

3.2 Erosion and Sediment Control

Soil Erosion and Sediment Control measures including sedimentation basins will also be provided for the development during the construction phase. All Soil and Sediment Control measures will be performed in accordance with Liverpool City Council requirements and *Landcom Managing Urban Stormwater, Soils and Construction (1998) – The Blue Book*.

Earthworks over the site will be relatively small when compared to large scale development or mining activity. The effect on groundwater is expected to be minor as a result of these works.

3.3 Embankment Stability

To assist in maintaining embankment stability, permanent batter slopes 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 7**.

3.4 Supervision of Earthworks

All geotechnical testing and inspections performed during the earthworks operations will be undertaken to Level 1 geotechnical control, in accordance with AS3798-1996.

3.5 Retaining Walls

The civil engineering objective is to minimise retaining walls within the constraints of the architectural layout and allowable grading (as per AS2890.1 and AS2890.2) through paved areas and batters in landscaped areas.

Retaining walls have been constructed as part of the estate infrastructure works approved under SSD7155. Numerous retaining walls are proposed for Buildings 1A and 1B however these remain generally consistent with the layout and heights proposed and approved under Mod 3.

Retaining will be required around the north-west corner of the building, for a portion along the southern boundary and along the eastern carpark, adjacent to the access road and Walbunga Street. These walls are currently partially constructed.

The proposed method of construction will be reinforced concrete masonry, masonry faced reinforced earth retaining, pile and shot-crete, or other concrete or masonry type construction.

Location and indicative heights of retaining walls are shown on drawing **Co8753.23-C50**.

4 STORMWATER MANAGEMENT

4.1 Hydrologic Modelling and Analysis

4.1.1 General Design Principles

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, Liverpool City Council 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” (1987 Edition), Volumes 1 and 2 (AR&R).

Storm events for the 2 to 100 Year ARI events have been assessed.

4.1.2 Minor/ Major System Design

The piped stormwater drainage (minor) system has been designed to accommodate the 20-year ARI storm event (Q20). Overland flow paths (major) which will convey all stormwater runoff up to and including the Q100 event have also been provided which will limit major property damage and any risk to the public in the event of a piped system failure.

4.1.3 Rainfall Data

Rainfall intensity Frequency Duration (IFD) data used as a basis for DRAINS modelling for the 2 to 100 Year ARI events, was taken from The Bureau of Meteorology Online IFD Tool.

4.1.4 Runoff Models

In accordance with the recommendations and standards of Liverpool City Council, the calculation of the runoff from storms of the design ARI has been calculated with the catchment modelling software DRAINS.

The design parameters for the DRAINS model are to be based on the recommendations as defined by council and parameters for the area and are as follows:

Model	Model for Design and analysis run	Rational method	
	Rational Method Procedure	ARR87	
	Soil Type-Normal	3.0	
	Paved (Impervious) Area Depression Storage	1	mm
	Supplementary Area Depression Storage	1	mm
	Grassed (Pervious) Area Depression Storage	5	mm
AMC	Antecedent Moisture Condition (ARI=1-5 years)	2.5	
AMC	Antecedent Moisture Condition (ARI=10-20 years)	3.0	
AMC	Antecedent Moisture Condition (ARI=50-100 years)	3.5	
	Sag Pit Blocking Factor (Minor Systems)	0	
	On Grade Pit Blocking Factor (Minor Systems)	0	
	Sag Pit Blocking Factor (Major Systems)	0.5	
	On Grade Pit Blocking Factor (Major Systems)	0.2	
	Inlet Pit Capacity		

Table 4.1. DRAINS Parameters

4.2 Hydraulics

4.2.1 General Requirements

Hydraulic calculations will be carried out utilising DRAINS modelling software during the detail design stage to ensure that all surface and subsurface drainage systems perform to or exceed the required standard.

4.2.2 Freeboard

The calculated water surface level in open junctions of the piped stormwater system will not exceed a freeboard level of 150mm below the finished ground/ grate level, for the peak runoff from the Minor System runoff.

The calculated water surface for the peak runoff from the Major System runoff will not exceed a freeboard level of 300mm below the finished floor level of the building/ development pads.

4.2.3 Public Safety

For all areas subject to pedestrian traffic, the product (dV) of the depth of flow d (in metres) and the velocity of flow V (in metres per second) will be limited to 0.4, for all storms up to the 100-year ARI.

For other areas, the dV product will be limited to 0.6 for stability of vehicular traffic (whether parked or in motion) for all storms up to the 100-year ARI.

4.2.4 Inlet Pit Spacing

The spacing of inlets throughout the site will be such that the depth of flow, for the Major System design storm runoff, will not exceed the top of the kerb (150mm above gutter invert).

4.2.5 Overland Flow

Dedicated flow paths have been designed to convey all storms up to and including the 100-year ARI. These flow paths will convey stormwater from the site to the detention systems prior to discharge

4.3 **Site Drainage**

4.3.1 Existing Site Drainage

The site currently has no formal drainage system and consists of rural land with undulating falls and generally grassed surfaces. Falls are to the west and a natural gully is present on the northern extent of the western boundary, downstream of an existing dam. Stormflows/ overflow from the dam currently discharge onto the adjoining private property, prior to reaching any council infrastructure. The site survey shows that there is no formal easement associated with the existing stormwater discharge location.

The construction of Walbunga Street, including a new drainage system was however recently completed by Vaughan Construction. A drainage connection, via a 450mm RCP was provided at the cul-de-sac. The connecting pipe directly conveys stormwater to drainage system under Walbunga Street and ultimately to Cabramatta Creek via Kookaburra Road North.

An existing drainage system is also present in Kurrajong Road with a kerb inlet pit being located in front of the property at the western end of the site. The outgoing pipe is a 375mm diameter RCP with an invert of RL 42.31m. Based on the pipe size and depth to invert and review of S94 plans from LCC, this system appears to be sized to accommodate flows from the road reserve only.

The site is not affected by overland flow or flooding.

4.3.2 Proposed Site Drainage

Detailed stormwater systems will be required to be constructed for the development.

As per general engineering practice and the guidelines of LCC, the proposed stormwater drainage system for the 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. This

meets the requirements of LCC and is the minimum recommended capacity for an industrial development.

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 LCC 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).

Stormwater Management is required to be provided for water quantity and quality in accordance with the requirements of LCC DCP and as per the items included in Liverpool City Council pre-development application minutes dated 30 October 2014 and further meeting with Liverpool City Council held between Liverpool Council, DBL Property and Costin Roe Consulting on 15 October 2015.

Further discussion on the Stormwater Management Strategy is provided in **Section 5** and **6** of this report. Reference to drawing **Co8753.23-C40** shows the proposed drainage layout.

4.3.3 Site Discharge

Discharge from the site is proposed at a single location which aligns with the existing gully and site discharge and proposed drainage connection point as proposed as part of the adjoining Vaughan Constructions development.

Reference to drawing **Co8753.23-C40** shows the proposed discharge arrangement.

Also refer to **Appendix E** for Walbunga Street and adjoining site drainage drawings.

4.4 **Flooding**

The current Mod 6 building layout is clear of any overland flow paths or affectation from flooding. Requirements for management of overland flow and flooding on affected parts of the property have been addressed in previous applications. As such no provisions or requirements for flooding or overland flow management are included in the Mod 6 application.

As noted areas of the overall Prestons Industrial Estate have been identified as being affected by overland flow and flooding from two primary areas. The first of these is located on the south and south-east of the estate generated from an upstream residential catchment south of Kurrajong Road. The second being on the far north-west of the estate at the intersection of Kookaburra Road North, and Yarrunga Street.

Management of the flow from the residential catchment required a reinforced concrete box culvert trunk drainage system and overland flow path between Kurrajong Road and Bernera Road. This system has now been constructed and no modifications are required as part of this application.

Additional flood consideration on the north-west corner of the property, in and around the intersection of Kookaburra Road North, and Yarrunga Street have been addressed in the Mod3 application documents and are associated with the near complete construction of the Volvo facility. The overland flow at the intersection of Kookaburra Road North, and Yarrunga Street is related to flooding from Cabramatta Creek and a minor overland flow path and twin 600mm culverts located on the north-west corner of the site. No modifications to the approved management are proposed or required as part of this application.

5 WATER QUANTITY MANAGEMENT

Liverpool City Council requires water quantity management, or stormwater detention, to be provided to limit the runoff discharged from private property into the underground piped drainage system to pre-developed flow and to assist in mitigating the increased stormwater runoff generated by development.

Attenuation of stormwater runoff from the development is proposed to be managed via a detention tanks provided in strategic locations for each of the development lots. As discussed with Liverpool Council the objective is to attenuate stormwater flow from the development to pre-developed flows.

Sizing of the basin systems has been completed using DRAINS modelling software in accordance with the Liverpool City Council Policy for the 1 in 2-year ARI to 1 in 100-year ARI storms for various durations. The modelling accounts for the drainage system provided for the adjacent sites.

Table 5.1 provides details for the pre-and post-development flows and storage for the total detention system and 2.19 Ha contributing catchment. The critical storm duration for the 1 in 2 year, 1 in 20 year and 1 in 100-year ARI storms is 1 hour and flows and storage information are provided for this storm as follows.

ARI	Pre-developed Flow (m ³ /s)	Post Developed Flow (m ³ /s)	
		Un-attenuated	Attenuated
2	0.423	0.547	0.308
20	0.766	0.885	0.580
100	0.946	1.060	0.931

Table 5.1. Site and Detention Hydrology

Indicative location of the detention system can be found on drawing **Co8753.23-C40**. The proposed system is for a construction detention tank located adjacent to the site discharge location. The final arrangement of tanks would be confirmed in detail design stage, ensuring the flow arrangements of **Table 5.1** are achieved. Indicative hydrological and storage arrangements are shown below.

ARI	Post Developed Flow (m³/s)				Storage (m³)
	Un-attenuated	Attenuated			
		Low Flow	High Flow	Total	
2	0.423	0.308	0	0.308	210
20	0.766	0.433	0.148	0.581	370
100	0.946	0.453	0.478	0.931	390

Table 5.2. Detention Tank

The modelling has shown that, with the provision of a total storage volume of 550m³ contained in the modelled system, stormwater flows from the development will be attenuated to predevelopment flows. Detention storage will be fully active and will be provided as underground tank. The proposed detention system meets the policy requirements of Liverpool City Council.

6 STORMWATER QUALITY CONTROLS

6.1 Regional 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 so as to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by Liverpool City Council.

Liverpool City Council have nominated, in *Section 6.4 of Part 1 of their DCP 2008*, 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:

Gross Pollutants	90%
Total Suspended Solids	80%
Total Phosphorus	45%
Total Nitrogen	45%
Total Hydrocarbons	90%

6.2 Proposed Stormwater Treatment System

Developed impervious areas 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 development shall be based on a treatment train approach to ensure that all of the objectives above are met.

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

- Treatment of stormwater on the development is to be performed via the provision of a treatment train of proprietary systems;
- All surface inlet pits and roofwater pits to be fitted with Enviropod S200 inserts. This will provide primary treatment of pollutants in stormwater flow, removing a proportion of sediments, gross pollutants and some nutrients;
- Tertiary treatment is to be made via a syphon actuated filtration system. The proposed system is the Stormfilter system by Stormwater 360. 13 PSorb filter cartridges will be housed within the 550m³ detention tank. The proposed filters will remove the remaining sediments, nutrients and hydrocarbons from stormwater prior to discharging from the site and into Council's drainage system; and
- A portion of the future building roof will also provide a level of treatment via rainwater reuse and settlement within rainwater tanks. Indicative locations and sizes of rainwater tanks has been included in the modelling of the development and shown on drainage layout plans.

6.3 Stormwater Quality Modelling

6.3.1 Introduction

The MUSIC modelling software 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 set out in Councils DCP and nominated in **Section 6.1** of this report were used as a basis for assessing the effectiveness of the selected treatment trains.

The MUSIC model “8753.23 Prestons Mod6 Rev1.sqz” was set up to examine the effectiveness of the water quality treatment train and to predict if council requirements have been achieved. The layout of the MUSIC model is presented in **Appendix B**.

6.3.2 Rainfall Data

Six-minute pluviographic data which has been 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

6.3.3 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

6.3.4 Pollutant Concentrations & Source Nodes

Pollutant concentrations for source nodes are not available from Liverpool City Council. The source nodes used are based on the land use parameters defined by Liverpool City Council and are shown as per the **Table 6.1**:

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	-0.85	0.19	0.11	0.12
	Landscaping	1.20	0.17	-0.85	0.19	0.11	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
	Landscaping	2.15	0.32	-0.60	0.25	0.30	0.19

Table 6.1. Pollutant Concentrations

The MUSIC model has been setup with a treatment train approach based on the pollutant concentrations in **Table 6.1** above and the catchments shown on drawing **Co8753.23-C42** in **Appendix A**.

6.3.5 Treatment Nodes

Stormwater 360 Enviropod and Stormwater 360 Stormfilter treatment nodes have been used in the modelling of the development as provided by the supplier of the products based on testing completed by the product manufacturer. Detention basin nodes were also introduced to the model using typical parameters contained in MUSIC modelling guidelines.

6.3.6 Results

Table 6.2 shows the results of the MUSIC analysis. The reduction rate is expressed as a percentage and compares the post-development pollutant loads without treatment versus post-development loads with treatment.

	Source	Residual Load	% Reduction	Target Met
Total Suspended Solids (kg/yr)	1770	251	85.8	Y
Total Phosphorus (kg/yr)	4.38	1.62	62.9	Y
Total Nitrogen (kg/yr)	38.6	21.2	45	Y
Gross Pollutants (kg/yr)	470	0	100	Y

Table 6.2. MUSIC analysis results

The 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 requirements of Part 1 of Liverpool City Councils DCP 2008 on an overall catchment basis.

6.3.7 Modelling Discussion

MUSIC modelling has been performed to assess the effectiveness of the selected treatment trains and to ensure that the pollutant retention requirements of Part 1 of Councils DCP 2008 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 will be treated by the treatment train of propriety devices described above and based on the manufacturers testing would 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 Liverpool City Council have been met.

6.4 **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 will be required for the development in order to meet Liverpool Council Policy and NSW Department of Planning and The Environment requirements with the aim being to reduce overall demand by providing re-use for non-potable applications. Internal uses include such applications as toilet flushing while external applications will be used for irrigation.

As individual building uses have not yet been defined as part of this application, sizing of rainwater tanks has not been undertaken. These would be defined in future detail design and development applications based on a water balance assessment as outlined in Council Policy and the document Managing Urban Stormwater: Harvesting and Reuse – 2006 (NSW DEC).

In general terms, the rainwater harvesting systems are expected to comprise an in-line tank for the collection and storage of rainwater. At times when the rainwater storage tank is full 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. This however would be, as noted, subject to future detail design.

6.5 Maintenance and Monitoring

It is important that each component of the water quality treatment train is properly operated and maintained. In order to achieve the design treatment objectives, an indicative maintenance schedule has been prepared (refer to **Table 6.3** 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 6.3. 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 top soil in eroded area and cover and secure with biodegradable fabric. Cut hole in fabric and revegetate.
OSD SYSTEM			
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

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
			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 is 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	Six monthly	Maintenance Contractor	Leaves and debris to be removed from the inlet leaf/litter screen

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
of the tank inlet - leaf/litter screen			
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.
PROPRIETARY TREATMENT DEVICES (ENVIROPOD PIT INSERTS & STORMFILTERS)			
Refer to Manufacturers Operation and Maintenance Manuel	Annually	Maintenance Contractor	Refer to Manufacturers Operation and Maintenance Manuel
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.

