ROZELLE VILLAGE

Stormwater Management Report

Prepared for Harris Page

27 January 2012

Revision C

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Document Status

Rev. no.	Issue Date	Document purpose	Approved for issue		
			Approved by	Signature	Date
A	20 October 2011	Preliminary	PGD		
B	3 November 2011	Final	PGD		
C	27 January 2012	Final	PGD		

Table of Contents

1 INTRODUCTION

1.1 General

Diversi Consulting have been engaged by Harris Page to undertake a concept stormwater and On-Site Detention (OSD) design of the proposed Rozelle Village which is to comprise a 32 storey mixed use high rise building at the site of the current Balmain Leagues Club at Rozelle.

1.2 Purpose of this report

The purpose of this report is to outline the design requirements for the site stormwater system and to provide a preferred engineering solution to address the site stormwater requirements.

1.3 Location

The subject proposed development area is located in the suburb of Rozelle in the Leichhardt Local Government Area (LGA). It is located at the current address of the Balmain Leagues Club Precinct site and comprises 10 allotments. The site is bounded by Victoria Road, Waterloo Street, Balmain Road and Moodie Street. The site area is about 8,200m^2 and falls 9m from the high point of the Darling Street frontage to a low point opposite Wellington Street on the Victoria Road frontage. Figure 1 below shows the location and boundary of the proposed site.

Figure 1 - Locality Plan

2 THE DEVELOPMENT

2.1 Proposed Development

The proposed development consists of 27 levels of residential strata apartments, 5 levels of aboveground and underground retail and commercial space, which includes the Balmain Leagues Club and supermarket, retail stores, cafes, SOHO offices and community facilities such as child care centre, medical services and fitness centre. Below the retail/commercial level is 6 levels of underground basement car parking.

2.2 The Stormwater System

The site stormwater runoff is generally collected by a series of box gutters on the roof areas, surface inlet pits on the terraces and the open space areas. The flow is then conveyed by downpipes and other pipe work through the building and into a rainwater harvesting tank for reuse within the development. Overflows from the rainwater tank will then flow to the OSD tank prior to passing through a discharge control pit which will control stormwater discharge into the Council's street stormwater drainage system.

3 THE STORMWATER CONCEPT DESIGN

3.1 Council and Authority Requirements

The site is located within the jurisdiction area of Leichhardt LGA. The Council has the following specific requirements on stormwater runoff control, generally as:

i. The post development site runoff for 100 year Average Recurrence Interval (ARI) does not exceed the 5 year pre development site runoff;
ii. All roof and paved areas are to drain through the OSD;
iii. The maximum storage level is to be such that habitable floor levels are at least 300mm above the maximum water level, and garages 150mm above;
iv. Maximum ponding depths for aboveground storages are to be 150mm in parking areas, 300mm in landscaping and 1m in a fenced off area; and
v. Existing stormwater storage can incorporated into the new design.

We note item i will require an excessive amount of OSD storage (in the order of 1500m^3) and we believe this to be unreasonable. Accordingly we have proposed the industry best practise standard of limiting stormwater flows such that the post developed flows do not exceed the predevelopment "green field"/ undeveloped flows for a range of storms up to the 100 year ARI.

Further we consider the proposed concept design at this stage is conservative as we have allowed conservative estimates for catchment areas and have not allowed for rain shadows which may occur and reduce these catchment areas allowed. As such the OSD tank size has additional storage available which will be subject to further refinement at the detail design stage.

In addition we advise that detaining flows to the predevelopment flows and providing a combination of pipe and overland flows in the street is an acceptable and practicable solution for minor and major storm events which is compliant to industry best practise.

Further discussions and negotiations is expected in the next phase of design with the Council to set site specific discharge requirements and to identify other site constraints.

3.2 Stormwater Model

In order to determine and model the proposed stormwater detention system, the proposed system was modelled using a stormwater computer program in order to size the detention volume and determine predevelopment and post development flows.

The hydrologic and hydraulic analysis of the catchment / system was undertaken using the DRAINS program by Watercom Pty Ltd which was developed for the design and analysis of urban stormwater drainage.

DRAINS is a simulation program which converts rainfall patterns in stormwater runoff and routes flows through networks of pipes and channels. It develops hydrographs and calculates hydraulic grade lines throughout drainage systems, enabling the users to determine the sizes and positions of pipes in new systems and to analyse the magnitude of overland flows and stored water for established drainage systems.

DRAINS draws on parts of the PIPES and ILSAX programs developed by Watercom Pty Ltd and Geoffrey O'Loughlin (formerly of the University of Technology, Sydney). In particular DRAINS uses the ILSAX hydrological model but substantially improves on ILSAX's hydraulic methods.

3.3 Model Characteristics

The model set up for the Rozelle project was based on the ILSAX submodule and on the following characteristics.

- Soil type = 2 (moderate infiltration rates)
- Antecedents rainfall (AMC) = 3 (rather wet)

Depression storage:

- Paved areas = 1 mm
- Supplementary areas = 1 mm
- Grassed areas = 5 mm

The model was constructed using a simplified links and nodes model. Nodes and a detention basin were added to represent the OSD tank which were then connected by links or pipes to the proposed street drainage in Waterloo Street in order to determine preliminary flows and pipe sizes.

Further details regarding the catchment, pit and pipe data is attached in Appendix A.

3.4 Rainfall

Rainfall was based on the Intensity Frequency Duration (IFD) data provided by Leichardt Council and was based on the following:

Duration	2 year	50 year
1 hour	40	85
12 hour	8	16
72 hour	2.5	5
Other parameters:		
G=0	F2=4.29	F50=15.80

Table 3.4 - IFD Data

Further, there is no IFD data readily available for the 1.5 year storm event. Thus the IFD for 1.5 year ARI storm event has been interpolated and averaged using the 1 and 2 year IFD data.

3.5 Catchment Areas

We note the site has a plan area of 8,204m^2, which is currently fully developed and impervious.

Based on the architectural plans prepared by Stanisic we have analysed the stormwater catchments for the roof areas, terraces, balconies, ground floors and vertical walls. Further

we have assessed different storm directions and the affects this would have on the vertical surfaces and horizontal catchments of the building so that we can determine the largest catchment areas and flow rates likely for the worst storm direction.

Further research revealed that the Commonwealth Scientific and Industrial Research Organization (CSIRO) has conducted a study on stormwater runoff from tall building facades, which suggested that the runoff from building facades is generally limited to the lower levels as the runoff collected in the higher levels are found to either evaporate or become wind borne droplets due to wind actions and surface tensions etc. Based on the CSIRO study, we have therefore made the following assumptions for determining catchments:

- All horizontal floor, terrace, roof and surfaces have been considered as contributing catchments;
- The vertical faces from all directions of the podiums and the 3 floors immediately above the podium has been considered as additional catchment with the highest resulting catchment area adopted for the four worst storm directions; and

Based on our analysis we have determined the ground floor, roof and terrace areas contribute about 8,200m^2 and that the vertical surfaces contribute about 3,300m^2 providing a total catchment area of about 11,500m^2.

3.6 Pre-development model

In order to determine the predevelopment flows and permissible site discharges, we constructed a simplified model shown in Figure 3.6 for the site based on a 100% impervious site area. Peaks flows for the pre-developed site are shown in Table 3.9.

