Hansen Yuncken

Site H-3 - Target, Erskine Park

Civil Engineering Assessment Report

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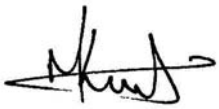
Checker	Michael Kurtz	
Approver		

Report No AAMK0001-02\14-91\Site H-3

Date 22 December 2008

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1 INTRODUCTION

This report has been prepared to support the Development Application by Hansen Yuncken for the site known as Site H-3, Erskine Park for a new building development.

Erskine Park is within Penrith City Council and located approximately 40 kilometres north west of Sydney CBD.

The requirements of the civil infrastructure management plan are based on:

- the Penrith City Council (PCC) guidelines. (Note, PCC have a Stormwater and OSD DCP that is in draft format only and at the time of writing is not available for public viewing),
- the conditions in the Minister's approval of the concept plan and stage 1 proposal – application No 06_0208 / 06_0216, and
- the 'Brown Consulting Stormwater Concept Plan, Eastern Lands Erskine Park', June 2006, report no. W03033.12-04C.

1.1 Site Description

Site H is located at the southern end of Templar Road and is largely Greenfield.

Site security has been provided by a 1.8m high chain wire fence and padlocked gates extending around the perimeter.

There is no vegetation on the site with the exception to the Bluescope steel detention basin located in the north western corner of the site.

The site falls generally to the south west corner into a sediment control basin. Stormwater flows from this basin discharge via a high level stormwater pit into a drainage channel adjacent to the western boundary, flows in excess of the basins capacity discharge overland either into the drainage channel noted above or into a recently constructed drainage corridor adjacent to the southern boundary and then onto South Creek.

Site H has a number of existing stormwater management features that are indicated in the site photographs below. Photograph locations are indicated in Figure 1.

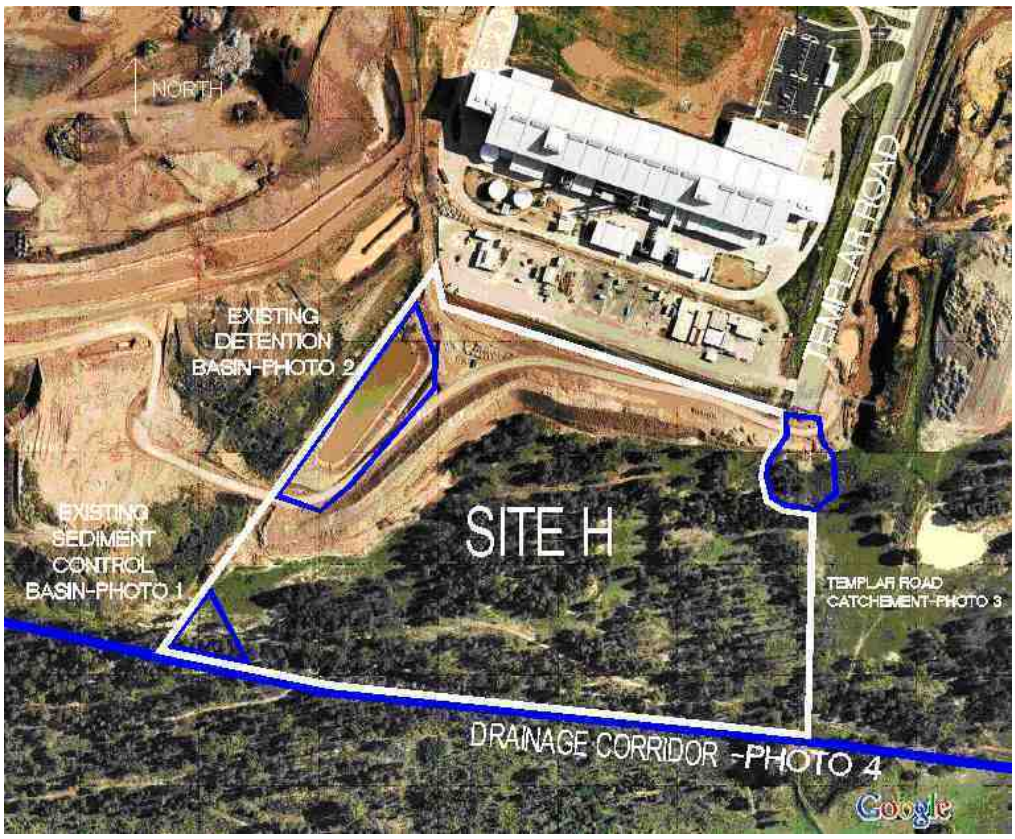


Figure 1: Site H Layout (Imagery extracted from Google Earth Pro Copyright 2008)

Photo 1 is an existing sediment control basin that is to be used for Site H-3 and Site H-1 development sites during construction and to treat runoff from Site H-2. The sediment basin is in the south west corner of Site H. Coordination with the proposed relocation of the Bluescope steel detention basin is required to maintain a basin for sediment control.

Photo 2 shows part of the existing Bluescope Steel stormwater detention basin that occupies a majority of the western boundary of Site H. This basin is proposed to be relocated to the south west corner of Site H

Photo 3 is a basin structure in the centre of a roundabout in Templar Road. The pipe outlet from this runs south, adjacent to the eastern boundary of Site H, then west adjacent to the southern boundary of Site H where flow discharges through a headwall shown in Photo 4.

Photo 4 shows the headwall outlet as for the piped system described under Photo 3 and the drainage corridor which is generally wide with shallow banks on its south.

Currently there is concept approval for three buildings for Site H, the proposal is to expand on this and provide three separate development sites (known as Site H-1, Site H-2, and Site H-3) as indicated in Figure 2. These sites all form part of the Erskine Park industrial area. Site H-3 (Target) occupies the south east corner of Site H and is approximately 2.3 hectares.