7 EROSION & SEDIMENT CONTROL PLAN

An erosion and sediment control plan (ESCP) is included in drawings **Co8753.23-C20 and C25**. 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.

7.1 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 Liverpool Council's specifications.
3. All subcontractors will be informed by the site manager of their responsibilities in minimising the potential for sedimentation and soil erosion.

7.2 Land Disturbance

1. Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in **Table 7.1**.

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 7.1. Limitations to access

7.3 Erosion & Sediment Control Conditions

1. Clearly visible barrier fencing shall be installed as shown on drawing **Co8753.23-C20** 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 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 low 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 2 year ARI (Q2).
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 sufficient 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.

7.4 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.

7.5 Waste Management Conditions

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

7.6 Site Inspection and Maintenance

1. A self-auditing program will be established based on a check sheet (refer **Appendix D**). 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.

8 CONCLUSION

This *Civil Engineering Report* has been prepared in support of a modification to SSD7155 for proposed inclusion of Lot B DP416483 on Kurrajong Road into the overall masterplan to facilitate an expansion of the existing Toll Facility (Building 5).

A civil engineering strategy for the site has been developed which provides a best practice solution within the constraints of the existing landform and proposed development layout, the previously approved development under SSD7155 and the constructed Buildings 2 & 5, and Mod 3 and currently under construction Volvo facility. Within this strategy a stormwater quantity and quality management strategy has been developed to reduce both peak flows and pollutant loads in stormwater leaving this site. The stormwater management for the development has been designed in accordance with Liverpool City Council's Part 1 of DCP2008.

The stormwater layout for the development sites maintain the existing catchment breakdown and adopt the stormwater discharge points provided as part of the infrastructure works and adopt proposed new discharge points. A hydrological assessment has been undertaken which confirms local post development flows from the site will be less than pre-development flows and demonstrates that the site discharge would not adversely affect any land, drainage system or watercourse as a result of the development. A stormwater detention system comprising total active storage of 550m³ is proposed to attenuate developed stormwater flows to pre-developed flows.

Although parts of the Prestons Industrial Estate are identified as being flood affected, the current Mod 6 development zone is not affected by flooding and works in relation to this Mod 6 development will not affect any management systems as proposed and approved under previous application on the site.

During the construction phase, a Sediment and Erosion Control Plan will be in place to ensure the downstream drainage system and receiving waters are protected from sediment laden runoff.

During the operational phase of the development, a treatment train incorporating the use Stormwater Treatment Measures (STM's) comprising a proprietary treatment train of pit inserts, detention tanks and Stormfilter units have been proposed to mitigate the increase in stormwater pollutant loads generated by the development. MUSIC modelling results indicate that the proposed STM are effective in reducing pollutant loads from the stormwater discharging from the site and that the provided treatment meet the requirements of Council's pollution reduction targets. Best management practices have been applied to the development to ensure that the quality of stormwater runoff is not detrimental to the receiving environment.

It is recommended the management strategies in this report be approved and incorporated into the future detailed design.

9 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);
- Liverpool City Council – DCP 2008 (Part 1); and
- Water Sensitive Urban Design – “Technical Guidelines for Western Sydney” by URS Australia Pty Ltd, May 2004

Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

TOLL PRESTONS - EXPANSION
41B KURRAJONG ROAD, PRESTONS, NSW
CIVIL DRAWINGS FOR PROPOSED DEVELOPMENT

DRAWING LIST

DRAWING NO.	DRAWING TITLE
C08753.23-C10	DRAWING LIST & GENERAL NOTES
C08753.23-C20	EROSION AND SEDIMENT CONTROL PLAN
C08753.23-C25	EROSION AND SEDIMENT CONTROL DETAILS
C08753.23-C30	BULK EARTHWORKS PLAN
C08753.23-C35	BULK EARTHWORKS SECTIONS- SHEET 1
C08753.23-C36	BULK EARTHWORKS SECTIONS- SHEET 2
C08753.23-C40	STORMWATER DRAINAGE PLAN
C08753.23-C42	STORMWATER CATCHMENT PLAN
C08753.23-C45	STORMWATER DRAINAGE DETAILS
C08753.23-C47	OSD PLAN & DETAILS
C08753.23-C50	FINISHED LEVELS PLAN
C08753.23-C65	RETAINING WALL DETAILS



SITE PLAN
N.T.S

GENERAL NOTES:

- G1 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' 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.
- G2 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.
- G3 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.
- G4 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.
- G5 UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.
- G6 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:

1. THE ISSUED DRAWINGS IN HARD COPY OR PDF FORMAT TAKE PRECEDENCE OVER ANY ELECTRONICALLY ISSUED INFORMATION, LAYOUTS OR DESIGN MODELS.
2. 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.
3. 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.
4. 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.

SITE PREPARATION NOTES:

1. ALL EARTHWORKS SHALL BE COMPLETED GENERALLY IN ACCORDANCE WITH THE GUIDELINES SPECIFIED IN THE GEOTECHNICAL REPORT
2. EXISTING LEVELS ARE BASED ON INFORMATION PROVIDED BY LANDPARTNERS TITLED S5073596.000 DETAIL SURVEY.
3. STRIP ANY TOP SOIL OR DELETERIOUS MATERIAL AND DISPOSE OF FROM SITE OR STORE AS DIRECTED.
4. COMPLETE CUT TO FILL EARTHWORKS TO ACHIEVE THE REQUIRED LEVELS AS INDICATED ON THE DRAWINGS WITHIN A TOLERANCE OF $\pm 0mm$ TO $\pm 10mm$ THROUGH BUILDING PADS/PAVEMENTS AND $\pm 0mm$ TO $\pm 20mm$ ELSEWHERE.
5. PREPARE STEEP BATTERS TO RECEIVE FILL BY CONSTRUCTING BENCHING TO FACILITATE FILL PLACEMENT.
6. 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.
7. 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.
8. 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 TESTED ON THE 37.5 mm SIEVE. ENGINEERED FILL SHALL BE ABLE TO BE OBTAINED IN ACCORDANCE WITH THE STANDARD COMPACTION METHOD (AS1289.5.4.1) OR HLF TEST METHOD (AS1289.7.1). THESE METHODS REQUIRE LESS THAN 30% 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
10. 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 ILEG. COSTIN ROE SITE PREPARATION NOTES IN DWG C03003.01-EWC10
11. PRIOR TO ANY EARTHWORKS, EROSION CONTROL AS OUTLINED IN THE EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE COMPLETED.
12. EXISTING ROCK, IF ANY, SHALL BE REMOVED BY HEAVY ROCK BREAKING OR RIPPING.
13. MATCH EXISTING LEVELS AT BATTER INTERFACE.
14. 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.

FINISHED LEVELS PLAN NOTES:

1. LEVELS DATUM IS A.H.D.
2. ALL CONTOUR LINES & SPOT LEVELS INDICATE FINISHED PAVEMENT LEVELS U.N.O. ON PLAN.
3. THE MAJOR CONTOUR INTERVAL IS 0.5m
4. THE MINOR CONTOUR INTERVAL IS 0.1m.
5. MINIMUM PAVEMENT GRADE IS TO BE 1:100 (1%).
6. MAXIMUM PAVEMENT GRADE IS TO BE 1:12 (8.3%) IN CARPARKING AREAS AND 1:25 (4%) ELSEWHERE.
7. MAXIMUM SLOPE GRADIENTS ARE TO BE 1:12 (8.3%) U.N.O. ON PLAN.
8. PROVIDE MINIMUM 3.0m LONG TRANSITION WHERE CHANGES GRADE EXCEED 1:20 (5%).
9. PERMANENT BATTER SLOPES ARE TO HAVE A MAXIMUM GRADE OF 1V:3H.
10. 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.
11. THE ACCESS ROAD TO THE HARSTAND AREA IS TO HAVE A CROSSFALL OF 2% AS INDICATED ON PLAN.
12. ALL FOOTPATHS ARE TO FALL AWAY FROM THE BUILDING AT 2.5% NOMINAL GRADE.
13. ALL PAVEMENTS ARE TO BE SET AT 50mm BELOW THE FINISHED FLOOR LEVEL OF THE WAREHOUSE AND OFFICE AREAS.

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.

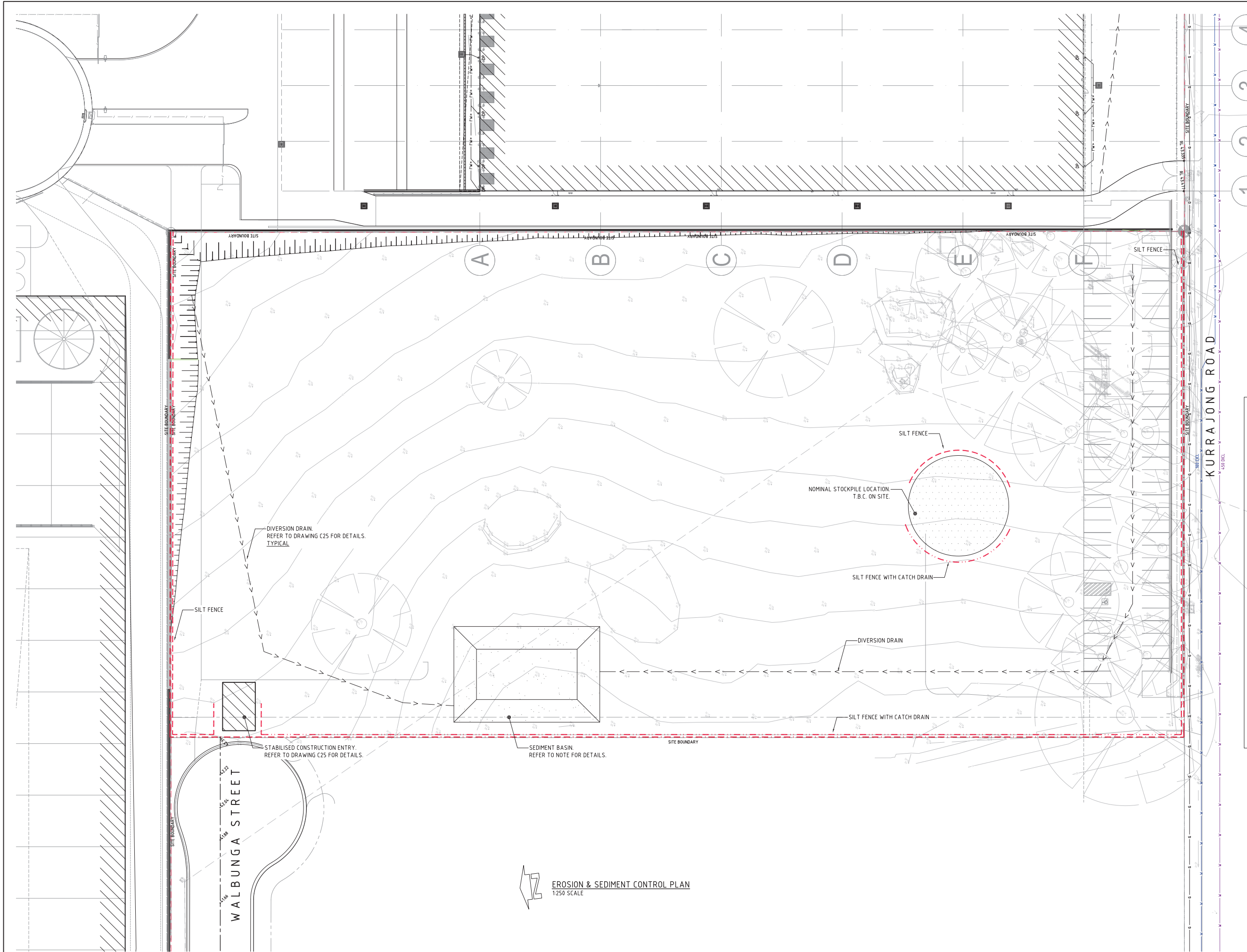
1. SILT FENCES AND SILT FENCE RETURNS SHALL BE ERRECTED CONVEX TO THE CONTOUR TO POND WATER.
2. HAY BALE BARRIERS AND GEOFABRIC FENCES ARE TO BE CONSTRUCTED TO TOE OF BATTER, PRIOR TO COMMENCEMENT OF EARTHWORKS, IMMEDIATELY AFTER CLEARING OF VEGETATION AND BEFORE REMOVAL OF TOP SOIL.
3. ALL TEMPORARY 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.
4. LEAKY WATER IS TO BE DIVERTED AWAY FROM DISTURBED GROUND AND INTO THE DRAINAGE SYSTEM.
5. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROVIDING ON GOING ADJUSTMENT TO EROSION CONTROL MEASURES AS REQUIRED DURING CONSTRUCTION.
6. 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.
7. ALL FINAL EROSION PREVENTION MEASURES INCLUDING THE ESTABLISHMENT OF GRASSING ARE TO BE MAINTAINED UNTIL THE END OF THE DEFECTS LIABILITY PERIOD.
8. ALL EARTHWORKS AREAS SHALL BE ROLLED ON A REGULAR BASIS TO SEAL THE EARTHWORKS.
9. 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.
10. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND HYDROMULCHED WITHIN 10 DAYS OF COMPLETION OF FORMATION.
11. 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.
12. ALL STOCKPILE STOCKPILES ARE TO BE SUITABLY COVERED TO THE SATISFACTION OF THE SITE MANAGER TO PREVENT WIND AND WATER EROSION.
13. 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.
14. 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 REQUIRED IN THE EROSION AND SEDIMENTATION CONTROL PLAN.
15. ACCESS AND EXIT AREAS SHALL INCLUDE SHAKE-DOWN OR OTHER METHODS APPROVED BY THE SITE MANAGER FOR THE REMOVAL OF SOIL MATERIALS FORM MOTOR VEHICLES.
16. 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 DISPOSED TO STABLE AREAS OR DIRECTED TO NATURAL WATERCOURSES.
17. 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.

STORMWATER DRAINAGE NOTES:

1. ALL STORMWORK WORKS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3500.3:2003 PLUMBING AND DRAINAGE, PART 3: STORMWATER DRAINAGE.
2. THE MINOR (PIPED) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 20 YEAR AIR STORM EVENT AND THE MAJOR (OVERLAND) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 100 YEAR AIR STORM EVENT.
3. ALL FINISHED PAVEMENT LEVELS SHALL BE AS INDICATED ON FINISHED LEVELS PLANS C50.
4. PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN.
5. EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE.
6. ALL STORMWATER PIPES Ø375 OR GREATER SHALL BE CLASS 2 (WITH HS2 SUPPORT) REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE.
7. ALL PIPES UP TO AND INCLUDING Ø300 TO BE uPVC GRADE S88 UNO.
8. PIPE CLASS NOMINATED ARE FOR IN-SERVICE LOADING CONDITIONS ONLY. CONTRACTOR IS TO MAKE ANY NECESSARY ADJUSTMENTS REQUIRED FOR CONSTRUCTION CONDITIONS.
9. 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 C 25 MPa. PRECAST PITS MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
10. ADDITION TO ITEM 9 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm.
11. 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 UNDER AND UNDER BACK OF PIPES AND PIPE FAUCETS, WITH NARROW EDGED RAMPERS OR OTHER SUITABLE TAMPING DETAILS.
12. 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.
13. WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED Ø100 uPVC TO EACH SIDE OF PIPE.
14. ALL SUBSOIL DRAINAGE LINES SHALL BE Ø100 SLOTTED uPVC WITH APPROVED FILTER WRAP LAID IN 300mm MINIMUM 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.
15. ALL PIPE GRADES 1 IN 100 MINIMUM UNO.
16. PROVIDE STEEL IRONS IN PITS DEEPER THAN 1000mm.
17. MIN. 600 COVER TO PIPE OVERT BE NEATH ROADS & MIN. 400 COVER BE NEATH LANDSCAPED AND PEDESTRIAN AREAS.
18. PIT COVERS IN TRAFFICABLE PAVEMENT SHALL BE CLASS D 'HEAVY DUTY', THOSE LOCATED IN NON-TRAFFICABLE AREAS SHALL BE CLASS B 'MEDIUM DUTY' UNO.
19. PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
20. DOWN PIPES (DP) TO BE AS PER HYDRAULIC ENGINEERS DETAILS WITH CONNECTOR TO MATCH DP SIZE UNO. ON PLAN. PROVIDE CLEANING EYE AT GROUND LEVEL.
21. 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.