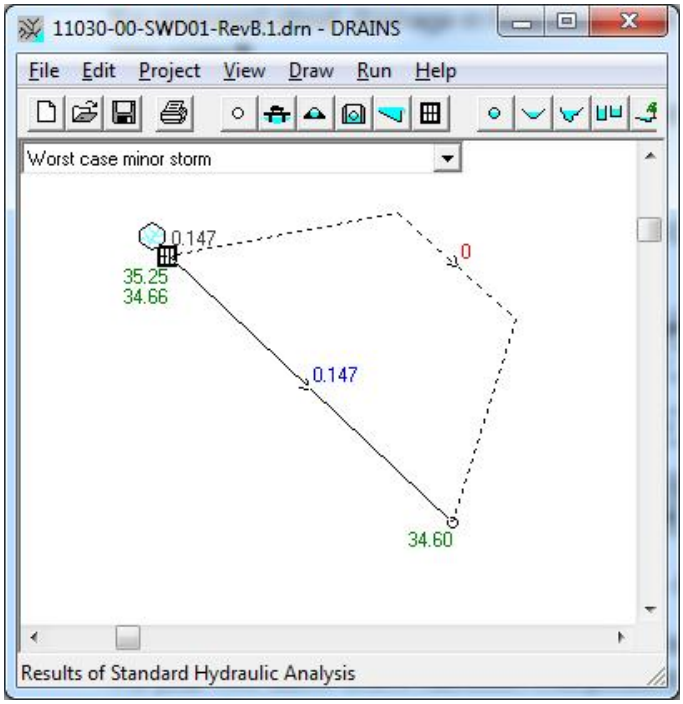


Figure 3.6 –5 Year ARI pre-development peak flows

3.7 Post development models

Several post development models were then evaluated incorporating different size OSD tanks. These models and their performance are discussed in the following sections.

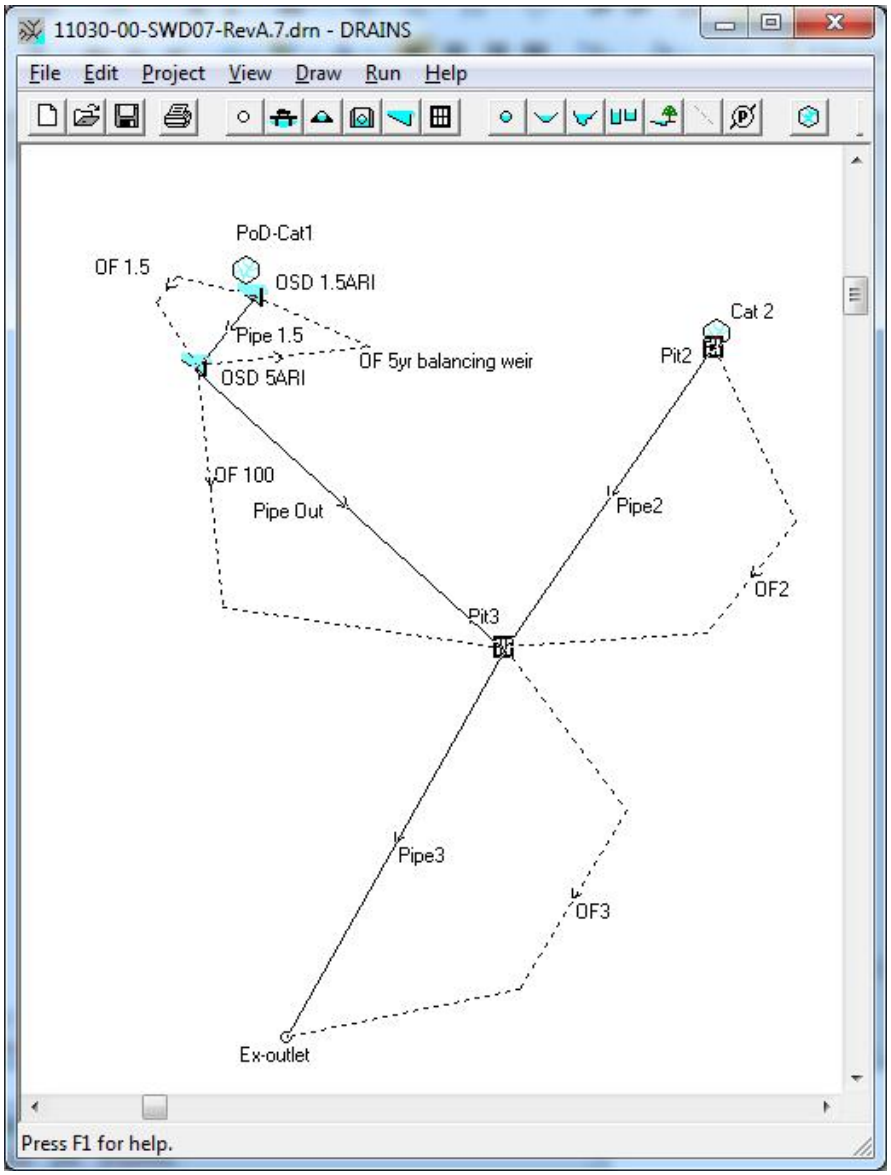


Figure 3.7 – Post-development model

3.8 OSD tank characteristics

Several options for the location and sizing of the OSD tanks were considered. Further options were then considered including:

- Single tank with a single outlet to the street; and
- Single tank with a staged outlet to the street.

Following analysis of several size tanks and outlet configurations the preferred OSD will be about 650m^{3}and will limits flows for all predevelopment flows for the 1.5, 5 and 100 year ARI events.

The location of the new site OSD tank is to be located in the north-western corner of the site which is generally the lowest point on the site which can drain via gravity to the street drainage system. It is proposed to locate the tank above street level but below ground floor so that it can drain to Waterloo Street to avoid works in Victoria Road which would otherwise impact on traffic flows during construction.

Access to the tank would be from above the tank in the terrace areas adjacent to the SOHO's.

3.9 Site Discharge Outlet

Based on the survey to date for the site and surrounding streets it appears there is no stormwater pipe system immediately adjacent to the site. As such the closest council pit and pipe is located near Moodie Street, some 90 m north of the site. Therefore it appears the existing development and site discharges to the street or an unknown pipe system.

As such we have proposed that the future development will connect to a new pipe system in Waterloo Street which will extend and connect to the Moodie Street pits and pipes.

To account for the variable water levels in the receiving pipe system and affects of a drowned outlet adjacent to the site we have considered the contributing catchment from Balmain Road which is about 0.5ha.

Further we have assumed that the tail water level at receiving pit near Moodie Street is as follows:

- Freely discharge onto the existing pipe for the 1.5 year ARI;
- 150mm below surface level for 5 year ARI;
- At surface level for 20 year ARI; and
- 150mm above surface level for 100 year ARI.

3.10 Performance of Proposed System

Based on the modelling undertaken for the site OSD system, the proposed stormwater will reduce post development flows to less than the pre-development flows as shown in the following table.

ARI	Pre Development Flow Q (m^3)	Post Development Flow Q (m^3)	OSD Depth (m)	OSD Area (m^2)	OSD Volume (m^3)	Approx OSD Volume Used (m^3)
1.5 year	0.061	0.056	2.5	260	650	266
5 year	0.147	0.139	2.5	260	650	339
20 year	0.237	0.157	2.5	260	650	441
100 year	0.342	0.178	2.5	260	650	562

Table 3.9 – Design Drainage System Performance

As such the proposed stormwater system complies with current industry best practise and is considered an acceptable solution.

3.11 Water quality treatment

Stormwater from the site will be treated by a treatment train system comprising gross pollutant traps in pits in the roof top gardens, terraces and forecourts and then treat this water further with a proprietary stormwater treatment device such as Stormwater 360's Stormfilter or similar. Preliminary discussions with Stormwater 360 have concluded the Stormfilter treatment system can be incorporated into the proposed OSD tank using cartridge modules subject to future detail design.

