

CIVIL ENGINEERING REPORT FOR DEVELOPMENT APPLICATION

TNT WAREHOUSE & DISTRIBUTION FACILITY LOCKWOOD ROAD ERSKINE PARK NSW

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1 INTRODUCTION

1.1 Background

This civil engineering report has been prepared by Costin Roe Consulting in support of a Development Application submission to the NSW Department of Planning & Infrastructure (DoPI) in support of the development of a purpose built warehouse and distribution facility for TNT.

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

1.2 Scope

Costin Roe Consulting Pty Ltd has been commissioned by CIP to prepare this Engineering Report in support of the proposed application for development on 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.

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

1.3 Authority Jurisdiction

The consent authority is The Director General NSW Planning as the proposal considered a State Significant Development (SSD). The Director Generals Requirements (DGR's) have been addressed and as the subject site is located within Penrith City Council local government area, the requirements of the Penrith City Council (PCC) have also been addressed.

1.4 Proposed Development

The proposed development is for a single level warehouse and distribution facility for TNT. The development will include ancillary office space, a multi level car park, trailer parking area and truck loading/ circulation areas.

2 SITE CHARACTERISTICS

2.1 Location

The proposed development is located in the suburb of Erskine Park on Lockwood Road as shown in Figure 2.1.

The Site is bounded by Lenore Lane to the north, vacant land to the east, Lockwood Road to the south and vacant industrial land to the west.

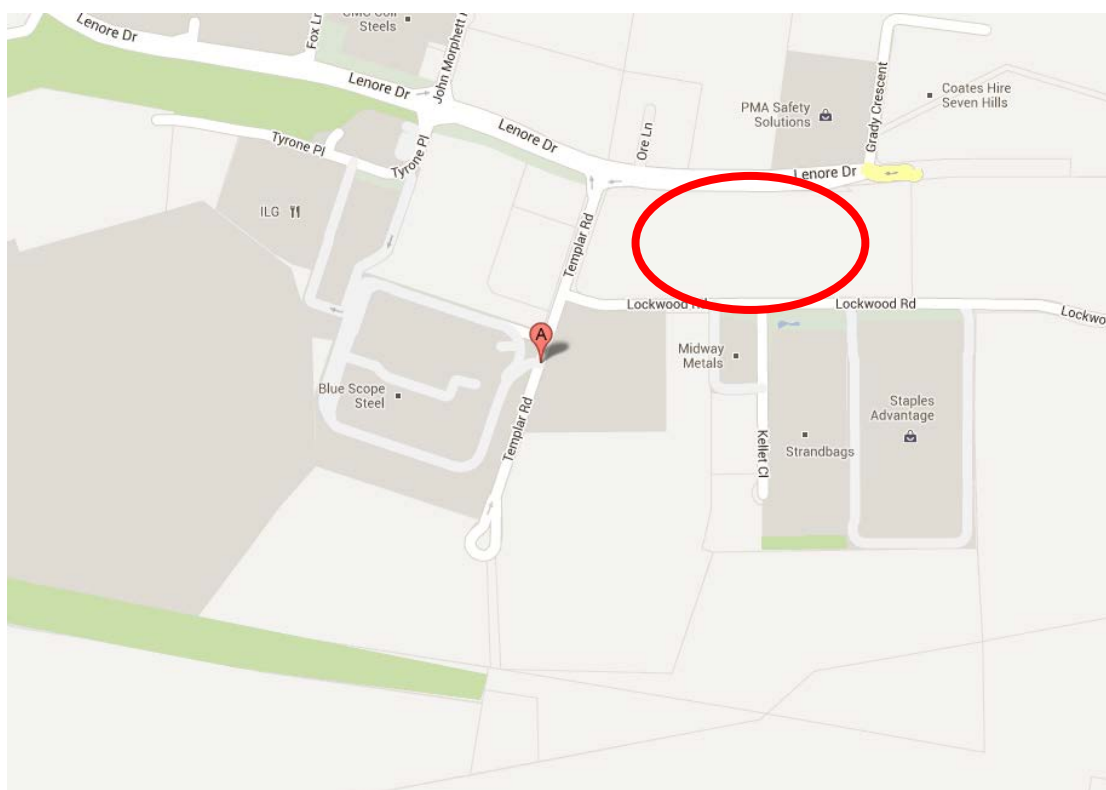


Figure 2.1. Locality Map

2.2 Topography & Description

The Site has been cut and filled to its current levels under the concept plan approval (06_0216). The cut to fill site comprises two large pads at approximately RL 60.8m on the larger eastern pad and RL 58.3m on the smaller western pad. The site is vacant and has a total area of approximately 7.9 Ha.

A 20m landscape setback is required along the Lenore Drive frontage (north side) which also acts as an overland flow path and the legal point of discharge. Provision for erosion and sediment control has been made on the site with a large sediment basin located in the north-west corner.

2.3 Existing Stormwater Drainage

There is no in-ground drainage on the site. Some stormwater management measures are present which are related to erosion & sediment control measures completed as part of

the estate works. These measures comprise a sediment basin located in the north-western corner of the site and open swale drains which direct water to this sediment basin.

2.4 Proposed Stormwater Drainage System

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 will consist of a piped drainage system 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 has been designed to cater for storms up to and including the 1 in 100-year ARI storm event (Q100). This major system employs overland flow paths to safely convey excess run-off from the site.

The design of the stormwater system for this site is based on the following:

- 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).
- Design recurrence intervals for major and minor storms will be in accordance with Part C3 of PCC DCP2010.
- On-site detention, water quality measures and flooding requirements will be in accordance with Part C3 of PCC DCP2010.
- Stormwater harvesting is based on the requirement of PCC DCP2010 Part C3 and the NSW Department of Environment and Conservation document *Managing Urban Stormwater: Harvesting and Reuse*.

Water quality and re-use has been considered in the design, throughout new paved areas, ensuring that any increase in the detrimental effects of pollution are mitigated, PCC Water Quality Objectives are met and that the demand on potable water resources is reduced.

Plans of the proposed stormwater drainage layout can be found on drawing **Co12156.00-DA40** in **Appendix A**.

The objectives for the management of stormwater quantity and quality for the proposed application are consistent with the management proposed under the current concept plan approval (06_0216), the DGR’s and PCC requirements. Section 5 of this report discusses the proposed water quantity management and Section 6 discusses the proposed water quality management. The means by which these objectives are achieved are as follows:

- Water Quantity – One on-site detention system is proposed for the site. This is comprised of an above ground storage basin in the 20m landscape zone on the Lenore Drive (northern) frontage. The objective for water quantity is to attenuate the post development flows to less than or equal to the pre development flows from the site.

- Water Quality – Treatment of stormwater flows will be performed by a treatment train which comprises pit inserts, rainwater tanks and bioretention. The bioretention will be located in a combined bioretention/ on-site detention basin.

The legal point of discharge for the site is the open drain on the north-west corner of the site. Stormwater from this point will be conveyed to a large culvert which passes beneath Templar Road and to its ultimate discharge to Kemps Creek to the west of the development.

2.5 External Catchments

The site is not affected by flow from any external catchments. No allowance has been made for the conveyance of overland flow or external catchments in the drainage design for the project.

3 SITE WORKS

3.1 Bulk Earthworks

Bulk earthworks will be undertaken to facilitate the construction of the development. The objective for the site is to balance cut and fill earthworks volumes.

As discussed previously, the Site has been cut and filled to its current configuration. The cut to fill site comprises a two large pads at approximately RL 60.8m on the larger eastern pad and RL 58.3m on the smaller western pad.

Allowing for the structural zone for the facility floor, recess docks, falls in external levels and the differences in level between the two pads, some earthworks will be required to the existing pad levels. Detailed assessment of the earthworks level will be completed during detailed design stage.

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

3.2 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 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

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 will be required in the vicinity of the western entry ramp and the combined bioretention/ on-site detention basin. Retaining is a maximum of 2.5m and 3.5m in height for the two areas respectively.

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 as discussed in Section 2.4 of this report.

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 Drains modelling for the 2 to 100 Year ARI events, was taken from *The Bureau of Meteorology Online IFD Tool*.

4.4 Runoff Models

Calculation of the runoff from storms of the design ARI have been calculated with the catchment modelling software DRAINS.

At this stage the modelling performed is to calculate OSD requirements. Detailed hydraulic assessment of the internal drainage system will be calculated at detail/ construction certificate stage.

The design parameters for the Drains 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 (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	
	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 meet 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 is not required.

4.5.3 Public Safety

For all areas subject to pedestrian traffic, the Depth-Velocity 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 systems prior to discharge.

5 WATER QUANTITY MANAGEMENT

5.1 General Design Principles

Penrith City Council 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.

Section 3.3.3 of Councils draft stormwater management policy requires that *“it will be necessary to demonstrate that there will be no increase in runoff from the site as result of the development for all storms up to and including the 100 year Average Recurrence Interval (ARI) event for all storm durations”*.

5.2 Methodology

A hydrological analysis was undertaken to estimate the impact of the development of the site on peak flows at the downstream extent of the site. Modelling of stormwater runoff quantity was considered for the pre-existing case and for the operational phase of the development.

In order to assess the existing and operational phase peak discharges from the development site, a DRAINS hydrological model was used to estimate peak flows from catchments on the site for various storm durations for Q2 year ARI to Q100 year ARI events.

5.3 Existing & Post Development Peak Flows

Table 5.2 shows the existing and developed flows at the downstream boundary

ARI	Design Storm Duration	Peak Flow (m ³ /s)		
		Undeveloped	Developed	
		Site	Site (no atten.)	Site (+ atten.)
2	30	0.438	1.59	0.438
	60	0.616	1.32	0.479
	120	0.651	1.53	0.488
20	30	1.59	2.96	1.13
	60	1.68	2.33	1.33
	120	1.81	2.68	1.45
100	30	2.34	3.6	1.76
	60	2.34	2.9	1.98
	120	2.34	3.34	2.17

Table 5.2. Q2, Q20 & Q100 ARI Peak Flows from Development

The post development (with site attenuation) flows can be seen to be lower than the pre-developed flows. The required detention storage for the development site is discussed in the following section.

5.4 Proposed Water Quantity Management

As previously discussed, detention storage on the development site is required to reduce local outflows. The proposed site layout allows for provision of one OSD system. The ultimate discharge location will be via a piped system in the north-western corner of the site for minor system storm events and overland flow along the 20m landscape zone on Lenore Drive via overflow weirs during major system events.

The proposed OSD system is an above ground basin in the 20m landscape zone on the Lenore Drive frontage. This will be combined with the bioretention filtration system required for the site stormwater quality.

A number of combinations of storages and outlet arrangements have been modelled. The adopted arrangement models the basin configuration shown in Table 5.3 and the

proposed layout can also be observed on drawing **Co12156.00-DA40** with details on **DA46**.

ARI	Duration (mins)	Peak Flow (m3/s)				Depth (mm)	Storage (m3)
		No Atten.	With attenuation				
			Low	High	Total		
2	120	1.53	0.488	-	0.488	750	1100
20	120	2.68	0.653	0.796	1.45	1100	1800
100	120	3.34	0.712	1.45	2.17	1200	2100

Table 5.3 OSD Characteristics (Post Developed)

The hydrologic analysis shows that, with the provision of the on-site detention system detailed above, the post development peak flows from the site will be attenuated to less than pre-development, hence the requirements of PCC have been met.

6 STORMWATER QUALITY CONTROLS

6.1 Regional Parameters

There is a need to provide a 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 PCC.