FOR DEVELOPMENT APPLICATION

[illegible]



LEGEND:

- OVERLAND FLOW PATH
- SILT FENCING
- SILT FENCING WITH CATCH DRAIN

SEDIMENTATION BASIN NOTE:

FOR SEDIMENT & EROSION CONTROL DETAILS REFER TO DRAWING C08753.23-C25.

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 (32.2mm).

APPROXIMATE TOTAL AREA OF SITE = xx ha

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)

SEDIMENTATION BASIN NOTE:

FOR SEDIMENT & EROSION CONTROL DETAILS REFER TO DRAWING C08753.23-C25.

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 (32.2mm).

APPROXIMATE AREA OF DISTURBED SITE = 2.18 Ha

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)

SOIL TYPE ASSESSED FROM THE GEOTECHNICAL REPORT PROVIDED BY GROUND TECHNOLOGIES TITLED GTES49-GEOTECH DATED 27.10.15.

SEDIMENT BASIN:

CATCHMENT AREA	= 2.18ha
REQUIRED BASIN VOLUME	= 527m ³
BASE DIMENSION (LxB)	= 20.0m x 10.0m
TOP DIMENSION (LxB)	= 29.0m x 19.0m
MAX SIDE SLOPE	= 1V:3H
DEPTH	= 1.5m
PROVIDED BASIN VOLUME	= 541m ³

EROSION & SEDIMENT CONTROL PLAN
1:250 SCALE

FOR DEVELOPMENT APPLICATION



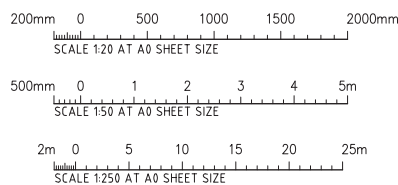
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AMENDMENTS			DATE	ISSUE	AMENDMENTS	DATE	ISSUE	AMENDMENTS	LOGOS PROPERTY			TOLL PRESTONS - EXPANSION			Consulting Engineers			PRECISION COMMUNICATION ACCOUNTABILITY			EROSION & SEDIMENT CONTROL PLAN		
									SUITE 02, LEVEL 12			41B KURRAJONG ROAD, PRESTONS, NSW			Level 1, 8 Windmill Street						C08753.23-C20		
									167 MACQUARIE STREET						Walsh Bay, Sydney NSW 2000						C08753.23-C20		
									SYDNEY NSW 2000												A		



TYPICAL SILT FENCE DETAIL
N.T.S.
PROVIDE 1m RETURNS AT 30m INTERVALS
TYPICAL

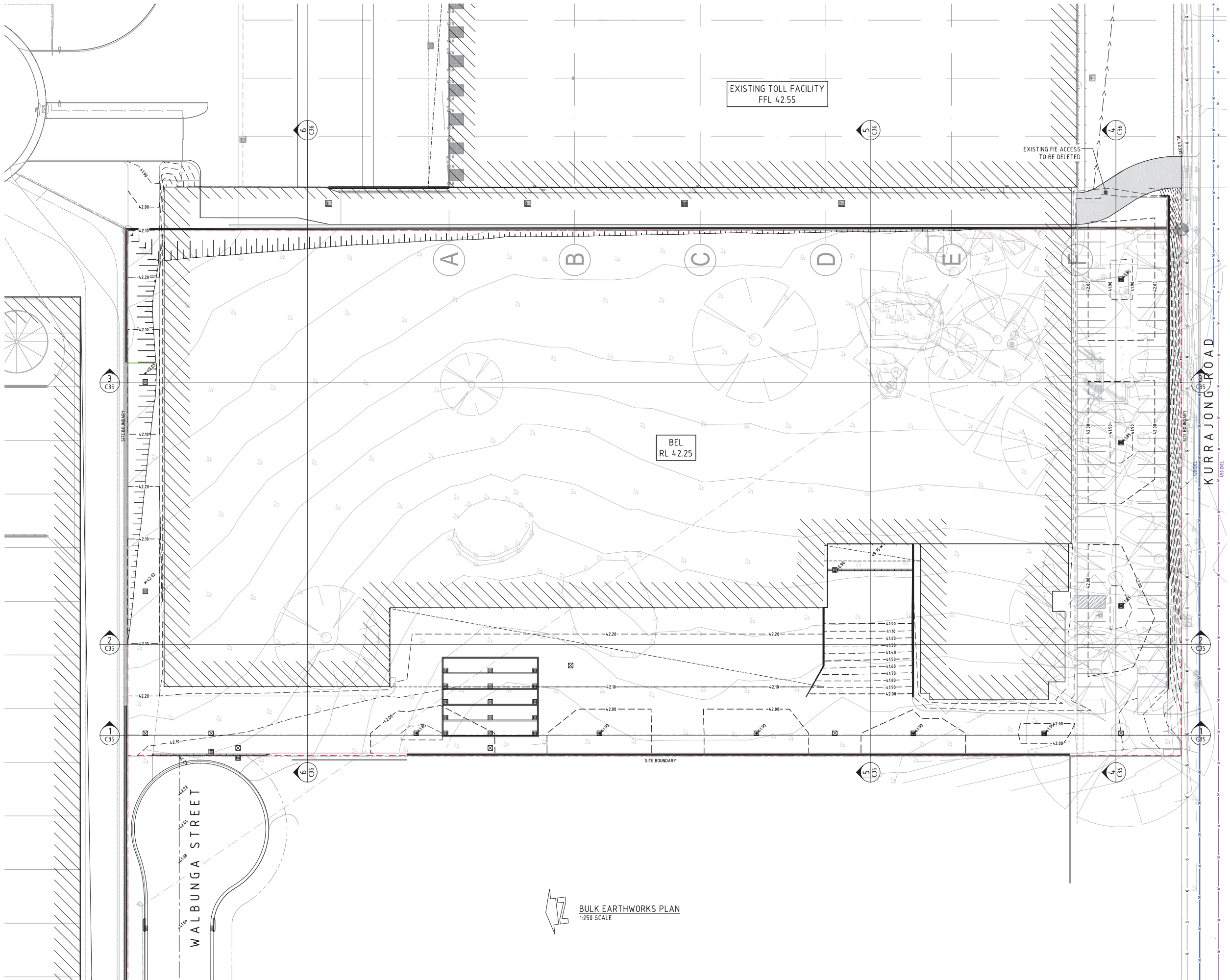


1. PLACE ALL STOCKPILES IN LOCATIONS MORE THAN 5m FROM EXISTING VEGETATION, ROADS & HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT ELONGATED MOUNDS. SIDE SLOPE TO BE 1 V: 2 H MAX.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE STOCKPILES ARE TO 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.



FOR DEVELOPMENT APPLICATION

[illegible]



LEGEND

LEVELS DATUM IS AHD.

- EXISTING CONTOUR
- - - B.E.L. CONTOUR (MAJOR 0.5m)
- - - B.E.L. CONTOUR (MINOR 0.1m)

NOMINATED B.E.L. DETAIL
N.T.S.

PAVEMENT
BASE/ SUBBASE
COURSES
SUBGRADE

PAVEMENT FFL
DEPTH OF PAVEMENT. REFER TO STRUCTURAL PLANS FOR DETAILS.

EARTHWORKS VOLUMES ESTIMATE

BULK EARTHWORKS VOLUMES BASED ON A NOMINAL TOPSOIL STRIP OF 200mm OVER SITE AREA:

TOPSOIL STRIP = 4,400 m³

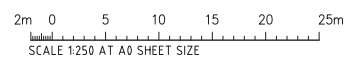
CUT = - 27,000 m³
FILL = + 4,000 m³

ALLOWANCES
DETAILED EXCAVATION = - 1,600 m³ (750m³/Ha OVER 2.185Ha)
CUT BULKING = - 1,100 m³ (4% OF CUT VOLUME)

BALANCE = - 25,700 m³ (EXPORT)

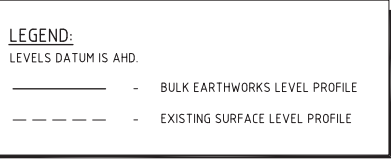
EARTHWORKS VOLUMES ARE APPROXIMATE ONLY. NO ALLOWANCE HAS BEEN MADE FOR EROSION & SEDIMENT CONTROL OR COMPACTION OF FILLED SOILS.

ALLOWANCES FOR STRUCTURE	
	DEPTH OF PAVEMENT
WAREHOUSE	300mm
OFFICE	300mm
HARDSTAND	300mm
CAR PARK	300mm

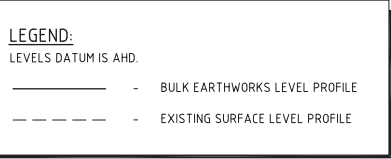


FOR DEVELOPMENT APPLICATION

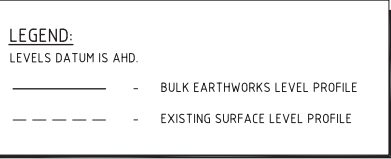
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AMENDMENTS		DATE		ISSUE		AMENDMENTS		DATE		DATE		CONSULTING ENGINEERS		BULK EARTHWORKS PLAN	
										4/1B KURRAJONG ROAD, PRESTONS, NSW		Level 1, 8 Windmill Street		DRAWING No	
										LOGOS PROPERTY		Walbah Bay, Sydney NSW 2000		C08753.23-C30	
										SUITE 02, LEVEL 12		Tel: (02) 8551-7899 Fax: (02) 8541-3721		PRECISION | COMMUNICATION | ACCOUNTABILITY	
										167 MACQUARIE STREET		email: mail@costinroe.com.au		ISSUE	
										SYDNEY NSW 2000				A	



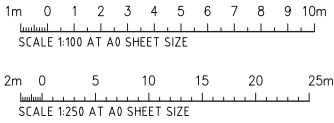
SECTION 3
HORIZONTAL SCALE 1:250
VERTICAL SCALE 1:100



SECTION 2
HORIZONTAL SCALE 1:250
VERTICAL SCALE 1:100



SECTION 1
HORIZONTAL SCALE 1:250
VERTICAL SCALE 1:100



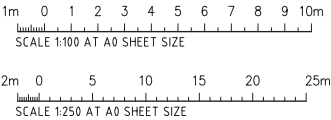
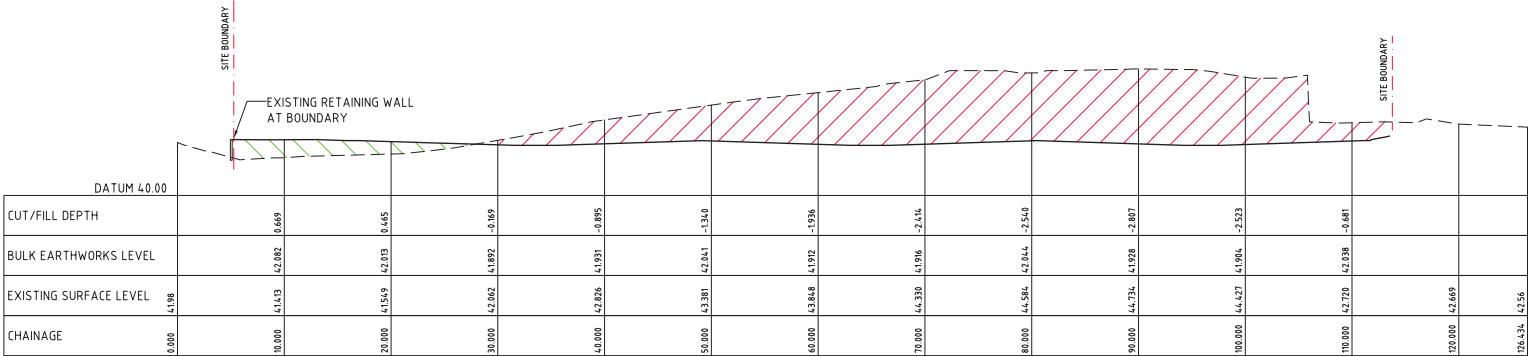
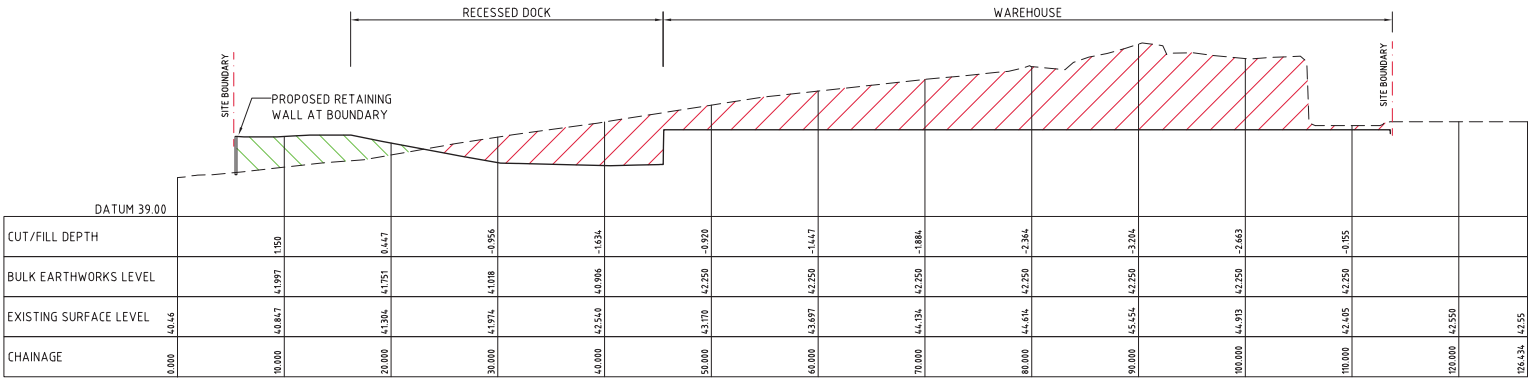
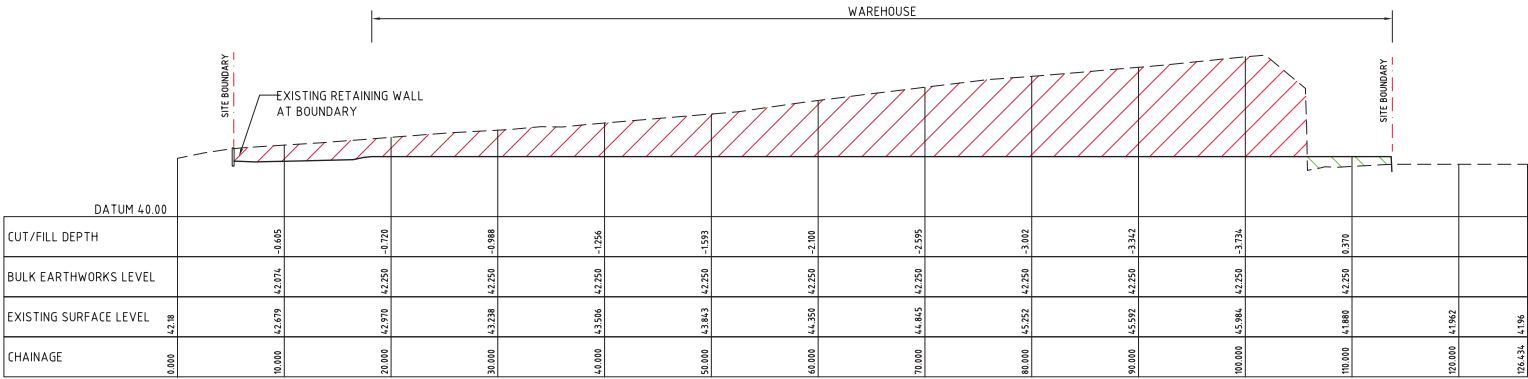
FOR DEVELOPMENT APPLICATION