4 CONCLUSION

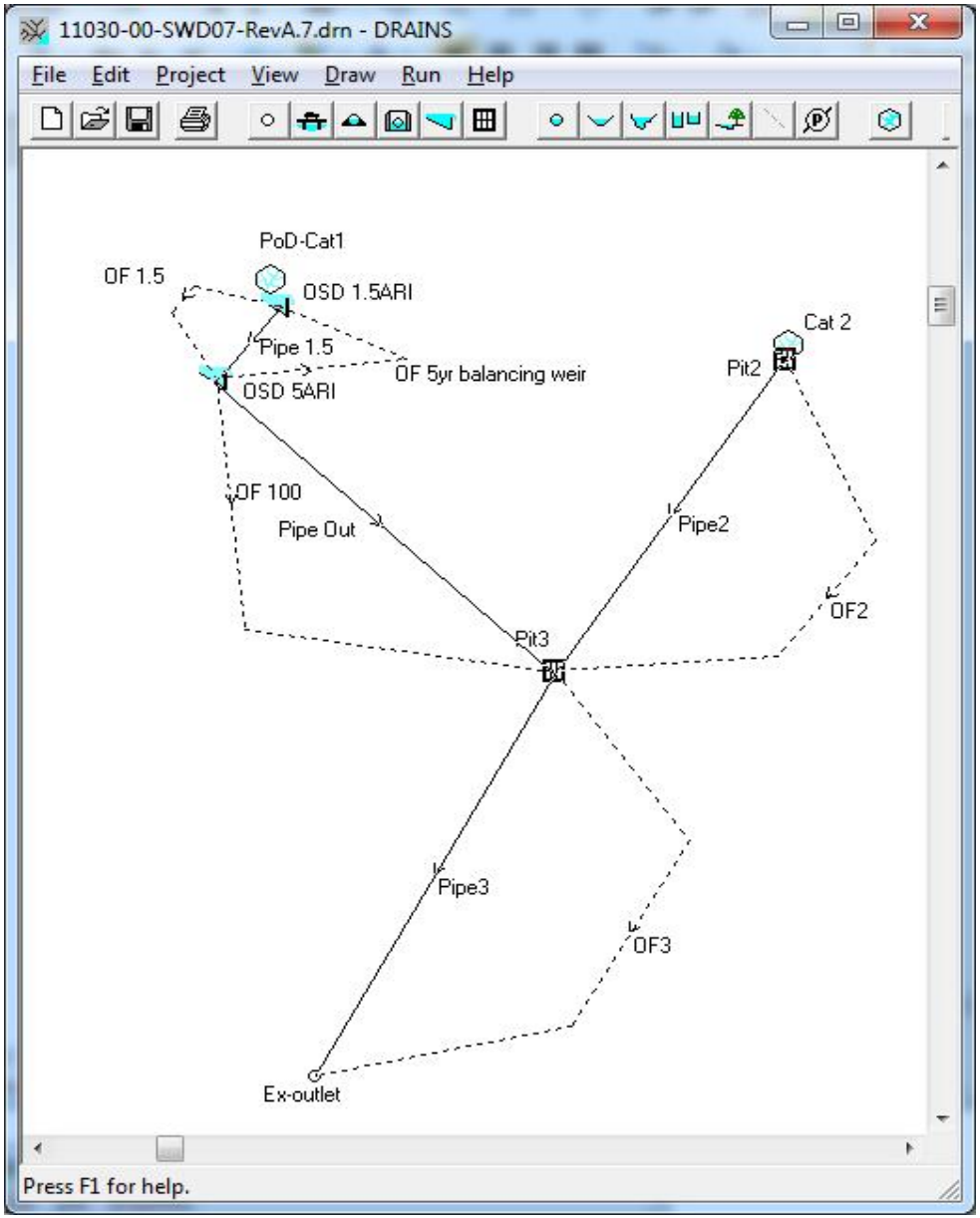
Based on the available site information, assumptions and design documented in this report, the proposed stormwater system for Rozelle Village project will comprise box gutters and surface inlet pits / grates, pits and pipes which will collect and convey the stormwater runoff to a rain water harvesting tank located in the basement. The rain water harvesting tank will then provide stormwater reuse for areas of the development. Overflows from the rain water harvesting tank will then be directed to an on site detention (OSD) tank.

The OSD system will be sized to detain stormwater flows from the site such that the post-development flows are less than the pre-development flows for the 1.5, 5 and 100 year ARI events. Further it is proposed to construct a new pipe line in Waterloo Street to connect the site drainage system to the existing drainage system in Moodie Street.

Stormwater from the site will be treated by a treatment train system comprising gross pollutant traps in pits in the roof top gardens, terraces and forecourts and then treat this water further with a proprietary stormwater treatment device such as Stormwater 360's Stormfilter or similar. Preliminary discussions with Stormwater 360 have concluded the Stormfilter treatment system can be incorporated into the proposed OSD tank using cartridge modules.

The final stormwater system and OSD design for the site is subject to detail design and discussions with Leichhardt Council and other relevant authorities.

APPENDIX A - DRAINS MODEL DATA AND RESULTS


11030-00-SWD07-RevA.7.drn - DRAINS
File Edit Project View Draw Run Help
PoD-Cat1
OF 1.5
OSD 1.5ARI
Pipe 1.5
OF 5yr balancing weir
OSD 5ARI
Cat 2
Pit2
OF 100
Pipe Out
Pipe2
OF2
Pit3
Pipe3
OF3
Ex-outlet
Press F1 for help.

STORMWATER DESIGN - DRAINS /ILSAX METHOD							DESIGN RUN:	SWD07-revA.7													
PROJECT:	ROZELLE VILLAGE						Date:	5/11/2011													
PIT / NODE DETAILS			Version 10																		
Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss	Inflow Hydrograph						
Pit2	OnGrade	Pit-unlimi	Pit-umlimited-GP5x		4	35		0	0.2	381.414	-223.5	No	550997	1 x Ku	No						
Pit3	OnGrade	NSW Dept	RM7		1.5	34.8		0	0.2	357.692	-257.688	No	550996	1 x Ku	No						
Ex-outlet	Node					33		0		332.807	-302.108		3								
DETENTION BASIN DETAILS																					
Name	Elev	Surf. Area	Init Vol. (c	Outlet Typ	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Leng	id						
OSD 1.5AF	33.7	1	0	Orifice		180	33.85			329.202	-217.83	No			3918088						
	33.8	1																			
	33.9	260																			
	34	260																			
	34.1	260																			
	34.7	260																			
	34.8	260																			
	34.9	260																			
	36	260																			
	36.2	260																			
	40	260																			
OSD 5ARI	33.7	1	0	Orifice		250	33.85			322.809	-225.771	No			160874						
	34.9	1																			
	35	1																			
	36	1																			
	36.2	1																			
SUB-CATCHMENT DETAILS																					
Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFacto
Cat 2	Pit2	0.5	100	0	0	5	0	0										0			
PoD-Cat1	OSD 1.5AF	1.151	100	0	0	5	0	0										0			
PIPE DETAILS																					
Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)	RL (m)	etc (m)		
Pipe2	Pit2	Pit3	10	33.7	33.6	1	Concrete,	525	525	0.013	New	1	Pit2	0							
Pipe3	Pit3	Ex-outlet	50	33.6	32.1	3	Concrete,	525	525	0.013	New	1	Pit3	0							
Pipe 1.5	OSD 1.5AF	OSD 5ARI	0.2	33.704	33.702	1	Concrete,	300	300	0.013	NewFixed	1	OSD 1.5AF	0							
Pipe Out	OSD 5ARI	Pit3	10	33.7	33.6	1	Concrete,	375	375	0.013	NewFixed	1	OSD 5ARI	0							