PCC has nominated, in Section C3 of their *DCP 2010*, 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	70%
Total Suspended Solids	80%
Total Phosphorus	45%
Total Nitrogen	45%
Free Oil and Grease	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). The STM shall be sized according to the whole catchment area of the Site. The STM's for the development are based on a treatment train approach 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 to parking, hardstand areas is via Enviropod pit inserts;
- Secondary treatment (overflow event only) is via trash screens and a sediment sump within the OSD system;
- Tertiary treatment of site water will be via a 600m² of bioretention system situated within the on-site detention basin; and
- Tertiary treatment of a portion of the roof will also be performed via the proposed rainwater reuse tanks.

6.3 Stormwater Quality Modelling

6.3.1 Introduction

The MUSIC model was chosen to model water quality. This model, released by the Cooperative Research Centre for Catchment Hydrology (CRCCH), 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 the proposed systems and changes to land use are appropriate for their catchments and capable of meeting specified water quality objectives (CRC 2002). The water quality constituents modelled in MUSIC, 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 C3 of PCC's 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 "12156.00_DA Rev1.sqz" was set up to examine the effectiveness of the water quality treatment train and to predict if PCC requirements have been achieved. The layout of the MUSIC model is presented in Appendix B.

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

In the absence of specific PCC requirements, 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.

6.3.5 Treatment Nodes

Bioretention, rainwater tank and SW360 Enviropod nodes have been used in the modelling of the development.

There is one bioretention basin proposed which will be provided in accordance with industry best practice and the guidelines of the Monash University Facility for Advancing Water Biofiltration with the following parameters:

Bioretention

Parameter	Value
<u>Storage Properties</u>	
Extended Detention Depth	300 mm
Storage Surface Area	650 m ² (minimum)
<u>Filter and Media Properties</u>	
Filtration Area	600 m ²
Saturated Hydraulic Conductivity	100 mm/hr
Filter Depth	500 mm

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)	51.7	49.4	4.4
Total Suspended Solids (kg/yr)	10600	12700	88.0
Total Phosphorus (kg/yr)	20.5	8.48	58.6
Total Nitrogen (kg/yr)	119	62.8	47.1
Gross Pollutants (kg/yr)	1310	0.00	100.0

Table 6.2. MUSIC analysis results

The model results indicate that, through the use of the STM in the treatment train, pollutant load reductions for Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants will meet the requirements of C3 of PCC's DCP 2010 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 C3 of PCC's DCP2010 have been met.

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

Hydrocarbon and oil & grease removal cannot be modelled with MUSIC software. As a warehouse and distribution centre, the facility is expected to have low source loadings of hydrocarbons. Potential sources of hydrocarbons and/ or oil & grease would be limited to leaking engine sumps or for accidental fuel spills/leaks and leaching of bituminous pavements (car parking only). The potential for these pollutants 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 bioretention which is known to be effective in the treatment of hydrocarbons in stormwater.

Given the expected low source loadings of hydrocarbons and oil/grease and removal efficiencies of the treatment devices we consider the DGR's and PCC requirements 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 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 and to satisfy the requirements of PCC DCP2010.

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*, using a simple water balance analysis to balance the supply and demand, based on the base water demands and the requirement of PCC DCP2010 Part C3 to provide a reduction in non-potable water demand with a minimum 100,000 litre rainwater tank.

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 6.5** below).

Note that inspection frequency may vary depending on site specific attributes and rainfall patterns in the area. In addition to the maintenance requirements below it is also recommended that inspections are made following heavy rainfall or major storm events. Event heavy rain inspections should be carried out as soon as practicable following an intense period of rainfall, (i.e. greater than 100mm over 48 hours), as measured at Prospect Dam Weather Station No. 67019.

Table 6.5. 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.

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
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 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.
OSD SYSTEM			
Inspect and remove any blockage from orifice	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen to inspect orifice.
Inspect trash screen	Six Monthly	Maintenance	Remove grate and screen

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
and clean		Contractor/ Owner	if required to clean it.
Inspect flap valve and remove any blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate. Ensure flap valve moves freely and remove any blockages or debris.
Inspect pit sump for damage or blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate & screen. Remove sediment/ sludge build up and check orifice and flap valve 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.

7 EROSION & SEDIMENT CONTROL PLAN

An erosion and sediment control plan (ESCP) is included in drawings **Co12156.00-DA20** and **DA25**. 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 PCC'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 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 1 Limitations to access

7.3 Erosion & Sediment Control Conditions

1. Clearly visible barrier fencing shall be installed as shown on drawing **Co12156.00-DA20** 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. 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.
5. Where practical, foot and vehicular traffic will be kept away from all recently established areas
6. 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
7. 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).
8. 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 to support a development application for the proposed warehouse and distribution facility for TNT at Lockwood Road, Erskine Park.

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. 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 Penrith City Council's Section C3 of DCP2010.

The hydrological assessment proves local post development flows from the site will be less than pre-development flows and demonstrates that the site discharge will not adversely affect any land, drainage system or watercourse as a result of the development.

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 of a bioretention system is proposed to mitigate any increase in stormwater pollutant load generated by the development. MUSIC modelling results indicate that the proposed STM are effective in reducing pollutant loads in stormwater discharging from the site and 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);
- Penrith City Council – DCP 2010 (Part C3); and
- Water Sensitive Urban Design – “Technical Guidelines for Western Sydney” by URS Australia Pty Ltd, May 2004

Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

TNT TRANSPORT TERMINAL

LENORE LANE, ERSKINE PARK, NSW

CIVIL DRAWING FOR DEVELOPMENT APPLICATION

LIST OF DRAWINGS

DRAWING NO.	DRAWING TITLE
C012156.00-DA 10	DRAWING LIST & GENERAL NOTES
C012156.00-DA 20	EROSION AND SEDIMENT CONTROL PLAN
C012156.00-DA 25	EROSION AND SEDIMENT CONTROL DETAILS
C012156.00-DA 40	CONCEPT STORMWATER DRAINAGE PLAN
C012156.00-DA 45	CONCEPT STORMWATER DETAILS - SHEET 1
C012156.00-DA 46	CONCEPT STORMWATER DETAILS - SHEET 2
C012156.00-DA 50	FINISHED LEVELS PLAN
C012156.00-DA 65	RETAINING WALL DETAILS

GENERAL NOTES:

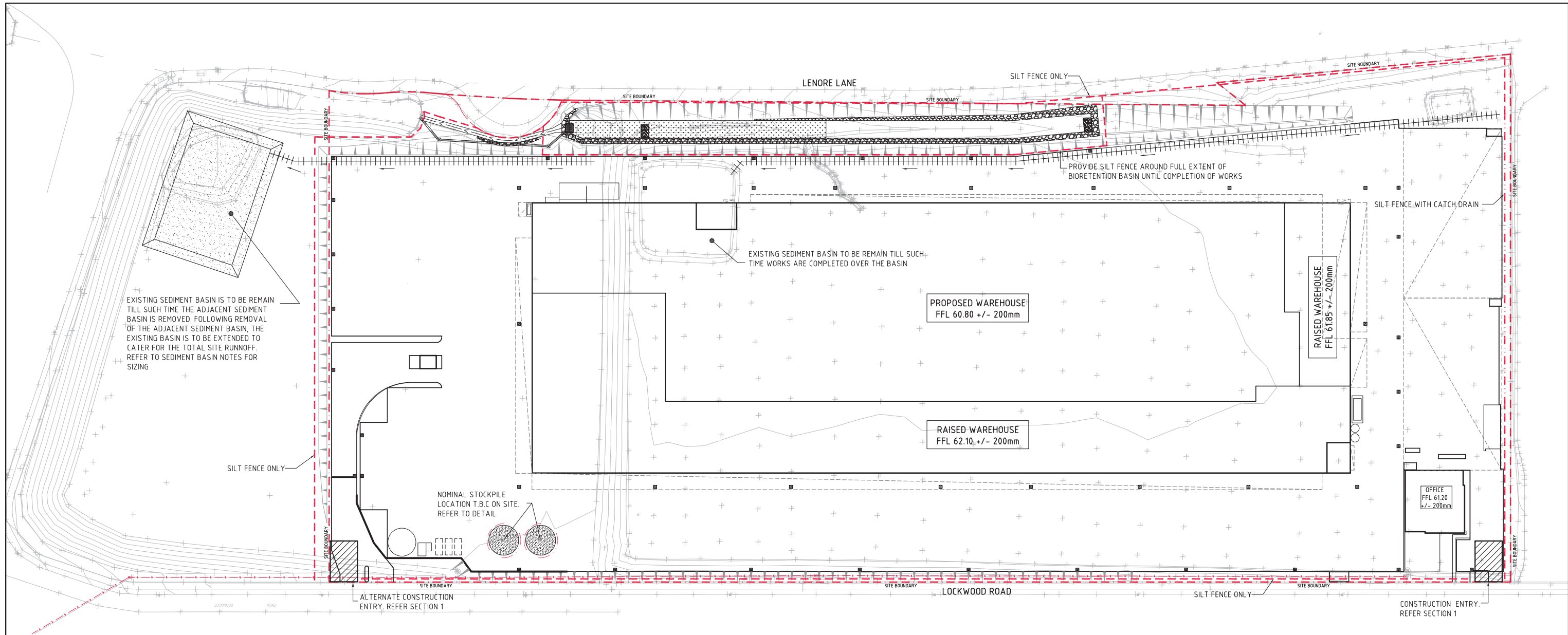
- G1 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
- 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. 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.



 SITE PLAN
N.T.S

FOR DEVELOPMENT APPLICATION

FOR DEVELOPMENT APPLICATION		27.08.13	B											DRAWING TITLE DRAWING LIST AND GENERAL NOTES					
FOR INFORMATION ONLY		22.08.13	A											DRAWING No C012156.00-DA 10					
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE					PROJECT TNT WAREHOUSE & DISTRIBUTION FACILITY ERSKINE PARK NSW		Costin Roe Consulting Pty Ltd. Consulting Engineers Level 1, 8 Windmill Street Walsh Bay, Sydney NSW 2000 Tel: (61) 651-7899 Fax: (61) 9241-3731 email: mail@costinroe.com.au ©				Value in Engineering and Management		ISSUE B	



EROSION AND SEDIMENT CONTROL PLAN
1500

EROSION CONTROL NOTES

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

SEDIMENTATION BASIN NOTE:

SEDIMENTATION BASIN SIZING BASED ON RECOMMENDATIONS OF 'SOILS AND CONSTRUCTION, MANAGING URBAN STORMWATER-THE BLUE BOOK'.
CAPACITY BASED UPON 5 DAY RAINFALL DEPTH AT 80th PERCENTILE INTENSITY (27.40mm).

APPROXIMATE AREA OF SITE = 9.5ha

REQUIRED SETTLING ZONE VOLUME	= 1300m ³
REQUIRED SEDIMENT STORAGE ZONE VOLUME	= 650m ³
TOTAL REQUIRED BASIN VOLUME	= 1950m³

SEDIMENTATION BASIN DIMENSIONS:

BASE DIMENSIONS (L X B)	= 30.0m x 45.0m
TOP DIMENSIONS (L X B)	= 37.2m x 52.2m
MAX SIDE SLOPE	= 1V:3H
DEPTH	= 1.2m
TOTAL VOLUME PROVIDED	= 1964m³

SEDIMENTATION BASIN TO BE CONSTRUCTED TO DIMENSIONS AS SPECIFIED ABOVE AND TO BE FENCED.

