

CIVIL ENGINEERING REPORT FOR S75W AMENDMENT TO AN APPROVED DEVELOPMENT

PROPOSED EXPANSION OF COLES CHILLED DISTRIBUTION CENTRE CAPICURE DRIVE, M7 BUSINESS HUB EASTERN CREEK NSW

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1 INTRODUCTION

1.1 Background

Goodman propose to expand the warehouse at the Coles Chilled Distribution Centre (CDC) on Capicure Drive, M7 business Hub, Eastern Creek, NSW

Works involve construction of a large single level warehouse with ancillary offices, truck circulation and loading areas and associated parking.

The Coles CDC is subject to a development approval, MP 06_0164 dated 12 July 2012, under Part 3A of the NSW *Environmental Planning and Assessment Act 1979*.

1.2 Scope

Costin Roe Consulting Pty Ltd has been commissioned by Goodman care of McKenzie Group to prepare this Engineering Report in support of the proposed application for S75w Amendment to Approved Development MP 06_0164 for 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 Control.

The engineering objectives for the development are to integrate the existing development with the proposed expansion, based on the proposed architectural layout, which responds to the topography and site constraints and to provide an appropriate and economical stormwater management system. The stormwater management for the site is to incorporate best practice in water sensitive urban design and is consistent with the requirements of council's water quality objectives.

A set of drawings have been prepared to show the proposed finished levels, retaining walls, stormwater drainage layout, water quantity and water quality requirements for the development. These drawings are conceptual only and subject to change during detail design.

1.3 Authority Jurisdiction

The consent authority is The NSW Department of Planning and Infrastructure as the proposal is an amendment to a Major Project Approval. However as the subject site is located within Blacktown City Council area, the requirements of Blacktown City Council (BCC) also apply.

1.4 Proposed Development

The proposed development is for the expansion of the southern end of the existing single level warehouse distribution facility for Coles. The development will include ancillary office space and truck loading/ circulation areas.

2 SITE CHARACTERISTICS

2.1 Location

The proposed development is located in the suburb of Eastern Creek within the M7 Business Hub on Capicure Drive as shown in Figure 2.1.

The site is bounded by an existing industrial development to the east, Lenore Lane to the south, industrial land to the west and residential development to the north.

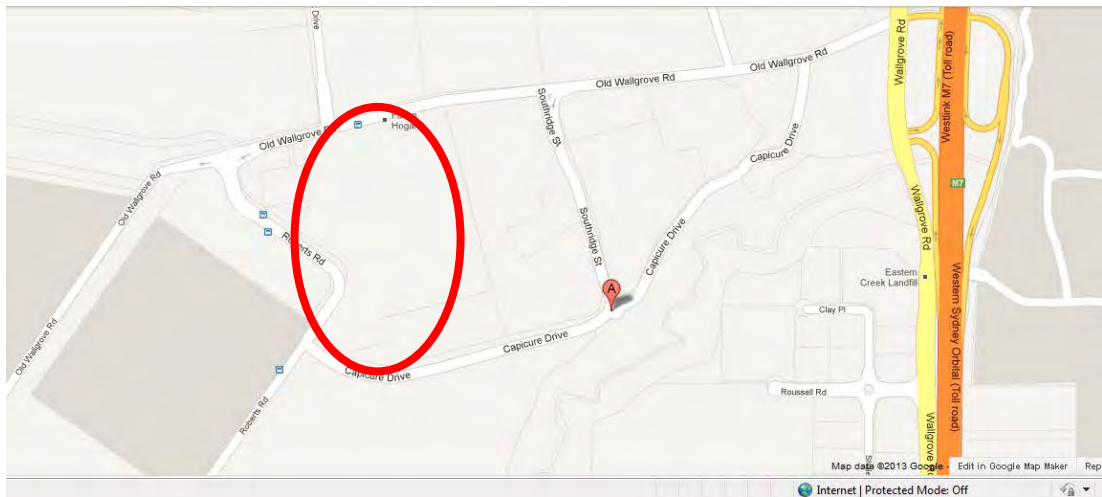


Figure 2.1. Locality Map

2.2 Topography & Description

The proposed expansion site comprises undeveloped industrial land. The expansion site has an area of 2.5 Ha and the total Coles CDC development area is approximately 14.0 Ha.

The site's natural gradient drops 8.5m from the high point in the north-west corner to the low point at the south-east corner. A large open drain is present on the site which drains to the existing facility along the northern portion of the expansion site to the south-east corner of the site. Batter work is also present on the eastern boundary which is related to the recent Reedy Creek Unit development. A number of localised depressions and stockpiles are also present on the site. The highest elevation is approximately RL 72.5m (AHD) and the lowest at RL 64.0m.

2.3 Existing Stormwater Drainage

Existing formalised drainage on the expansion site is limited and is generally confined to the large open drain which is present on the northern and eastern boundaries of the site and discharging into the estate drainage infrastructure at the south-east corner of the site.

The open drain conveys stormwater from the existing Coles CDC. A total of five reinforced concrete pipes of diameter 600mm to 900mm discharge stormwater from the existing facility into the open drain. Upon site discharge, stormwater flows are conveyed via the estate drainage infrastructure to the estate on-site detention/

bioretention system on the southern side of Capicure Drive and ultimate discharge to Reedy Creek.

2.4 Proposed Stormwater Drainage System

As per general engineering practice and the guidelines of BCC, 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.

The minor system is to consist of a piped drainage system which has been designed to accommodate the 1 in 20-year ARI storm event (Q20). This results in the piped system being able to convey all stormwater runoff up to and including the Q20 event. The major system through new paved areas has been designed to cater for storms up to and including the 1 in 100-year ARI storm event (Q100). The major system employs the use of defined overland flow paths 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 BCC and accepted engineering practice. Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage. Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication “Australian Rainfall and Runoff” (1988 Edition), Volumes 1 and 2 (AR&R).

Water quality and re-use are to be considered in the design, throughout new paved areas, to ensure that any increase in the detrimental effects of pollution are mitigated, BCC Water Quality Objectives are met and that the demand on potable water resources is reduced by 80%.

Plans of the proposed stormwater drainage layout can be found on drawings **Co8487.21.00-DA40 to DA42 & DA45** while the proposed finished levels plans are shown on drawing DA51 and DA52. A full set of the proposed civil engineering plans are located in **Appendix A**.

The design for the expansion will include the extension and conveyance of the five stormwater lines from the existing Coles CDC development through the expansion site to the estate infrastructure in Capicure Drive.

3 SITE WORKS

3.1 Bulk Earthworks

Bulk earthworks will be performed to facilitate the construction of the warehouse expansion. The objective for the site is to perform site filling to facilitate extension of the existing facility at the current level.

Detailed earthworks are not included as part of this application however the existing building levels and architectural layout for the expansion will require extensive filling of the site. The proposed pad level for the building will be up to 8m above existing surface levels and it is expected that fill volumes of 42,000m³ will be required for the site. Of this 42,000m³ of fill, approximately 8000m³ will comprise high quality

Soil Erosion and Sediment Control measures including sedimentation basins will also be provided for the development – please refer to the Soil and Water Management Plan in Section 5 of this report.

3.2 Embankment Stability

To assist in maintaining embankment stability permanent batters 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 5.

3.3 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.

3.4 Retaining Walls

Retaining will be required on the southern and eastern boundaries of the site at heights up to 8m. The proposed wall system will be segmental concrete block faced and reinforced earth retaining walls. In accordance with Blacktown City Council policy, the walls will be tiered at 3m maximum height intervals with 1.5m setbacks between tiers.

Refer to drawings **Co8487.21-DA51 & DA52** for location of walls and **DA65** for typical wall details.

4 STORMWATER HYDROLOGICAL MODELLING AND ANALYSIS

4.1 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, Penrith 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.

4.2 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.

4.3 Rainfall Data

Rainfall intensity Frequency Duration (IFD) data used as a basis for ILSAX modelling for the 2 to 100 Year ARI events, was taken from BCC Engineering Guide for Development 2005.

4.4 Runoff Models

Calculation of the runoff from storms of the design ARI will be calculated with the catchment modelling software DRAINS.

The design parameters for the ILSAX model are to be based on typical values 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	0.5	
	On Grade Pit Blocking Factor	0.2	
	Minor Storm Pit Freeboard	150	mm

Table 4.1: DRAINS ILSAX Parameters

4.5 Hydraulics

4.5.1 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.

4.5.2 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 level, for the peak runoff from the Minor System runoff. Where the pipes and junctions are sealed, this freeboard would not be required.

4.5.3 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.

4.5.4 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).

4.5.5 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 basin adjacent to Lenore Lane and trunk drainage system.

4.6 **External Catchments and Flooding**

There are no external catchments being directed through the development site. For this reason, only flows from the development site have been considered in the sizing of the stormwater system for the development. We note that the extension of the stormwater pipes from the existing facility are incorporated in the stormwater design for the development.

5 WATER QUANTITY MANAGEMENT

5.1 General Design Principles

Blacktown City Council (in common with many other local authorities) adopts the principles of Water Quantity Management, also known as “On-site Detention (OSD)”, to ensure the cumulative effect of development does not have a detrimental effect on the existing stormwater infrastructure and watercourses located within their LGA downstream from the particular site.

5.2 Estate and Site Water Quantity

As part of the M7 Business Hub Estate infrastructure works, estate level detention system has been provided which will attenuate stormwater flows for various storm durations for Q2 year ARI to Q100 year ARI events for the pre-existing (natural) case and for the operational phase of the development.

Due to the provision of the estate level detention system, no site detention is required for individual sites and as such none is proposed for this development.

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 Blacktown City Council.

BCC have nominated, in Part R of their *DCP 2006*, 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	85%
Total Phosphorus	65%
Total Nitrogen	45%
Total Hydrocarbons	90%

6.2 Proposed Stormwater Treatment System

Roof, hardstand, car parking, roads and other extensive paved 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 as per the Part R of BCC DCP2006 and as discussed in the NSW EPA document *Managing Urban Stormwater: Treatment Techniques* to ensure that all of the objectives above are met.

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

- Primary treatment of the new hardstand areas is to be performed via the provision of Stormwater 360 Enviropod Inserts to all surface stormwater inlet pits. The Enviropod inserts will capture gross pollutants, coarse and fine sediments and some nutrients. This will help to ensure early onset sedimentation to bioretention systems are avoided; and
- Generally there will be no treatment to roof water prior to discharge into the estate drainage system. A catchment of 2550sqm will be diverted to a rainwater storage tank for rainwater reuse (irrigation and toilet flushing) which will provide some tertiary treatment for this component of the new roof catchment.
- Tertiary treatment to the entire (existing facility and expansion development) will be made via the 13500m² estate bio-retention basin. The estate bio-retention treats a total catchment of 62.2Ha of which the 14Ha Coles CDC property comprises approximately 22.5%. For the purpose of the MUSIC modelling (discussed in following sections) a 22.5% proportion of the estate bioretention basin has been attributed to treating the Toll property and has been modelled as such.

6.3 Stormwater Quality Modelling

6.3.1 Introduction

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

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

The pollutant retention criteria set out in Part R of BCC's DCP2006 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 "8487.21 CDC Exp *Rev1.sqz*" was set up to examine the effectiveness of the water quality treatment train and to predict if BCC requirements have been achieved. The layout of the MUSIC model is presented in Appendix B.

The MUSIC model incorporates the entire 14Ha site.