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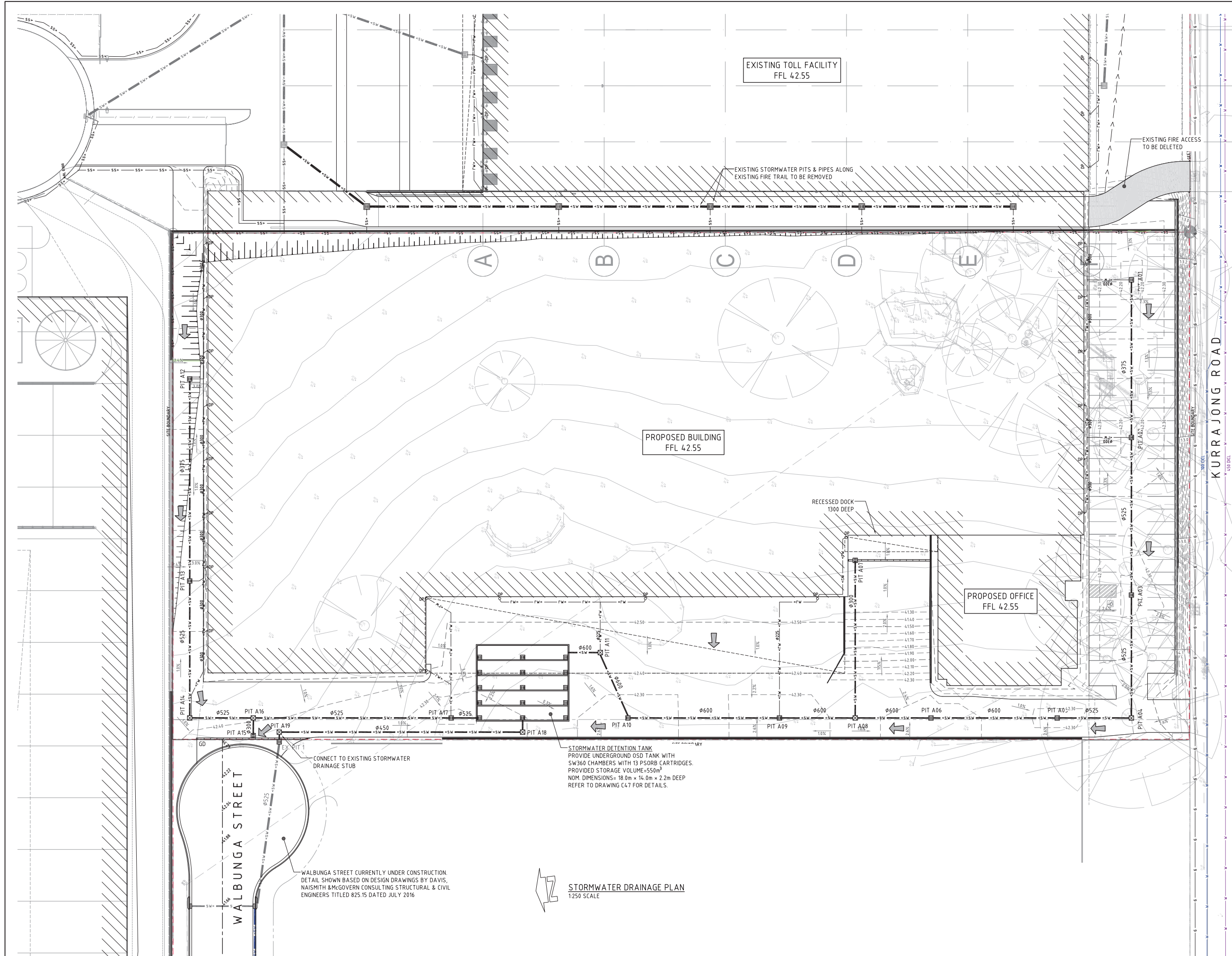
LEGEND:
LEVELS DATUM IS AHD.

- BULK EARTHWORKS LEVEL PROFILE

- EXISTING SURFACE LEVEL PROFILE



FOR DEVELOPMENT APPLICATION



LEGEND:
LEVELS DATUM IS AHD.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- PROPOSED DRAINAGE LINE
- EXISTING DRAINAGE LINE TO BE REMOVED
- EXISTING DRAINAGE LINE TO REMAIN
- ROOFWATER LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS

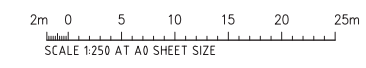
PIT SCHEDULE

PIT No.	GRATE RL	TYPE	SIZE	COMMENT
PIT A 01	42.15	S.G.G.P.	900x900	⊕
PIT A 02	42.15	S.G.G.P.	900x900	⊕
PIT A 03	42.15	S.G.G.P.	900x900	⊕
PIT A 04	42.40	S.J.P.	900x900	
PIT A 05	42.25	S.G.G.P.	900x900	⊕
PIT A 06	42.20	S.G.G.P.	900x900	⊕
PIT A 07	41.20	S.G.G.P.	900x900	⊕
PIT A 08	42.35	S.J.P.	900x900	
PIT A 09	42.20	S.G.G.P.	900x900	⊕
PIT A 10	42.20	S.G.G.P.	900x900	⊕
PIT A 11	42.44	S.J.P.	900x900	
PIT A 12	42.32	S.G.G.P.	900x900	⊕
PIT A 13	42.32	S.G.G.P.	900x900	⊕
PIT A 14	42.42	S.J.P.	900x900	
PIT A 15	42.37	S.G.G.P.	900x900	⊕
PIT A 16	42.41	S.J.P.	900x900	
PIT A 17	42.15	S.G.G.P.	900x900	⊕
PIT A 18	42.29	S.J.P.	900x900	
PIT A 19	42.37	S.J.P.	900x900	

⊕ DENOTES PITS TO BE FITTED WITH SW360 ENVIROPOD PIT INSERTS

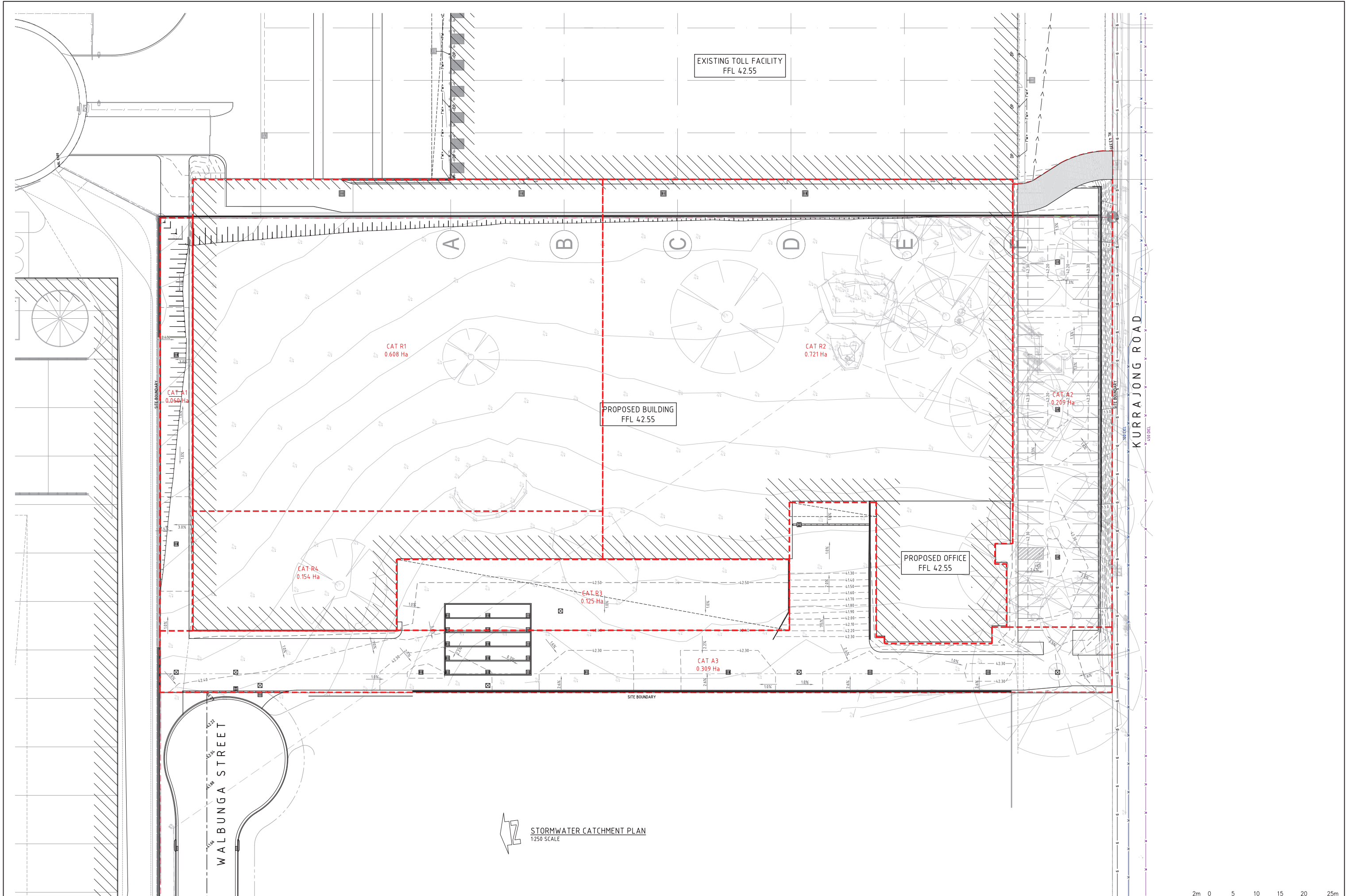
LEVELS NOTE:
LEVELS SHOWN TO BE +500mm FROM THOSE SHOWN.
FINAL LEVELS SUBJECT TO MINOR VARIATIONS TO
SUIT DETAILED DESIGN.

STORMWATER DRAINAGE NOTES:
REFER TO DRAWING C08753.23-C10 FOR STORMWATER
DRAINAGE NOTES



FOR DEVELOPMENT APPLICATION

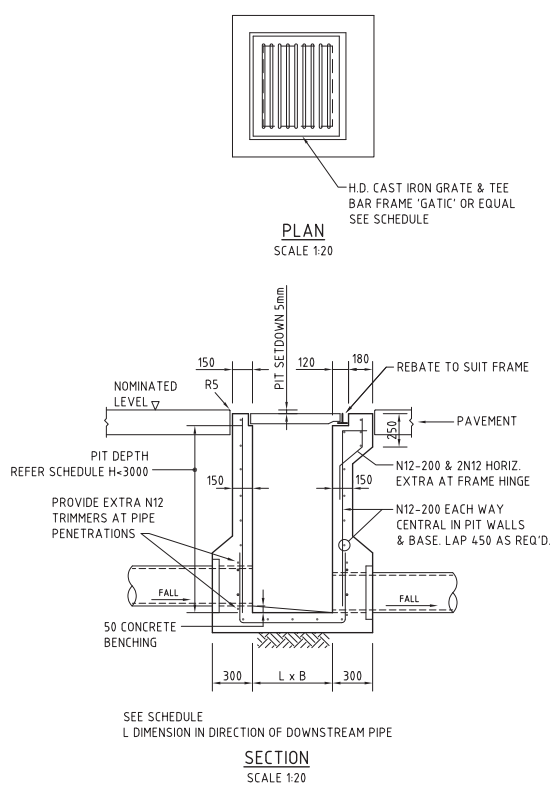
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ARCHITECT			CLIENT LOGOS PROPERTY SUITE 02, LEVEL 12 167 MACQUARIE STREET SYDNEY NSW 2000			PROJECT TOLL PRESTONS - EXPANSION 4/1B KURRAJONG ROAD, PRESTONS, NSW			DESIGNED MW			CHECKED TW			DATE JULY 18		
COSTIN ROE CONSULTING			COSTIN ROE CONSULTING PTY LTD. Level 1, 8 Windmill Street Wahah Bay, Sydney NSW 2000 Tel: (02) 8551-7000 Fax: (02) 8541-3721 email: mail@costinroe.com.au			COSTIN ROE CONSULTING			DRAWING TITLE STORMWATER DRAINAGE PLAN			DRAWING NO C08753.23-C40			ISSUE B		