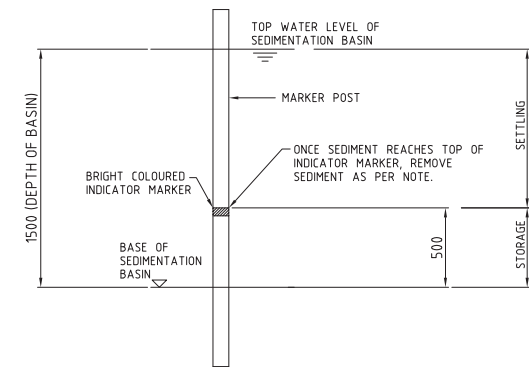
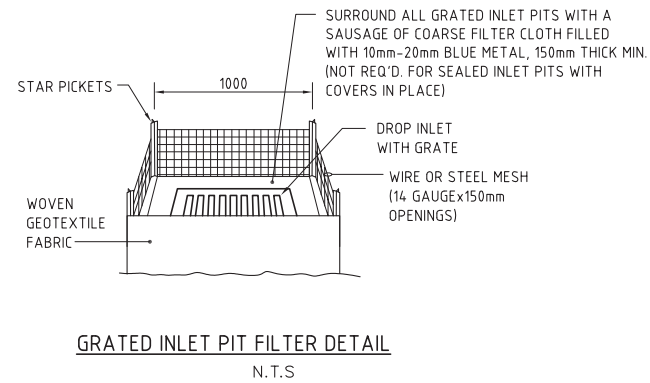
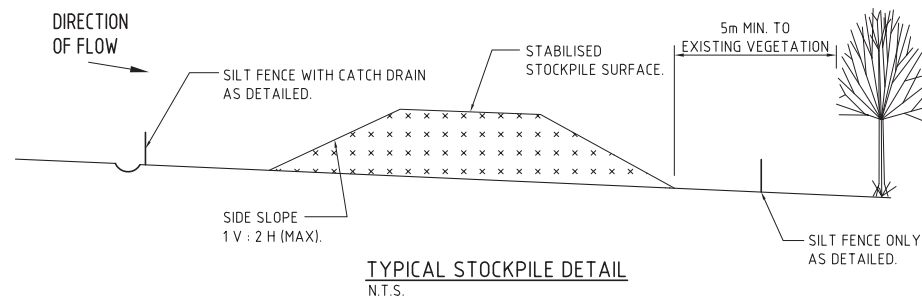
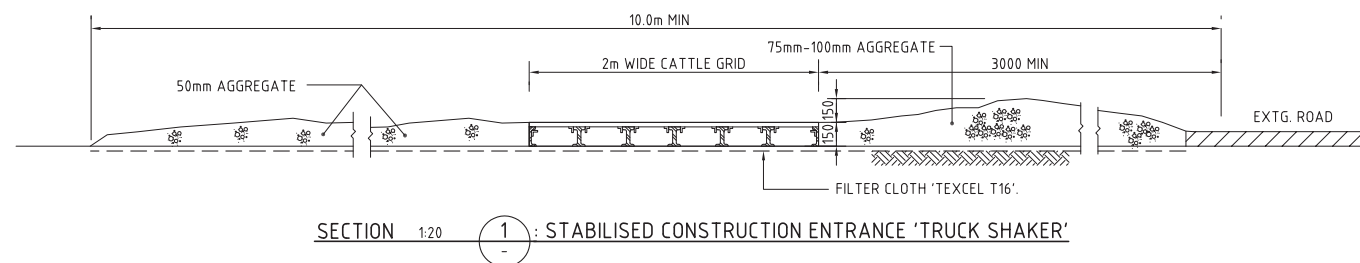
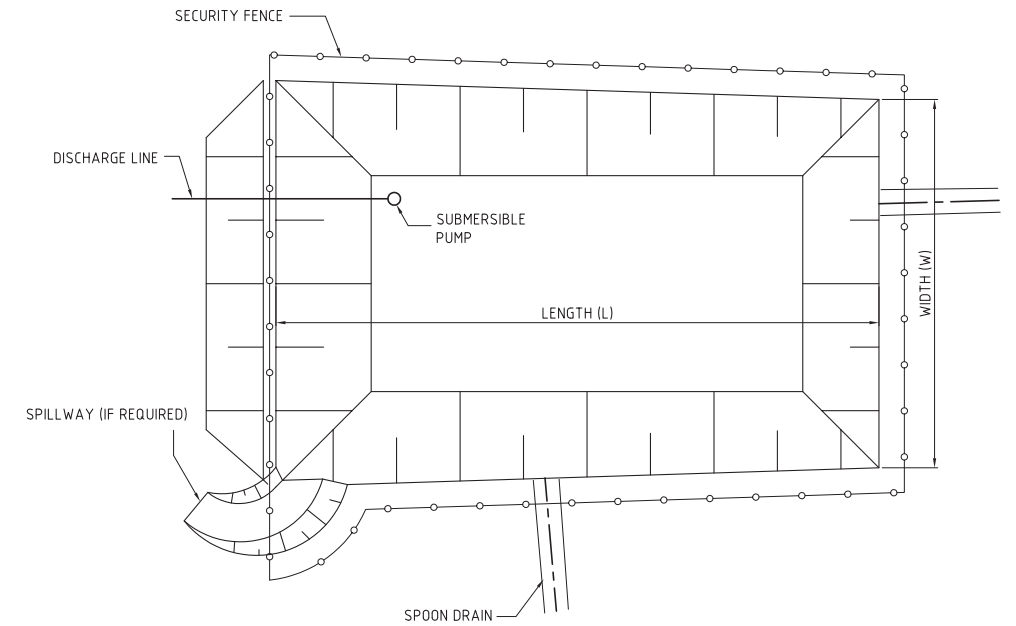
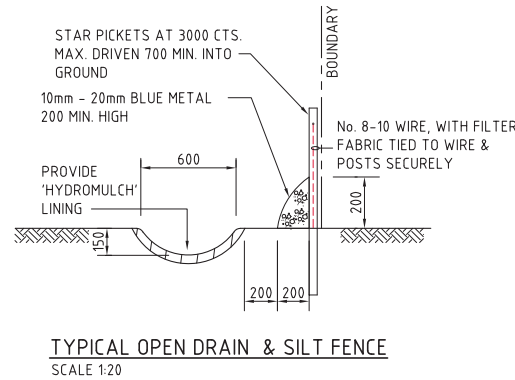
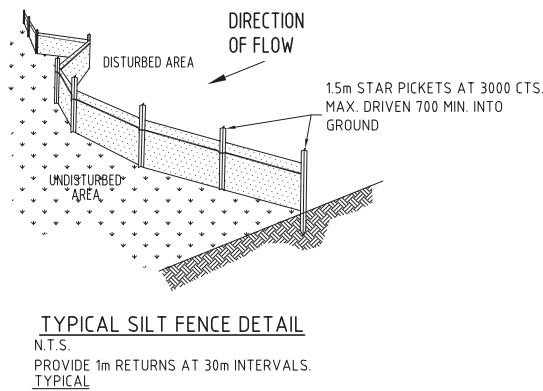
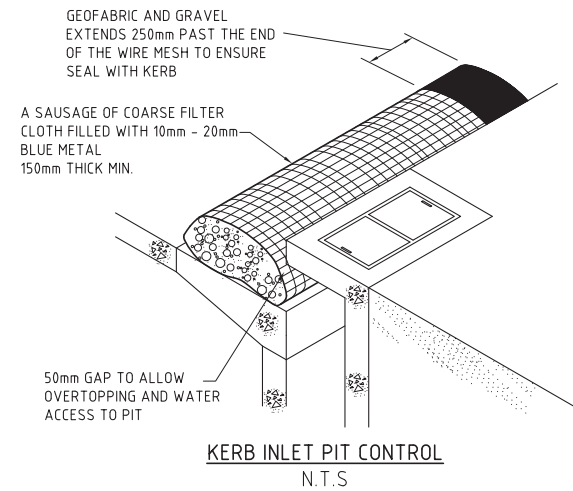
BASIN IS TO HAVE SEDIMENT MARKER PLACED AS PER DETAIL ON DRG DA25 TO INDICATE WHEN SEDIMENT IS TO BE REMOVED. REMOVED SEDIMENT IS TO BE CLASSED AND DEWATERED PRIOR TO REMOVAL FROM SITE.

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



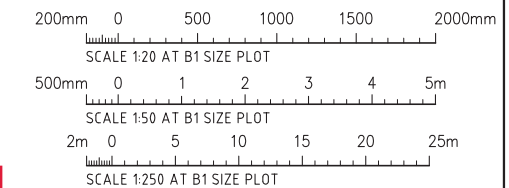
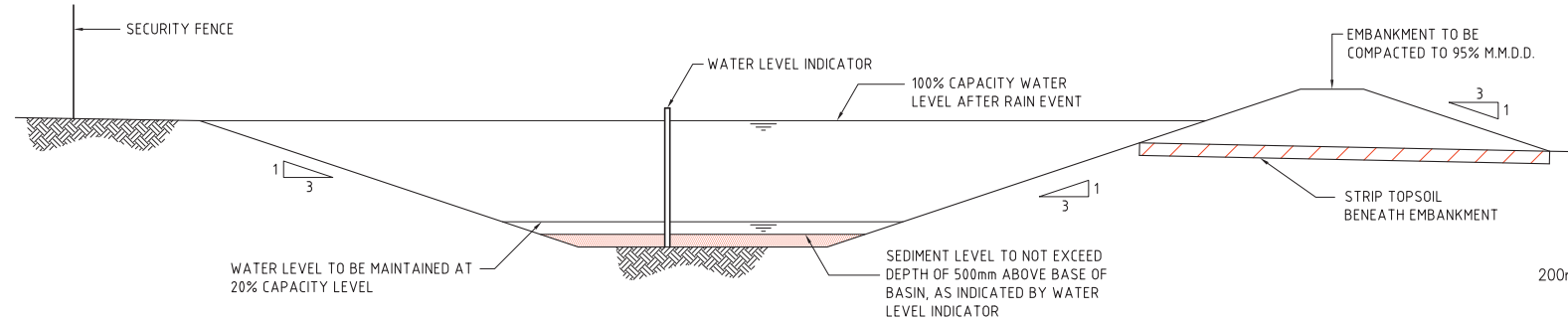
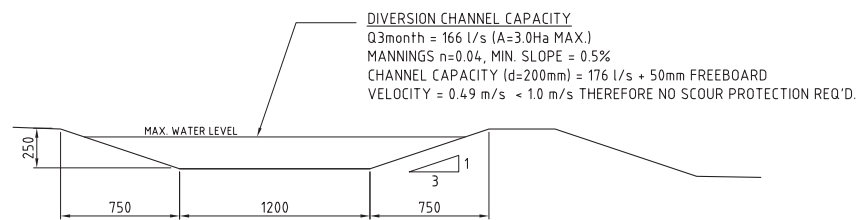
FOR DEVELOPMENT APPLICATION

FOR DEVELOPMENT APPLICATION FOR INFORMATION ONLY AMENDMENTS	27.08.13 B 22.08.13 A DATE ISSUE	ARCHITECT CLIENT Developing Relationships Building Success Sydney Melbourne Brisbane Adelaide Perth www.cipconsulting.com.au National Enquiries: 1800 809 877	PROJECT TNT WAREHOUSE & DISTRIBUTION FACILITY ERSKINE PARK NSW Costin Roe Consulting Pty Ltd. Consulting Engineers Level 1, 8 Windmill Street Walsh Bay, Sydney NSW 2000 Tel: (61) 6551-7699 Fax: (61) 9241-3731 email: mail@costinroe.com.au ©	Value in Engineering and Management	DRAWING TITLE EROSION AND SEDIMENT CONTROL PLAN DRAWING No C012156.00-DA20 ISSUE B
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- STOCKPILE NOTES**
1. PLACE ALL STOCKPILES IN LOCATIONS MORE THAN 5m FROM EXISTING VEGETATION, ROADS & HAZARD AREAS.
 2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT ELONGATED MOUNDS. SIDE SLOPE TO BE 1V:2H MAX.
 3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
 4. WHERE STOCKPILES ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE USING WOOD CHIP MULCH - 16 TONNE/Ha.
 5. CONSTRUCT SILT FENCE WITH CATCH DRAIN ON UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES & SILT FENCE ONLY 1 TO 2m DOWNSLOPE AS SHOWN.