6.3.2 Rainfall Data

Six minute pluviographic data for the nearby Liverpool (Whitlam) weather station was sourced from the Bureau of Meteorology (BOM) as nominated below. Evapotranspiration 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 based on parameters adopted by the adjacent LGA Blacktown City Council land use parameters 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	-1.11	0.48	0.14	0.12
Stormflow	Roof	1.30	0.32	-0.89	0.25	0.30	0.19
	Roads	2.43	0.32	-0.30	0.25	0.34	0.19

Table 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 **Co8487.21-DA40**.

6.3.5 Treatment Nodes

A number of treatment nodes have been used in the modelling of the development. These include bioretention, rainwater tank and Stormwater 360 Enviropod nodes have been used in the modelling of the development.

The model has been set up such that there are no internal treatment nodes applied to the existing component of the CDC facility. Enviropod Inserts have been applied to the new paved areas only.

The whole of the 14Ha site is treated via the estate bioretention basin.

Treatment nodes are based on the following parameters:

Estate Bioretention (22.5% of total)

Parameter	Value
<u>Storage Properties</u>	
Extended Detention Depth	400 mm
Storage Surface Area	4220 m ²
<u>Filter and Media Properties</u>	
Filtration Area	3035 m ²
Saturated Hydraulic Conductivity	125 mm/hr
Filter Depth	400 mm

Stormwater 360 Series 200 Enviropod Inserts (Stand Alone Use)

Parameter	Value
Treatable Flow	0.020m ³ /s per insert
<u>Pollutant Reductions</u>	
TSS	54%
TP	30%
TN	13%
GP's	100%

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
Flow (ML/yr)	95.2	87.9	7.7
Total Suspended Solids (kg/yr)	22300	976	95.6
Total Phosphorus (kg/yr)	40.8	6.61	83.8
Total Nitrogen (kg/yr)	222	111	49.9
Gross Pollutants (kg/yr)	2520	0.00	100.0

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 R of BCC's DCP 2006 on an overall catchment basis.

6.3.7 Modelling Discussion

MUSIC modelling has been performed to assess the effectiveness of the selected treatment train and to ensure that the pollutant retention requirements of Part R of BCC's DCP2006 have been met.

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

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

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

6.4 **Stormwater Harvesting**

6.4.1 Introduction

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.

For the purposes of this development, we refer to a rainwater harvesting system, where benefits of collected stormwater from roof areas over a stormwater harvesting system can be made as rainwater is generally less polluted than stormwater drainage.

Rainwater harvesting is proposed for this development with re-use for non-potable applications. Internal uses include such applications as toilet flushing while external applications will be used for irrigation. The aim is to reduce the water demand for the development by 80% and to satisfy the requirements of Part R of BCC DCP2006.

In general terms the rainwater harvesting system will be 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.

Rainwater tanks have been sized with reference to the NSW Department of Environment and Conservation document *Managing Urban Stormwater: Harvesting and Reuse*, and the BBC preferred method of utilising the MUSIC model to analyse and balance the supply and demand, based on the below base water demands and roof catchment discharging to the re-use tank.

6.4.2 Internal Base Water Demand

Indoor water demand has been based on each employee using 15 litres of potable water per day for toilet flushing which is typical of an office environment which uses energy efficient flushing devices. As the proposed building populations are not currently known these have been based on 1 person every 350m² for warehouse areas and 1 person every 30m² for office areas.

These rates give the following internal non-potable demand:

Proposed Development 45 People 0.9 kL/day

6.4.3 External Base Water Demand

External water consumption within each landscaping system varies depending upon the nature of the irrigation system, species of planting, and the prevailing climate. For this development, the base case outdoor potable water demand has been modelled using a simple rainwater balance. The proposed irrigation system will be a drip fed system with application rates averaging 10 l/m² (i.e. 10 mm/m²). For the purposes of our analysis the average of this application rate has been used, in conjunction with the application regime shown in Table 6.3, to determine the monthly and total yearly demand.

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

Table 6.3. External Irrigation Application Schedule

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

Proposed Development Area= 725m² 730 kL/year

6.4.4 Rainwater Tank Sizing

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

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

Tank	Roof Catchment to Rainwater Tank (m ²)	Tank Size (kL)	Predicted Demand Reduction (%)
	2550	90	80

Table 6.4. Rainwater Reuse Requirements

The water balance calculation, results summarised in Table 6.4, predicts that the requirements of Part R of BCC DCP2006 for an 80% reduction in non-potable water demand will be met for the development with the provision a 90kL.

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 5.5** below) to assist in the effective operation and maintenance of the various water quality components.

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

Table 5.5. Indicative Maintenance Schedule

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
SWALES/ LANDSCAPED AREAS			
Check density of vegetation and ensure minimum height of 150mm is maintained. Check for any evidence of weed infestation	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Inspect swale for excessive litter and sediment build up	Six monthly	Maintenance Contractor	Remove sediment and litter and dispose in accordance with local authorities' requirements.
Check for any evidence of channelisation and erosion	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed swale profile is maintained
Weed Infestation	Three Monthly	Maintenance Contractor	Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required.
Inspect swale surface for erosion	Six Monthly	Maintenance Contractor	Replace top soil in eroded area and cover and secure with biodegradable fabric. Cut hole in fabric and revegetate.
RAINWATER TANK			
Check for any clogging and blockage of the first flush device	Monthly	Maintenance Contractor	First flush device to be cleaned out
Check for any clogging and blockage of the tank inlet - leaf/litter screen	Six monthly	Maintenance Contractor	Leaves and debris to be removed from the inlet leaf/litter screen
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

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
			hydraulic consultant
INLET & JUNCTION PITS			
Inside Pit	Six Monthly	Maintenance Contractor	Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.
Outside of Pit	Four Monthly/ After Major Storm	Maintenance Contractor	Clean grate of collected sediment, debris, litter and vegetation.
STORMWATER SYSTEM			
General Inspection of complete stormwater drainage system	Bi-annually	Maintenance Contractor	Inspect all drainage structures noting any dilapidation in structures and carry out required repairs.
ENVIROPOD PIT INSERTS			
Refer to manufacturers O&M manual.	As per manufacturers O&M Manual and minimum of six monthly/ after major storm	Maintenance Contractor/ Owner	Refer to manufacturers O&M manual.

7 EROSION & SEDIMENT CONTROL PLAN

An erosion and sediment control plan (ESCP) is shown on drawings **Co8487.21-DA20** and **DA25**. These are conceptual plans only providing sufficient detail to clearly show that the works can proceed without undue pollution to receiving waters. A detailed plan will be prepared once consent is given and before works start.

7.1 General Conditions

1. The ESCP will be read in conjunction with the engineering plans, and any other plans or written instructions that may be issued 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 specification and constructed following the guidelines stated in Managing Urban Stormwater, Soils and Construction (1998) and BCC specifications.
3. All subcontractors will be informed of their responsibilities in minimising the potential for soil erosion and pollution to down slope areas.

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 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.
Access areas	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones onsite. They can vary in position so as to best conserve existing vegetation and protect downstream areas while being considerate of the needs of efficient works activities. All site workers will clearly recognise these boundaries.
Remaining lands	Entry prohibited except for essential management works	

Table 1 Limitations to access

7.3 Erosion Control Conditions

1. Clearly visible barrier fencing shall be installed as shown on the plan 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 remain on the surface at the completion of works.
3. Where practicable, schedule the construction program so that the time from starting land disturbance to stabilisation has a duration of less than six months.
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 meters
 - 2.5H:1V where slope length is between 7 and 10 meters
 - 3H:1V where slope length is between 10 and 12 meters
 - 4H:1V where slope length is between 12 and 18 meters
 - 5H:1V where slope length is between 18 and 27 meters
 - 6H:1V where slope length is greater than 27 meters
8. All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event.
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 meters 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 meters, a storage depth (including both settling and settled zones) of at least 0.6 meters, and internal dimensions that provide maximum surface area for settling, and
 - c) Provide a return of 1 meter 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 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 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 will be provided at least weekly.

7.6 Site Inspection and Maintenance

1. A self-auditing program will be established based on a Check Sheet. A site inspection using the Check Sheet will be made by the site manager:
 - At least weekly.
 - Immediately before site closure.
 - 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

- Forwarding a signed duplicate of the completed Check Sheet to the project manager/developer for their information
2. In addition, a suitably qualified person 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. The responsible person will ensure that:
 - The plan is being implemented correctly
 - Repairs are undertaken as required
 - Essential modifications are made to the plan if and when necessary

The report shall carry 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 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 or installing additional diversion upslope.
 - 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 meters from hazard areas will be removed. Such hazard areas include and 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 or less 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 stabilised
12. Litter, debris and sediment will be removed from the gross pollutant traps and trash racks as required.

8 CONCLUSION

This Civil Engineering Details Report has been prepared to support the application for a S75w amendment to the previously approved Part 3A Development 06_0164 for expansion of the Coles Chilled Distribution Centre.

A civil engineering strategy for the site has been developed which provides a best fit solution within the constraints of the existing landform and proposed architectural layout. Within this strategy a stormwater quantity and quality management strategy has been developed to reduce both peaks flows and pollutant loads in stormwater leaving this site. The stormwater management for the development has been designed in accordance with Blacktown City Councils *Part R of DCP2006*.

During the construction phase, a Sediment and Erosion Control Plan will be in place which ensures 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 of the pit inserts and an estate level bioretention basin system is proposed to mitigate the likely increase in stormwater pollutant load generated by the development. MUSIC modelling results indicate that the proposed stormwater management measures are effective in reducing pollutant loads in stormwater discharging from the site and meet the requirements of council pollutant based reductions. 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 that the management strategies mentioned in this report be incorporated into the future detailed design. Detailed design may result in changes to the concept however design criteria will be followed.

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);
- Blacktown City Council – DCP 2006 (Part R); and
- Water Sensitive Urban Design – “Technical Guidelines for Western Sydney” by URS Australia Pty Ltd, May 2004

Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

PROPOSED COLES CDC EXPANSION

M7 BUSINESS HUB, WALLGROVE ROAD

MINCHUNBURY, NSW

DRAWING LIST

Co8487.21-DA10	DRAWING LIST & GENERAL NOTES
Co8487.21-DA15	SITE MASTERPLAN
Co8487.21-DA20	EROSION & SEDIMENT CONTROL PLAN & DETAILS
Co8487.21-DA40	CONCEPT STORMWATER CATCHMENT PLAN
Co8487.21-DA41	CONCEPT STORMWATER PLAN - SHEET 1
Co8487.21-DA42	CONCEPT STORMWATER PLAN - SHEET 2
Co8487.21-DA45	CONCEPT STORMWATER DETAILS
Co8487.21-DA51	FINISHED LEVELS PLAN - SHEET 1
Co8487.21-DA52	FINISHED LEVELS PLAN - SHEET 2
Co8487.21-DA65	RETAINING WALL DETAILS