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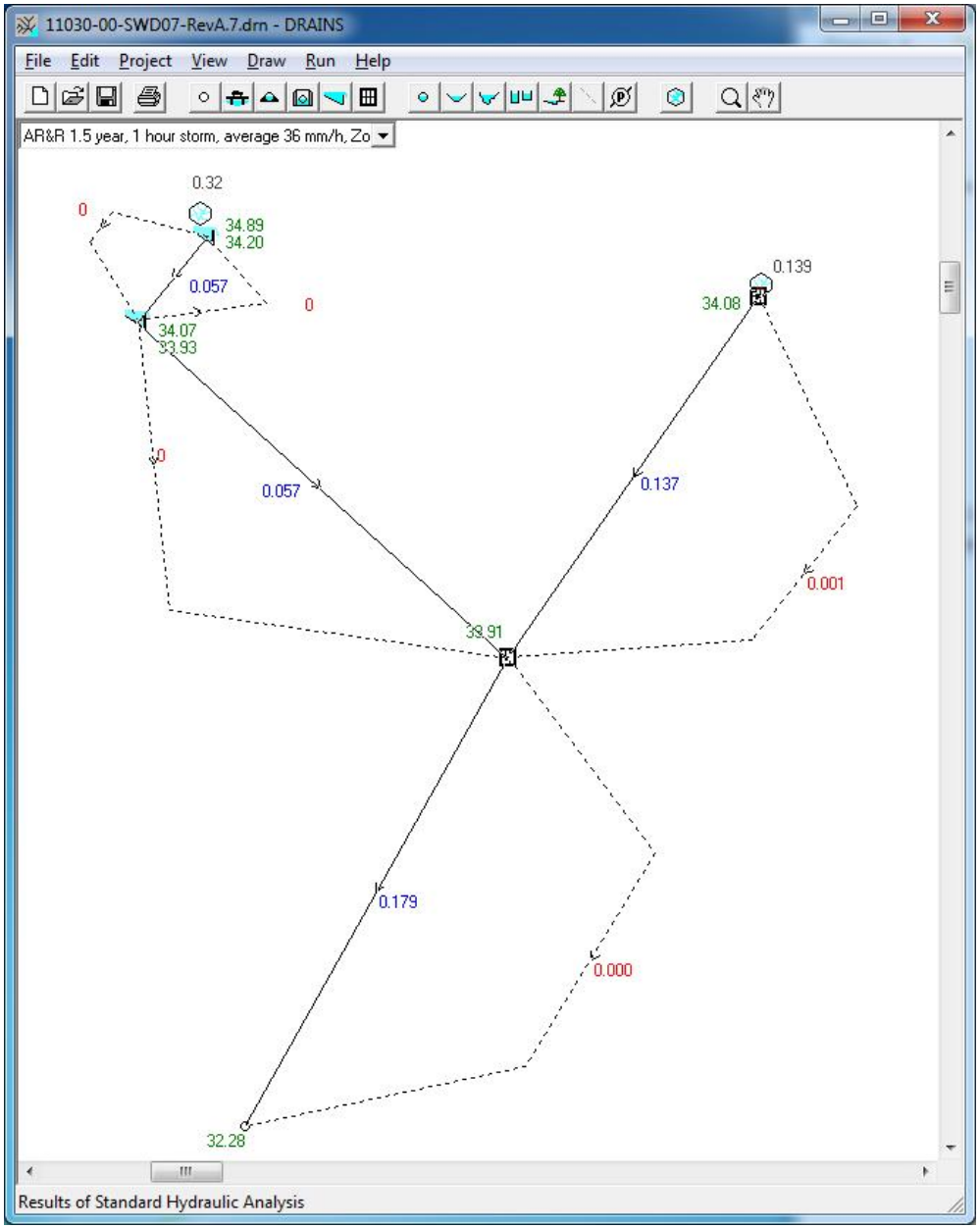
DETAILS of SERVICES CROSSING PIPES																				
Pipe	Chg	Bottom	Height of	Chg	Bottom	Height of	Chg	Bottom	Height of	etc										
	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	etc										
CHANNEL DETAILS																				
Name	From	To	Type	Length	U/S IL	D/S IL	Slope	Base Width	L.B. Slope	R.B. Slope	Manning	Depth	Roofed							
				(m)	(m)	(m)	(%)	(m)	(1:?)	(1:?)	n	(m)								
OVERFLOW ROUTE DETAILS																				
Name	From	To	Travel	Spill	Crest	Weir	Cross	Safe Depth	SafeDepth	Safe	Bed	D/S Area		id						
			Time	Level	Length	Coeff. C	Section	Major Storm	Minor Sto	DxV	Slope	Contributing								
			(min)	(m)	(m)			(m)	(m)	(sq.m/sec	(%)	%								
OF2	Pit2	Pit3	0.5				Dummy us	0.2	0.05	0.6	1	0		551445						