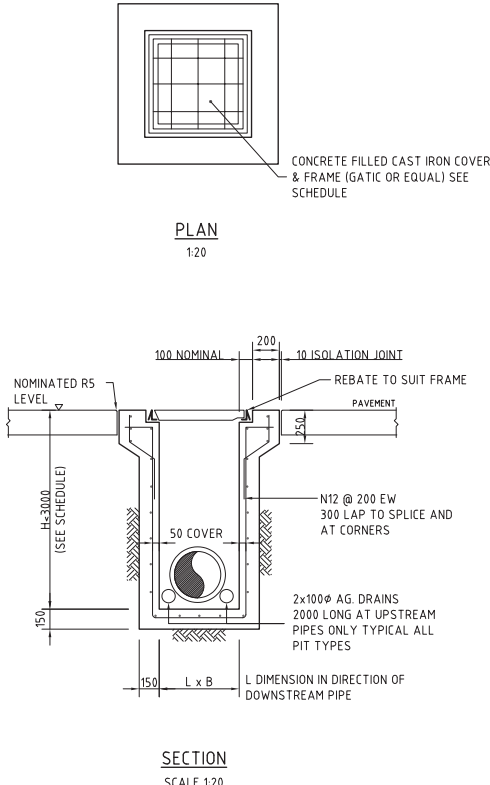
FOR DEVELOPMENT APPLICATION

2m 0 5 10 15 20 25m
SCALE 1:250 AT A0 SHEET SIZE

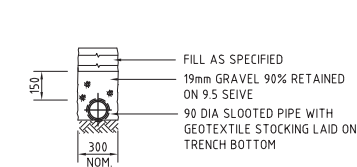
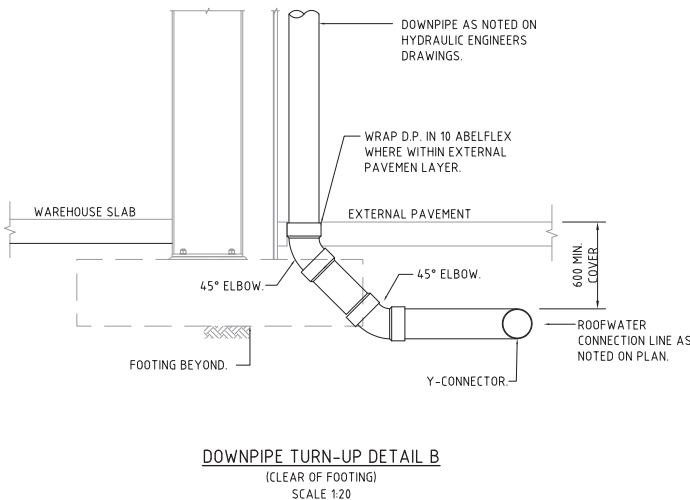
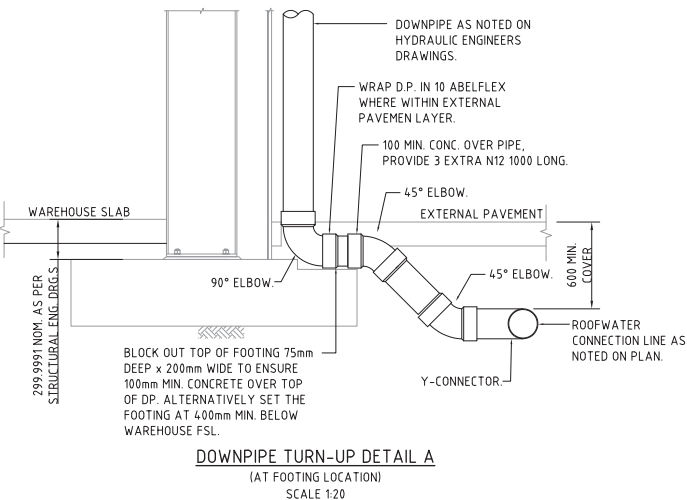
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Consulting Engineers Level 1, 8 Windmill Street Wahah Bay, Sydney NSW 2000 Tel: (02) 8551-7889 Fax: (02) 8541-3721 email: mail@costinroe.com.au ©										 PRECISION COMMUNICATION ACCOUNTABILITY										DRAWING TITLE STORMWATER CATCHMENT PLAN DRAWING NO C08753.23-C42 ISSUE 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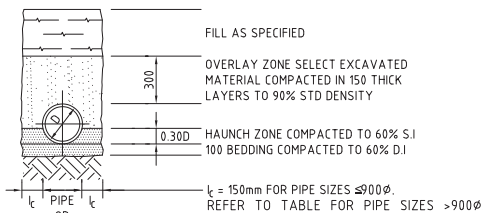
SINGLE GRATED GULLY PIT – SGGP



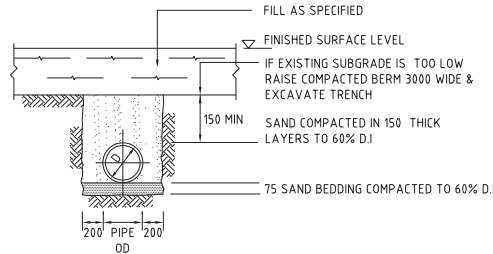
SEALED JUNCTION PIT – SJP



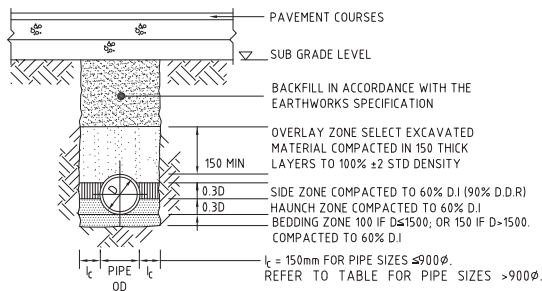
SUPPORT TO AG DRAIN



TYPE H1 SUPPORT TO CONCRETE PIPES AT LANDSCAPED AREAS



SUPPORT TO uPVC PIPES



TYPE HS2 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT

D ≤ 1350, MAX FILL = 4.0m
D > 1350, MAX FILL = 3.0m

BEDDING & HAUNCH MATERIAL GRADING	
SIEVE SIZE	WEIGHT PASSING(%)
19	100
2.36	100 TO 50
0.60	90 TO 20
0.30	60 TO 10
0.15	25 TO 0
0.075	10 TO 0

SIDE ZONE MATERIAL GRADING	
SIEVE SIZE	WEIGHT PASSING(%)
75	100
9.5	100 TO 50
2.36	100 TO 30
0.60	50 TO 15
0.075	25 TO 0

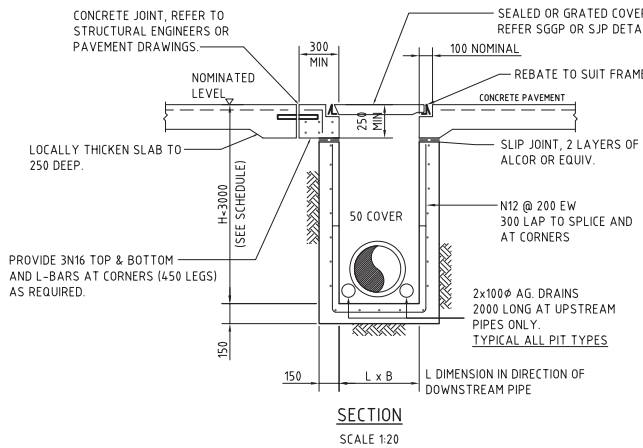
SELECT FILL MATERIAL IN ACCORDANCE WITH TABLE 1 AS 3725

SIDE ZONE WIDTH	
PIPE SIZE	L _t (mm)
≤900φ	150
1050φ	175
1200φ	200
1350φ	225
1500φ	250
1650φ	275
1800φ	300

REFER TO ENGINEER FOR TRENCH WIDTHS FOR PIPE SIZES GREATER THAN 1800φ

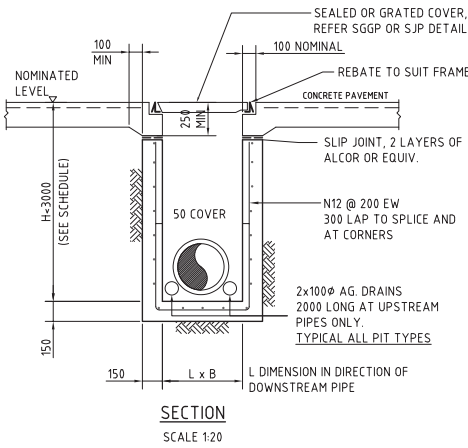
PIPE LAYING DETAILS

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)



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)

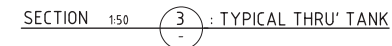
FOR DEVELOPMENT APPLICATION

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT A0 SHEET SIZE

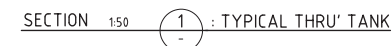
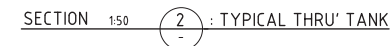
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ISSUED FOR INFORMATION			27.07.18			A						LOGOS PROPERTY			TOLL PRESTONS – EXPANSION			Consulting Engineers			STORMWATER DRAINAGE DETAILS		
AMENDMENTS			DATE			ISSUE			AMENDMENTS			DATE			ISSUE			PRECISION COMMUNICATION ACCOUNTABILITY			DRAWING No		
																					C08753.23-C45		
																					B		



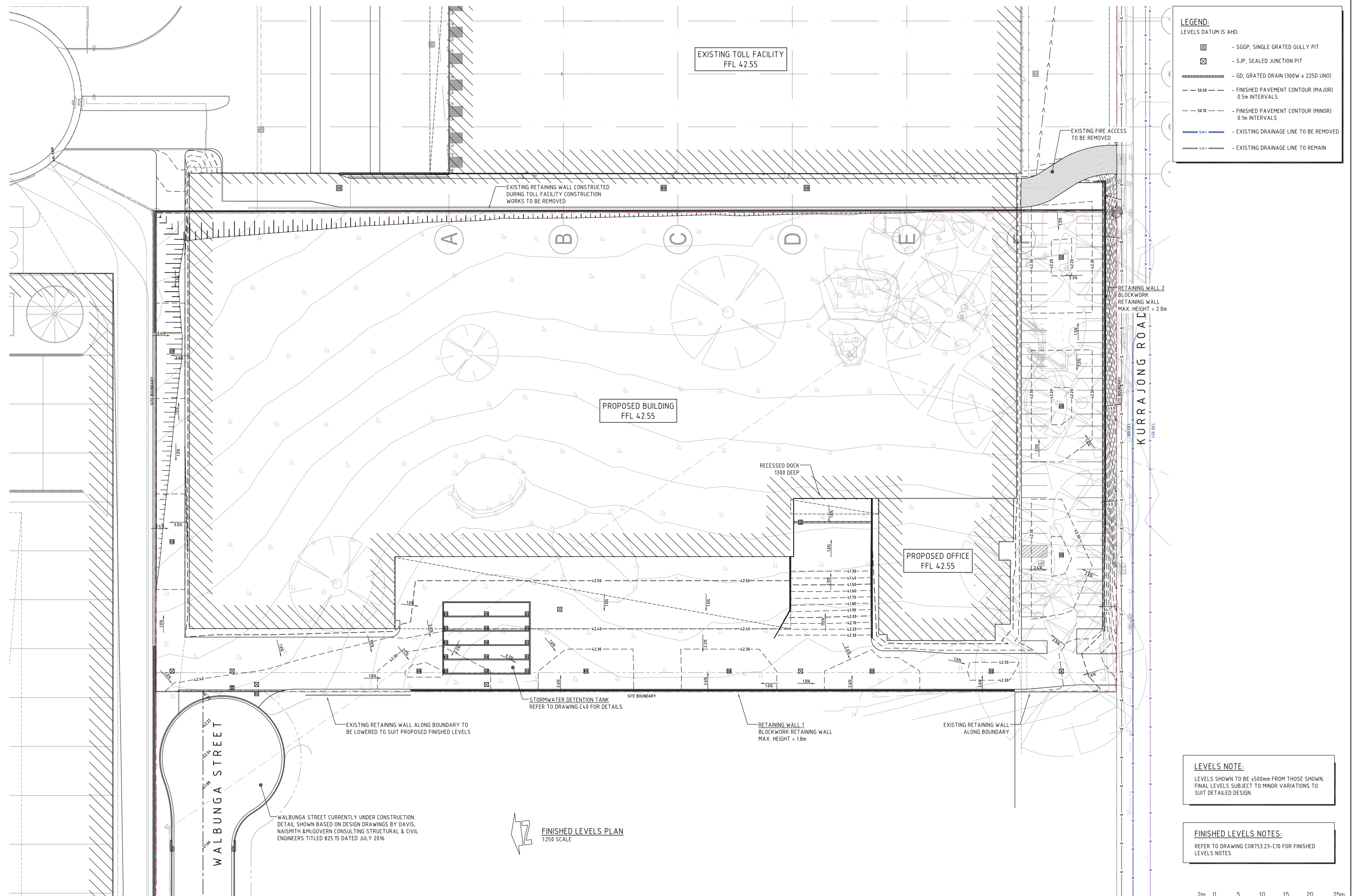
A 3D diagram of a rectangular prism. The front horizontal edge is labeled 18.0m. The receding horizontal edge on the right is labeled 14.0m. The vertical edge on the left is labeled 2.2m.



NOTE:
TANK TO BE DESIGNED
BY STRUCTURAL ENGINEER

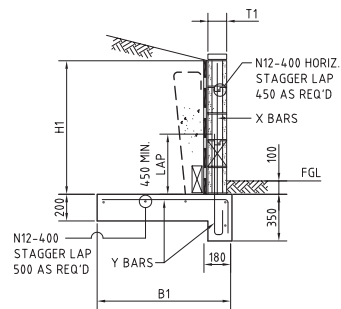


										ARCHITECT CLIENT LOGOS PROPERTY SUITE 02, LEVEL 12 167 MACQUARIE STREET SYDNEY NSW 2000 PROJECT TOLL PRESTONS - EXPANSION 41B KURRAJONG ROAD, PRESTONS, NSW  Costin Roe Consulting Pty Ltd. Consulting Engineers Level 1, 8 Windmill Street Wahbi Bay, Sydney NSW 2060 Tel: (02) 8251-7999 Fax: (02) 8041-3721 email: mail@costinroe.com.au ©										PRECISION COMMUNICATION ACCOUNTABILITY DRAWING TITLE OSD PLAN & DETAILS									
ISSUED FOR DEVELOPMENT APPLICATION 15.08.18 8										DESIGNED DATE 15.08.18										DRAWING NO. C08753.23-C47									
ISSUED FOR INFORMATION 27.07.18 4										DRAWN DATE 27.07.18										SCALE AS SHOWN									
AMENDMENTS DATE ISSUE AMENDMENTS DATE ISSUE AMENDMENTS DATE ISSUE										CHECKED DATE 15.08.18										CAD REF. C08753.23-C47									

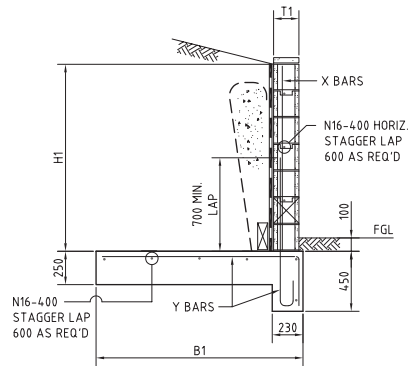


FOR DEVELOPMENT APPLICATION

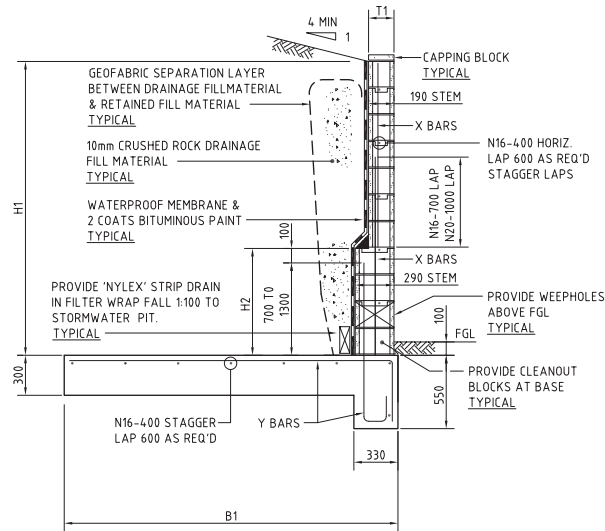
[illegible]



WALL WITH SINGLE STEM OF 140 BLOCK
1:20 SCALE



WALL WITH SINGLE STEM OF 190 BLOCK
1:20 SCALE

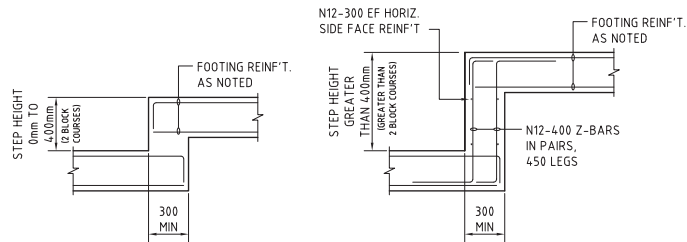


WALL WITH THIN STEM OF 190 BLOCK AND
THICK STEM OF 290 BLOCK
1:20 SCALE

NOTE :
ALL BLOCK CORES TO BE FULLY GROUTED.
NOTES SHOWN ARE TYPICAL FOR ALL WALLS.
ALL BASE KEYS TO BE POURED AGAINST
UNDISTURBED NATURAL GROUND.