GENERAL NOTES

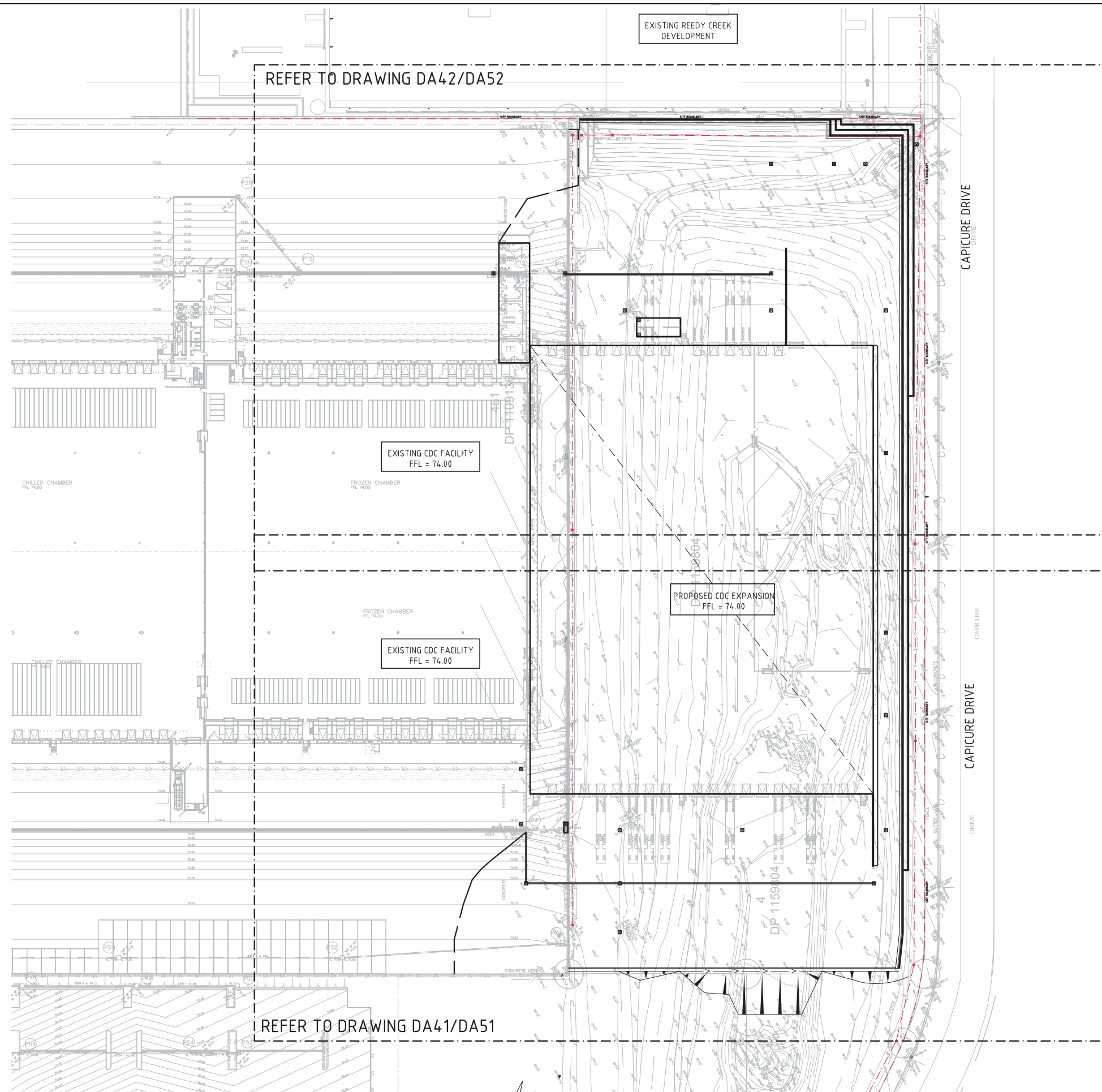
- G1 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
- 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.
- G4 UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETERS.
- G5 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.



LOCALITY PLAN
N.T.S.

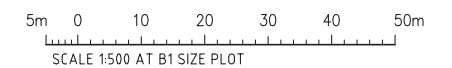
FOR DEVELOPMENT APPLICATION

FOR DEVELOPMENT APPLICATION			ARCHITECT			CLIENT			PROJECT			Costin Roe Consulting Pty Ltd.			Costin Roe Consulting			DRAWING TITLE		
PRELIMINARY - FOR INFORMATION			SBA ARCHITECTS			Goodman			PROPOSED COLES CDC EXPANSION			Consulting Engineers			Value in Engineering and Management			DRAWING LIST AND GENERAL NOTES		
AMENDMENTS			08.02.13 B			LEVEL 10, 60 Castlereagh Street SYDNEY NSW, 2000, Australia			M7 BUSINESS HUB WALLGROVE ROAD, MINCHUNBURY, NSW			Level 1, 8 Windmill Street Walsh Bay, Sydney NSW 2000								
			22.01.13 A			Tel: (02) 9230 7400 Fax: (02) 9230 7444			DESIGNED M.W.			Tel: (02) 9230 7400 Fax: (02) 9230 7444								
			DATE			T: 02 9230 7400 F: 02 9230 7444 E: info@sbarchitects.com.au W: www.sbarchitects.com.au			DATE			M.C.								
			AMENDMENTS						CHECKED			CAD REF: Co8487.21-DA10						DRAWING No		
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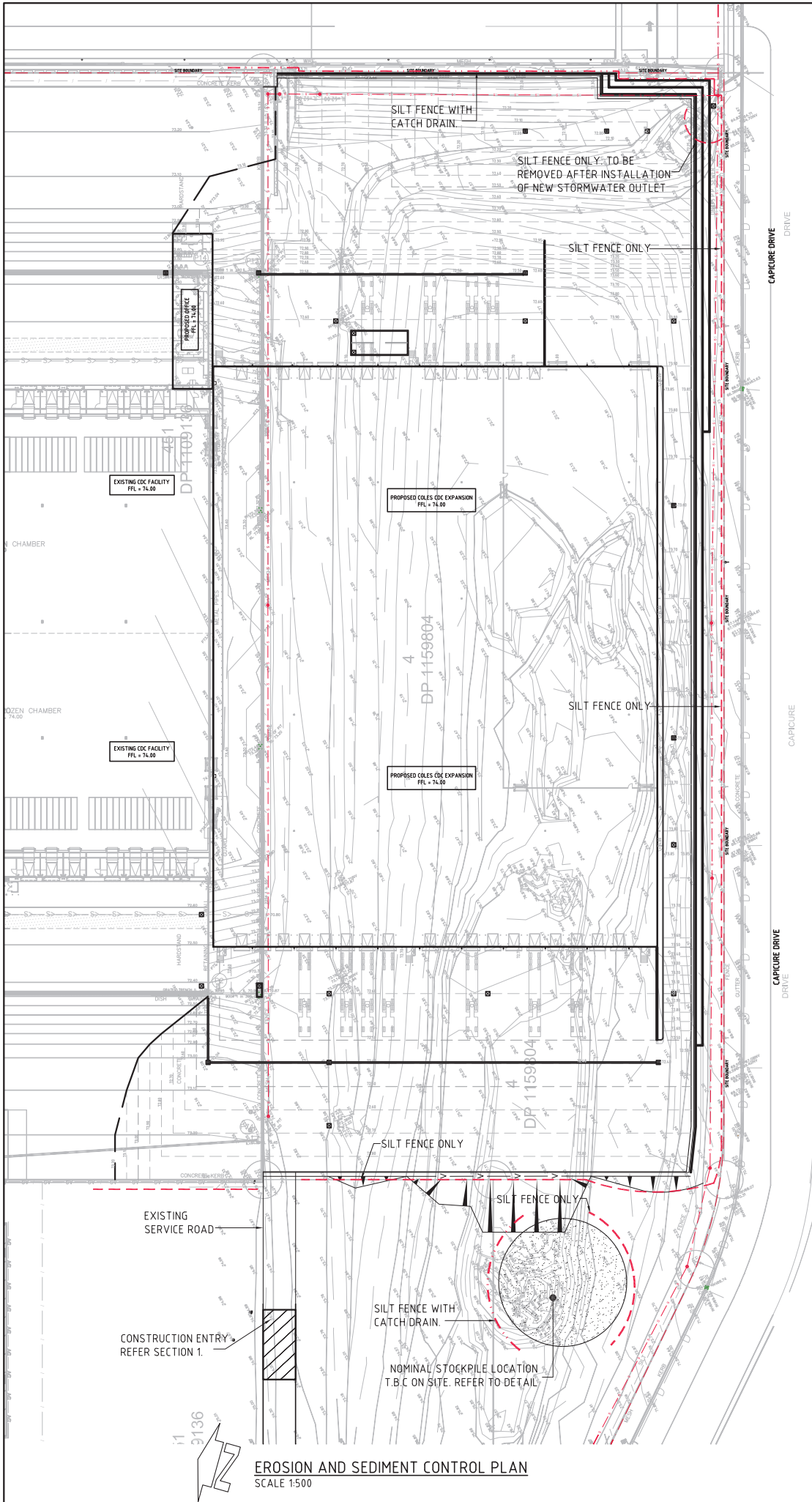


SITE MASTER PLAN
SCALE 1:500

FOR DEVELOPMENT APPLICATION



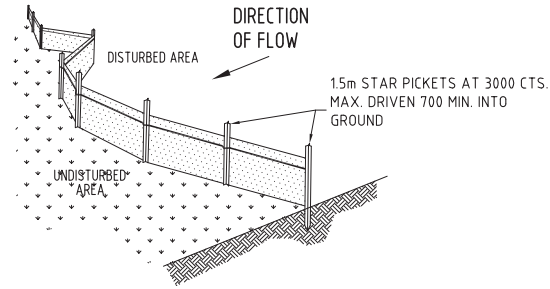
										 Commercial Residential Healthcare Retail Precinct Design Suite 101, 83 Mount Street, North Sydney NSW 2060 Tel: (02) 9230 7400 Fax: (02) 9230 7444 info@sbaarchitects.com.au www.sbaarchitects.com.au										 LEVEL 10, 60 Castlereagh Street SYDNEY NSW, 2000, Australia Tel: (02) 9230 7400 Fax: (02) 9230 7444										 PROJECT PROPOSED COLES CDC EXPANSION M7 BUSINESS HUB WALLGROVE ROAD, MINCHINBURY, NSW										 Level 1, 8 Windmill Street Walsh Bay, Sydney NSW 2000 Tel: (02) 8251-7699 Fax: (02) 8241-3731 email: mail@costinroe.com.au @																				DRAWING TITLE SITE MASTER PLAN									
FOR DEVELOPMENT APPLICATION 08.02.13 C										PRELIMINARY - FOR INFORMATION 06.02.13 B										PRELIMINARY - FOR INFORMATION 22.01.13 A										AMENDMENTS DATE ISSUE AMENDMENTS DATE ISSUE																														DRAWING No Co8487.21 - DA15 ISSUE									
Value in Engineering and Management																																																																					



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.

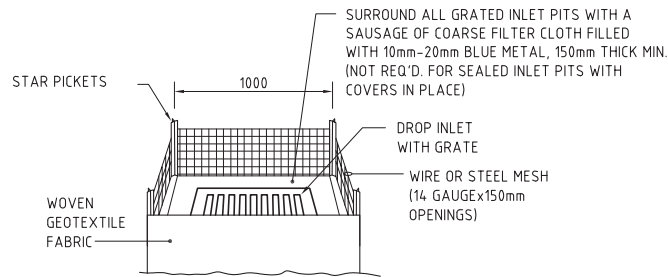
1. SILT FENCES AND SILT FENCE RETURNS SHALL BE ERECTED CONVEX TO THE CONTOUR TO POND WATER.
2. HAY BALE BARRIERS AND GEOFABRIC FENCES ARE TO BE CONSTRUCTED TO TOE OF BATTER, PRIOR TO COMMENCEMENT OF EARTHWORKS, IMMEDIATELY AFTER CLEARING OF VEGETATION AND BEFORE REMOVAL OF TOP SOIL.
3. ALL TEMPORARY 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. CLEAR 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 DAY'S EARTHWORKS. THE HEIGHT OF THE BUND SHALL BE A MINIMUM OF 200MM.
10. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND MULCHED 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 TOPSOIL STOCKPILES ARE TO BE SUITABLY COVERED TO THE SATISFACTION OF THE CONTRACT ADMINISTRATOR 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 CONTRACT ADMINISTRATOR. A 6m BUFFER ZONE SHALL EXIST BETWEEN STOCKPILE SITES AND ANY STREAM OR FLOW PATH. ALL STOCKPILES SHALL BE ADEQUATELY PROTECTED FROM EROSION AND CONTAMINATION OF THE SURROUNDING AREA BY USE OF THE MEASURES APPROVED IN THE EROSION AND SEDIMENTATION CONTROL PLAN.
15. ACCESS AND EXIT AREAS SHALL INCLUDE SHAKE-DOWN OR OTHER METHODS APPROVED BY THE CONTRACT ADMINISTRATOR FOR THE REMOVAL OF SOIL MATERIALS FROM 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 DISPERSED 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.
18. THE CONTRACTOR SHALL INCORPORATE THE MEASURES ON THIS PLAN WITHIN THE CONTRACTORS CONSTRUCTION MANAGEMENT PLAN.