OF3	Pit3	Ex-outlet	0.5				Dummy us	0.2	0.05	0.6	1	0		551441						
OF 1.5	OSD 1.5AF	OSD 5ARI	0.1	34.9	4	2	Dummy us	0.2	0.05	0.6	1	0		3918094						
OF 100	OSD 5ARI	Pit3	0.1	36.2	6	2	Dummy us	0.3	0.3	0.6	1	0		9442677						
OF 5yr bal	OSD 5ARI	OSD 1.5AF	0.1	34.9	4	2	Dummy us	0.2	0.05	0.6	1	0		9223227						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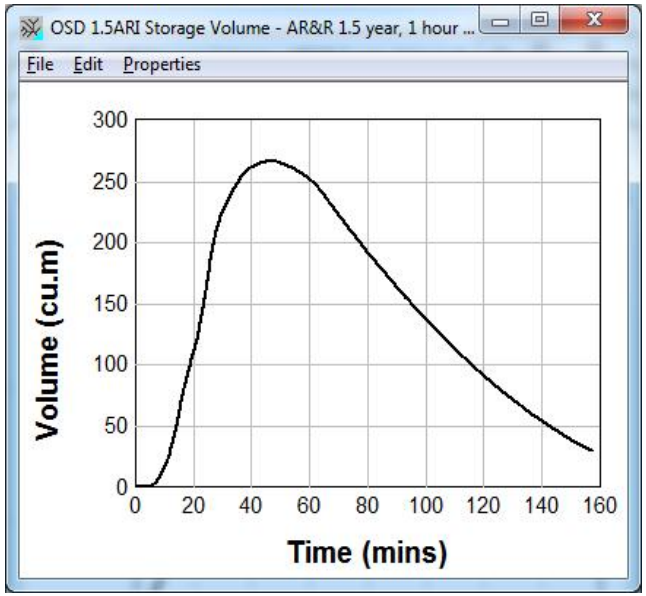
AR&R 1.5 year, 1 hour storm, average 36 mm/h, Zo
0.32
0
34.89
34.20
0.057
0
34.07
33.93
0
0.057
0.139
34.08
0.137
0.001
33.91
0.179
0.000
32.28
Results of Standard Hydraulic Analysis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200
150
100
50
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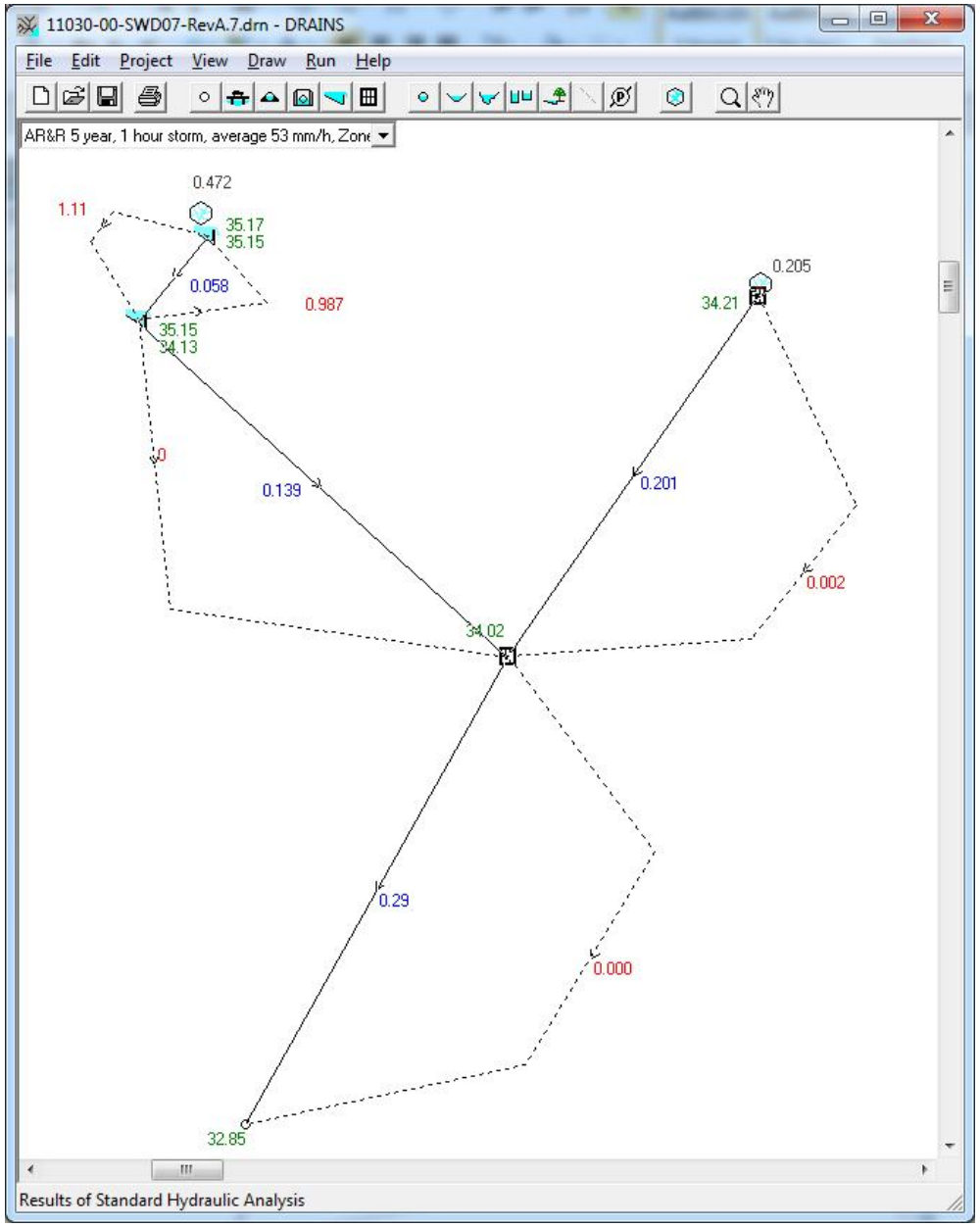
0 20 40 60 80 100 120 140 160