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



FOR DEVELOPMENT APPLICATION

FOR DEVELOPMENT APPLICATION	27.08.13	B
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AMENDMENTS	DATE	ISSUE

ARCHITECT	CLIENT

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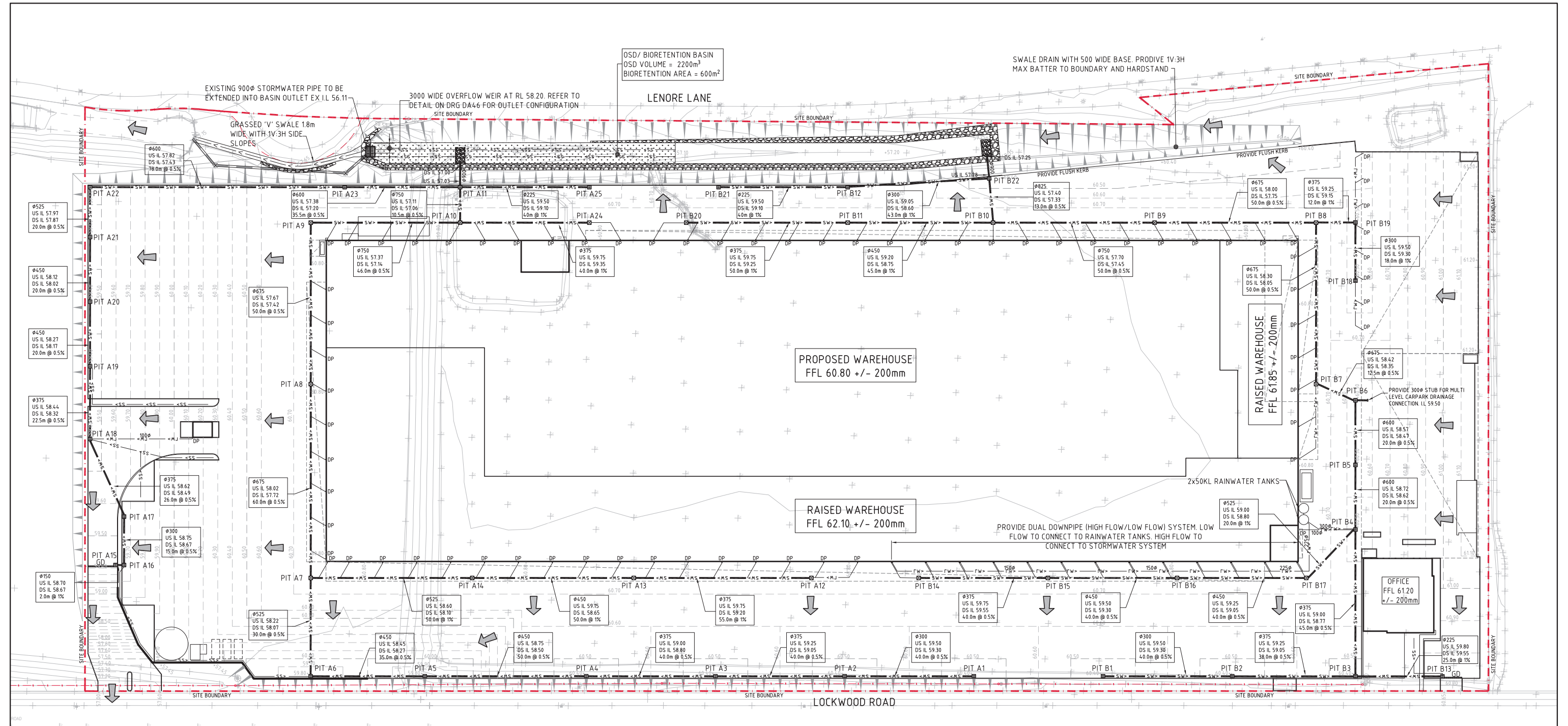
PROJECT
TNT WAREHOUSE & DISTRIBUTION FACILITY
ERSKINE PARK NSW

DESIGNED: MW
DRAWN: MJC
DATE: 13.08.13
CHECKED: B1
SCALE: AS SHOWN
CAD REF: C012156-00-DA-25

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EROSION AND SEDIMENT CONTROL DETAILS	C012156.00-DA 25	B



OSD/ BIORETENTION BASIN
OSD VOLUME = 2200m³
BIORETENTION AREA = 600m²

SWALE DRAIN WITH 500 WIDE BASE, PROVIDE 1V:3H
MAX BATTER TO BOUNDARY AND HARDSTAND

EXISTING 900Ø STORMWATER PIPE TO BE
EXTENDED INTO BASIN OUTLET EX IL 56.11

3000 WIDE OVERFLOW WEIR AT RL 58.20. REFER TO
DETAIL ON DRG DA46 FOR OUTLET CONFIGURATION

LENORE LANE

PROPOSED WAREHOUSE
FFL 60.80 +/- 200mm

RAISED WAREHOUSE
FFL 62.10 +/- 200mm

RAISED WAREHOUSE
FFL 61.85 +/- 200mm

OFFICE
FFL 61.20
+/- 200mm

- STORMWATER DRAINAGE NOTES:**
- ALL FINISHED PAVEMENT LEVELS SHALL BE AS INDICATED ON FINISHED LEVELS PLAN
 - PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN
 - EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE
 - ALL STORMWATER PIPES Ø375 OR GREATER SHALL BE CLASS 2 REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE
 - ALL PIPES UP TO AND INCLUDING 300mm TO BE UPVC GRADE SN8
 - 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 F₂₈ 25 MPA. PRECAST PITS MAY BE USED WITH THE APPROVAL OF THE ENGINEER
 - IN ADDITION TO ITEM 6 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm
 - PIPES SHALL BE LAID AS PER PIPE LAYING DETAILS. PARTICULAR CARE SHALL BE TAKEN TO ENSURE THAT THE PIPE IS FULLY AND EVENLY SUPPORTED - RAM AND PACK FILLING AROUND AND UNDER BACK OF PIPES AND PIPE FAUCETS, WITH NARROW EDGED RAMMERS OR OTHER SUITABLE TAMPING DETAILS
 - WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED Ø100 uPVC TO EACH SIDE OF PIPE
 - ALL SUBSOIL DRAINAGE LINES SHALL BE Ø100 SLOTTED UPVC WITH APPROVED FILTER WRAP LAID IN 300mm WIDE GRANULAR FILTER UNLESS NOTED OTHERWISE. LAY SUBSOIL LINES TO MATCH FALLS OF LAND AND/OR 1 IN 200 MINIMUM. PROVIDE CAPPED CLEANING EYE (RODDING POINT) AT UPSTREAM END OF LINE AND AT 30m MAX. CTS. PROVIDE SUBSOIL LINES TO ALL PAVEMENT / LANDSCAPED INTERFACES, TO REAR OF RETAINING WALLS (AS NOMINATED BY STRUCTURAL ENGINEER) AND AS SHOWN ON PLAN
 - ALL PIPE GRADES 1 IN 100 MINIMUM UNDO
 - PROVIDE STEP IRONS IN PITS DEEPER THAN 1000mm
 - MIN. 600 COVER TO PIPE OBVERT BENEATH ROADS & MIN. 400 COVER BENEATH LANDSCAPED AND PEDESTRIAN AREAS
 - PIT COVERS IN TRAFFICABLE PAVEMENT SHALL BE CLASS D 'HEAVY DUTY', THOSE LOCATED IN NON-TRAFFICABLE AREAS SHALL BE CLASS B 'MEDIUM DUTY' UNDO
 - PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT
 - DOWN PIPES TO BE AS PER HYDRAULIC ENGINEERS DETAILS WITH CONNECTOR TO MATCH DP SIZE UNDO ON PLAN. PROVIDE CLEANING EYE AT GROUND LEVEL
 - PIPE LENGTHS NOMINATED ON PLAN OR LONGSECTIONS ARE MEASURED FROM CENTER OF PITS TO THE NEAREST 0.5m AND DO NOT REPRESENT ACTUAL LENGTH. THE CONTRACTOR IS TO ALLOW FOR THIS
 - GRADED DRAINS ARE TO BE 200mm MIN. WIDE & 150mm MIN. DEEP (REFER TO SCHEDULE) WITH CLASS D GRATE. PROVIDE 1% FALL TO OUTLET.

PIT SCHEDULE - SYSTEM A

PIT No.	GRATE RL	DEPTH	TYPE	SIZE	COMMENT
PIT A1	60.40	900	SGGP	900x900	⊕
PIT A2	60.40	1150	SGGP	900x900	⊕
PIT A3	60.40	1400	SGGP	900x900	⊕
PIT A4	60.40	1650	SGGP	900x900	⊕
PIT A5	59.80	1350	SGGP	900x900	⊕
PIT A6	59.80	1580	SGGP	900x900	⊕
PIT A7	60.75	2730	SJP	900x900	⊕
PIT A8	60.75	3080	SJP	900x900	⊕
PIT A9	60.75	3380	SJP	900x900	⊕
PIT A10	60.75	3640	SJP	900x900	⊕
PIT A11	60.75	3470	SGGP	1200x1200	⊕
PIT A12	60.75	1000	SJP	900x900	⊕
PIT A13	60.75	1600	SJP	900x900	⊕
PIT A14	60.75	2150	SJP	900x900	⊕
PIT A15	59.40	700	SGGP	600x600	⊕
PIT A16	59.65	900	SGGP	900x900	⊕
PIT A17	59.65	1030	SGGP	900x900	⊕
PIT A18	59.40	960	SGGP	900x900	⊕
PIT A19	59.40	1130	SGGP	900x900	⊕
PIT A20	59.40	1280	SGGP	900x900	⊕
PIT A21	59.40	1430	SGGP	900x900	⊕
PIT A22	59.40	1580	SGGP	900x900	⊕
PIT A23	60.50	3120	SGGP	900x900	⊕
PIT A24	60.75	1000	SJP	900x900	⊕
PIT A25	60.50	1000	SGGP	900x900	⊕

⊕ - DENOTES PIT TO BE FITTED WITH STORMWATER 360 ENVIROPOD UNIT

PIT SCHEDULE - SYSTEM B

PIT No.	GRATE RL	DEPTH	TYPE	SIZE	COMMENT
PIT B1	60.40	900	SGGP	900x900	⊕
PIT B2	60.40	1150	SGGP	900x900	⊕
PIT B3	60.40	1400	SGGP	900x900	⊕
PIT B4	60.50	1780	SGGP	900x900	⊕
PIT B5	60.50	1930	SGGP	900x900	⊕
PIT B6	60.50	2080	SGGP	900x900	⊕
PIT B7	60.75	2450	SJP	900x900	⊕
PIT B8	60.75	2750	SJP	900x900	⊕
PIT B9	60.75	3050	SJP	900x900	⊕
PIT B10	60.75	3350	SJP	900x900	⊕
PIT B11	60.75	1450	SGGP	900x900	⊕
PIT B12	60.50	1250	SJP	1200x1200	⊕
PIT B13	60.72	920	SGGP	600x600	⊕
PIT B14	60.75	1000	SJP	900x900	⊕
PIT B15	60.75	1250	SJP	900x900	⊕
PIT B16	60.75	1500	SJP	900x900	⊕
PIT B17	60.75	1750	SJP	900x900	⊕
PIT B18	60.50	1000	SGGP	900x900	⊕
PIT B19	60.50	1250	SGGP	900x900	⊕
PIT B20	60.75	1000	SJP	900x900	⊕
PIT B21	60.50	1000	SGGP	900x900	⊕
PIT B22	60.40	3120	SGGP	1200x1200	⊕