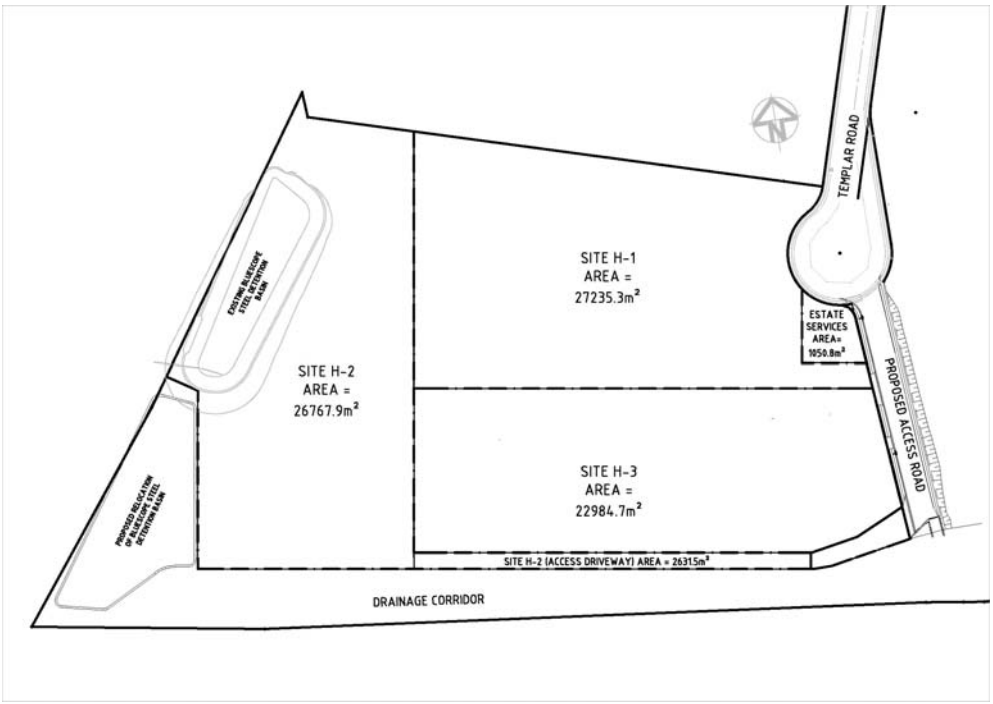


Figure 2: Site H breakup

2 STORMWATER

2.1 Pre-Development Conditions

2.1.1 Site Flows

The Site H-3 (Target) pre-development condition flows have been determined using firstly the rural rational method in accordance with Australian Rainfall and Runoff (2001, see Appendix A), which quantifies recurrence interval flows (for peak duration), then DRAINS software to approximate the rural rational method flows while generating flows and hydrographs for a range of storm durations. The range of flow durations was then used to facilitate the post-development mitigation requirements for on site detention.

Peak recurrence interval flows are summarised in Table 1. The DRAINS model input data and results for pre-development conditions are included in Appendix C.

Average Recurrence Interval (years)	Flow (m^3/s)
5	0.17
10	0.26
20	0.28
100	0.46

Table 1: Pre-Developed Peak Flows

2.1.2 Drainage Corridor Flows and Flood Levels

There is an upstream catchment of approximately 108ha which discharges into the drainage corridor at the south eastern corner of Site H. The drainage corridor flows and flood levels have been estimated at two locations adjacent to Site H using uniform flow analysis. Calculations are included in Appendix B.

The calculated flood depths 0.85m (20 year ARI) and 1.0m (100 year ARI) were added to the existing creek invert levels to obtain water levels which facilitated site stormwater design for post-development conditions.

2.2 Post-Development Conditions

2.2.1 Site Layout and General Drainage Requirements

Site H-3 is to be developed into an off site reserve. This is to include the provision of a car parking area, truck loading dock, building and access road. The general layout of these is shown in Figure 3. Table 2 provides a summary of the site areas.

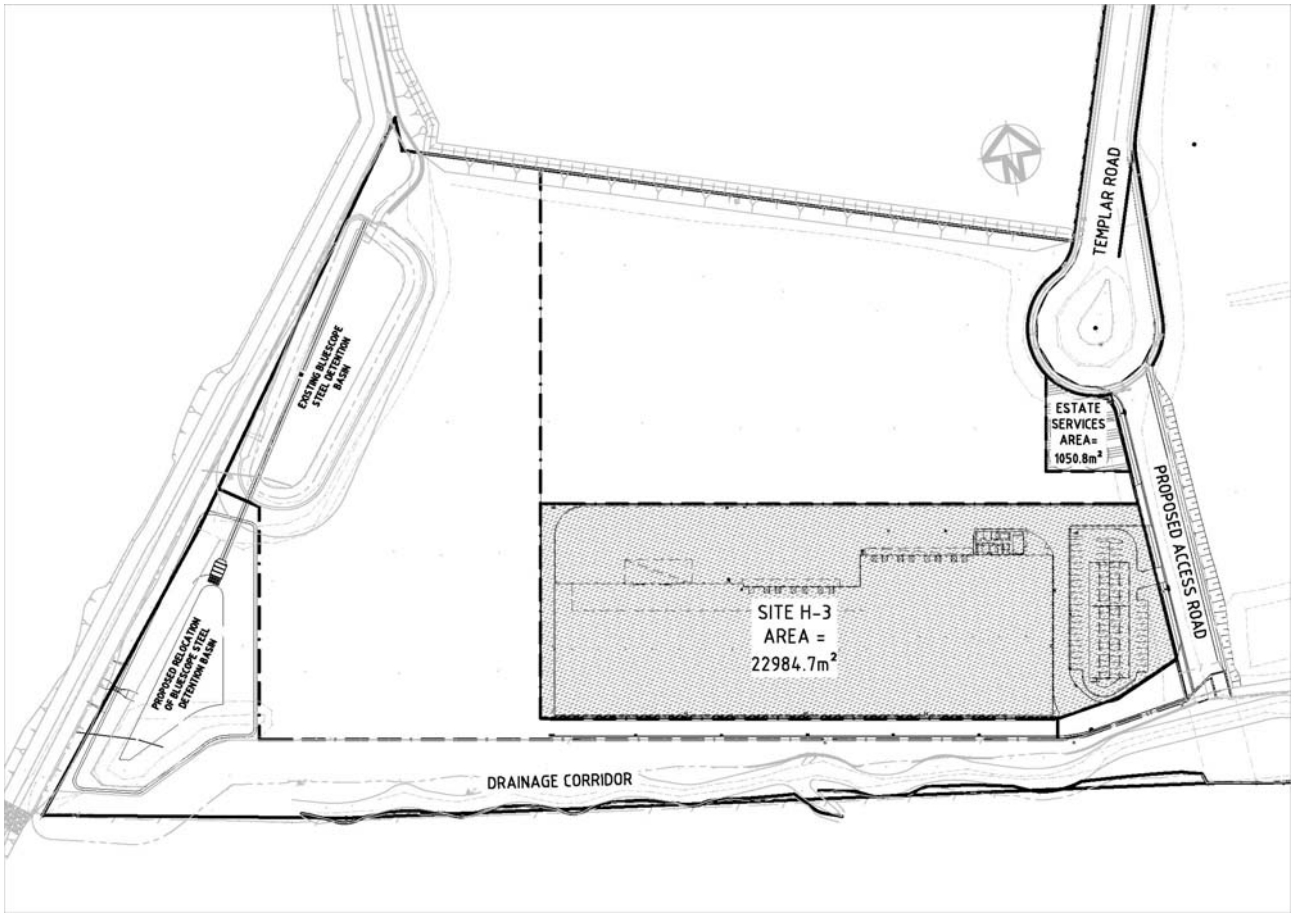


Figure 3: Site H-3 (Target) Area

Description	Area (ha)
Buildings & Loading Dock	1.85
Car Park	0.27
Additional Roads	0.12
Total	2.24

Table 2: Site H-3 (Target) Areas

The 'Brown Consulting Stormwater Concept Plan, Eastern Lands Erskine Park' requires that the minor piped stormwater system is to be designed with a minimum 20 year Average Recurrence Interval (ARI) capacity and that major overland flow path systems be provided to manage events up to the 100 year ARI. It is also required that post-development site runoff be mitigated to pre-development conditions. To achieve this, the development requires on site detention (OSD).