TYPICAL SILT FENCE DETAIL

N.T.S.

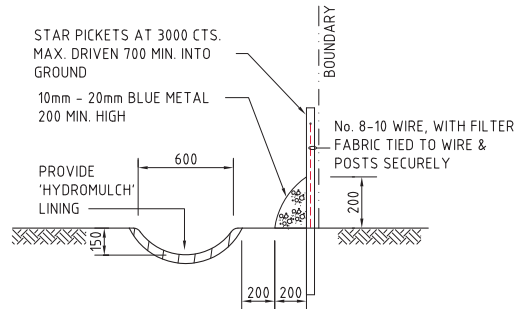
PROVIDE 1m RETURNS AT 30m INTERVALS.
TYPICAL



GRATED INLET PIT FILTER DETAIL

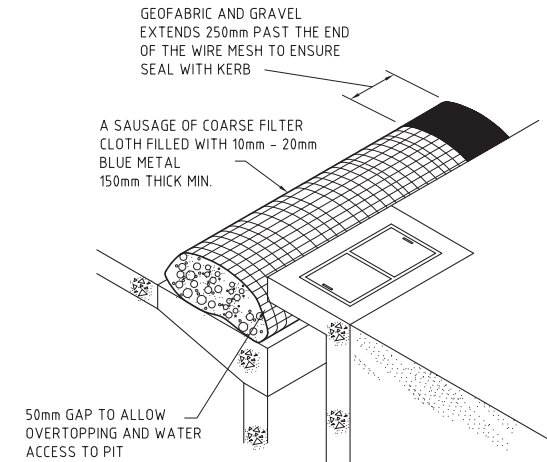
N.T.S.

NOTE: ADOPT ABOVE DETAILS AROUND ALL PITS WITHIN AREA ENCOMPASSED BY SILT FENCE & TO PITS ON THE ROAD ADJACENT TO SITE BOUNDARY.



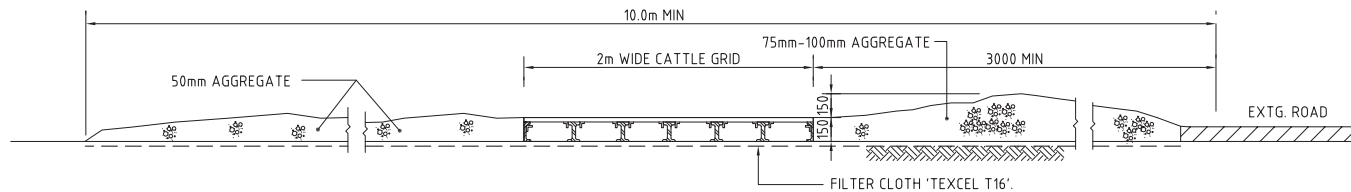
TYPICAL OPEN DRAIN & SILT FENCE

SCALE 1:20

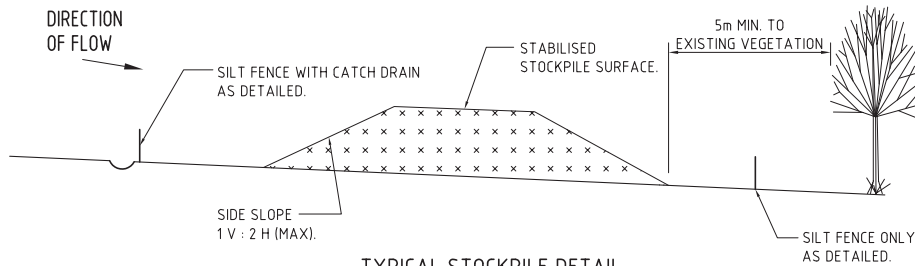


KERB INLET PIT CONTROL

N.T.S.



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



TYPICAL STOCKPILE DETAIL

N.T.S.

STOCKPILE NOTES

1. PLACE ALL STOCKPILES IN LOCATIONS MORE THAN 5m FROM EXISTING VEGETATION, ROADS & HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT ELONGATED MOUNDS. SIDE SLOPE TO BE 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.

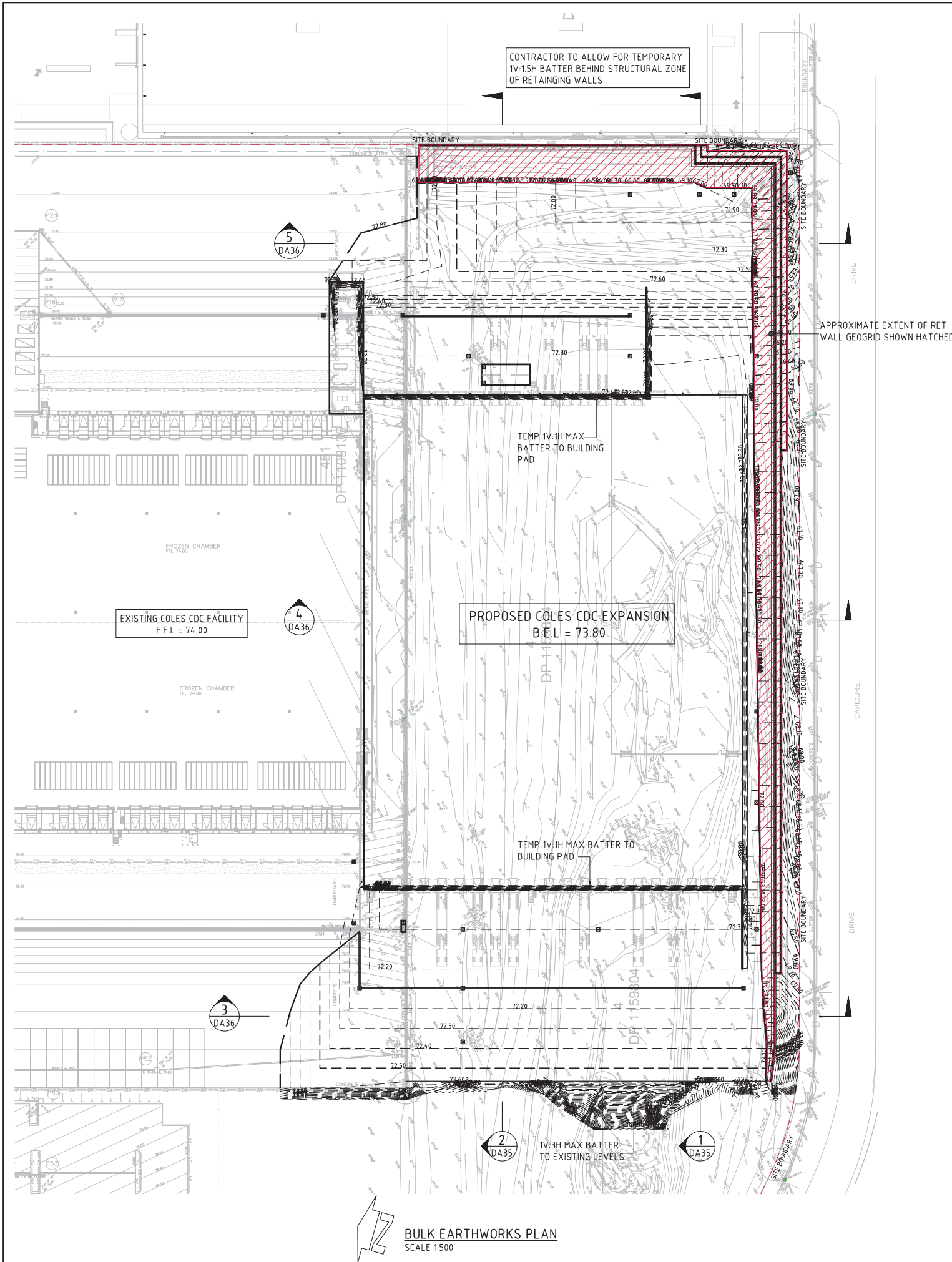
LEGEND:

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

- SILT FENCE WITH CATCH DRAIN.
- SILT FENCE ONLY

FOR DEVELOPMENT APPLICATION

FOR DEVELOPMENT APPLICATION PRELIMINARY - FOR INFORMATION AMENDMENTS				ARCHITECT SBA ARCHITECTS Suite 102, 43 Mount Street, North Sydney NSW 2060 Tel: (02) 9529 8888 Fax: (02) 9529 8889 www.sbaarchitects.com.au				CLIENT Goodman LEVEL 10, 60 Castlereagh Street SYDNEY NSW, 2000, Australia Tel: (02) 9230 7400 Fax: (02) 9230 7444				PROJECT PROPOSED COLES CDC EXPANSION M7 BUSINESS HUB WALLGROVE ROAD, MINCHINBURY, NSW DESIGNED: M.W. DRAWN: M.C. DATE: 09.01.13 CHECKED: B1 SCALE: AS SHOWN CAD REF: C08487.21-DA29				Costin Roe Consulting Pty Ltd. Consulting Engineers Level 1, 8 Windmill Street Wahia Bay, Sydney NSW 2000 Tel: (02) 9551-7000 Fax: (02) 9541-3731 email: mail@costinroe.com.au ©				Costin Roe Consulting				DRAWING TITLE EROSION AND SEDIMENT CONTROL PLAN & DETAILS DRAWING No: C08487.21-DA20 ISSUE: B			
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SITE PREPARATION NOTES:

1. ALL EARTHWORKS SHALL BE COMPLETED GENERALLY IN ACCORDANCE WITH THE GUIDELINES SPECIFIED BY THE GEOTECHNICAL REPORT AND NOTES PROVIDED BY - DATED -.
2. EXISTING LEVELS ARE BASED ON SURVEY INFORMATION PROVIDED BY CARDNO HARD & FORESTER DATED JANUARY 2013.
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 +0mm/-20mm THROUGH BUILDING PADS AND +0mm/-50mm ELSEWHERE.
5. PREPARE STEEP BATTERS TO RECEIVE FILL BY CONSTRUCTING BENCHING TO FACILITATE FILL PLACEMENT AND COMPACTION.
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.
7. SITE WON FILL TO BE PLACED IN MAXIMUM 300mm LOOSE LAYERS AND COMPACTED TO 98% STANDARD AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT.
8. IMPORTED FILL SHALL BE PLACED IN MAXIMUM 300mm LOOSE LAYERS AND COMPACTED TO 98% STANDARD AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT.
9. MAXIMUM PARTICLE SIZE TO BE THE SMALLER OF 150mm OR HALF THE (LOOSE) LAYER THICKNESS AND/OR TWO THIRDS THE LAYER THICKNESS AFTER COMPACTION.
10. ALL EARTHWORKS SHALL BE COMPLETED UNDER LEVEL 1 CONTROL IN ACCORDANCE WITH AS 3798-2007.
11. AT COMPLETION OF EARTHWORKS SITE SHALL BE CLEARED AND MADE READY FOR INSTALLATION OF EROSION CONTROL AS OUTLINED IN THE EROSION AND SEDIMENTATION CONTROL PLAN.
12. EXISTING ROCK SHALL BE REMOVED BY HEAVY ROCK BREAKING OR RIPPING.