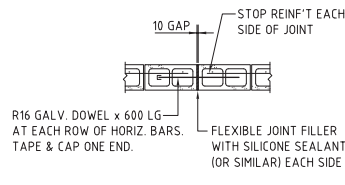
CONCRETE QUALITY					
ELEMENT	SLUMP	AGGREGATE (MAX. SIZE)	CEMENT TYPE	AD MIXTURE	P/C (MPa)
CORE FILL	230	10	GP	NIL	20

RETAINING WALL TYPE 1 SPECIFICATIONS FOR 1 IN 4 BACKFILL OR 5kPa SURCHARGE :					
RETAINED HEIGHT H1	290 STEM HEIGHT H2	BASE WIDTH B1	(THIN) STEM THICKNESS T1	REINF'T. X BARS	REINF'T. Y BARS
3400	1400	3600	190	N16-200	N20-200
3200	1200	3300	190	N16-200	N20-200
3000	1000	3000	190	N16-200	N16-200
2800	1000	2800	190	N16-400	N16-200
2600	1000	2500	190	N16-400	N16-200
2400	800	2300	190	N16-400	N16-400
2200	800	2100	190	N16-400	N16-400
2000	N/A	1800	190	N16-400	N16-200
1800	N/A	1600	190	N16-400	N16-400
1600	N/A	1400	190	N16-400	N16-400
1400	N/A	1200	190	N16-400	N16-400
1200	N/A	1000	140	N12-400	N12-400
1000	N/A	900	140	N12-400	N12-400
800	N/A	800	140	N12-400	N12-400
600	N/A	600	140	N12-400	N12-400



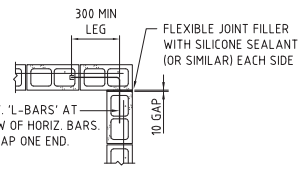
STEP HEIGHT
0mm TO 400mm
STEP HEIGHT
GREATER THAN 400mm

TYPICAL WALL FOOTING STEPS
1:20

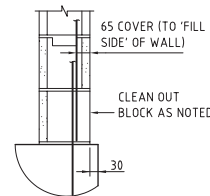


VERTICAL JOINT DETAIL
PROVIDE VERTICAL JOINTS IN
BLOCKWORK 8.0M MAX. CENTRES

RETAINING WALL BLOCKWORK JOINTING DETAILS
1:20 SCALE



CORNER DETAIL



WALL VERTICAL REINF'T DETAIL
TYPICAL
NOT TO SCALE

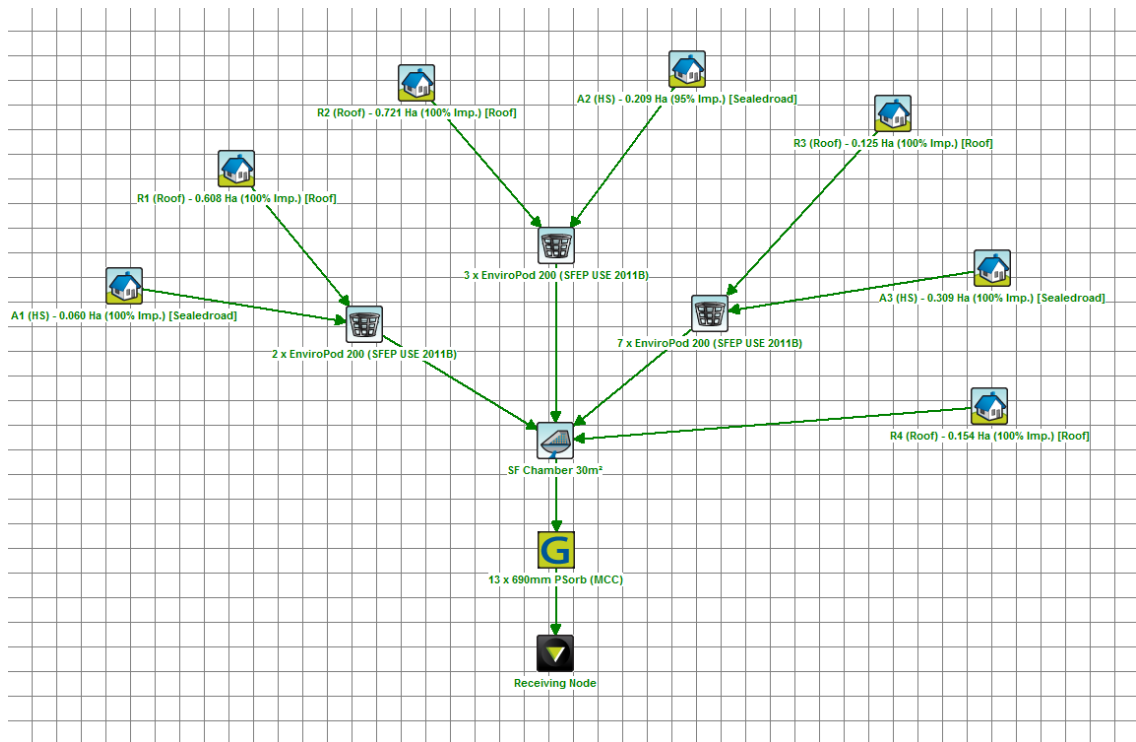
FOR DEVELOPMENT APPLICATION

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT A0 SHEET SIZE

ISSUED FOR DEVELOPMENT APPLICATION			ARCHITECT			CLIENT LOGOS PROPERTY SUITE 02, LEVEL 12 167 MACQUARIE STREET SYDNEY NSW 2000			PROJECT TOLL PRESTONS - EXPANSION 41B KURRAJONG ROAD, PRESTONS, NSW			Costin Roe Consulting Pty Ltd. Consulting Engineers Level 1, 8 Windmill Street Wahbi Bay, Sydney NSW 2000 Tel: (02) 8551-7899 Fax: (02) 8541-3721 email: mail@costinroe.com.au ©			DRAWING TITLE RETAINING WALL DETAILS		
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE	DESIGNED MW	DRAWN TW	CHECKED JULY 18	SIZE A0	SCALE AS SHOWN	CAD REF: C08753.23-C65	PRECISION | COMMUNICATION | ACCOUNTABILITY	DRAWING No C08753.23-C65	ISSUE A

Appendix B

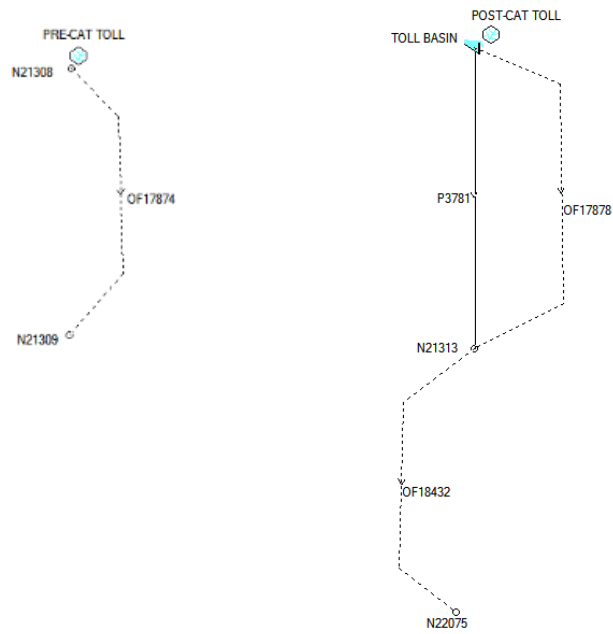
MUSIC MODEL CONFIGURATION



	Sources	Residual Load	% Reduction
Flow (ML/yr)	17.3	17.3	0
Total Suspended Solids (kg/yr)	1770	251	85.8
Total Phosphorus (kg/yr)	4.38	1.62	62.9
Total Nitrogen (kg/yr)	38.6	21.2	45
Gross Pollutants (kg/yr)	470	0	100

Appendix C

DRAINS MODEL CONFIGURATION



Appendix D

EROSION CONTROL CHECK SHEET

EROSION AND SEDIMENT CONTROL WEEKLY SITE INSPECTION SHEET

LOCATION

INSPECTION OFFICER **DATE**

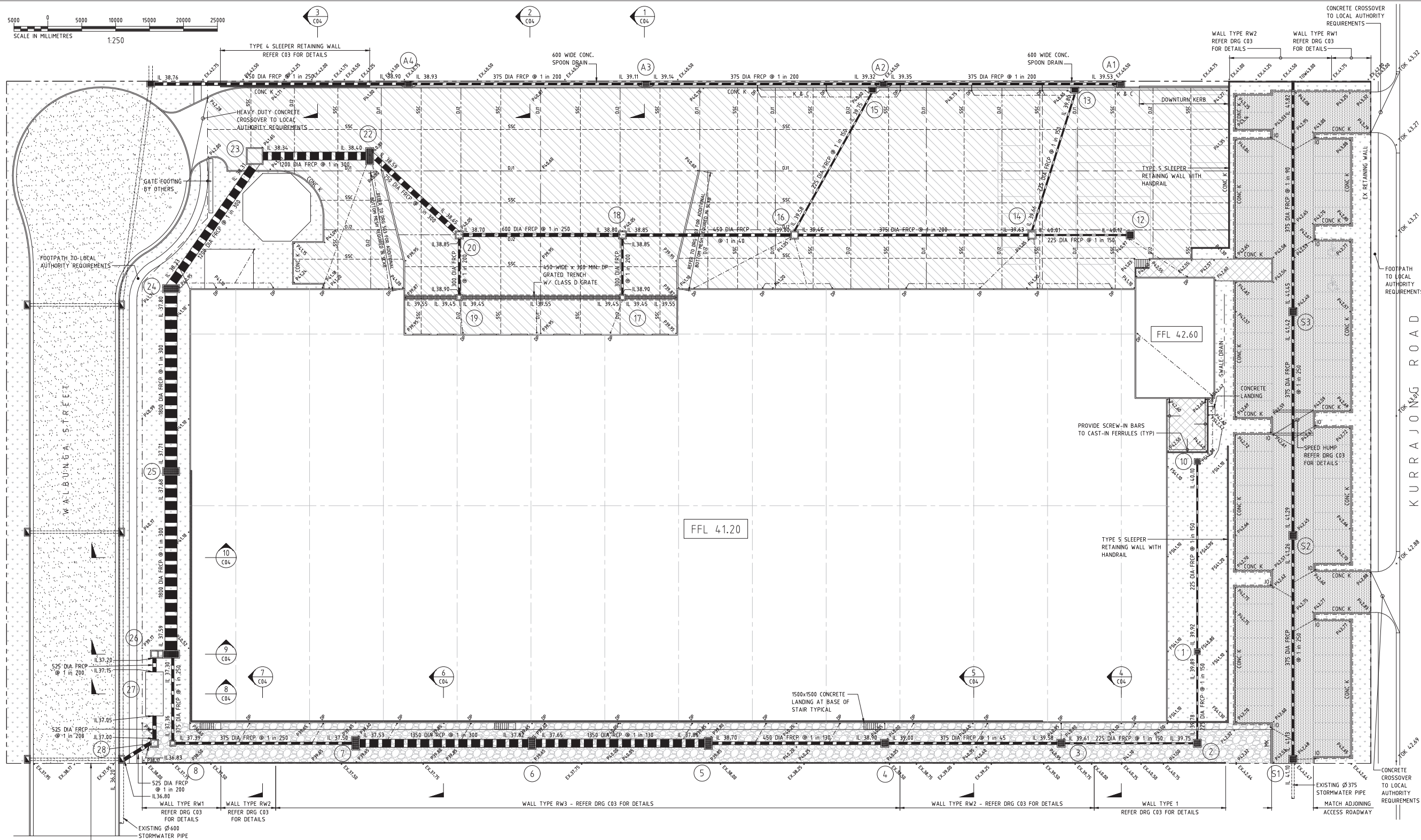
SIGNATURE

Legend: ☐ OK ☐ Not OK N/A Not applicable

Item	Consideration	Assessment
1	Public roadways clear of sediment.	.....
2	Entry/exit pads clear of excessive sediment deposition.	.....
3	Entry/exit pads have adequate void spacing to trap sediment.	.....
4	The construction site is clear of litter and unconfined rubbish.	.....
5	Adequate stockpiles of emergency ESC materials exist on site.	.....
6	Site dust is being adequately controlled.	.....
7	Appropriate drainage and sediment controls have been installed prior to new areas being cleared or disturbed.	.....
8	Up-slope “clean” water is being appropriately diverted around/through the site.	.....
9	Drainage lines are free of soil scour and sediment deposition.	.....
10	No areas of exposed soil are in need of erosion control.	.....
11	Earth batters are free of “rill” erosion.	.....
12	Erosion control mulch is not being displaced by wind or water.	.....
13	Long-term soil stockpiles are protected from wind, rain and stormwater flow with appropriate drainage and erosion controls.	.....
14	Sediment fences are free from damage.	.....
15	Sediment-laden stormwater is not simply flowing “around” the sediment fences or other sediment traps.	.....
16	Sediment controls placed up-slope/around stormwater inlets are appropriate for the type of inlet structure.	.....
17	All sediment traps are free of excessive sediment deposition.	.....
18	The settled sediment layer within a sediment basin is clearly visible through the supernatant prior to discharge such water.	.....
19	All reasonable and practicable measures are being taken to control sediment runoff from the site.	.....
20	All soil surfaces are being appropriately prepared (i.e. pH, nutrients, roughness and density) prior to revegetation.	.....
21	Stabilised surfaces have a minimum 70% soil coverage.	.....
22	The site is adequately prepared for imminent storms.	.....
23	All ESC measures are in proper working order.	.....