The current Site H-3 stormwater design allows for the Site H-2 access driveway runoff (along the southern Site H-3 boundary) to discharge into the Site H-3 (Target) site drainage system downstream of the proposed OSD tank.

Site H as a whole, generally falls from the north east corner to the south west, as such flows from the neighbouring northern Site H-1 area are to be diverted away from the Site H-3 (Target) site along its northern boundary (in a westerly direction) to the west of Site H-3.

Overland flow for the area east of the building can travel south and along the Site H-2 access driveway overtopping the kerb and into the drainage corridor.

As a result of building requirements, a trapped low point is formed in front of the loading dock area. The stormwater system in this area is capable of conveying the 100 year ARI flow. If this system blocks an overland flow path is available along the northern boundary conveying water to the west where it can then discharge south along the fire access and into the drainage corridor. It is noted that in this event significant ponding (approximately 1.2m deep) will occur in the loading dock area. This ponding is below the building floor level and is unlikely to enter the building.

2.2.2 Stormwater Pipe Drainage System

The stormwater pipe system has been designed to cater a minimum of 20 year ARI storm events with a minimum 300mm pipe diameter adopted within the car park and loading dock to avoid potential blockage due to litter and gross pollutants.

Roof gutter, downpipes and associated pipework are to be sized (by others) to capture and convey the 100 year ARI roof flows into the proposed in ground piped stormwater system which has been designed to convey the flows into the proposed rainwater harvesting/OSD tank.

The site contains two separate pipe stormwater systems that outlet via headwalls into the drainage corridor.

- The northern system collects stormwater from the portion of the site to the north of the building and includes the loading bays. The low lying portion acts as an above ground storage, which limits flows by an orifice within the discharge pit (Pit B/5). Ponding depths are limited to 200mm maximum up to the 100 year ARI event. Should the orifice control block an adjacent pit (Pit B/4, and 100 year ARI capacity downstream pipe system) captures and conveys the surcharge flows while limiting ponding depths to no greater than 240mm up to the 100 year ARI event.
- The eastern system collects car park, road and access runoff. Roof drainage is discharged into a rainwater harvesting tank before overtopping an internal weir which discharges into the OSD tank. The car park and access drainage discharge directly into the OSD tank.

The outlet from each piped system will be through a separate headwall structure. There is an existing headwall on the southern boundary of the site (Photo 4) for a piped system from the north (Templar Road). It is intended that the proposed system downstream of the OSD tank utilises the existing headwall and scour protections with a new pipe outlet.

The second proposed headwall will be into the drainage corridor in the lower south west corner of the development. This will be constructed similar to the existing headwall (Photo 4) with an additional outlet from Site H-1. The proposed stormwater network is provided in the accompanying DA design drawings.

2.2.3 Stormwater Design Methodology

DRAINS software has been used to develop a stormwater design model of the site. The following parameters and considerations have been incorporated into the stormwater model and design.

- Site catchments have been assessed as 100 % impervious, with an initial loss of 1mm, and continuing loss of 0mm/hr.

- Design rainfall IFD intensities have been derived using procedures described in chapter 2 of Australian Rainfall and Runoff.
- Pit and pipe systems have been designed with a minimum of 20 year ARI capacity.
- Overland flows are to be low hazardous up to the 100 year ARI event.
- Minimum pipe grade is 0.5%.
- Pipework downstream of designed ponding areas with orifice control is to have 100 year ARI capacity.
- Blockage factors of 0.2 and 0.5 have been included for on grade and sag pits respectively.
- The OSD systems have been designed such that post-development site discharges are mitigated to pre-development conditions for 5, 10, 20 and 100 year ARI events and for 5 minute to 3 hour durations.
- Tailwater levels at stormwater outlets into the drainage corridor have been included in the modelling process.

DRAINS model input data is included in Appendix C.

2.2.4 Findings and Comments

DRAINS model summary results are included in Appendix C.

Appendix D includes a comparison of pre-development and post-development site discharges which indicated that post development site runoff is limited to that of pre-development conditions for 5 year ARI to 100 year ARI events for durations of 5 minute to 3 hour.

The proposed detention storage provides above ground (approx. 100m^3) and a below ground tank (approx. 720m^3). The size of these storages is to be reviewed at detailed design stage following discussions with Council.

Should the orifice of the underground OSD tank orifices block, the overland flow velocity x depth would be limited to approximately 0.2m^2/s in the 100 year event (on the basis that the overland flow route will be along the Site H-2 access driveway adjacent to southern boundary and this is 6 metres wide with a one way cross fall, and the maximum flow being 1m^3/s).

The overall drainage strategy is understood to be in accordance with Penrith City Council requirements.

2.2.5 Rainwater Harvesting Tank

The approved concept plan requires that all stormwater from the roofs is to be collected and stored in a rainwater harvesting tank with a capacity of at least 330kL/ha of roof or 190kL/ha gross land area (whichever is greater).

Construction of Site H-3 is to have a total roof area of 1.25 Ha with an approximate gross area of 2.3 Ha. Therefore, it requires an underground rainwater tank with storage capacity of at least 430KL as the gross area relationship is the greater. The rainwater tank is to be placed under the car park to the east of the building and will work together with the OSD tank. It is noted that Penrith City Council does not offset the volume of the OSD against any rainwater harvesting.

The 100 year ARI roof runoff is to be collected via a number of downpipes that discharge into a pipe system that connects to the underground rainwater tank and is separate from any other stormwater pipework up to that point.

Provision is to be made for connection of the rainwater harvesting tank back to Templar Road to allow the water within the rainwater harvesting tank to be used as part of an area wide Penrith City Council reuse system.

2.2.6 Water Quality

The development will be approximately 100% paved with the exception of some landscaping around car parking areas. The development is dominated by the building roof which contributes the major runoff from the development and discharges into the rainwater tank in the first instance. Nutrients and gross pollutants is to be controlled from the building roof with a mixture of leaf collectors and first flush devices attached the gutter system and the rainwater tank will allow sediments to settle out.

The loading dock is to have grease arrestors on inlets to the main stormwater system to collect hydrocarbons and gross pollutant traps will be installed in pits prior to discharge into the drainage corridor.

Gross pollutant traps are to be installed upstream of the headwall outlets, with maintenance access via the Site H-2 access driveway.

3 EROSION AND SEDIMENT CONTROL

Prior to any earthworks associated with Site H-3 commencing, on site erosion and siltation control measures is to be put in place in accordance with the Landcom Publication for the NSW government “Managing Urban Stormwater – Soils and Construction” March 2004 (refer to the accompanying sediment and erosion control drawing). These measures include:

- The installation of a 1.8m high chain wire perimeter fence covered with shade cloth or solid A class hoarding, to the perimeter of the work site area,
- The construction of a silt fence on the low side of all site areas to be disturbed,
- All water leaving each site will be processed through a sediment control basin located at the south west corner of Site H (the south west corner of H-2),
- Swales and hay bales are to be used to assist with sediment control for overland flow paths leading into sedimentation control basins.
- As the pit and pipe system is progressed, the grated pit inlets will have a geotextile pit surround to prevent silt migration into the stormwater system,
- The erosion and sediment control measures will be inspected at least once a week or after rainfall events to check their integrity.