EARTHWORKS VOLUMES

VOLUMES:

TOPSOIL = 1,750 m³
CUT = -13,900 m³
FILL = 29,700 m³

GROSS BALANCE = 15,800 m³
TOLL IMPORT = 15,000 m³
NET BALANCE = 800 m³ (TO BE IMPORTED)

RET WALLS:
APPROX 15,000 m³ OF CRUSHED SANDSTONE TO BE IMPORTED T.B.C UPON DETAILED STRUCTURAL DESIGN OF WALLS.

EARTHWORK VOLUMES ARE APPROXIMATE ONLY & ARE CALCULATED BASED ON A NOMINAL TOPSOIL STRIP OF 40mm. NO ALLOWANCE HAS BEEN MADE FOR EROSION AND SEDIMENT CONTROL, BULKING, COMPACTION OF FILLED SOILS.

REFER TO DRAWING DA20 FOR EROSION AND SEDIMENT CONTROL PLAN.

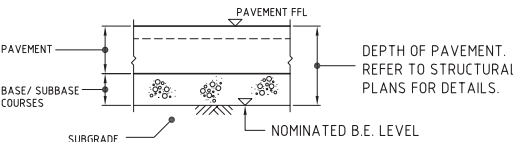
THE EXISTING SURFACE IS BASED ON SURVEY INFORMATION PROVIDED. THIS SURVEY IS MOST CURRENT HOWEVER IT MAY NOT ACCURATELY REFLECT ACTUAL GROUND LEVELS OR STOCKPILES ETC ON SITE. IT IS THE CONTRACTORS RESPONSIBILITY TO CONFIRM VOLUMES AND ALLOWANCES FOR EARTHWORKS.

LEGEND

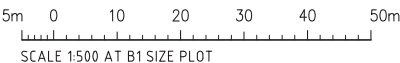
LEVELS DATUM IS AHD.

EXISTING SITE DETAIL AND LEVELS BASED ON PLAN OF SURVEY BY ROSE ATKINS AND ASSOCIATES PTY LTD.
REF. #: 21/3798
DATED: JULY 2005

- 60 - EXISTING CONTOUR
- 45.80 - EXISTING SPOT HEIGHT
- 30.50 - B.E.L. CONTOUR (MAJOR - 0.5m)
- 30.40 - B.E.L. CONTOUR (MINOR - 0.1m)



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



FOR DEVELOPMENT APPLICATION	08.02.13	C
PRELIMINARY - FOR INFORMATION	06.02.13	B
PRELIMINARY - FOR INFORMATION	04.02.13	A
AMENDMENTS	DATE	ISSUE

ARCHITECT
SBA ARCHITECTS
CONSULTANTS: ARCHITECTS, ENGINEERS, INTERIORS, LANDSCAPE ARCHITECTS, PLANNING, CIVIL ENGINEERS
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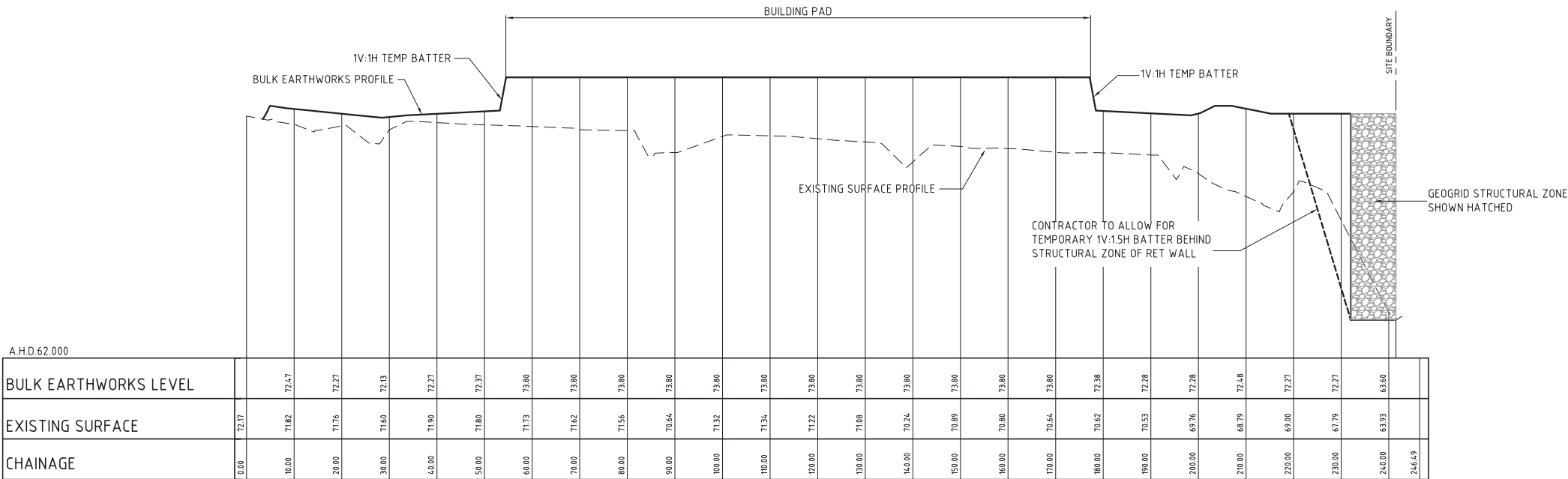
CLIENT
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60 Castlereagh Street
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Fax: (02) 9230 7444

PROJECT
PROPOSED COLES CDC EXPANSION
M7 BUSINESS HUB
WALLGROVE ROAD, MINCHINBURY, NSW
DESIGNED: M.W. DRAWN: M.C. DATE: 31.01.13 CHECKED: B1 SCALE: AS SHOWN CAD REF: Co8487.21-DA30

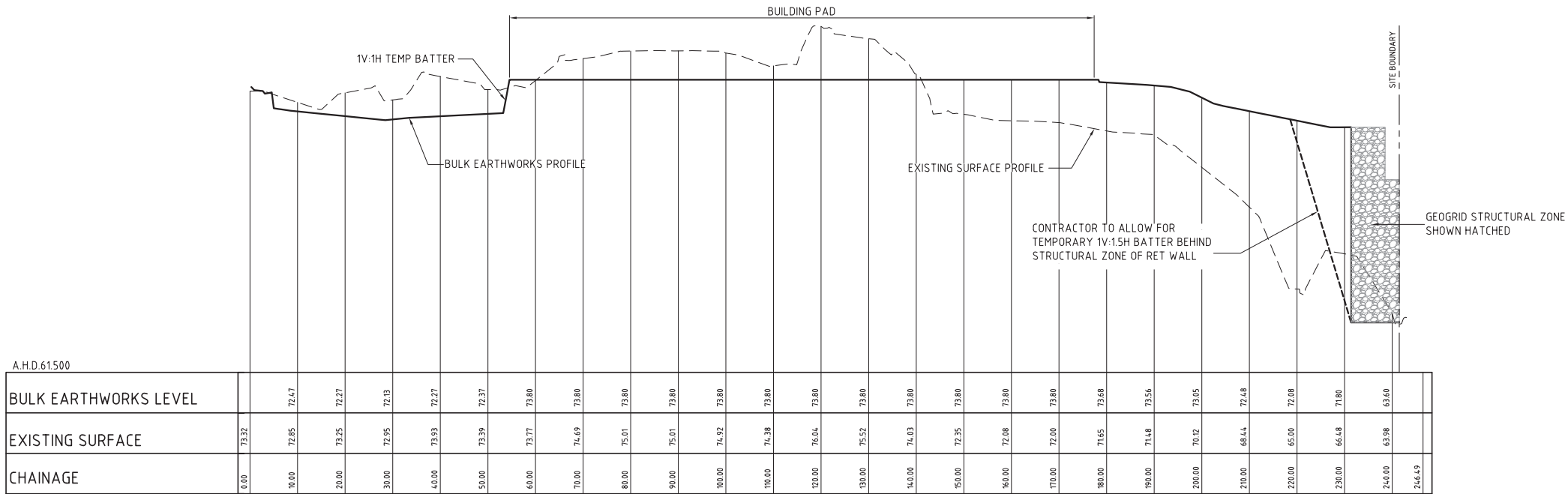
CONSULTING ENGINEERS
Costin Roe Consulting Engineers
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Costin Roe Consulting
Value in Engineering and Management

DRAWING TITLE
BULK EARTHWORKS PLAN
DRAWING No: **Co8487.21-DA30** ISSUE: **C**



CROSS SECTION 2
SCALE 1:500 HORIZONTAL.
SCALE 1:100 VERTICAL.

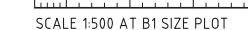
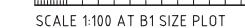


CROSS SECTION 1
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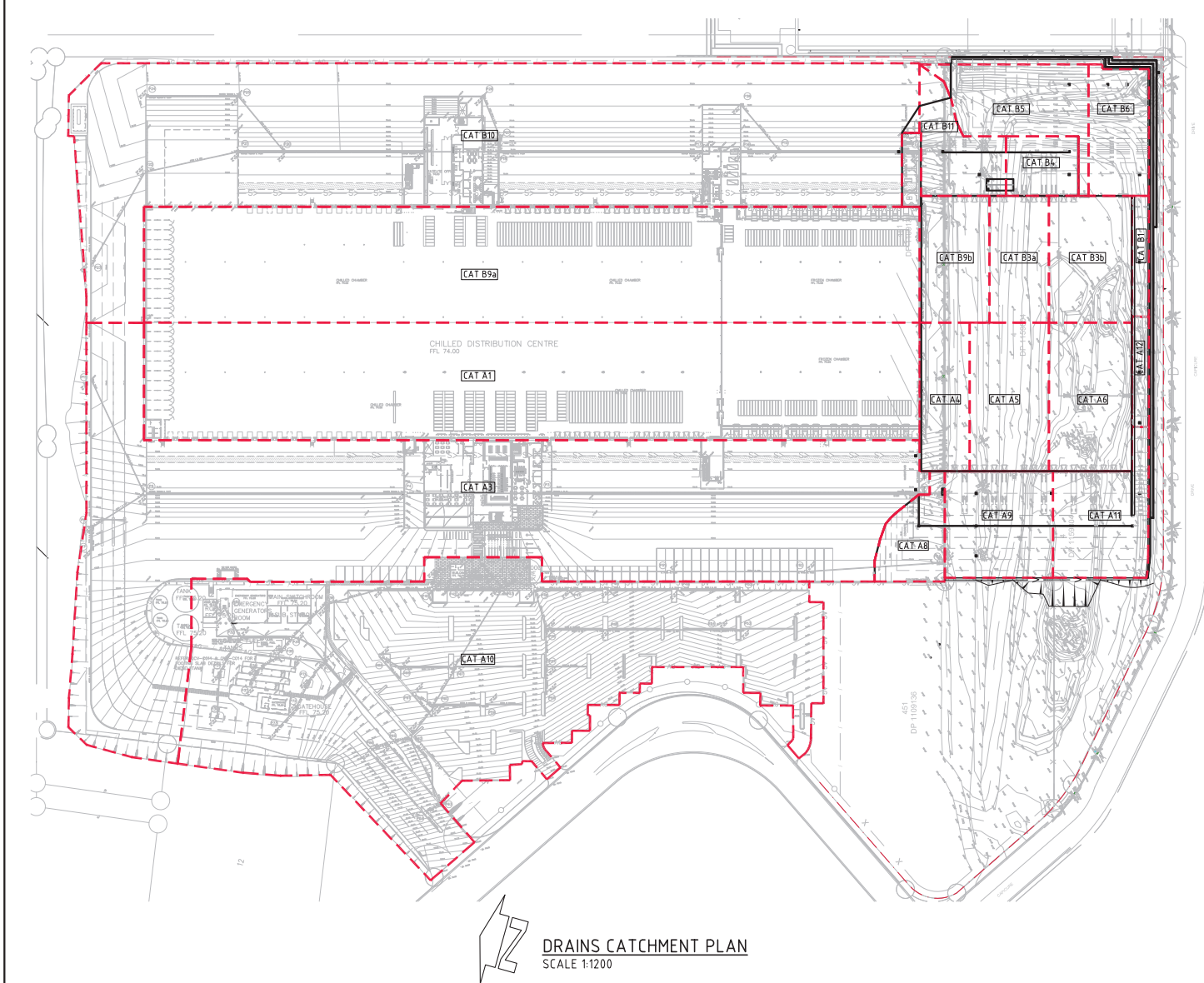
1m 0 1 2 3 4 5 6 7 8 9 10m
SCALE 1:100 AT B1 SIZE PLOT