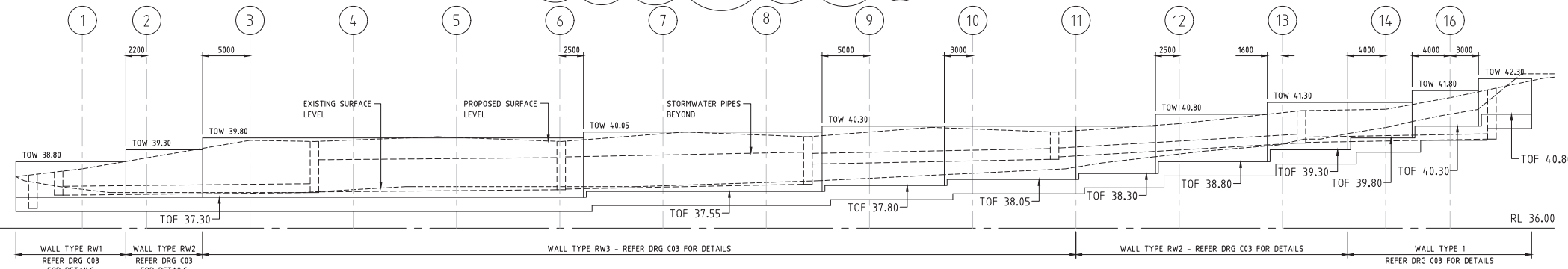
Appendix E

WALBUNGA STREET DESIGN DRAWINGS



DRAINAGE AND PAVEMENT LAYOUT PLAN

ALL CIVIL TO BE IN ACCORDANCE WITH LIVERPOOL CITY COUNCILS DESIGN GUIDELINES AND CONSTRUCTION SPECIFICATION FOR CIVIL WORKS



WESTERN BOUNDARY RETAINING WALL

Amendments			
Rev	By	Date	Description
P2	A.B.	08.07.16	PIPE SIZES REVISED
P3	A.B.	13.07.16	WALL ELEVATION ADDED
P4	A.B.	18.07.16	JOINTS AND SECTIONS ADDED
P5	A.B.	03.08.16	ISSUED FOR CERTIFICATION
P6	A.B.	12.08.16	REVISED AS NOTED
P7	A.B.	18.11.16	RETAINING WALLS REVISED
A	A.B.	18.08.17	ISSUED FOR CONSTRUCTION
B	A.B.	15.12.17	ISSUED FOR CONSTRUCTION
C	A.B.	22.12.17	ISSUED FOR CONSTRUCTION

LEGEND

- DOWNPIPE WITH BRANCH TO MATCH DOWNPIPE SIZE (150 DIA. MIN.) @ 1 in 100 (MIN FALL (450 MIN COVER))
- AG INSPECTION OPENING
- NEW REINFORCED CONC PIPE @ 1 in 100
- 90 DIA AG DRAIN BEHIND ALL KERBS TYPICAL
- EXIST REINFORCED CONC PIPE
- NEW SIDE ENTRY PIT REFER DRG C02 FOR DETAILS
- NEW GRATED PIT REFER DRG C02 FOR DETAILS
- NEW JUNCTION PIT REFER DRG C02 FOR DETAILS
- EXIST STORMWATER PIT
- NEW CONCRETE KERB & CHANNEL - REFER DRG C02 FOR DETAILS
- NEW CONCRETE KERB - REFER DRG C02 FOR DETAILS
- NEW FINISHED PAVEMENT LEVELS

NOTE:
ALL CONCRETE PIPES TO BE CLASS 2 (UNO)
ALL UPVC PIPES TO BE CLASS S8 (UNO)

- LIGHT DUTY CAR PARK BITUMEN REFER DRG C02 FOR DETAILS
- HEAVY DUTY BITUMEN REFER DRG C02 FOR DETAILS
- CRUSHED ROCK FIRE ACCESS ROCK REFER DRG C02 FOR DETAILS
- HEAVY DUTY PAVEMENT REFER DRG C02 FOR DETAILS
- FOOTPATH REFER DRG C02 FOR DETAILS

FOR GENERAL, CIVIL & ALL OTHER RELEVANT NOTES REFER TO DRG S01

DAVIS, NAISMITH & MCGOVERN
Consulting Structural and Civil Engineers

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Fax 613 9870 2827
Email dnm@dmconsulting.com
Web www.dnmconsulting.com

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F 02 9624 4444

DEPT OF
18 Commercial Road
Parramatta NSW 2150
VIC 3003
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F 02 9624 4444

Project Title
WAREHOUSE AND OFFICE DEVELOPMENT
KURRAJONG ROAD
PRESTONS, NSW
FOR : IFC GLOBAL

Drawing Title
DRAINAGE & PAVEMENT LAYOUT PLAN

North

Drawn A.L. Approved A.B.

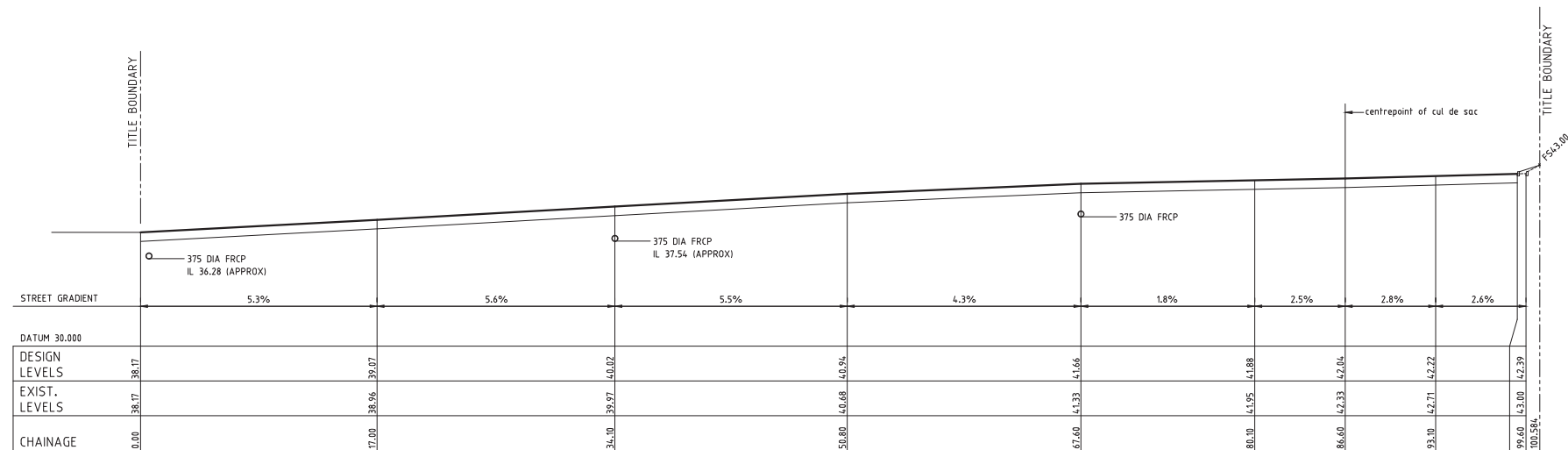
Date JUN '16

Scale 1:250 @ B1

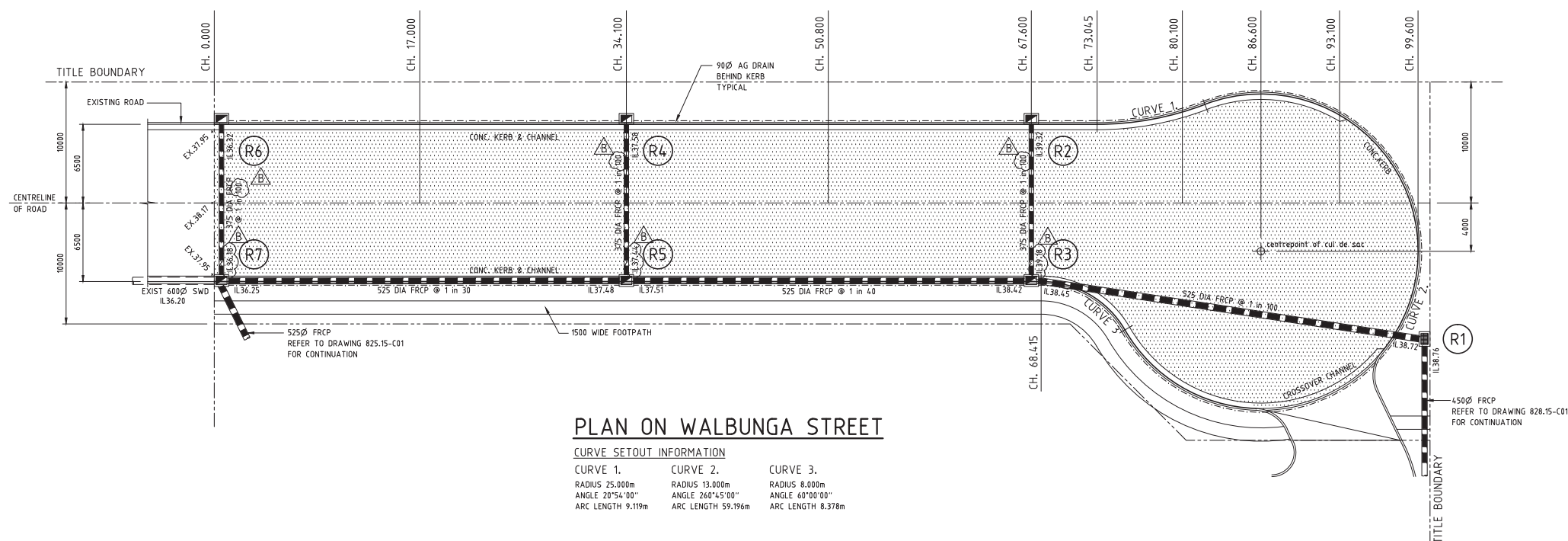
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Drawing No 828.15 - C01

Revision C



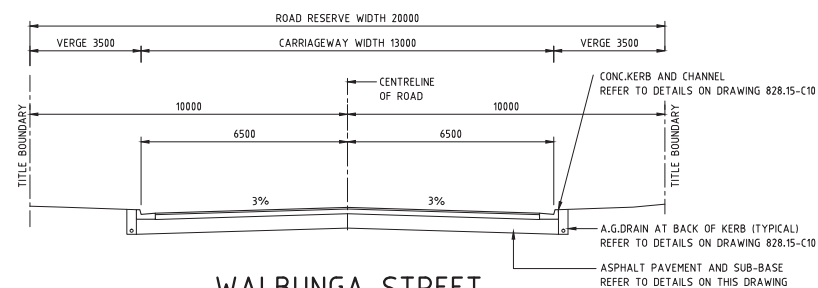
LONGITUDINAL SECTION



PLAN ON WALBUNGA STREET

CURVE SETOUT INFORMATION

CURVE 1.	CURVE 2.	CURVE 3.
RADIUS 25.000m	RADIUS 13.000m	RADIUS 8.000m
ANGLE 20°54'00"	ANGLE 260°45'00"	ANGLE 60°00'00"
ARC LENGTH 9.119m	ARC LENGTH 59.196m	ARC LENGTH 8.378m



WALBUNGA STREET

TYPICAL ROAD CROSS SECTION

CHAINAGE 0.000 TO CHAINAGE 68.415

SCALE 1:100

PIT SCHEDULE		NOTE: PROVIDE STEP IRONS FOR ALL PITS OVER 900mm DEEP.				
MARK	TYPE	SIZE	COVER TYPE	TOP OF PIT	DEPTH OF PIT	REMARKS
R1	GP	900 x 900	GALV STEEL GRATE CLASS C	42.60	3880	-
R2	SEP	900 x 680	GALV STEEL GRATE REFER DETAIL	41.48	2160	-
R3	SEP	900 x 680	GALV STEEL GRATE REFER DETAIL	41.48	3060	-
R4	SEP	900 x 680	GALV STEEL GRATE REFER DETAIL	39.84	2260	-
R5	SEP	900 x 680	GALV STEEL GRATE REFER DETAIL	39.84	2360	-
R6	SEP	900 x 680	GALV STEEL GRATE REFER DETAIL	37.95	1630	-
R7	SEP	900 x 750	GALV STEEL GRATE REFER DETAIL	37.95	1750	-

NOTE:
ALL FRCP/RCP SHALL BE CLASS 2 (UNO) WITH RUBBER RING JOINTS (RRJ)
ALL UPVC PIPES SHALL BE CLASS SN8 (UNO)



Amendments			
Rev	By	Date	Description
P1	A.B.	18.07.16	ISSUED FOR INFORMATION
P2	A.B.	03.08.16	ISSUED FOR CERTIFICATION
P3	A.B.	04.07.17	DIMENSIONS ADDED
A	A.B.	18.08.17	ISSUED FOR CONSTRUCTION
B	A.B.	22.12.17	ISSUED FOR CONSTRUCTION

LEGEND :

300 DIA FRCP
@ 1 m 150

NEW FIBRE REINFORCED CONCRETE PIPE
RCP FOR REINFORCED CONCRETE PIPE

90 DIA AG DRAIN
BEHIND ALL KERBS TYPICAL

EXIST EXIST REINFORCED CONCRETE PIPE

NEW SIDE ENTRY PIT -
REFER DRG C10 FOR DETAIL

NEW GRATED PIT -
REFER DRG C10 FOR DETAIL

NEW JUNCTION PIT -
REFER DRG C10 FOR DETAIL

EXIST STORMWATER PIT

NEW CONCRETE KERB & CHANNEL -
REFER DRG C10 FOR DETAIL

NEW CONCRETE KERB -
REFER DRG C10 FOR DETAIL

NEW FINISHED PAVEMENT LEVELS

BITUMEN ROAD PAVEMENT
REFER THIS DRG FOR DETAILS

FOR GENERAL, CONCRETE & ALL OTHER
RELEVANT NOTES REFER TO DRG S01



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Established 1955

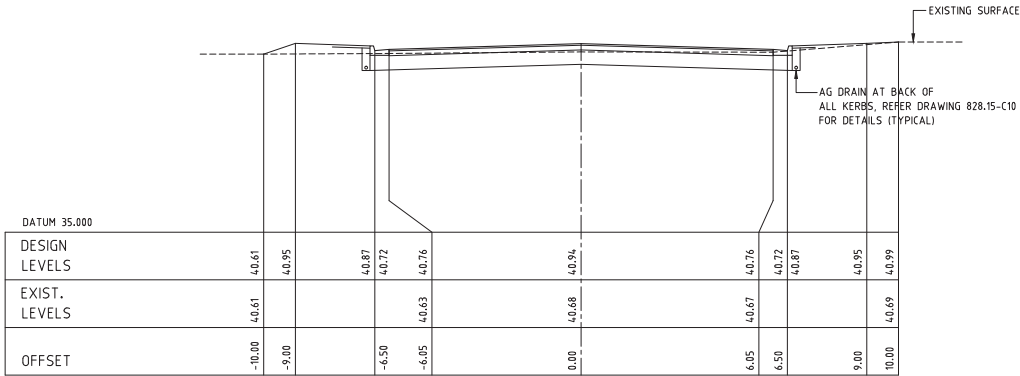
Melbourne	Sydney
880 Lorimer Street	8A Commercial Road
Port Melbourne VIC 3207	Kingsgrove NSW 2206
PO Box 320 Port Melbourne	PO Box 451 Kingsgrove
VIC 3207	NSW 2206
T 03 9362 4513	T 02 9502 4544
F 03 9362 5674	F 02 9502 4463

Project Title
WAREHOUSE AND OFFICE
DEVELOPMENT
KURRAJONG ROAD
PRESTONS, NSW
FOR : IFC GLOBAL

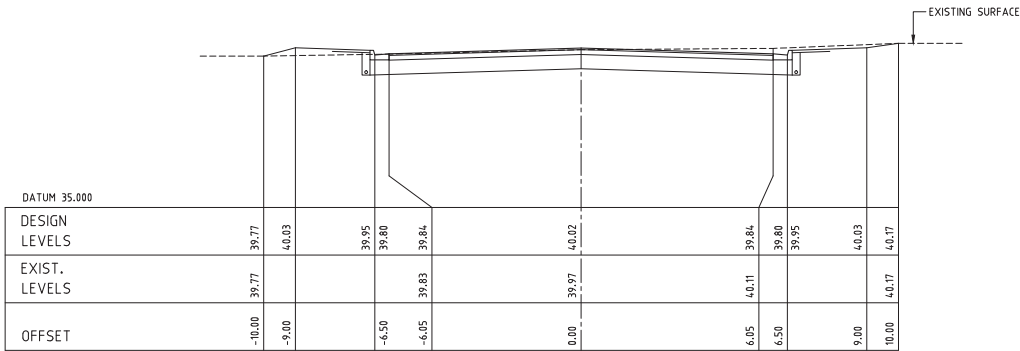
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WALBUNGA STREET - PLAN
AND LONGITUDINAL SECTION