Time (mins)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1.11
35.17
35.15
0.058
0.987
35.15
34.13
0.205
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0
0.139
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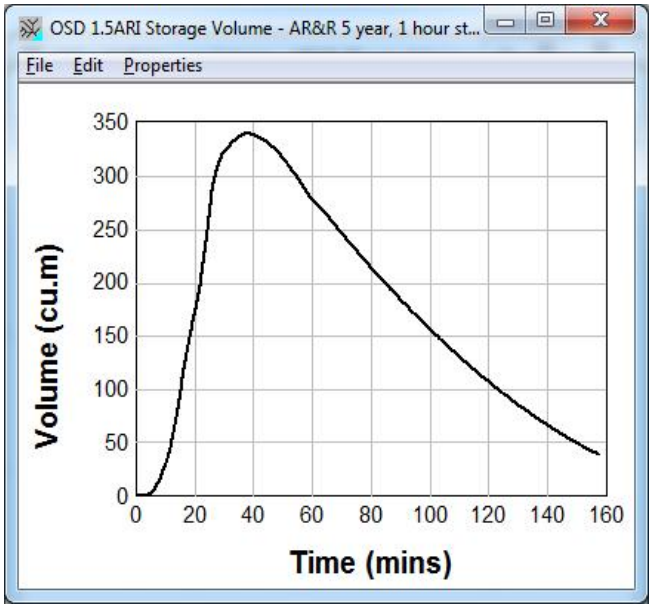
0.002
34.02
0.29
0.000
32.85
Results of Standard Hydraulic Analysis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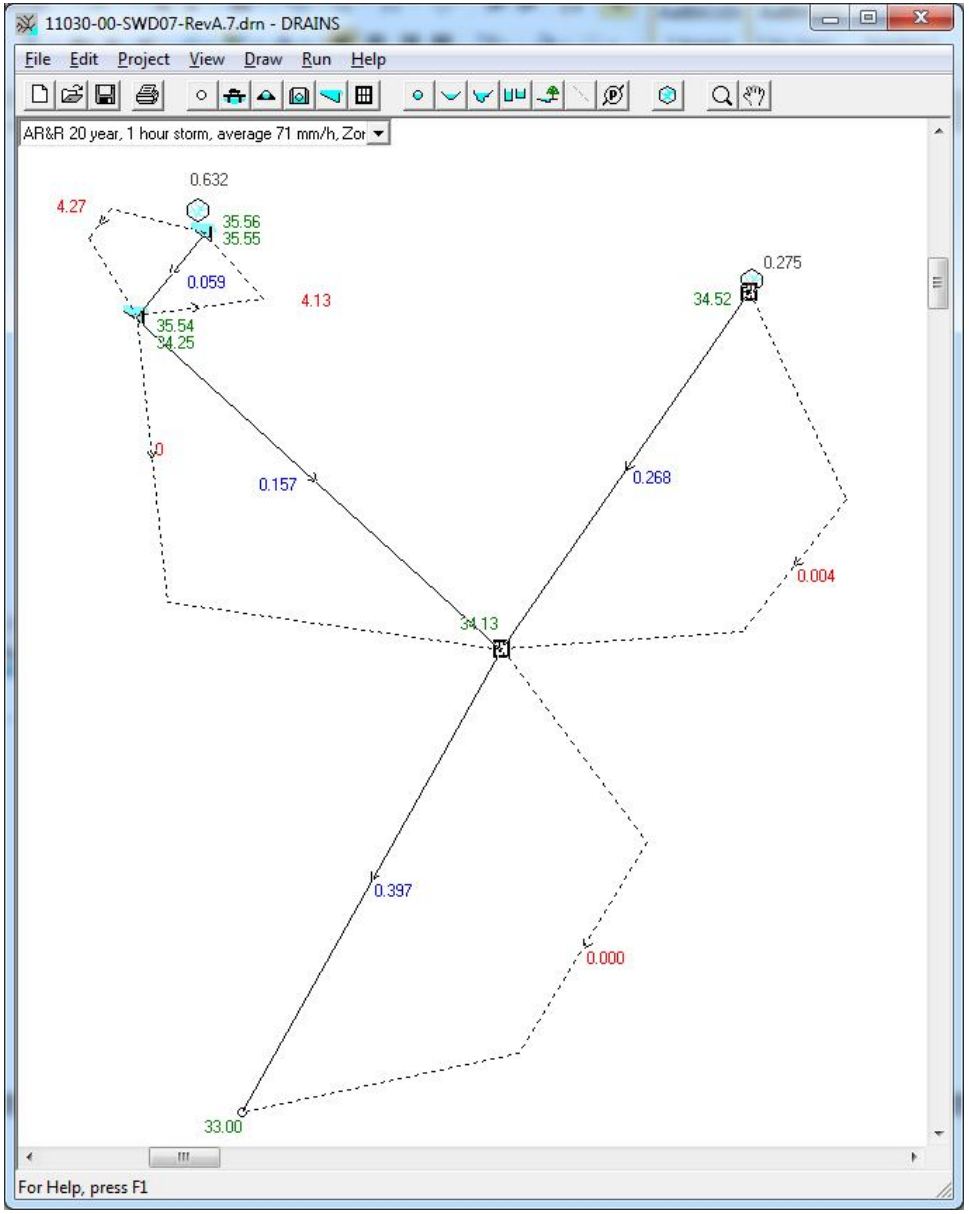
50
100
150
200
250
300
350
0 20 40 60 80 100 120 140 160
Time (mins)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0.632
4.27
35.56
35.55
0.059
4.13
35.54
34.25
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0
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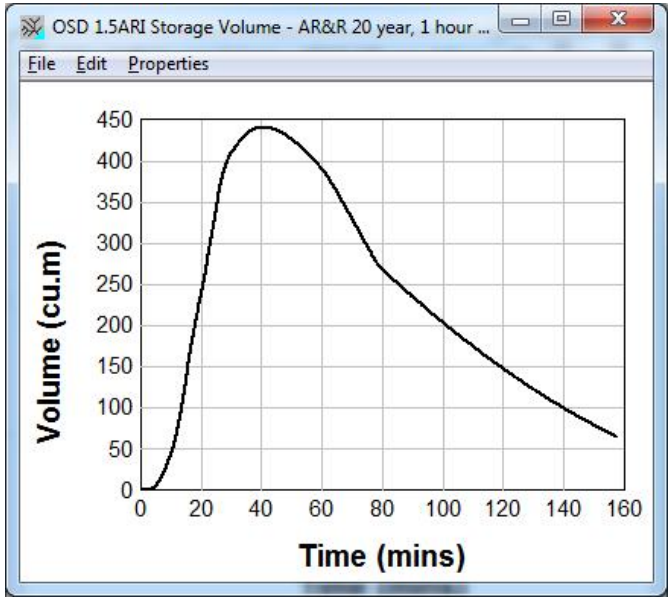
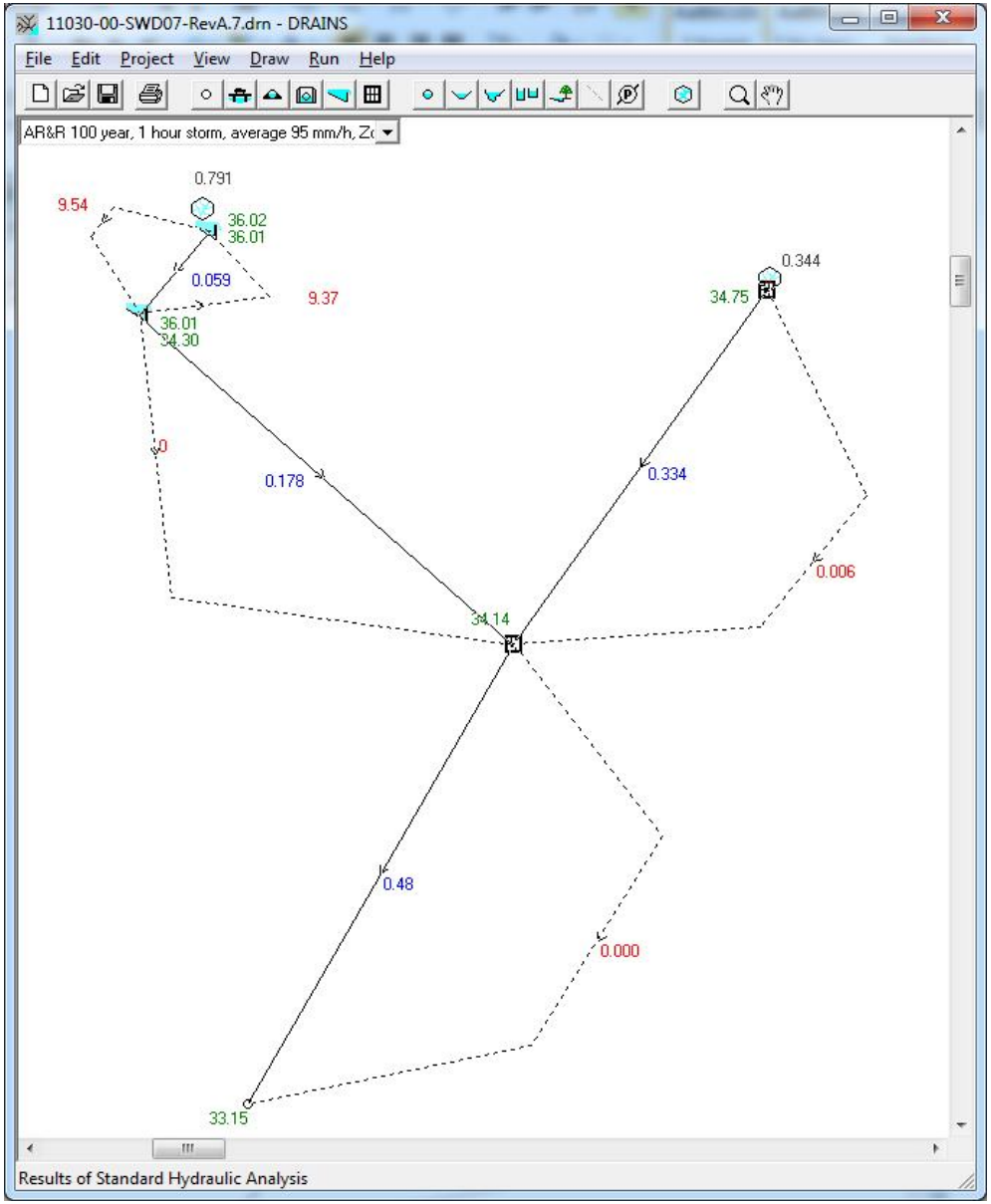
0.397
0.000
33.00
For Help, press F1