4 BULK EARTHWORKS

The bulk earthworks applicable to the Site H-3 site Development Application building works generally involve:

- Excavation to provide a graded platform ranging from RL50.00 to RL48.48 in the loading dock area, with varying grade configurations for different sections.

- Excavation to provide a graded platform ranging from RL50.60 to RL49.43 in the car park area.
- The use of excavated material to provide fill level platform for building at RL50.00.

Computer modelling of the proposed development of Site H and the access road (excluding Site H-2) has been undertaken in order to provide a design that balances the cut and fill across the site. It is envisaged that there will be little (if any) need to import or export material from or to the site during the bulk earthworks stage.

5 SERVICES

5.1 Sewer

The site will likely be serviced from the existing sewer main constructed in the vicinity of the site. The final connection point to the sewer main will be determined by Sydney Water when a Section 73 Certificate application is lodged and conditions received.

The likely connection point is to the existing sewer main along the western boundary.

5.2 Water

The site will likely be serviced from the existing water main constructed in the vicinity of the site. The final connection point to the sewer main will be determined by Sydney Water when a Section 73 Certificate application is lodged and conditions received.

It is proposed to extend the existing water main along the proposed access road on the eastern side of Site H and into Site H-3.

5.3 Electricity

The adjustment of any electrical conduits and connection to the electrical conduits in the vicinity of the site will be carried out in accordance with the relevant authority's requirements.

It is proposed to extend the existing electrical cables along the proposed access road on the eastern side of Site H and into Site H-3.

5.4 Gas

Gas is not located within the vicinity of the site and a connection is not proposed to be made for Site H-3. If Gas is required for the site it will need to be extended along Templar Road from the intersection with Lenore Lane in accordance with Jemenas requirements.

5.5 Telecommunications

The adjustments of any telecommunication conduits, service pits and connection to telecommunications conduits in the vicinity of the site will be carried out in accordance with the relevant authority's requirements.

It is proposed to extend the existing telecommunications cables along the proposed access road on the eastern side of Site H and into Site H-3.

6 PAVEMENT DESIGN / TRAFFIC

Driveways, circulation roads, car parks, truck parking and loading areas will be designed in accordance with Council's and AUSTROADS standards. The subgrade strength will be determined by Geotechnical Engineer and the sub grade strength will form the basis of the pavement design.

Site H is proposed to be divided into three separate building zones / lots with individual accesses for each.

An access road is proposed to extend from the end of the existing Templar Road turning head to allow for vehicular access to Site H, Site G and site(s) further to the south. This access road is to form part of the Site H-3 Development Application and consists of a 20m road reserve allowing for two 6.5m wide lanes with a 3.5m wide footpath zone along each side. The pavement design for this road has been designed to cater for vehicles up to the 25m B-Double and in accordance with Penrith City Council Guidelines for engineering works for subdivisions and developments. The existing drainage corridor access ramp will retain its current configuration but be relocated to the eastern side of the road reserve to allow better access to Site H.

Access to Site H-3 is proposed from the access road at the end of Templar Road noted earlier (which forms part of this sites DA) with separate loading dock and carpark driveways. Turning paths have been reviewed at both these locations for a 25m B-Double and a B99 vehicle respectively (both in Accordance with Austroads 2006 and the Autoturn 6.0 computer program).

Appendix A

Pre-Development Flows

Hyder Consulting	DOCUMENT No	SHEET OF
SUBJECT	**Target**	

SUBJECT	CALCULATIONS	OUTPUT

Subcatchment 1b

Total Area:	22445	m^2	2.2445	ha	0.022445	km^2	

Time Of Concentration

$tc = 0.76xA^{0.38}$

tc (min) = 10.77433

Coefficient of Runoff Calculation

C_{10} =	0.4						
C_1 =	0.25				FF_1	0.62	
C_2 =	0.30				FF_2	0.74	
C_5 =	0.35				FF_5	0.88	
C_{10} =	0.40				FF_{10}	1	
C_{20} =	0.45				FF_{20}	1.12	
C_{50} =	0.51				$*FF_{50}$	1.27	
C_{100} =	0.56				$*FF_{100}$	1.41	

$I_{12,50}$ =	13.09mm/h			$*FF_{50}$	1.99-0.366 x $I_{12,50}/I_{12,2}$		
$I_{12,2}$ =	6.66 mm/h			$*FF_{100}$	2.57-0.588 x $I_{12,50}/I_{12,2}$		

PRM Calculation

Q = C x I x A / 360

IFD Data

Q_1 =	**0.07**				**YEAR ARI**	**Intensity**	
Q_2 =	**0.11**				1	46.38	
Q_5 =	**0.17**				2	59.73	
Q_{10} =	**0.26**				5	76.88	
Q_{20} =	**0.28**				10	106.16	
Q_{50} =	**0.37**				20	99.96	
Q_{100} =	**0.46**				50	117.13	
					100	130.2	

Appendix B

Drainage Corridor Catchment and Flow Calculations

Hyder Consulting

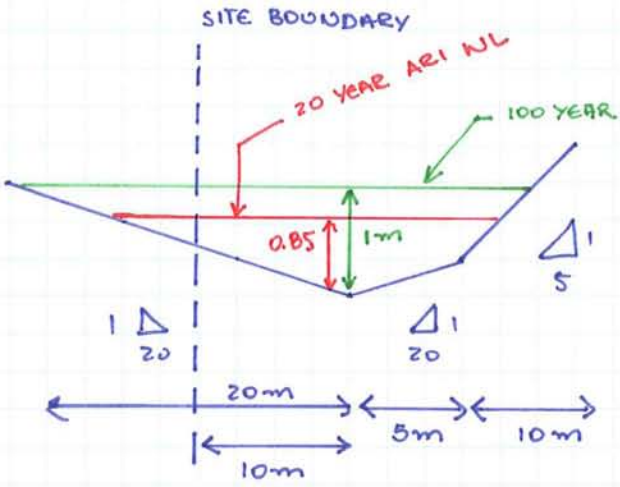
PROJECT ERSKINE PARK | PAGE No

TARGET SITE (PAD 4) | JOB No.