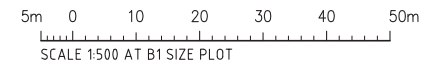
⊕ - DENOTES PIT TO BE FITTED WITH STORMWATER 360 ENVIROPOD UNIT

CONCEPT STORMWATER PLAN
1:500

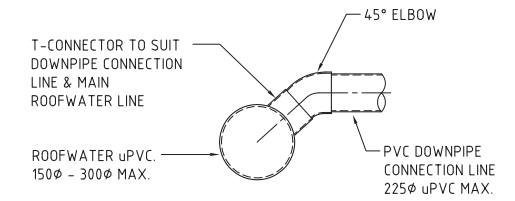
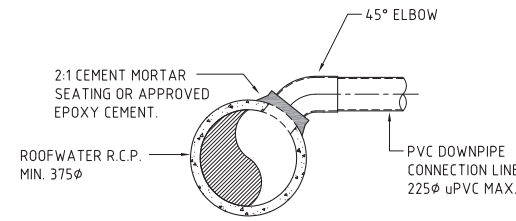
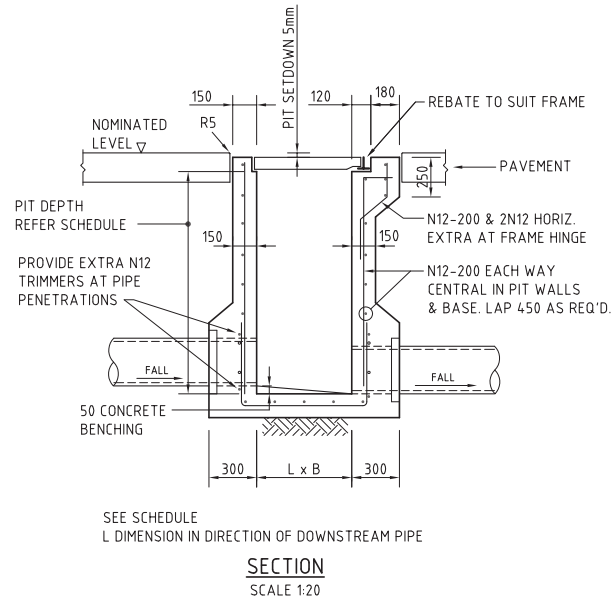
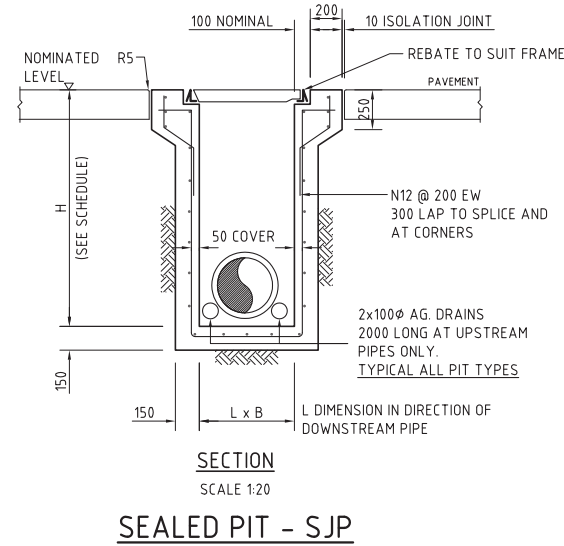
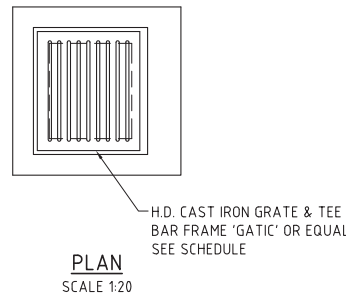
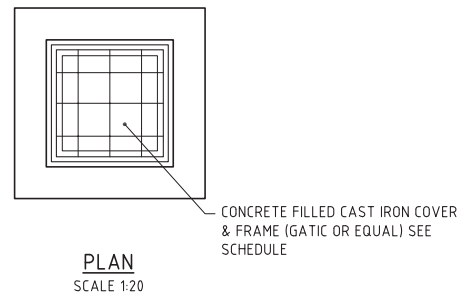
LEGEND:
LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LAND PARTNERS DATED AUG 2013.

- ⊕ - SJP, SEALED JUNCTION PIT
- ⊕ - SGGP, SINGLE GRATED GULLY PIT
- GD - GRATED DRAIN 200 WIDE
- sw - DRAINAGE LINE
- ss - SUBSOIL LINE
- - - - EXISTING DRAINAGE PIPE
- - - - EXISTING SEWER
- rw - ROOFWATER LINE
- - OVERLAND FLOW PATH
- * DP - DOWNPIPE (INDICATIVE ONLY)
- - - - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- - - - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- - - - FINISHED PAVEMENT SPOT HEIGHT



FOR DEVELOPMENT APPLICATION



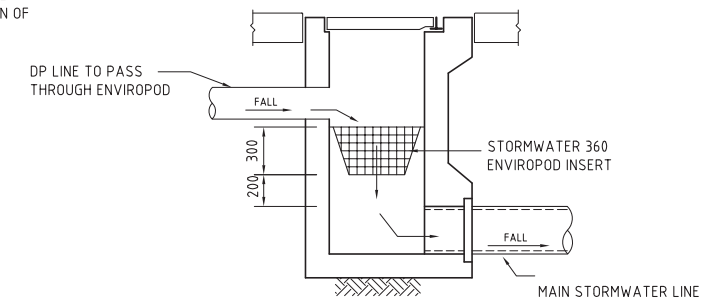
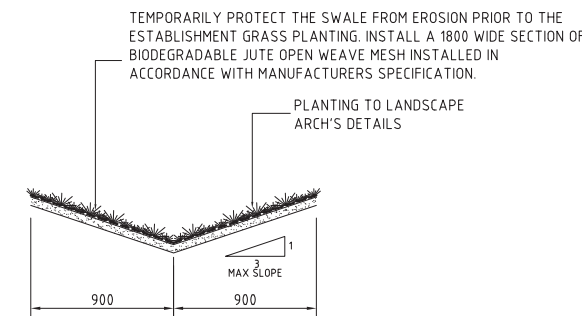
DOWN PIPE CONNECTION TO R.C.P. PIPE

1. THE R.C. STORMWATER PIPE SHALL BE PIERCED BY A NEAT OPENING TO ALLOW THE CONNECTION OF A PVC PIPE.
2. THE EXPOSED R.C. PIPE REINFORCEMENT IS TO BE BENT OUTWARDS TO RETAIN THE MORTARTED JOINT.
3. THE PVC PIPE SHALL NOT PROTRUDE BEYOND THE INNER SURFACE OF THE R.C. STORMWATER PIPE.
4. THE INTERNAL JUNCTION SHALL BE SMOOTHLY FINISHED SO AS TO PRESENT NO OBSTRUCTION WITHIN THE INTERNAL CHANNEL OF THE R.C. STORMWATER PIPE.
5. PROPRIETARY SADDLES MAY BE USED FOR THE CONNECTION SEATING. THE CONTRACTOR IS TO PROVIDE DETAILS OF THE PROPOSED CONNECTION TO THE ENGINEER FOR APPROVAL.

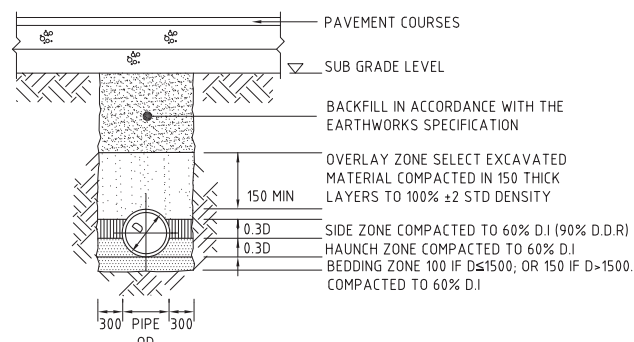
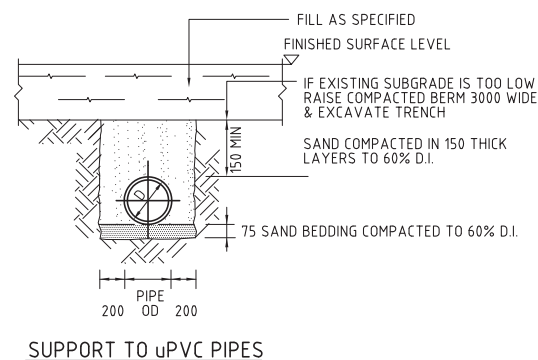
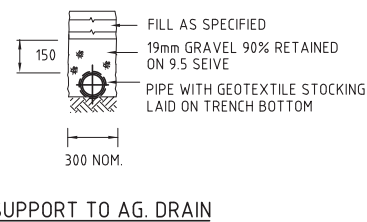
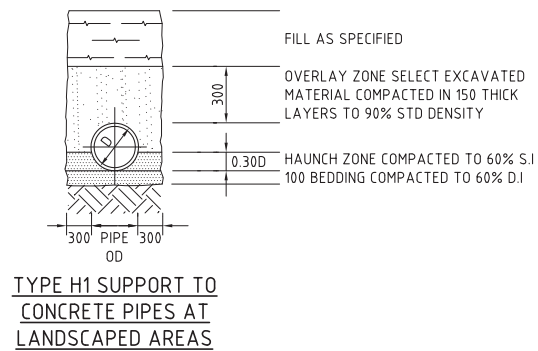
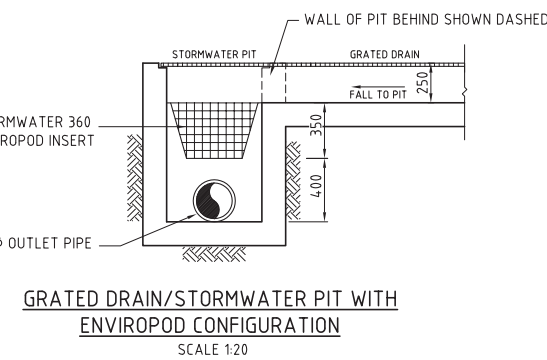
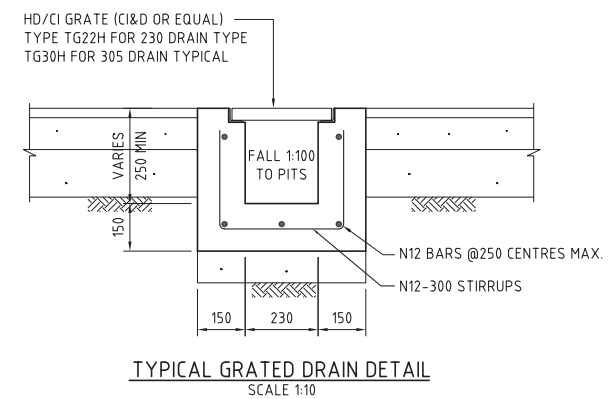
DOWN PIPE CONNECTION TO uPCV PIPE

1. PROPRIETARY T-PIECE CONNECTORS SHALL BE USED TO WHERE DIRECT CONNECTIONS ARE REQUIRED TO uPVC PIPES.
2. ALL JOINTS TO BE SEALED WITH SOLVENT WELDED JOINTS.
3. THE PVC PIPE SHALL NOT PROTRUDE BEYOND THE INNER SURFACE OF THE STORMWATER PIPE.