5m 0 10 20 30 40 50m
SCALE 1:500 AT B1 SIZE PLOT

FOR DEVELOPMENT APPLICATION



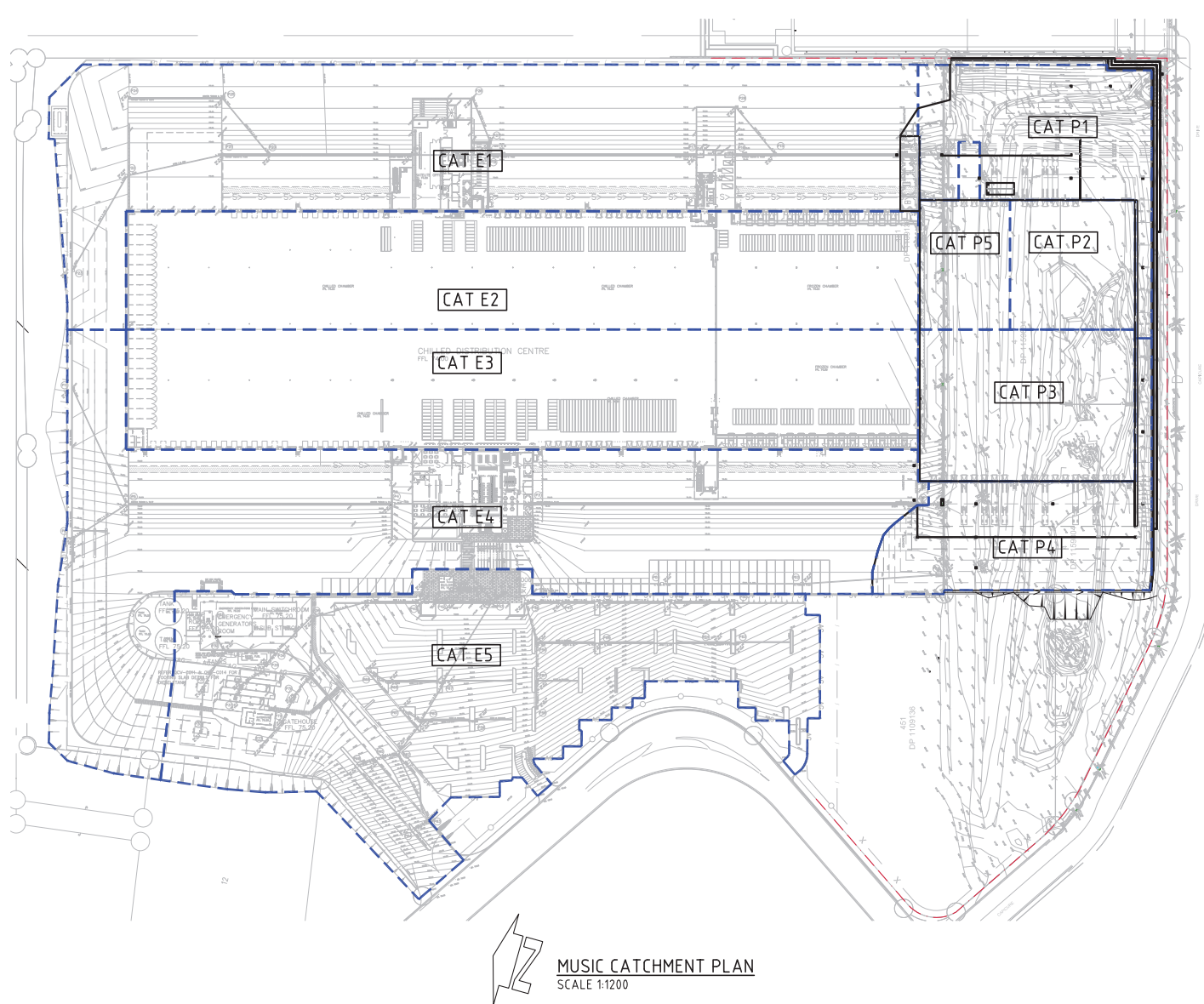
DRAWING TITLE
BULK EARTHWORKS SECTIONS
SHEET 2



DRAINS CATCHMENT PLAN
SCALE 1:1200

SUB-CATCHMENT AREAS - DRAINS

No.	CATCHMENT AREA (Ha)
CAT A1	1.878
CAT A3	2.862
CAT A4	0.152
CAT A5	0.242
CAT A6	0.254
CAT A8	0.113
CAT A9	0.237
CAT A10	2.310
CAT A11	0.224
CAT A12	0.038
CAT B1	0.042
CAT B3a	0.155
CAT B3b	0.216
CAT B3b	0.088
CAT B5	0.219
CAT B6	0.159
CAT B9a	1.850
CAT B9b	0.210
CAT B10	2.608
CAT B11	0.146
TOTAL	14.003



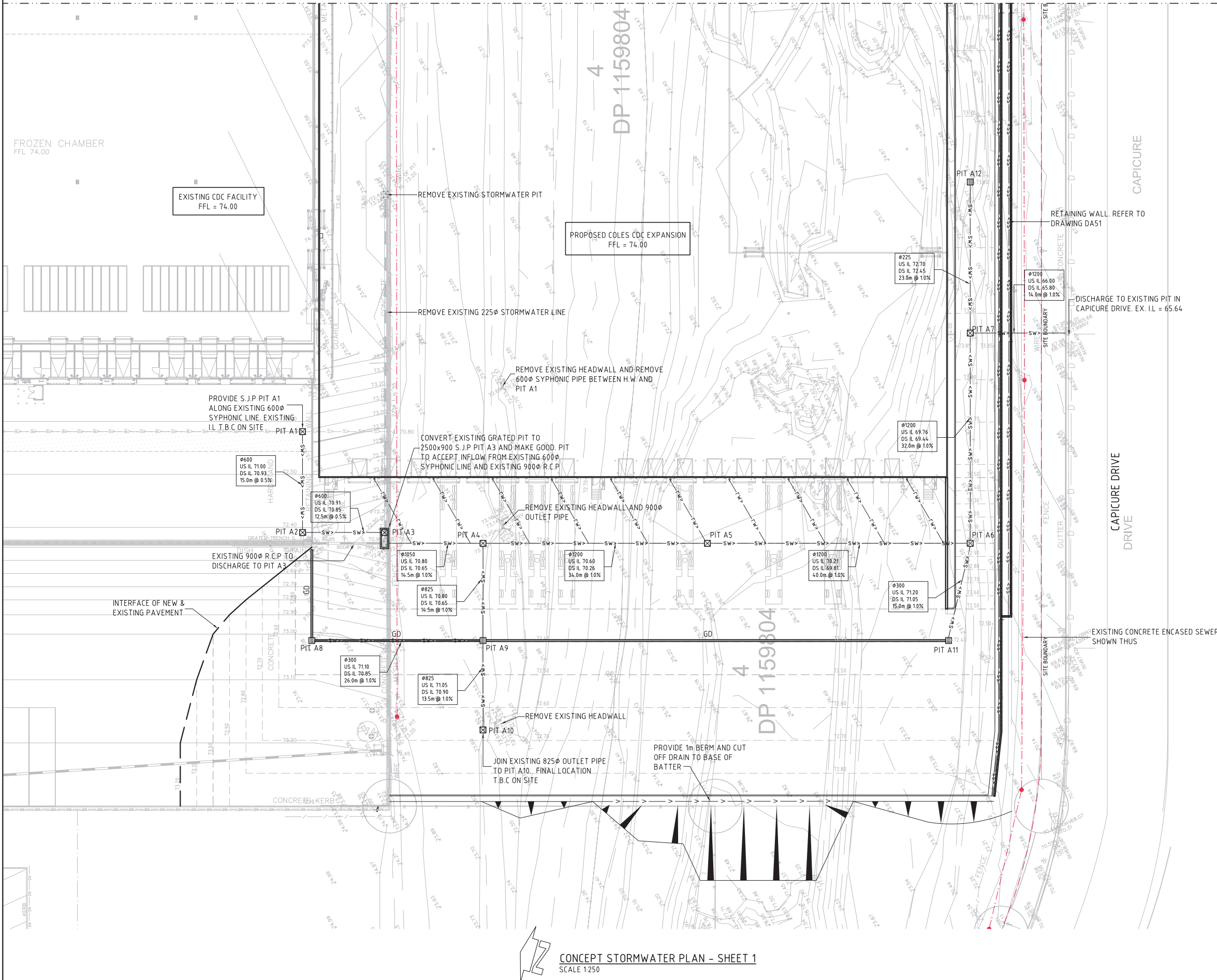
MUSIC CATCHMENT PLAN
SCALE 1:1200

SUB-CATCHMENT AREAS - MUSIC

No.	CATCHMENT AREA (Ha)	% IMPERVIOUS	COMMENT
E1	2.644	90	EXISTING HARDSTAND
E2	1.850	100	EASTERN ROOF EXISTING CDC
E3	1.878	100	WESTERN ROOF EXISTING CDC
E4	2.862	90	EXISTING HARDSTAND
E5	2.310	90	EXISTING CARPARK
P1	0.637	90	EASTERN HARDSTAND
P2	0.320	100	EASTERN ROOF
P3	0.650	100	WESTERN ROOF
P4	0.605	90	WESTERN HARDSTAND
P5	0.255	100	ROOF TO RW TANK
TOTAL	14.003		

FOR DEVELOPMENT APPLICATION

BREAKLINE - REFER TO DRAWING Co8487.21-DA42 FOR CONTINUATION



CONCEPT STORMWATER PLAN - SHEET 1
SCALE 1:250

STORMWATER DRAINAGE NOTES:

1. ALL FINISHED PAVEMENT LEVELS SHALL BE AS INDICATED ON FINISHED LEVELS PLAN.
2. PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN.
3. EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE.
4. ALL STORMWATER PIPES $\phi 375$ OR GREATER SHALL BE CLASS 2 REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE.
5. ALL PIPES UP TO AND INCLUDING 300ϕ TO BE uPVC GRADE SN8.
6. ALL CONCRETE PITS GREATER THAN 1000mm DEEP SHALL BE REINFORCED USING N12-200 EACH WAY CENTRED IN WALL AND BASE. LAP MINIMUM 300mm WHERE REQUIRED. ALL CONCRETE FOR PITS SHALL BE F'c 25 MPA. PRECAST PITS MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
7. IN ADDITION TO ITEM 6 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm.
8. PIPES SHALL BE LAID AS PER PIPE LAYING DETAILS. PARTICULAR CARE SHALL BE TAKEN TO ENSURE THAT THE PIPE IS FULLY AND EVENLY SUPPORTED. RAM AND PACK FILLING AROUND AND UNDER BACK OF PIPES AND PIPE FAUCETS, WITH NARROW EDGED RAMPERS OR OTHER SUITABLE TAMPING DETAILS.
9. WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED $\phi 100$ uPVC TO EACH SIDE OF PIPE.
10. ALL SUBSOIL DRAINAGE LINES SHALL BE $\phi 100$ SLOTTED uPVC WITH APPROVED FILTER WRAP LAID IN 300mm WIDE GRANULAR FILTER UNLESS NOTED OTHERWISE. LAY SUBSOIL LINES TO MATCH FALLS OF LAND AND/OR 1 IN 200 MINIMUM. PROVIDE CAPPED CLEANING EYE (RODDING POINT) AT UPSTREAM END OF LINE AND AT 30m MAX. CTS. PROVIDE SUBSOIL LINES TO ALL PAVEMENT/ LANDSCAPED INTERFACES, TO REAR OF RETAINING WALLS (AS NOMINATED BY STRUCTURAL ENGINEER) AND AS SHOWN ON PLAN.
11. ALL PIPE GRADES 1 IN 100 MINIMUM UNO.
12. PROVIDE STEP IRONS IN PITS DEEPER THAN 1000mm.
13. MIN. 600 COVER TO PIPE OVERT BENEATH ROADS & MIN. 400 COVER BENEATH LANDSCAPED AND PEDESTRIAN AREAS.
14. PIT COVERS IN TRAFFICABLE PAVEMENT SHALL BE CLASS D 'HEAVY DUTY', THOSE LOCATED IN NON-TRAFFICABLE AREAS SHALL BE CLASS B 'MEDIUM DUTY' U.N.O.
15. PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
16. DOWN PIPES TO BE AS PER HYDRAULIC ENGINEERS DETAILS WITH CONNECTOR TO MATCH DP SIZE U.N.O. ON PLAN. PROVIDE CLEANING EYE AT GROUND LEVEL.
17. 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.

PIT SCHEDULE - SYSTEM A

PIT No.	GRATE RL	DEPTH	TYPE	SIZE	COMMENT
PIT A1	72.58	1580	S.J.P	900x900	
PIT A2	72.40	1490	S.J.P	900x900	
PIT A3	72.60	1800	S.J.P	2500x900	
PIT A4	72.60	2000	S.J.P	1500x1500	
PIT A5	72.60	2390	S.J.P	1500x1500	
PIT A6	73.00	3240	S.J.P	1500x1500	
PIT A7	73.93	7930	S.J.P	1500x1500	
PIT A8	72.40	1300	S.G.G.P	900x900	⊗
PIT A9	72.40	1600	S.G.G.P	1200x1200	⊗
PIT A10	72.67	1620	S.J.P	1200x1200	
PIT A11	72.40	1200	S.G.G.P	900x900	⊗
PIT A12	73.70	1000	S.G.G.P	900x900	⊗

⊗ - DENOTES PIT TO BE FITTED WITH STORMWATER 360 ENVIPOD UNIT

LEGEND:

LEVELS DATUM IS AHD.

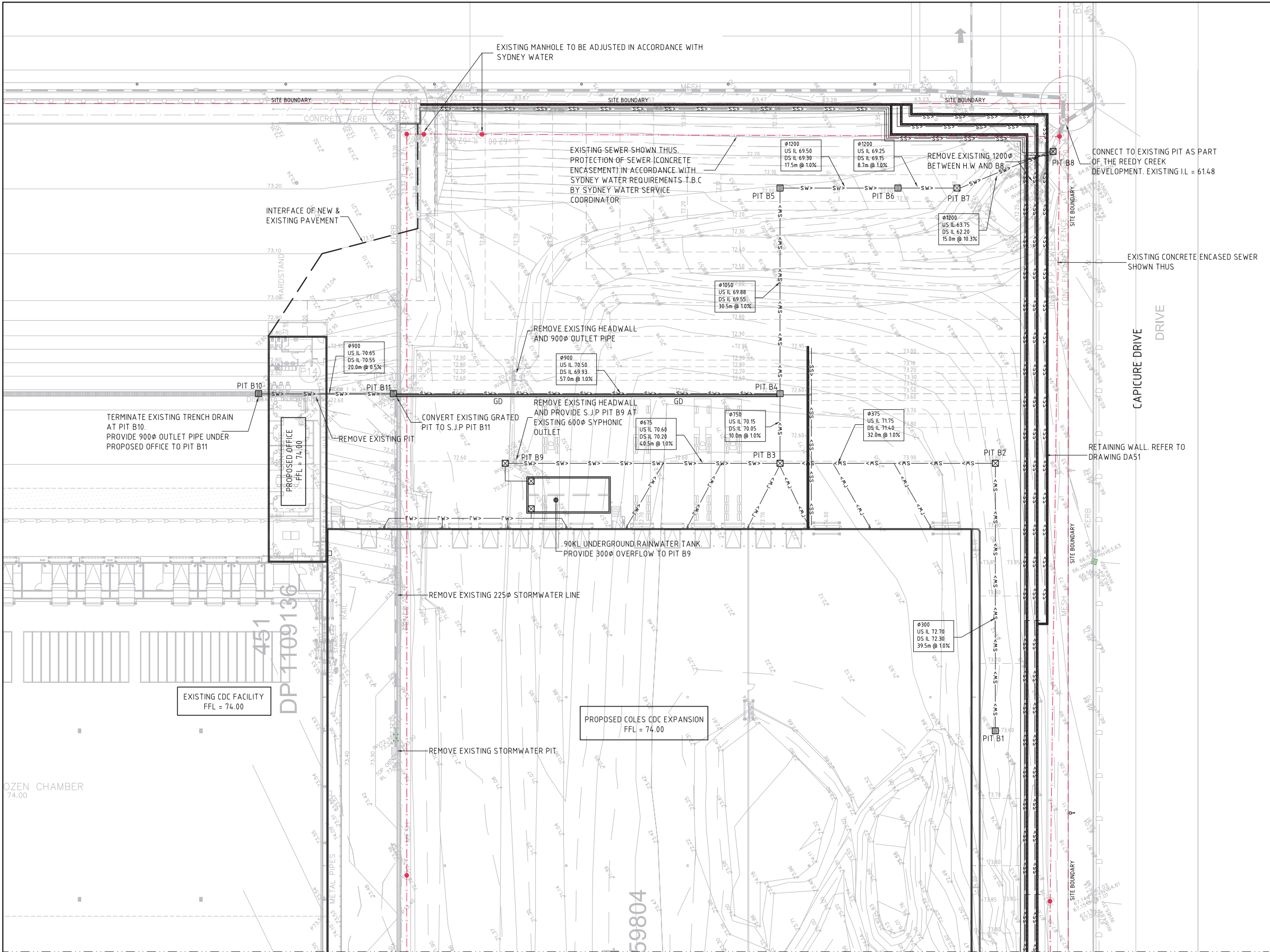
EXISTING SITE LEVELS AND DETAILS BASED ON A PLAN OF SURVEY BY HARD & FORESTER.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- GRATED DRAIN (200 WIDE)
- OVERLAND FLOW PATH
- DOWNPIPE (INDICATIVE ONLY). REFER TO HYDRAULIC ENGINEERS DRAWINGS
- DRAINAGE LINE
- SUBSOIL LINE
- ROOFWATER LINE
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- EXISTING SEWER LINE

2m 0 5 10 15 20 25m
SCALE 1:250 AT B1 SIZE PLOT

FOR DEVELOPMENT APPLICATION

FOR DEVELOPMENT APPLICATION PRELIMINARY - FOR INFORMATION PRELIMINARY - FOR INFORMATION AMENDMENTS				ARCHITECT SBA ARCHITECTS Suite 702, 43 Mount Street, North Sydney NSW 2060 T: (02) 9559 9888 F: (02) 9559 9889 E: info@sbaarchitects.com.au W: www.sbaarchitects.com.au		CLIENT Goodman LEVEL 10, 60 Castlereagh Street SYDNEY NSW, 2000, Australia Tel: (02) 9230 7400 Fax: (02) 9230 7444		PROJECT PROPOSED COLES CDC EXPANSION M7 BUSINESS HUB WALLGROVE ROAD, MINCHINBURY, NSW DESIGNED: M.W. DRAWN: M.C. DATE: 09.01.13 CHECKED: B1 SCALE: AS SHOWN CAD REF: Co8487.21-DA4.1		Costin Roe Consulting Pty Ltd. Consulting Engineers Level 1, 8 Windmill Street Wahia Bay, Sydney NSW 2000 Tel: (02) 9551-7000 Fax: (02) 9541-3731 email: mail@costinroe.com.au ©		Costin Roe Consulting Value in Engineering and Management		DRAWING TITLE CONCEPT STORMWATER PLAN SHEET 1 DRAWING No: Co8487.21-DA4.1 ISSUE: C	
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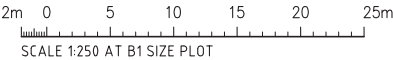
PIT SCHEDULE - SYSTEM B

PIT No.	GRATE RL	DEPTH	TYPE	SIZE	COMMENT
PIT B1	73.70	1000	S.G.G.P	900x900	⊗
PIT B2	73.90	2150	S.J.P	900x900	
PIT B3	72.60	2450	S.J.P	1200x1200	
PIT B4	72.50	2620	S.G.G.P	1500x1500	⊗
PIT B5	72.00	2500	S.G.G.P	1500x1500	⊗
PIT B6	72.00	2750	S.G.G.P	1500x1500	⊗
PIT B7	72.10	8350	S.J.P	1800x1800	
PIT B8	65.20	3000	S.J.P	1800x1800	
PIT B9	72.40	1750	S.J.P	900x900	
PIT B10	72.80	900	S.G.G.P	900x900	⊗
PIT B11	73.45	2950	S.J.P	1200x1200	

⊗ - DENOTES PIT TO BE FITTED WITH STORMWATER 360 ENVIPOD UNIT

- LEGEND:
- LEVELS DATUM IS AHD.
- EXISTING SITE LEVELS AND DETAILS BASED ON A PLAN OF SURVEY BY HARD & FORESTER.
- [Symbol] - SGGP, SINGLE GRATED GULLY PIT
 - [Symbol] - SJP, SEALED JUNCTION PIT
 - GD - GRATED DRAIN (200 WIDE)
 - [Symbol] - OVERLAND FLOW PATH
 - DP - DOWNPIPE (INDICATIVE ONLY). REFER TO HYDRAULIC ENGINEERS DRAWINGS
 - SW> - DRAINAGE LINE
 - SS> - SUBSOIL LINE
 - RW> - ROOFWATER LINE
 - 50.00 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
 - 50.10 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
 - - EXISTING SEWER LINE

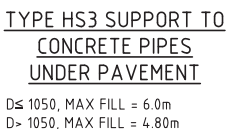
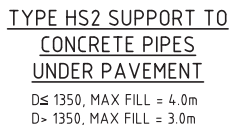
STORMWATER DRAINAGE NOTES:
REFER TO DRAWING DA41 FOR STORMWATER DRAINAGE NOTES





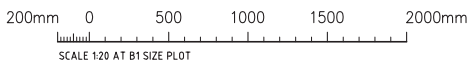
PIT NOTES:

1. WHERE GULLY PIT IS LOCATED ON KERB RETURNS OR BULB OF CUL-DE-SACS PROVIDE CURVED PRECAST CONCRETE LINTELS.
2. SAG PITS SHALL HAVE LINTEL PLACED CENTRALLY ABOUT THE GRATE.
3. ALL REINFORCING TO HAVE 30 MIN. CLEAR CONCRETE COVER.
4. FOR PITS DEEPER THAN 1000mm CLIMB RAILS SHALL BE PROVIDED.
5. REINFORCEMENT CAN BE NEGATED FOR PITS LESS THAN 1000mm DEEP.