TITLE CHANNEL FLOW CALCS | PREPARED DC | DATE 19/12/2008

CHECKED | DATE

* CHANNEL SHAPE USED FOR CROSS SECTION 1 and 2 (REFER CATCHMENT PLAN)



* NOT TO SCALE

* FLOW DEPTH BASED ON UNIFORM FLOW

CHECKED USING DRAINS

TOTAL FLOW 100 YEAR :

CROSS SECTION ① = 15.4 m^3/s

CROSS SECTION ② = 16.3 m^3/s

TOTAL FLOW 20 YEAR

CROSS SECTION ① = 9.8 m^3/s

CROSS SECTION ② = 10.1 m^3/s

Hyder Consulting

DOCUMENT No

SHEET OF

SUBJECT ERSKINE PARK - TARGET SITE / EXTERNAL CALC. AREA (1)

SUBJECT	CALCULATIONS	OUTPUT

Subcatchment 1b

Total Area:	1015986	m^2	101.5986	ha	1.015986	km^2

Time Of Concentration

$tc = 0.76xA^{0.38}$

tc (min) = 45.87564

Coefficient of Runoff Calculation

C_{10} =	0.4		
C_1 =	0.25	FF_1	0.62
C_2 =	0.30	FF_2	0.74
C_5 =	0.35	FF_5	0.88
C_{20} =	0.45	FF_{20}	1.12
C_{50} =	0.51	$*FF_{50}$	1.27
C_{100} =	0.56	$*FF_{100}$	1.41

$I_{12,50}$ =	13.09mm/h	$*FF_{50}$	$1.99-0.366 \times I_{12,50}/I_{12,2}$
$I_{12,2}$ =	6.66 mm/h	$*FF_{100}$	$2.57-0.588 \times I_{12,50}/I_{12,2}$

PRM Calculation

Q = C x I x A / 360

Q_1 =	**1.95**
Q_2 =	**3.00**
Q_5 =	**4.58**
Q_{20} =	**7.56**
Q_{50} =	**10.03**
Q_{100} =	**12.37**

IFD Data

YEAR ARI	Intensity
1	27.88
2	35.87
5	46.07
20	59.78
50	69.98
100	77.73

TARGET test.drn - DRAINS

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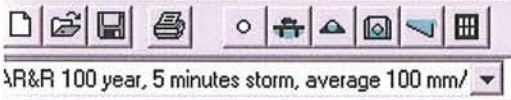
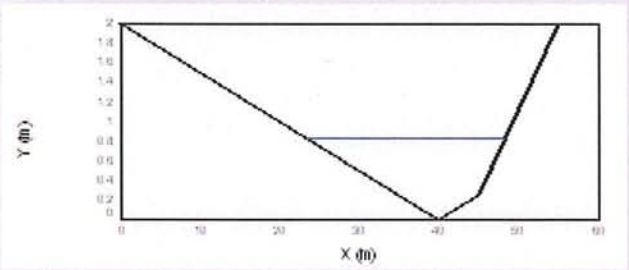


R&R 100 year, 5 minutes storm, average 100 mm/

erflow Route OF1

asic Data | Cross Section Data

Shape: crosssection1



Safe Depths and Flow Rates

- (•) Use default values for this cross section
- ( ) You specify

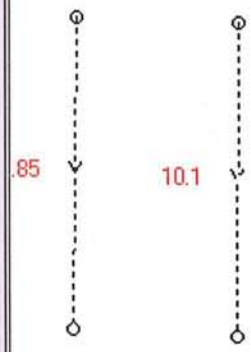
Safe Depth for Major Storms (m)	0.3
Safe Depth for Minor Storms (m)	0.3
Safe Depth x Velocity (sq.m/sec)	0.6

% of downstream catchment flow carried by this channel: 0

Channel slope (%): 2.2

For Major Storms:
Safe flow = 0.771 cu.m/sec
Maximum flow = 9.850 cu.m/s
Corresponding velocity = 0.87 m/s
Maximum depth = 0.826 m - UNSAFE
Maximum flow width = 24.80 m
Maximum D x V = 0.72 sq.m/sec - UNSAFE

OK | Cancel | Help



TARGET test.drn - DRAINS

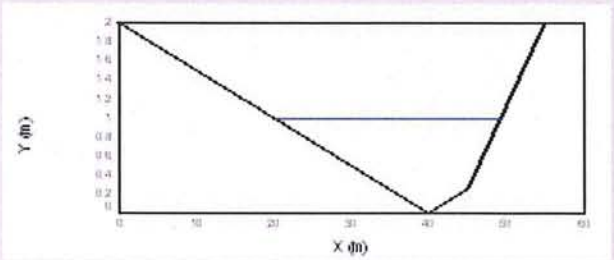
File Edit Project View Draw Run Help

AR&R 100 year, 5 minutes storm, average 100 mm/

verflow Route OF1

Basic Data | Cross Section Data

Shape: crosssection1



Safe Depths and Flow Rates

- (•) Use default values for this cross section
- ( ) You specify

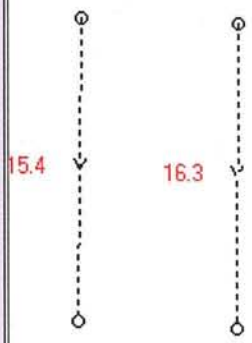
Safe Depth for Major Storms (m)	0.3
Safe Depth for Minor Storms (m)	0.3
Safe Depth x Velocity (sq.m/sec)	0.6

% of downstream catchment flow carried by this channel: 0

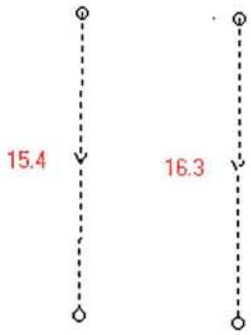
Channel slope (%): 2.2

For Major Storms:
Safe flow = 0.771 cu.m/sec
Maximum flow = 15.400 cu.m/s
Corresponding velocity = 0.98 m/s
Maximum depth = 0.990 m - UNSAFE
Maximum flow width = 29.02 m
Maximum D x V = 0.97 sq.m/sec - UNSAFE

OK Cancel Help



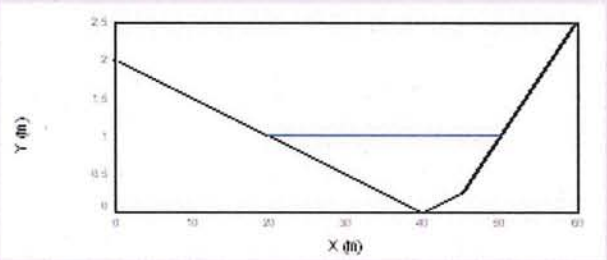
Results of Analysis



Overflow Route OF3

Basic Data | Cross Section Data

Shape: crossection2



Safe Depths and Flow Rates

- (•) Use default values for this cross section
- ( ) You specify

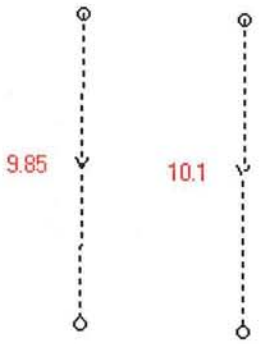
Safe Depth for Major Storms (m)	0.3
Safe Depth for Minor Storms (m)	0.3
Safe Depth x Velocity (sq.m/sec)	0.6