OSD 1.5ARI Storage Volume - AR&R 20 year, 1 hour ...
File Edit Properties
Volume (cu.m)
0
50
100
150
200
250
300
350
400
450
0
20
40
60
80
100
120
140
160
Time (mins)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9.54
36.02
36.01
0.059
9.37
36.01
34.30
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0
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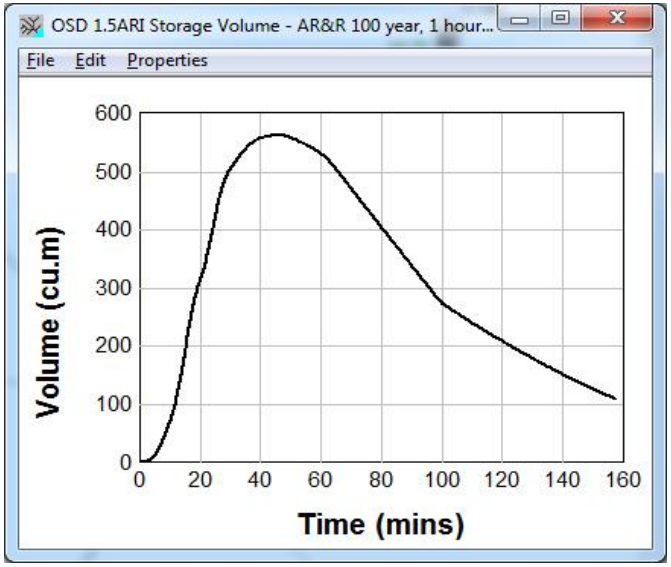
0.48
0.000
33.15
Results of Standard Hydraulic Analysis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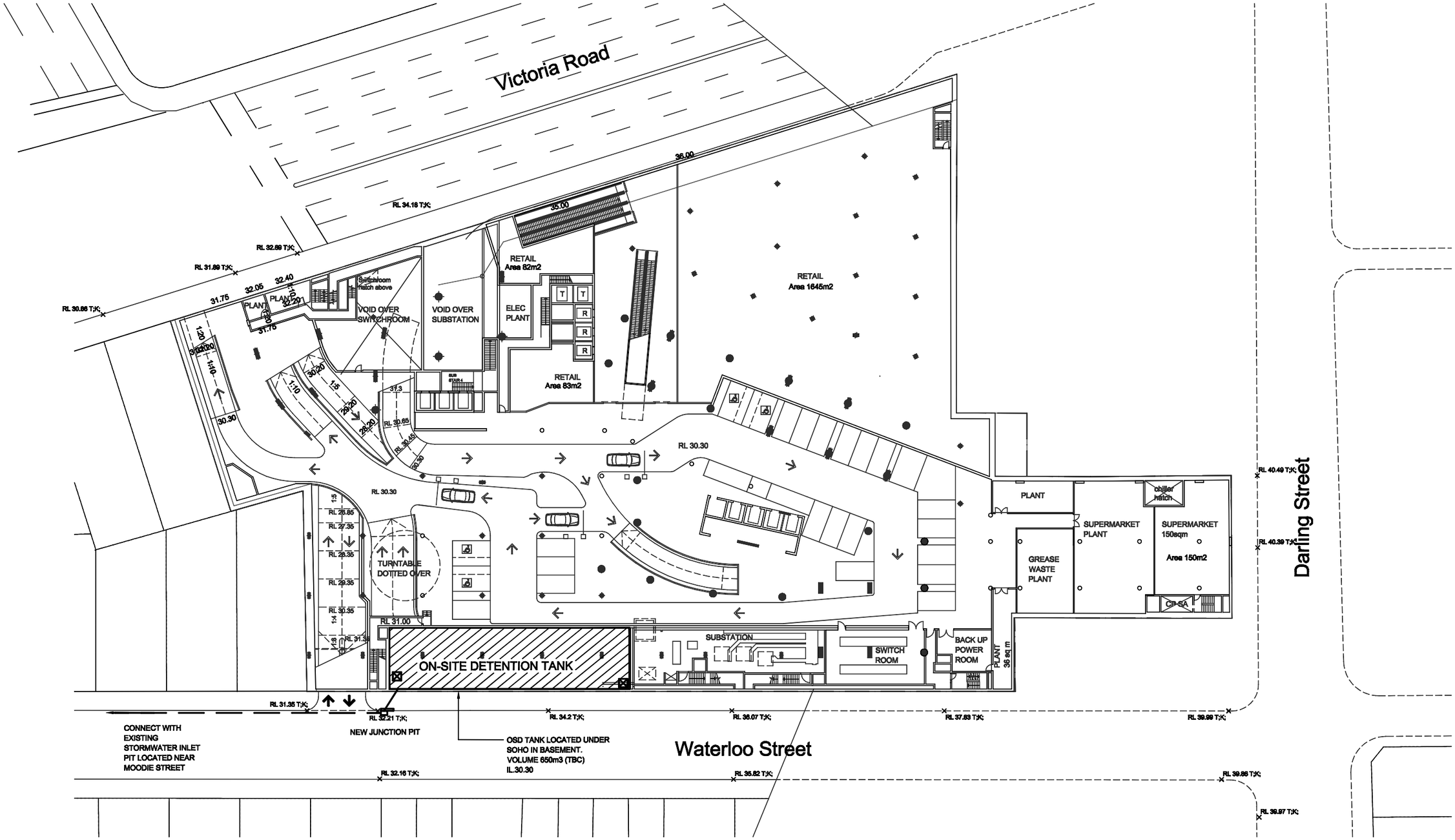
Time (mins)