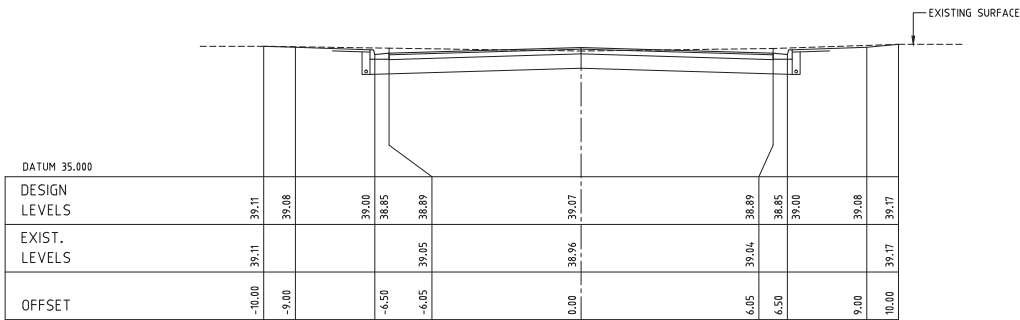
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Drawing No			Revision	
828.15-C08			B	



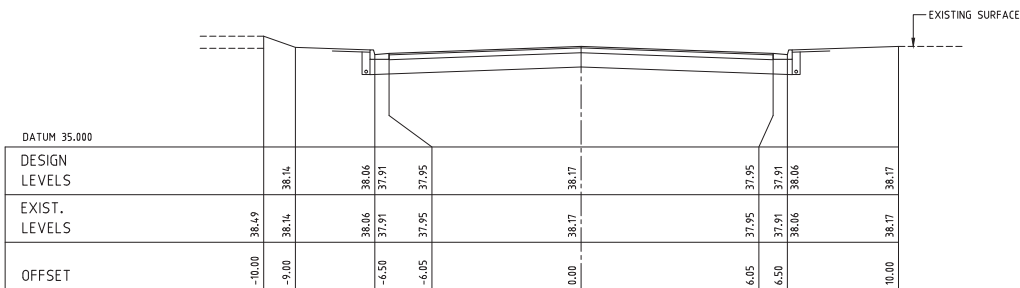
CH. 50.800



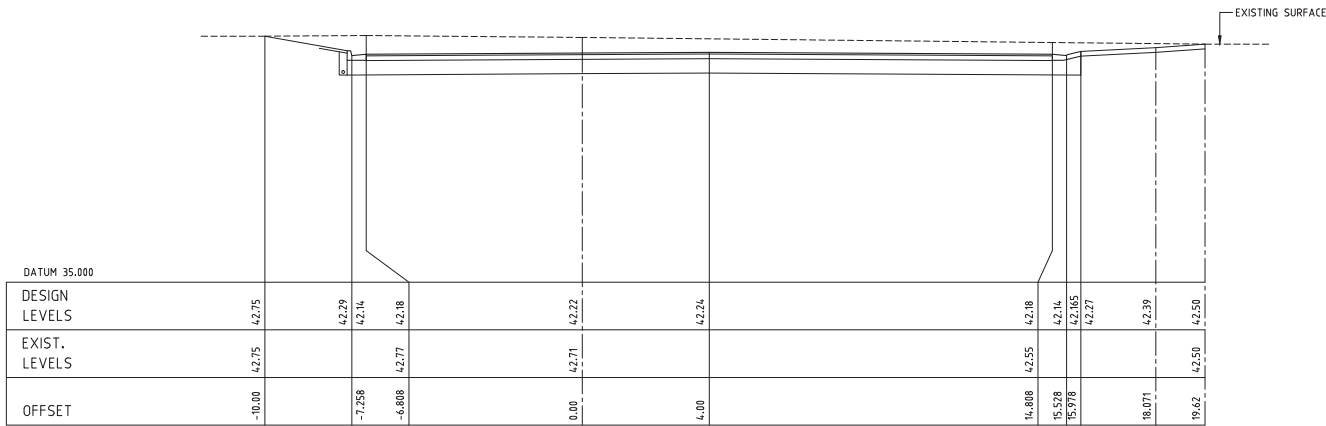
CH. 34.100



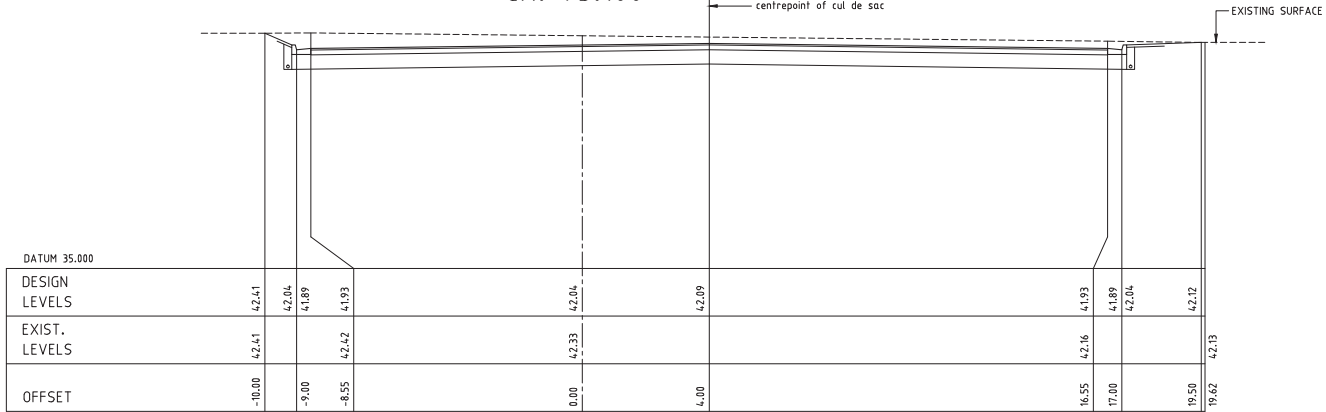
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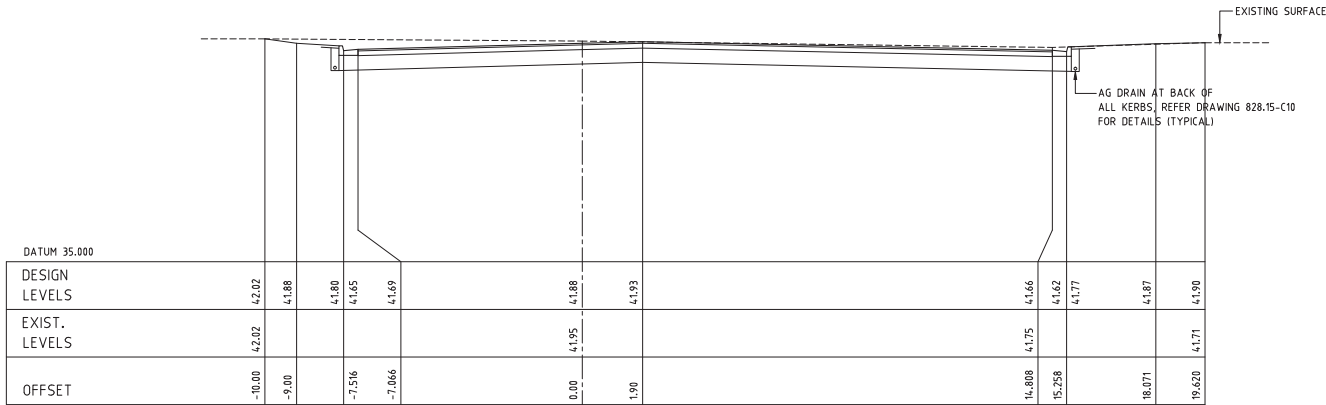
CH. 00.000
(MATCH EXISTING ROAD PROFILE)



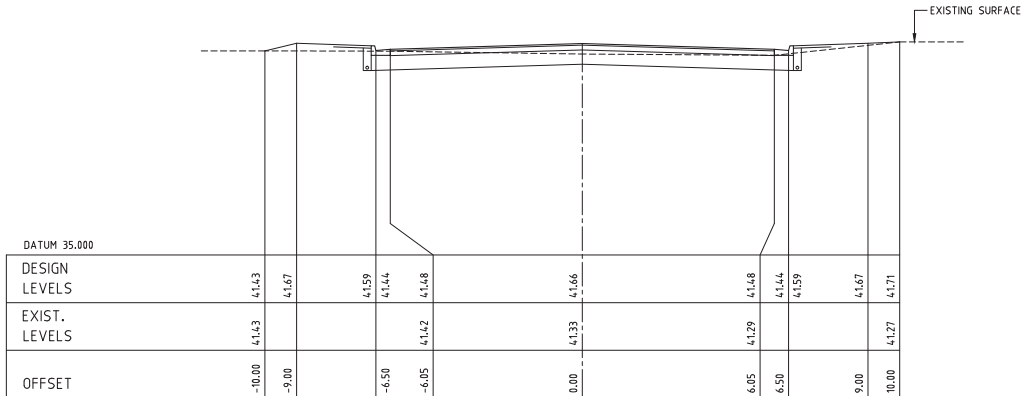
CH. 93.100



CH. 86.600



CH. 80.100



CH. 67.600



Amendments			
Rev	By	Date	Description
P1	A.B.	18.07.16	ISSUED FOR INFORMATION
P2	A.B.	03.08.16	ISSUED FOR CERTIFICATION
A	A.B.	18.08.17	ISSUED FOR CONSTRUCTION

FOR GENERAL, CONCRETE & ALL OTHER
RELEVANT NOTES REFER TO DRG S01

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JOB No. : 15/166

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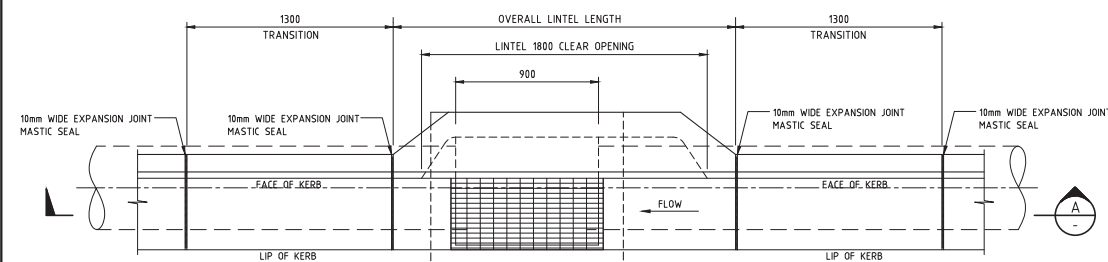
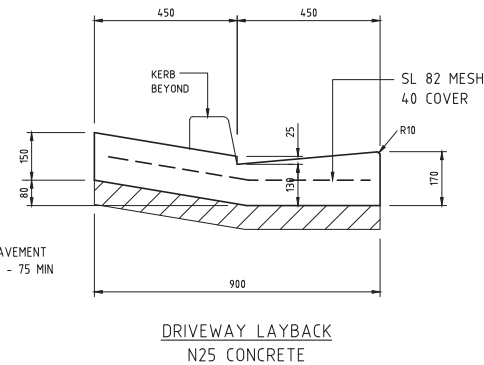
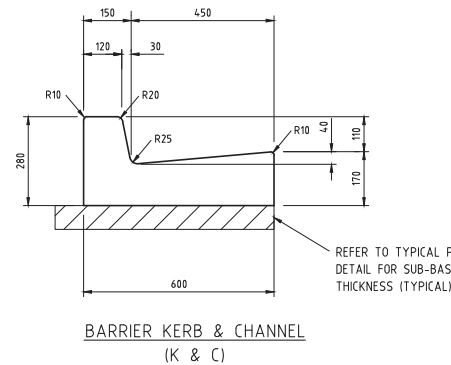
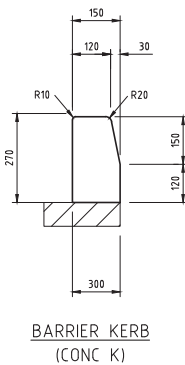
Project Title
**WAREHOUSE AND OFFICE
DEVELOPMENT
KURRAJONG ROAD
PRESTONS, NSW
FOR : IFC GLOBAL**

Drawing Title
**WALBUNGA STREET
CROSS SECTIONS**

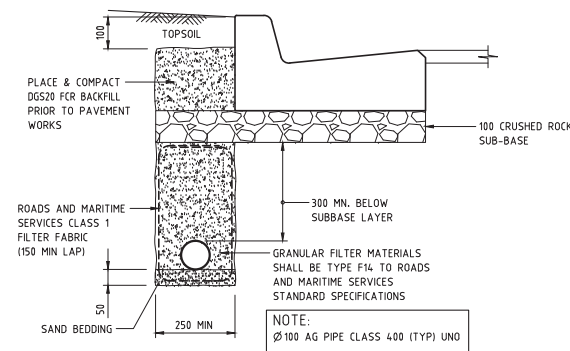
North	Drawn K.B.	Approved J.McG
Date	JUL '16	
Scale	1:100 @ B1	
Project No	828.15	
Drawing No	828.15-C09	Revision A



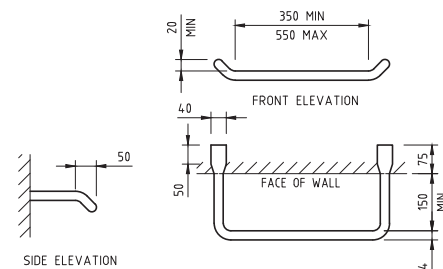
1. WIDTH OF TRENCH SHALL BE SUFFICIENT TO ALLOW THE ACHIEVEMENT OF THE REQUIRED COMPACTION.
2. ALL TRENCHES SHALL COMPLY WITH THE 'CODE OF PRACTICE FOR SAFETY PRECAUTIONS IN TRENCHING OPERATIONS' (OH&S ACT) AND IN PARTICULAR ALL TRENCHES GREATER THAN 1500 DEEP SHALL COMPLY WITH THE MINES ACT.
3. ALL SERVICE TRENCHES THAT PASS FROM EXTERNAL AREAS TO AREAS UNDER BUILDING SLABS SHALL BE "PLUGGED" BY IMPERVIOUS BACKFILL TO MINIMIZE MIGRATION OF MOISTURE.



REFER TO LIVERPOOL CITY COUNCIL
GRATED GULLY PIT WITH EXTENDED KERB INLET - STANDARD DRAWING D8
FOR ALL PIT DETAILS



LOCATE SUB SOIL DRAINS TYPICALLY AT BACK OF ALL
EXTERNAL KERB & CHANNELS AND KERBS AND ABUTTING
ALL LANDSCAPE AREAS. PROVIDE INSPECTION OPENING/
FLUSHING POINTS @ 40m. MAX. SPACING (TYPICAL)



1. STEP IRON MATERIAL : 24mm DIAMETER GRADE 250 STEEL TO AS 3679 (HOT DIPPED GALVANISED) OR APPROVED EQUIVALENT
2. MAX VERTICAL RISE OF 6m.
3. HARNESS BASED FALL ARREST SYSTEM SHALL BE USED FOR VERTICAL RISE GREATER THAN 3.5m
4. RUNGS SHALL BE SPACED AS PER AS 1657
5. RUNGS TO BE PLACED ON A WALL CLEAR OF FLOW WHERE POSSIBLE

FOR GENERAL, CONCRETE & ALL OTHER
RELEVANT NOTES REFER TO DRG S01

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Drawing No	Revision
828.15-C10	A