% of downstream catchment flow carried by this channel: 0

Channel slope (%): 2.2

For Major Storms:
Safe flow = 0.770 cu.m/sec
Maximum flow = 16.300 cu.m/s
Corresponding velocity = 0.99 m/s
Maximum depth = 1.008 m - UNSAFE
Maximum flow width = 30.22 m
Maximum D x V = 1.00 sq.m/sec - UNSAFE

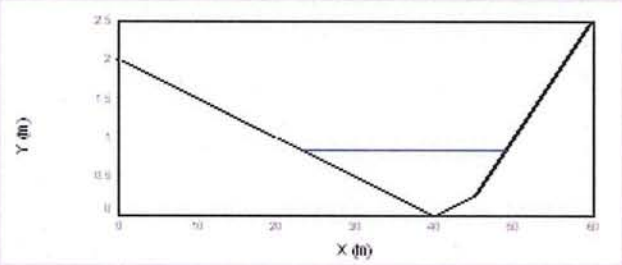
OK | Cancel | Help



Overflow Route OF3

Basic Data | Cross Section Data

Shape: crossection2



Safe Depths and Flow Rates

- (•) Use default values for this cross section
- ( ) You specify

Safe Depth for Major Storms (m)	0.3
Safe Depth for Minor Storms (m)	0.3
Safe Depth x Velocity (sq.m/sec)	0.6

% of downstream catchment flow carried by this channel	0
Channel slope (%)	2.2

For Major Storms:
Safe flow = 0.770 cu.m/sec
Maximum flow = 10.150 cu.m/s
Corresponding velocity = 0.88 m/s
Maximum depth = 0.832 m - UNSAFE
Maximum flow width = 25.53 m
Maximum D x V = 0.73 sq.m/sec - UNSAFE

OK | Cancel | Help

Hyder Consulting

PROJECT ERSKINE PARK TARGET SITE (PAD 4) | PAGE No
JOB No
TITLE Area 2 Flows | PREPARED DATE
CHECKED DATE

Area (2) FLOWS (5.9 ha)

TC = 8 min

100 YEAR Intensity = 182 mm/h

$$Q = \frac{CIA}{360}$$

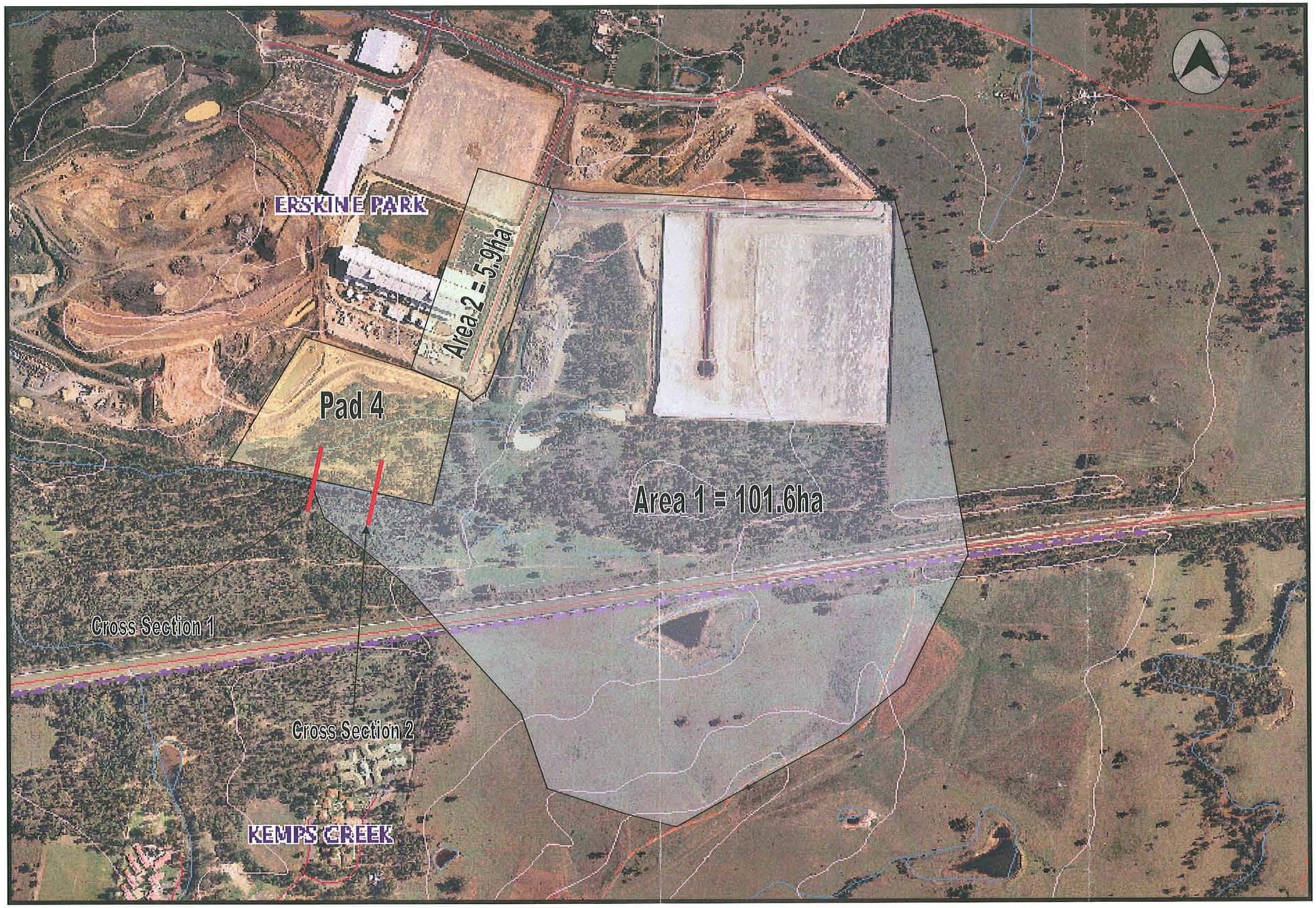
$$Q = \frac{1 \times 182 \times 5.9}{360}$$

$$\boxed{Q = 2.98 \text{ m}^3/\text{s}}$$

20 year Intensity = 139.61 mm/h

$$Q = \frac{1 \times 139.61 \times 5.9}{360}$$

$$\boxed{Q = 2.2 \text{ m}^3/\text{s}}$$


ERSKINE PARK
Area 2 = 5.9ha
Pad 4
Area 1 = 101.6ha
Cross Section 1
Cross Section 2
KEMPS CREEK

Appendix C

DRAINS Modelling and Results

(pre- and post-development)

DRAINS Model Name and File Path: F:\AAMK0001-02\14-91 Target - Erskine Park\D-Calcs\Stormwater\TARGET 22-12-08.drn
DRAINS Version: 2008.12 - 12 Dec 08
Modeller's Name: Rick Andrew
Description: Target Distribution Facility, Erskine Park, Penrith **DRAINS Input**