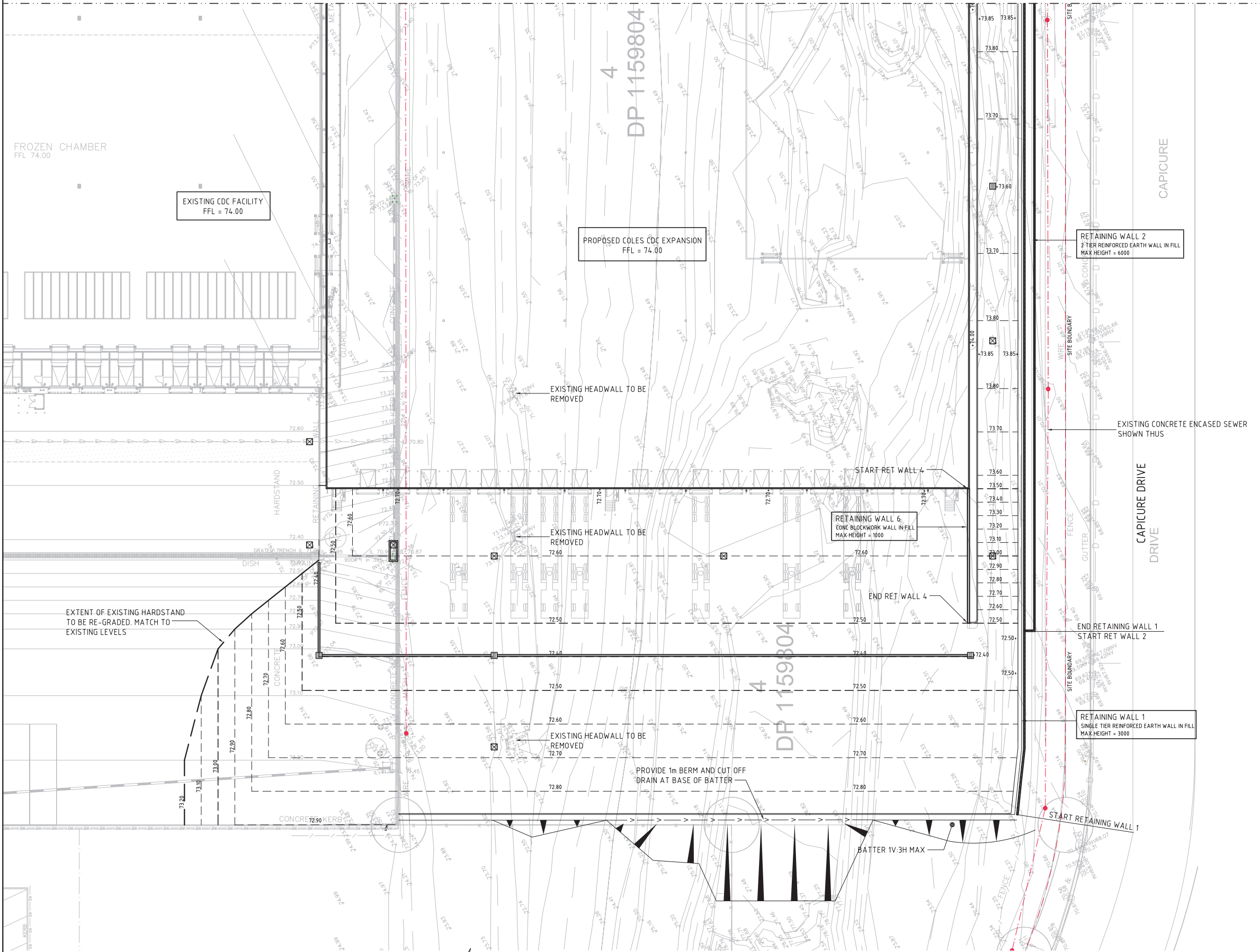
SIDE ZONE MATERIAL GRADING	
SIEVE SIZE	WEIGHT PASSING(%)
75	100
9.5	100 TO 50
2.36	100 TO 30
0.60	50 TO 15
0.075	25 TO 0

1:20



FOR DEVELOPMENT APPLICATION

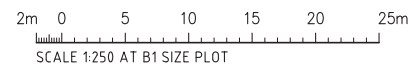
BREAKLINE - REFER TO DRAWING Co8487.21-DA52 FOR CONTINUATION



- 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 1:30 IN DISABLED PARKING, 1:20 (5%) IN CARPARKING AREAS AND 1:25 (4%) ELSEWHERE.
 7. MAXIMUM RAMP GRADES 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 SLOPE 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. ALL FOOTPATHS ARE TO FALL AWAY FROM THE BUILDING AT 2.5% NOMINAL GRADE.
 12. ALL PAVEMENTS ARE TO BE SET AT 50mm BELOW THE FINISHED FLOOR LEVEL OF THE WAREHOUSE AND OFFICE AREAS U.N.O. ON PLAN.

- LEGEND**
- LEVELS DATUM IS A.H.D.
- GD - GRATED DRAIN
 - SGGP - SINGLE GRATED GULLY PIT
 - SJP - SEALED JUNCTION PIT
 - FINISHED PAVEMENT CONTOUR (MAJOR)
 - FINISHED PAVEMENT CONTOUR (MINOR)
 - FINISHED PAVEMENT SPOT HEIGHT
 - EXISTING CONTOUR
 - EXISTING SPOT HEIGHT
 - EXISTING SEWER LINE

FINISHED LEVELS PLAN - SHEET 1
SCALE 1:250

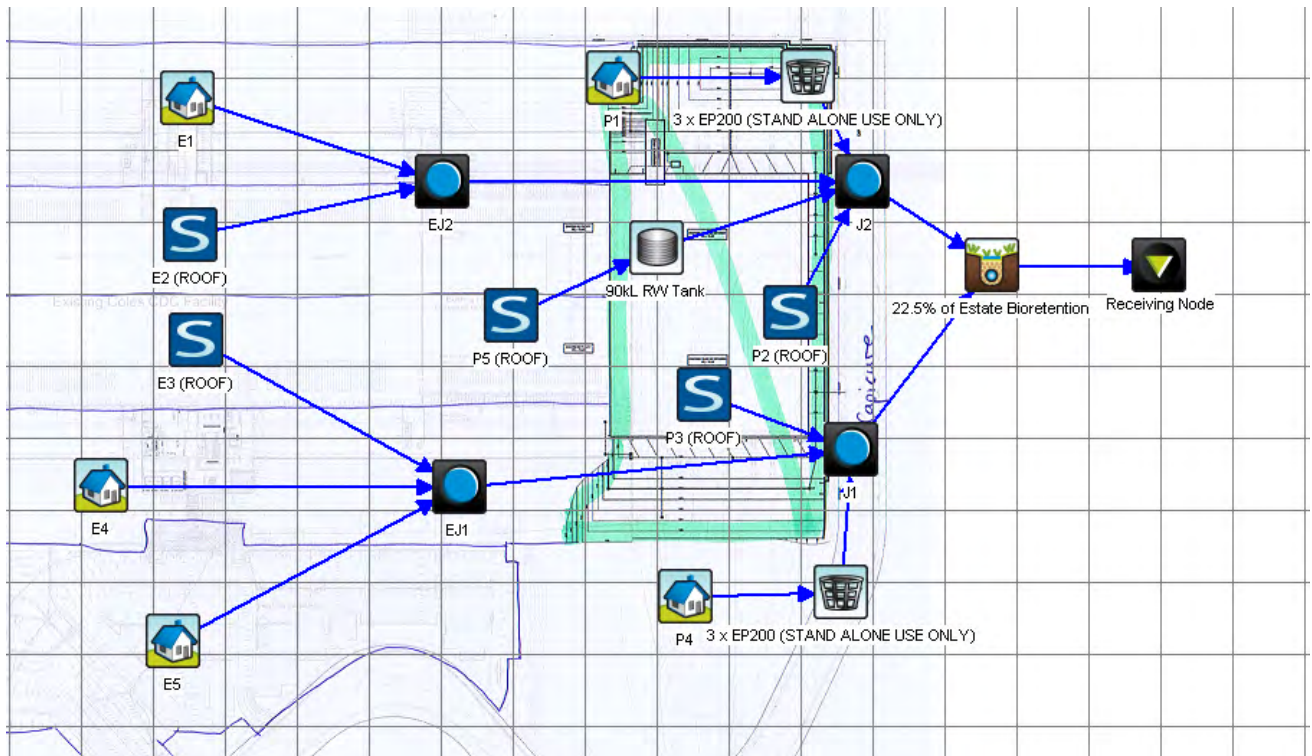


FOR DEVELOPMENT APPLICATION

FOR DEVELOPMENT APPLICATION				ARCHITECT		CLIENT		PROJECT		CONSULTING ENGINEERS		DRAWING TITLE	
PRELIMINARY - FOR INFORMATION	08.02.13	D		SBA ARCHITECTS		LEVEL 10, 60 Castlereagh Street SYDNEY NSW, 2000, Australia		PROPOSED COLES CDC EXPANSION		Costin Roe Consulting Engineers		FINISHED LEVELS PLAN	
PRELIMINARY - FOR INFORMATION	06.02.13	C		SBA ARCHITECTS		Suite 102, 43 Mount Street, North Sydney NSW 2060		M7 BUSINESS HUB		Level 1, 8 Windmill Street		SHEET 1	
PRELIMINARY - FOR INFORMATION	22.01.13	B		SBA ARCHITECTS		T 02 9529 5888 F 02 9529 5889		WALLGROVE ROAD, MINCHINBURY, NSW		Walsh Bay, Sydney NSW 2200			
PRELIMINARY - FOR INFORMATION	15.01.13	A		SBA ARCHITECTS		E info@sbarchitects.com.au W www.sbarchitects.com.au				Tel: (02) 9551-7000 Fax: (02) 9551-3731			
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE			DESIGNED	DRAWN	DATE	CHECKED	SCALE	CAD REF:
								M.W.	M.C.		B1	AS SHOWN	Co8487.21-DA51

Appendix B

MUSIC MODEL CONFIGURATION



Treatment Train Effectiveness - Receiving Node			
	Sources	Residual Load	% Reduction
Flow (ML/yr)	95.2	87.9	7.7
Total Suspended Solids (kg/yr)	22.3E3	976	95.6
Total Phosphorus (kg/yr)	40.8	6.61	83.8
Total Nitrogen (kg/yr)	222	111	49.9
Gross Pollutants (kg/yr)	2.52E3	0.00	100.0