APPENDIX B – STORMWATER CONCEPT DRAWINGS



REV	DATE	AMENDMENT / DESCRIPTION	REV	DATE	AMENDMENT / DESCRIPTION
B	30/01/2012	BUILDING BASEMENT LAYOUT AMENDED			
A	4/11/2011	PRELIMINARY ISSUE			

DRAWING DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE

PRELIMINARY
NOT FOR CONSTRUCTION

DESIGNED	CP
DRAWN	CP/GM
CHECKED	PGD
DATE	4/11/2011
APPROVED	-
DATE	-
SCALE	N.T.S

DIVERSI CONSULTING
BLOCK B, SUITE 104
26 LEXINGTON DRIVE
BELLA VISTA NSW 2153
T: 02 8883 1113
F: 02 8883 3344
www.diversi.com.au

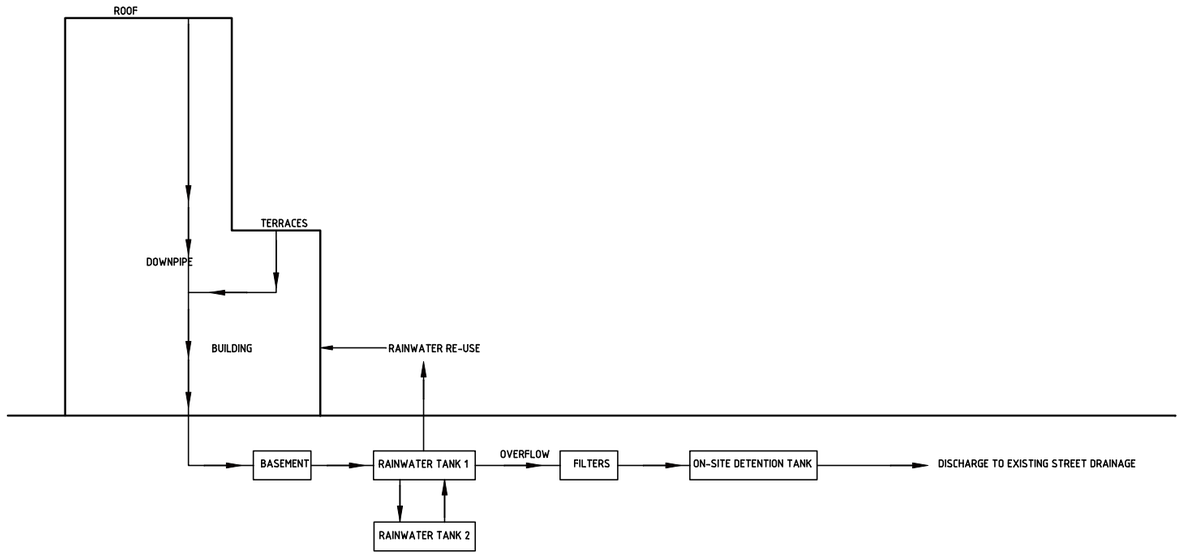
CLIENT: HARRIS PAGE AND ASSOCIATES

PROJECT: ROZELLE VILLAGE
-

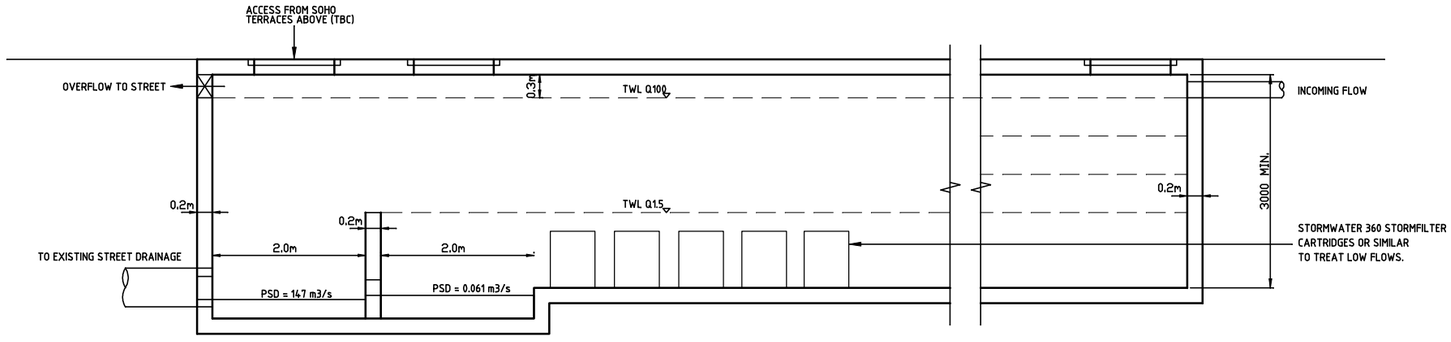
TITLE: STORMWATER CONCEPT PLAN

PROJECT No.: 11030

DRG No.: SKCO1 - B



SITE DRAINAGE SYSTEM SCHEMATIC



SECTION

STORMWATER ON-SITE DETENTION TANK

DIMENSIONS SUBJECT TO DETAIL DESIGN

REV	DATE	AMENDMENT / DESCRIPTION	REV	DATE	AMENDMENT / DESCRIPTION
A	04/11/2011	PRELIMINARY ISSUE			

DRAWING DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE

PRELIMINARY
NOT FOR CONSTRUCTION

DESIGNED: CP	DRAWN: CP/GM
CHECKED: -	DATE: -
APPROVED: -	DATE: -
SCALE: N.T.S	

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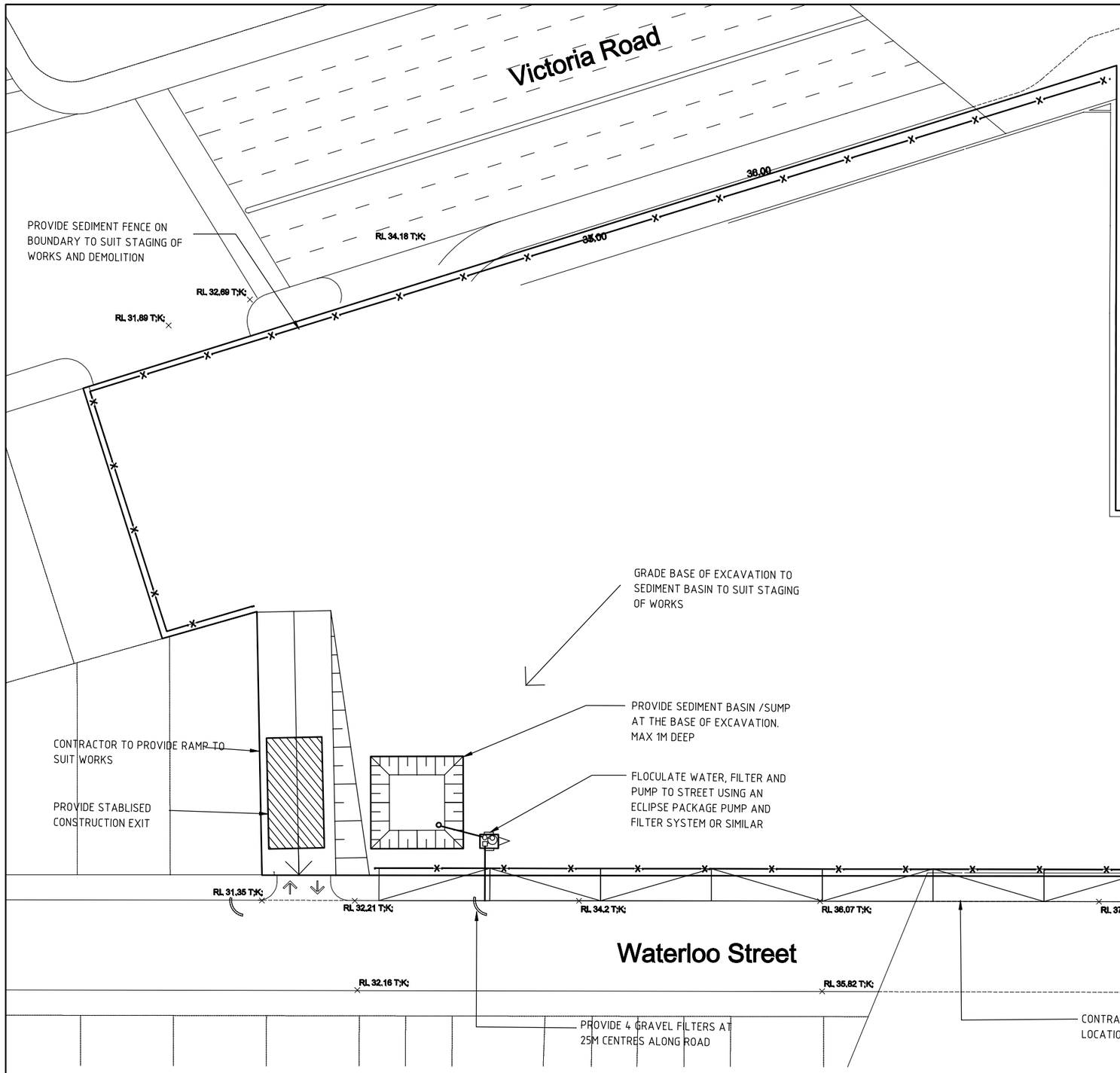
CLIENT: HARRIS PAGE AND ASSOCIATES

PROJECT: ROZELLE VILLAGE
-

TITLE: STORMWATER CONCEPT DETAILS
-

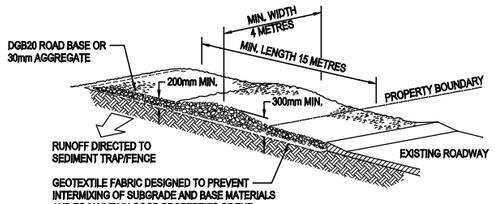
PROJECT No.: 11030

DRG No.: SKCO2 - A



EROSION AND SEDIMENT CONTROLS

1. ALL WORK SHALL BE GENERALLY CARRIED OUT IN ACCORDANCE WITH THESE DOCUMENTS AND
   - A LOCAL AUTHORITY REQUIREMENTS
   - B EPA REQUIREMENTS
   - C SOIL AND CONSTRUCTION, "MANAGING URBAN STORMWATER" LADCOM, MARCH 2004
2. MAINTAIN THE EROSION CONTROL DEVICES INDICATED TO THE SATISFACTION OF THE SUPERINTENDENT AND THE LOCAL AUTHORITY.
3. WHEN STORM WATER PITS ARE CONSTRUCTED , PREVENT SITE RUNOFF ENTERING UNLESS SILT FENCES ARE ERECTED AROUND THE PITS.
4. CONTRACTOR IS TO ENSURE ALL EROSION AND SEDIMENTATION CONTROL DEVICES ARE MAINTAINED IN GOOD WORKING ORDER AND OPERATE EFFICIENTLY. REPAIRS AND/OR MAINTENANCE SHALL BE UNDERTAKEN AS REQUIRED , PARTICULARLY FOLLOWING STORM EVENTS.
5. THE CONTRACTOR SHALL MAINTAIN AND OPERATE THE EXISTING SEDIMENT BASIN IN ACCORDANCE WITH EPA GUIDELINES, LOCAL AUTHORITY REQUIREMENTS AND TO THE SATISFACTION OF THE SUPERINTENDENT.
6. THE WATER IN THE SEDIMENT BASIN SHALL BE LOWERED PERIODICALLY TO ALLOW FOR A FREE BOARD OF 200MM BELOW THE OUT LET PIPE. WATER FROM THE BASIN SHALL BE FILTERED AND PUMP TO THE STREET.

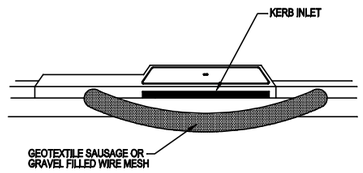


STABILISED SITE ACCESS CONSTRUCTION NOTES:

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE - PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15 METRES LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3 METRES WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO SEDIMENT FENCE.

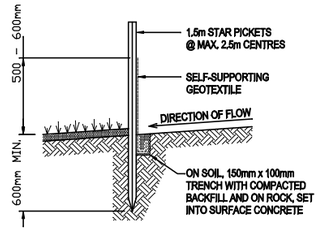
STABILISED SITE ACCESS (SSA)

SCALE N.T.S.



GRAVEL FILTER SAUSAGE (GFS)

SCALE N.T.S.



SECTION DETAIL

SEDIMENT FENCE (SF)

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