PIT / NODE DETAILS			Version 9										
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
Pit-E-2	OnGrade	NSW Dept. of I	2.4 m lintel (all grades)		4	49.75		0	0.2	295892.306	6255399.95	No	17
Pit-E-1	OnGrade	NSW RTA SA	Unlimited		1	49.58		0	0	295887.557	6255373.3	No	8
Pit-C-5	Sag	NSW Dept. of I	RM.7 Grated Acces	30	2.5	49.23	0.15	0	0.5	295883.793	6255318.01	No	117070561
Pit-C-4	Sag	NSW Dept. of I	2.4 m lintel (all grad	30	0.9	49.57	0.09	0	0.5	295819.146	6255327.15	No	4659083
Pit-C-3	Sag	NSW Dept. of I	2.4 m lintel (all grad	30	0.9	49.57	0.09	0	0.5	295791.015	6255331.86	No	60319568
Pit-C-2	Sag	NSW Dept. of I	2.4 m lintel (all grad	30	2.5	49.57	0.09	0	0.5	295757.356	6255337.36	No	4659081
Pit-C-1	Node					46		0		295754.95	6255326.47		4659097
Pit-B-7	Sag	NSW Dept. of I	RM.7 Grated Acces	30	4	48.5	0.15	0	0.5	295839.462	6255411.53	No	20
Pit-B-6	Sag	NSW Dept. of I	RM.7 Grated Acces	30	0.7	48.5	0.15	0	0.5	295821.21	6255414.63	No	24
Pit B-4	OnGrade	NSW Dept. of I	RM.7 Grated Accessway Pit at 1%		0.8	48.63		0	0.5	295761.531	6255435.16	No	171940408
Pit-B-3	OnGrade	NSW RTA SA	Unlimited		2.5	49.3		0	0	295679.459	6255448.35	No	39
Pit-B-2	Sag	NSW Dept. of I	RM.7 Grated Acces	15	2	49.7	0.09	0	0.5	295664.926	6255352.53	No	4659079
Pit-B-1	Node					47		0		295663.493	6255343.53		145
N-1	Node							0		295623.467	6255340.6		283962
N-A-1	Node							0		295695.338	6255337.72		4659092
N-A-5	Node							0		295817.448	6255315.26		4659099
N-A-2	Node							0		295726.079	6255332.13		60319538
N-A-4	Node							0		295789.624	6255320.24		60319539
Pit-A-2	Sag	NSW Dept. of I	2.4 m lintel (all grad	30	4	49.57	0.09	0	0.5	295727.034	6255341.89	No	60319566
Pit-A-1	Sag	NSW Dept. of I	2.4 m lintel (all grad	30	0.9	49.57	0.09	0	0.5	295697.036	6255346.85	No	4659080
Pit-D-2	Sag	NSW Dept. of I	RM.7 Grated Acces	10	1	49.49	0.15	0	0.5	295883.738	6255338.11	No	84268744
Pit-D-1	OnGrade	NSW RTA SA	Unlimited		2.5	49.5		0	0.2	295882.352	6255343.19	No	1
N-ROOF	Node					49.65		0		295877.228	6255367.46		93404411
N493	Node							0		295768.489	6255356.86		142568773
N512	Node							0		295751.566	6255359.16		154658953
N513	Node							0		295734.251	6255362.09		154658954
N514	Node							0		295711.361	6255365.03		154658955

DETENTION BASIN DETAILS													
Name	Elev	Surf. Area	Init Vol. (cu.m)	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	**HED**	Crest RL
OSD	46.963	1	0	Orifice		150	47.288			295890.528	6255341.73	No	
	47.187	1											
	47.188	480											
	49.3	480											
Basin-B	46.205	1.4	0	Orifice		71	47.008			295773.423	6255433.02	No	
	48.48	1.4											
	48.63	900											

SUB-CATCHMENT DETAILS													
Name	Pit or	Total	Paved	Grass	Supp	Paved	Grass	Supp	Paved	Grass	Supp	Paved	Grass
	Node	Area	Area	Area	Area	Time	Time	Time	Length	Length	Length	Slope(%)	Slope
		(ha)	%	%	%	(min)	(min)	(min)	(m)	(m)	(m)	%	%
Cat-E-2	Pit-E-2	0.0381	100	0	0	1	0	0					
Cat-E-1	Pit-E-1	0.1502	100	0	0	1	0	0					
Cat-C-5	Pit-C-5	0.0889	100	0	0	1	1	0					
Cat-C-4	Pit-C-4	0.0306	100	0	0	1	1	0					
Cat-C-3	Pit-C-3	0.0306	100	0	0	1	1	0					
Cat-C-2	Pit-C-2	0.0306	100	0	0	1	1	0					
Cat-B-4	Pit-B-7	0.0781	100	0	0	1	0	0					
Cat-B-3	Pit-B-6	0.0517	100	0	0	1	0	0					
Cat-B-2	Basin-B	0.4191	100	0	0	2	0	0					
Cat-B-1	Pit-B-2	0.0201	100	0	0	1	0	0					
Cat-A-2	Pit-A-2	0.0306	100	0	0	1	1	0					
Cat-A-1	Pit-A-1	0.0306	100	0	0	1	1	0					
Cat-D-2	Pit-D-2	0.0425	100	0	0	1	0	0					
Cat-D-1	Pit-D-1	0.1515	100	0	0	1	0	0					
Cat-ROOF	N-ROOF	1.25	100	0	0	5	0	0					
100 Yr	N493	2.24	0	100	0	1	22	0					
20 Yr	N512	2.24	0	100	0	1	28	0					
10 Yr	N513	2.24	0	100	0	1	27	0					
5 Yr	N514	2.24	0	100	0	1	39	0					