DOWNPIPE CONNECTION DETAILS
SCALE 1:20



ROOFWATER/STORMWATER PIT WITH ENVIROPOD CONFIGURATION
SCALE 1:20



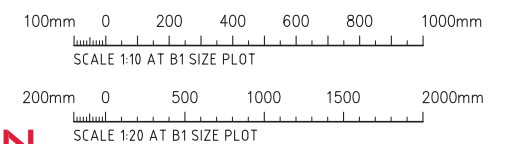
SIDE ZONE MATERIAL GRADING

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

BEDDING & HAUNCH MATERIAL GRADING

SIEVE SIZE	WEIGHT PASSING(%)
19	100
2.36	100 TO 50
0.60	90 TO 50
0.30	60 TO 10
0.15	25 TO 0
0.075	10 TO 0

PIPE LAYING DETAILS
1:20



FOR DEVELOPMENT APPLICATION

FOR DEVELOPMENT APPLICATION	DATE	ISSUE	AMENDMENTS
	27.08.13	B	
	22.08.13	A	

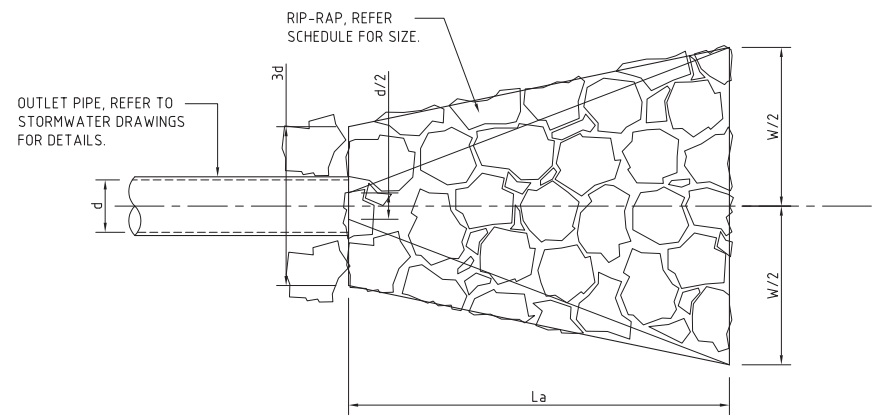
ARCHITECT	CLIENT

PROJECT	DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF.
TNT WAREHOUSE & DISTRIBUTION FACILITY ERSKINE PARK NSW	MW	MJC	13.08.13		B1	AS SHOWN	C02756.00-DA45

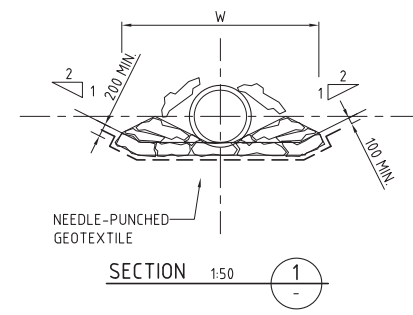
COMPANY	CONTACT
CIP	Costin Roe Consulting Pty Ltd.

CostinRoe Consulting
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (61) 851-7899 Fax: (61) 9241-3731
email: mail@costinroe.com.au ©
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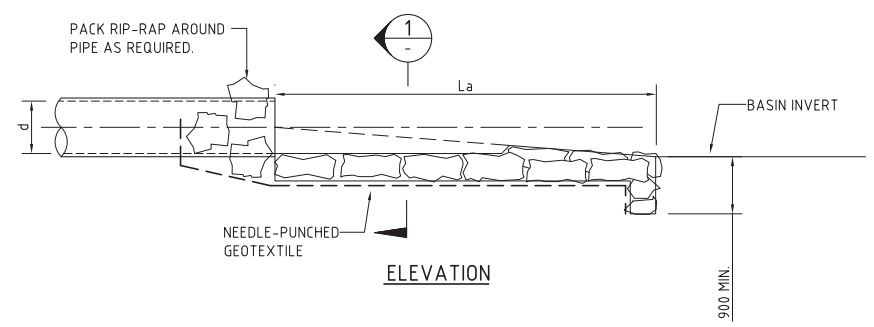
DRAWING TITLE	DRAWING No	ISSUE
CONCEPT STORMWATER DETAILS	C012156.00-DA 45	B



PLAN VIEW



SECTION 1:50



ELEVATION

- DISSIPATER NOTES:**
- 1) ALIGN STRUCTURE EVENLY WITH BANK.
 - 2) LOCATE STRUCTURE AT INVERT LEVEL OF BASIN.
 - 3) PIPE TO REST ON, AND BE PACKED IN, BY RIP-RAP (SIZE AS NOTED).
 - 4) RIP-RAP TO CONSIST OF ANGULAR RUN-OF-QUARRY ROCK AS NOTED PLACED OVER A 200mm LAYER OF 140mm COBBLES OVER NEEDLE-PUNCHED GEOFAB A44.
 - 5) GAPS IN RIP-RAP TO BE PLANTED WITH NATIVE SEDGES & RUSHES.

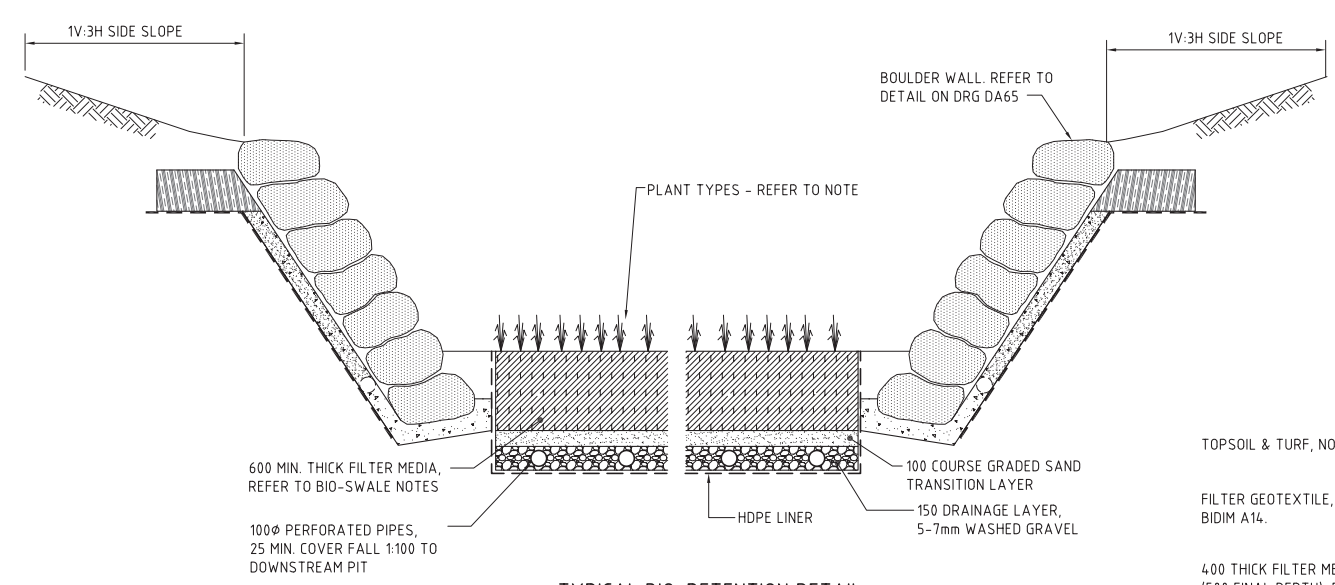
DISSIPATER SCHEDULE

DISCHARGE POINT	d	La	W	RIP-RAP
OUTLET TYPE 1	900	4000	3000	200

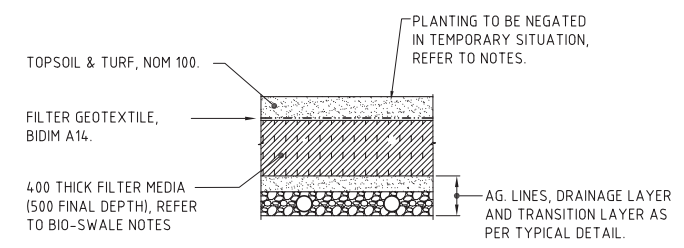
STORMWATER OUTLET DISSIPATER
SCALE 1:50

BIO-RETENTION NOTES:
 FILTER MEDIA TO BE LOAMY SAND WITH A PERMEABILITY NOT LESS THAN 200mm/hr. FILTER MEDIA TO BE FREE OF RUBBISH, DELETERIOUS MATERIAL, TOXICANTS, DECLARED PLANTS AND LOCAL WEEDS, AND IS TO NOT BE HYDROPHOBIC.
 FILTER MEDIA TO HAVE THE FOLLOWING COMPOSITION RANGE:
 (CLAY & SILT (<0.05mm) +3%
 VERY FINE SAND (0.05-0.15mm) 5-30%
 FINE SAND (0.15-0.25mm) 10-30%
 MEDIUM TO COARSE SAND (0.25-1.00mm) 40-60%
 COARSE SAND (1.0-2.0mm) 7-10%
 FINE GRAVEL (2.0-3.4mm) +3%
 FILTER MEDIA THAT DOES NOT MEET THE FOLLOWING CRITERIA SHALL BE REJECTED:
 a. ORGANIC MATTER CONTENT TO BE IDEALLY WITHIN 1% TO 3% (W/W) AND TO BE NO GREATER THAN 5%(W/W).
 b. PH TO BE BETWEEN 5.5 AND 7.5
 c. PHOSPHOROUS CONTENT TO BE NO GREATER THAN 35mg/kg
 FILTER MEDIA TO BE ASSESSED BY QUALIFIED HORTICULTURIST TO ENSURE CAPABILITY OF SUPPORTING PLANT LIFE.
 DRAINAGE LAYER TO BE CLEAN GRAVEL 5-7mm.
 PLANTS TO BE IN ACCORDANCE WITH PENRITH CITY COUNCIL & LANDSCAPE ARCHITECT.
 PROVIDE 100mm TOPSOIL AND TEMPORARY EROSION PROTECTION (LUTEMASTER OR EQUIV) TO SWALE BATTER SLOPES AND ADJACENT LANDSCAPED AREAS. NOTE THAT NO TOPSOIL IS TO BE PLACED OVER FILTRATION MEDIA. PROVIDE SILT FENCE TO TOP OF BANK UNTIL SUCH TIME AS THIS STABILISING AND VEGETATION HAS BEEN COMPLETED.
 BIO-RETENTION TO BE PARTIALLY INSTALLED, FOLLOWING COMPLETION OF THE ROAD, WITH THE TOP 75-100mm OF FILTER MEDIA REPLACED WITH A FINE TO COARSE SAND UNDERLAIN WITH A GEOTEXTILE LAYER (REFER TO DETAIL). FOLLOWING COMPLETION OF THE UPSTREAM DEVELOPMENT AND SITE STABILISATION, THE SAND IS TO BE REMOVED, REPLACED WITH FILTER MATERIAL AND PLANTED OUT. REFER TO TEMPORARY BIO-BASIN DETAIL.
 PRIOR TO PLANTING, THE TOP 100mm OF THE BIORETENTION FILTER MEDIA IS TO BE AMELIORATED WITH APPROPRIATE ORGANIC MATTER, FERTILISER AND TRACE ELEMENTS TO AID PLANT ESTABLISHMENT AS PER THE TABLE BELOW:

CONSTITUENT	QUANTITY (kg/m ² OF FILTER AREA)
GRANULATED POULTRY MANURE FINES	50
SUPERPHOSPHATE	3
MAGNESIUM SULPHATE	3
POTASSIUM SULPHATE	2
TRACE ELEMENT MIX	1
FERTILISER NPK (16.4.14)	4
LIME	20



TYPICAL BIO-RETENTION DETAIL
SCALE 1:20



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

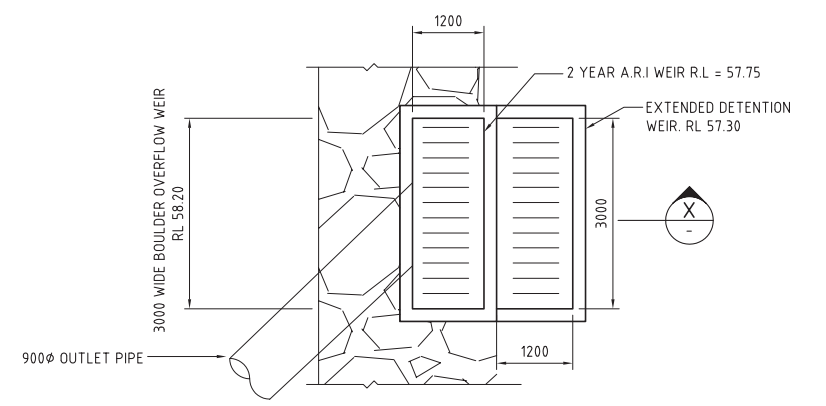
OSD BASIN DETAILS

SITE AREA
 TOTAL SITE AREA 78 642m²
 TOTAL SITE AREA DRAINING TO STORAGE (90% IMPERVIOUS) 73 850m²
 STORAGE
 LOW FLOW ORIFICE ϕ 590mm
 VOLUME PROVIDED 2200m³

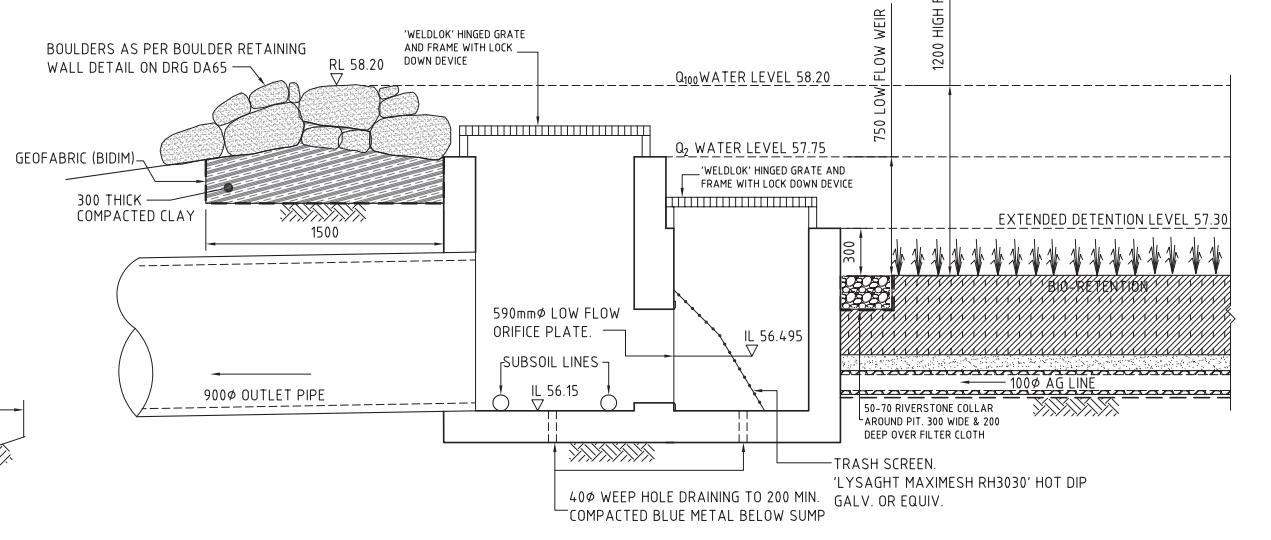
ON SITE DETENTION - HYDROLOGIC DETAILS

ARI (yrs)	Storm Duration (hrs)	Flow (m ³ /s)		
		Pre - Devel.	Post Devel. (un-attenuated)	Post Devel. (with attenuation)
2	2	0.65	1.53	0.49
20	2	1.81	2.68	1.45
100	2	2.34	3.34	2.17

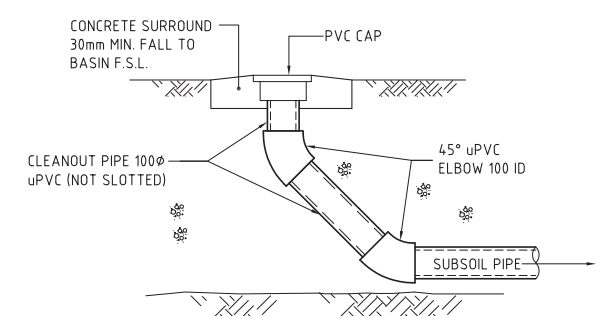
REFER TO CIVIL REPORT C012156.00-03.rpt FOR DETAILED OSD INFORMATION



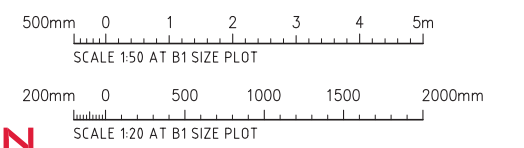
OUTLET CONTROL PIT FOR OSD BASIN - PLAN
SCALE 1:50



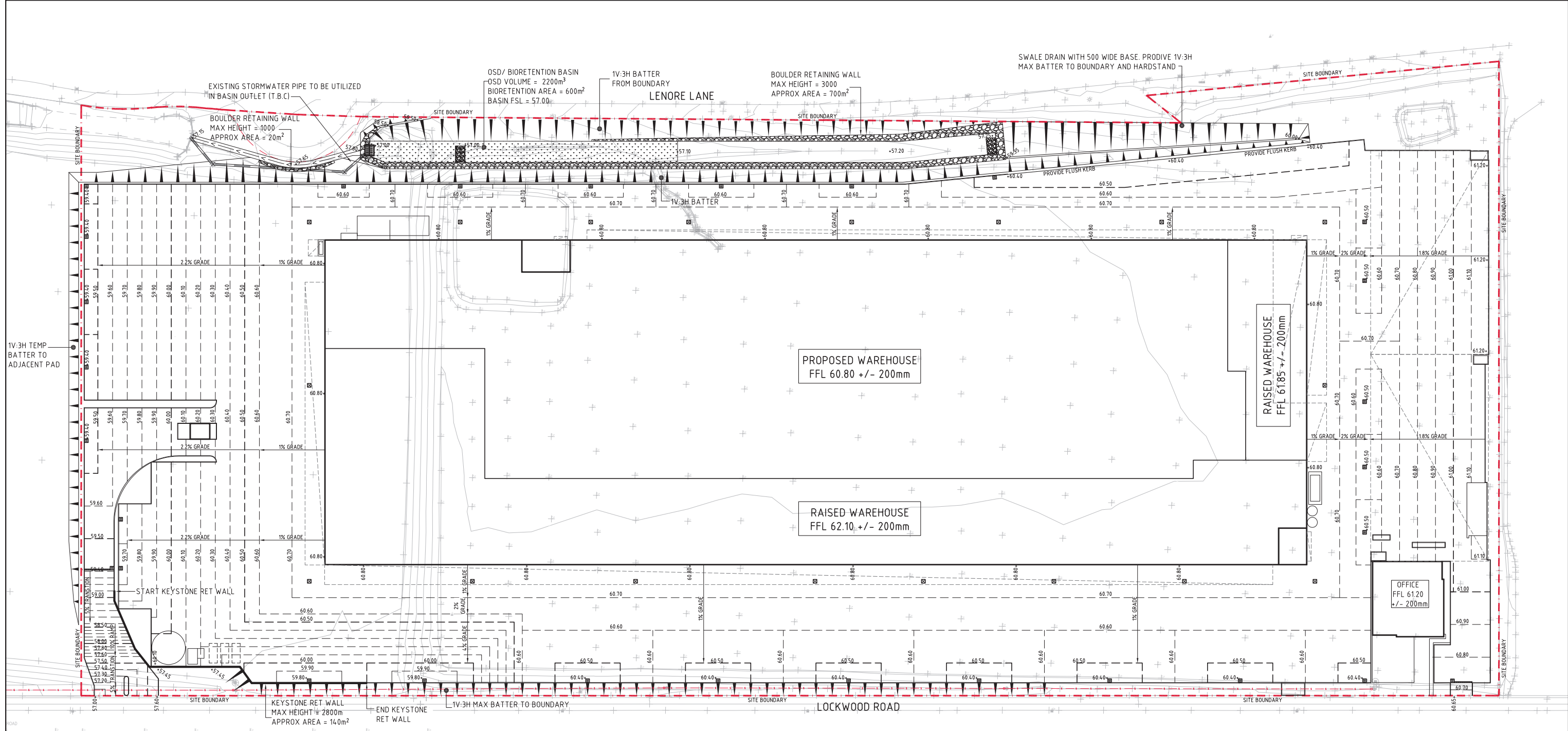
OUTLET CONTROL PIT FOR OSD BASIN - SECTION 1:20



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



FOR DEVELOPMENT APPLICATION



LEGEND:
LEVELS DATUM IS A.H.D.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LAND PARTNERS DATED 01.07.08.

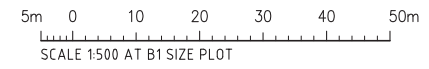
- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- FINISHED LEVEL SPOT HEIGHT
- EXISTING CONTOUR
- EXISTING SPOT HEIGHT
- DRAINAGE PIPE

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 1:20 (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 EXCEEDS 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.

FINISHED LEVELS PLAN
1:500

FOR DEVELOPMENT APPLICATION



FOR DEVELOPMENT APPLICATION	27.08.13	D			
FOR INFORMATION ONLY	23.08.13	C			
FOR INFORMATION ONLY	22.08.13	B			
FOR INFORMATION ONLY	13.08.13	A			
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE

ARCHITECT	CLIENT
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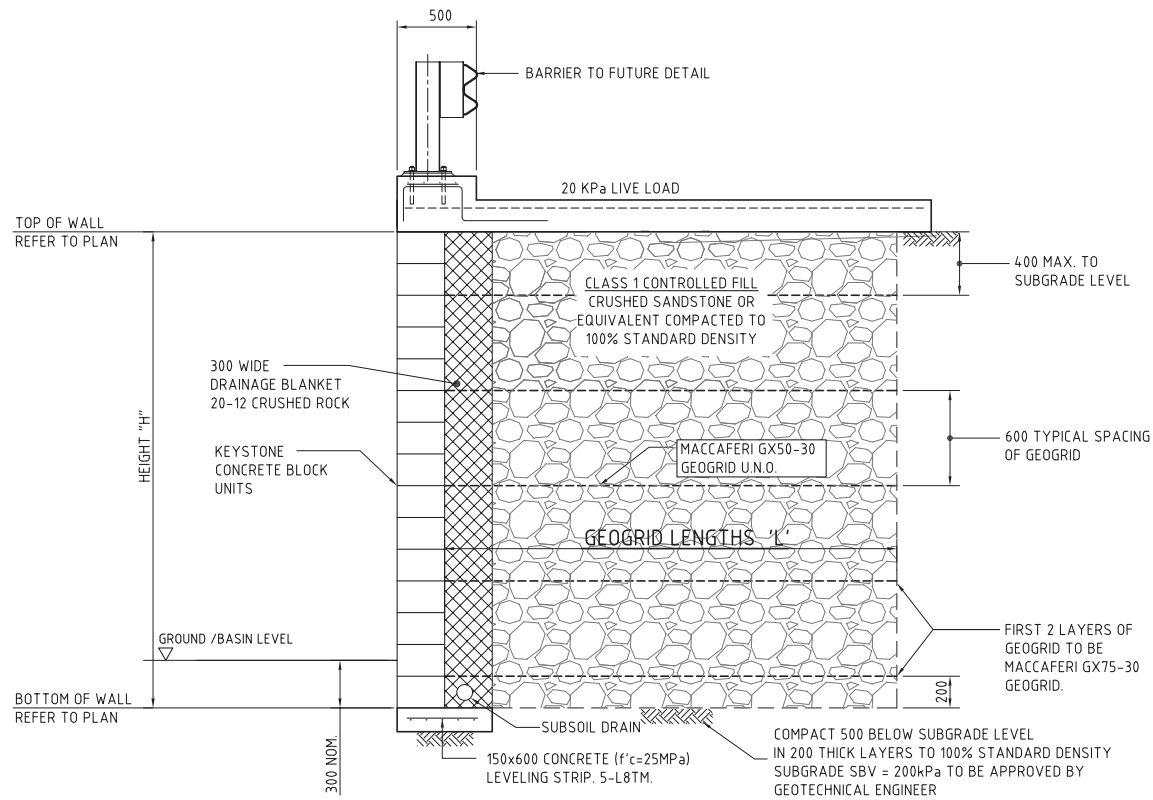
CIP
Developing Relationships Building Success

PROJECT
TNT WAREHOUSE & DISTRIBUTION FACILITY
ERSKINE PARK NSW

Costin Roe Consulting Pty Ltd.
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DRAWING TITLE	FINISHED LEVELS PLAN
DRAWING No	C012156.00-DA50
ISSUE	D

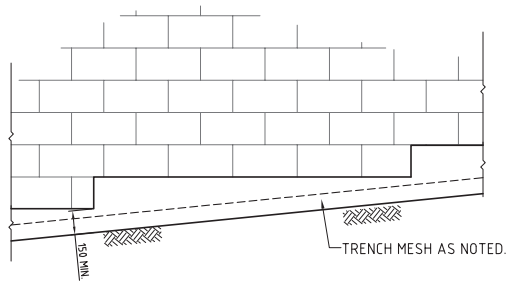


REINFORCED EARTH KEYSTONE WALL TYPICAL DETAIL
UP TO 3m MAXIMUM HEIGHT
SCALE 1:20

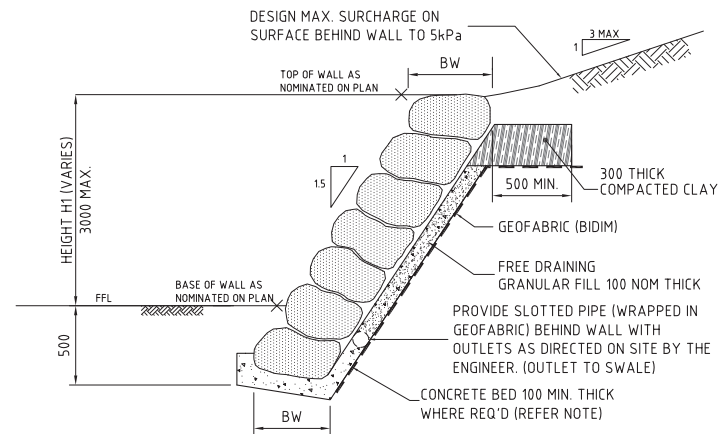
RETAINING WALL 1 SPECIFICATIONS :

RETAINED HEIGHT (mm)	GEOGRID LENGTH "L" (mm)
UP TO 3000	3500

x INDICATIVE LENGTHS SHOWN ONLY. FINAL GEOGRID LENGTH T.B.C DURING DETAIL DESIGN STAGE



CONCRETE BLOCK REINFORCED EARTH WALL TYPICAL LEVELLING STRIP STEP DETAIL
SCALE 1:20

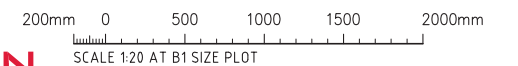


BOULDER RETAINING WALL TYPICAL DETAIL
N.T.S.

BOULDER RETAINING WALL NOTES

- MINIMUM BEARING CAPACITY OF FOUNDATION TO BE 100kPa ASSUMING THE FOLLOWING:
 - CLAY FOUNDATION $C_u=50kPa, \phi=0$
- SLIDING STABILITY IS BASED ON THE FOLLOWING:
 - FRICTION ANGLE OF BOULDER WALL: NOT LESS THAN 40°
 - EFFECTIVE FRICTION ANGLE OF SOIL SUBGRADE: NOT LESS THAN 30° FOR SOIL OR 35° FOR ROCK
- SOIL AND ROCK DESIGN PARAMETERS SHALL BE CONFIRMED BY GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF BOULDERS OR CONCRETE BED.
- BOULDERS TO BE A NOMINAL 750mm DIA. (400mm DIA. UP TO 800mm DIA.) PLACED ON THEIR BROADEST BASE. BOULDERS TO BE PLACED IN AN INTERLOCKING ARRANGEMENT ON THE CONTACT SURFACES DIPPING TOWARDS BACK OF THE WALL AT 10° AND SHALL BE INSPECTED BY THE ENGINEER DURING CONSTRUCTION.
- DENSITY OF INDIVIDUAL BOULDERS SHALL BE MINIMUM 2.5 TONNES/m³
- FOR WALLS ABOVE 1000mm IN HEIGHT, THE FIRST LAYER OF BOULDERS ARE TO SET IN A BED OF 150 CONCRETE AND THE JOINTS BETWEEN SHALL BE FILLED WITH CONCRETE TO A LEVEL EQUAL TO THE SURFACE LEVEL OF THE TOE OF THE WALL.
- NO STRUCTURE TO BE BUILT WITHIN H1 FROM THE BACK OF THE TOP OF THE WALL (WHERE H1=HEIGHT OF WALL), UNLESS THE STRUCTURE IS FOUNDED ON ROCK WITH $SBV=150kPa$
- CONSTRUCTION METHODS AND SEQUENCE TO ENSURE THAT DESIGN MAX. SURCHARGE OF 5kPa IS NOT EXCEEDED.
- CONSTRUCTION TO BE IN ACCORDANCE WITH AS 4678:2002

WALL DIMENSIONS	
HEIGHT H1	BW
500	500
1000	500
1500	600
2000	700
2500	800
3000	950



FOR DEVELOPMENT APPLICATION

FOR DEVELOPMENT APPLICATION	DATE	ISSUE	AMENDMENTS
	27.08.13	B	
	22.08.13	A	

ARCHITECT	CLIENT

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PROJECT
TNT WAREHOUSE & DISTRIBUTION FACILITY
ERSKINE PARK NSW

DESIGNED MW
DRAWN MJC
DATE 13.08.13
CHECKED B1
SCALE AS SHOWN
CAD REF: C012156.00-DA65

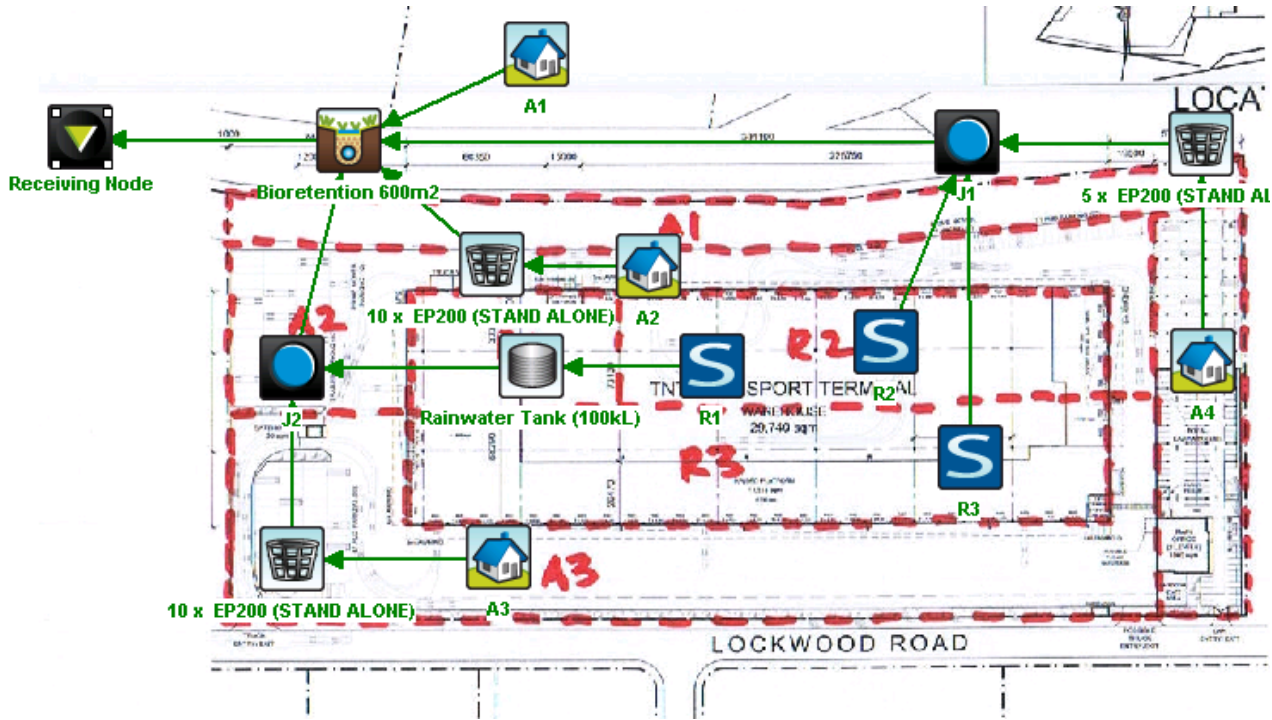
Costin Roe Consulting Pty Ltd.
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DRAWING TITLE
RETAINING WALL DETAILS
DRAWING No C012156.00-DA65
ISSUE B

Appendix B

MUSIC MODEL CONFIGURATION



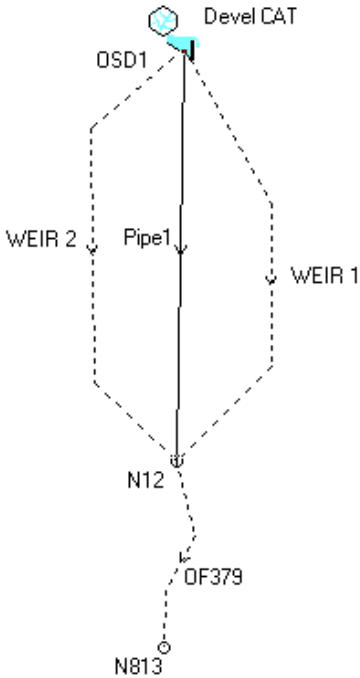
Treatment Train Effectiveness - Receiving Node

	Sources	Residual Load	% Reduction
Flow (ML/yr)	51.7	49.4	4.4
Peak Flow (m3/s)	0.812	2.63	-224.0
Total Suspended Solids (kg/yr)	10.6E3	1.27E3	88.0
Total Phosphorus (kg/yr)	20.5	8.48	58.6
Total Nitrogen (kg/yr)	119	62.8	47.1
Gross Pollutants (kg/yr)	1.31E3	0.00	100.0

Appendix C

DRAINS MODEL CONFIGURATION

 Extg Cat
N Extg



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.	.....