PIPE DETAILS													
Name	From	To	Length	U/S IL	D/S IL	Slope	Type	Dia	I.D.	Rough	Pipe Is	No. Pipes	Chg From
			(m)	(m)	(m)	(%)		(mm)	(mm)				
Pipe-F-2	Pit-E-2	Pit-E-1	35	48.7	48.35	1	Concrete, under road	375	375	0.3	New	1	Pit-E-2
Pipe-F-1	Pit-E-1	OSD	5	48.32	48.27	1	Concrete, under road	375	375	0.3	NewFixed	1	Pit-E-1
Pipe-C-5	OSD	Pit-C-5	20	46.963	46.5	2.32	Concrete, under road	450	450	0.3	NewFixed	1	OSD
Pipe-C-4	Pit-C-5	Pit-C-4	46	46.47	46.15	0.7	Concrete, under road	600	600	0.3	New	1	Pit-C-5
Pipe-C-3	Pit-C-4	Pit-C-3	36	46.12	45.87	0.69	Concrete, under road	600	600	0.3	New	1	Pit-C-4
Pipe-C-2	Pit-C-3	Pit-C-2	36	45.84	45.59	0.69	Concrete, under road	600	600	0.3	New	1	Pit-C-3
Pipe-C-1	Pit-C-2	Pit-C-1	8	45.57	45.5	0.87	Concrete, under road	600	600	0.3	New	1	Pit-C-2
Pipe-B-7	Pit-B-7	Pit-B-6	24	47.45	47.33	0.5	Concrete, under road	450	450	0.3	New	1	Pit-B-7
Pipe-B-6	Pit-B-6	Basin-B	65	47.3	46.97	0.51	Concrete, under road	450	450	0.3	NewFixed	1	Pit-B-6
Pipe-B-5	Basin-B	Pit B-4	5	46.205	46.155	1	Concrete, not under r	450	450	0.3	NewFixed	1	Basin-B
Pipe-B-4	Pit B-4	Pit-B-3	57	46.115	45.83	0.5	Concrete, under road	450	450	0.3	NewFixed	1	Pit B-4
Pipe-B-2	Pit-B-3	Pit-B-2	95	45.79	45.315	0.5	Concrete, under road	450	450	0.3	New	1	Pit-B-3
Pipe-B-1	Pit-B-2	Pit-B-1	15	45.275	45.2	0.5	Concrete, under road	1050	1070	0.3	New	1	Pit-B-2
Pipe-A-2	Pit-A-2	Pit-A-1	36	48.52	48.34	0.5	Concrete, under road	375	375	0.3	New	1	Pit-A-2
Pipe-A-1	Pit-A-1	Pit-B-2	35	48.31	48.13	0.51	Concrete, under road	375	375	0.3	New	1	Pit-A-1
Pipe-D-2	Pit-D-2	Pit-D-1	15	48.39	48.315	0.5	Concrete, under road	375	375	0.3	New	1	Pit-D-2
Pipe-D-1	Pit-D-1	OSD	5	48.39	47.89	10	Concrete, under road	375	375	0.3	NewFixed	1	Pit-D-1
Pipe-E-1	N-ROOF	OSD	12	47.44	47.38	0.5	Concrete, under road	825	825	0.3	NewFixed	1	N-ROOF

DETAILS of SERVICES CROSSING PIPES													
Pipe	Chg	Bottom	Height of Service	Chg	Bottom	Height of Serv	Chg	Bottom	Height of Serv	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	
			Time	Level	Length	Coeff. C	Section	Major Storms	Minor Storms	DxV	Slope	Contributing	
			(min)	(m)	(m)			(m)	(m)	(sq.m/sec)	(%)	%	
OF-A-16	Pit-E-2	Pit-E-1	0.3				Dummy used to mode	0.2	0.05	0.6	-5.07	0	
OF-A-15	Pit-E-1	Pit-D-1	0.3				Dummy used to mode	0.2	0.05	0.6	-5.07	0	
OF-A-14	OSD	Pit-C-5	0.4	48.689	3.6	1.6	Dummy used to mode	0.2	0.05	0.6	3.72	0	
OF-A-11	Pit-C-5	N-A-5	1				Dummy used to mode	0.2	0.05	0.6	1	0	
OF-A-10	Pit-C-4	N-A-5	0.3				Dummy used to mode	0.2	0.05	0.6	9.5	0	
OF-A-8	Pit-C-3	N-A-4	0.3				Dummy used to mode	0.2	0.05	0.6	1	0	
OF-A-6	Pit-C-2	Pit-C-1	1				Dummy used to mode	0.2	0.05	0.6	1	0	
OF-A-5	Pit-C-1	N-A-2	0.5				Dummy used to mode	0.2	0.05	0.6	1	0	
OF-B-6	Pit-B-7	Pit-B-6	0.27				Dummy used to mode	0.2	0.05	0.6	0.67	0	
OF6-B-6	Pit-B-6	Basin-B	1				Dummy used to mode	0.2	0.05	0.6	1	0	
OF-B-5	Basin-B	Pit B-4	1	48.681	3	1.6	Dummy used to mode	0.2	0.05	0.6	1	0	
OF-B-4	Pit B-4	Basin-B	1				Dummy used to mode	0.2	0.05	0.6	1	0	
OF-B-2	Pit-B-2	Pit-B-1	0.3				Dummy used to mode	0.2	0.05	0.6	12.83	0	
OF-B-1	Pit-B-1	N-1	0.4				Dummy used to mode	0.2	0.05	0.6	3.75	0	
OF-A-1	N-A-1	Pit-B-1	0.5				Dummy used to mode	0.2	0.05	0.6	1	0	
OF-A-9	N-A-5	N-A-4	0.5				Dummy used to mode	0.2	0.05	0.6	1	0	
OF-A-3	N-A-2	N-A-1	0.5				Dummy used to mode	0.2	0.05	0.6	1.39	0	
OF-A-7	N-A-4	Pit-C-1	0.5				Dummy used to mode	0.2	0.05	0.6	1.39	0	
OF-A-4	Pit-A-2	N-A-2	0.3				Dummy used to mode	0.2	0.05	0.6	1	0	
OF-A-2	Pit-A-1	N-A-1	0.3				Dummy used to mode	0.2	0.05	0.6	12.83	0	
OF-A-13	Pit-D-2	Pit-C-5	0.4				Dummy used to mode	0.2	0.05	0.6	1	0	
OF-A-12	Pit-D-1	Pit-D-2	0.1				Dummy used to mode	0.2	0.05	0.6	4.5	0	

DRAINS Model Name and File Path: F:\AAMK0001-02\14-91 Target - Erskine Park\D-Calcs\Stormwater\TARGET 22-12-08.drn
DRAINS Version: 2008.12 - 12 Dec 08
Modeller's Name: Rick Andrew
Description: Target Distribution Facility, Erskine Park, Penrith **5 Year ARI Results**

DRAINS results prepared 22 December, 2008 from Version 2008.06

PIT / NODE DETAILS				Version 8						
Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint			
Pit-E-2	48.86		0.013		0.89	0	None			
Pit-E-1	48.58		0.053		1	0	None			
Pit-C-5	46.74	49.29	0.031	4.8	2.49	0	None			
Pit-C-4	46.34	49.59	0.011	3	3.23	0	None			
Pit-C-3	46.07	49.59	0.011	3	3.5	0	None			
Pit-C-2	45.88	49.59	0.011	3	3.69	0	None			
Pit-C-1	45.63		0							
Pit-B-7	48.65	48.65	0.028	30	-0.15	0.013	Outlet System			
Pit-B-6	48.65	48.65	0.019	30	-0.15	0.076	Outlet System			
Pit B-4	46.22		0.002		2.41	0	None			
Pit-B-3	45.94		0		3.36		None			
Pit-B-2	45.4	49.72	0.007	1.1	4.3	0	None			
Pit-B-1	45.29		0.08							
Pit-A-2	48.63	49.59	0.011	3	0.94	0	None			
Pit-A-1	48.41	49.59	0.011	3	1.16	0	None			
Pit-D-2	48.73	49.53	0.015	0.8	0.76	0	None			
Pit-D-1	48.73		0.053		0.77	0	None			
N-ROOF	48.39		0.423							

SUB-CATCHMENT DETAILS										
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm			
Cat-E-2	0.013	0.013	0	1	0	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-E-1	0.053	0.053	0	1	0	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-C-5	0.031	0.031	0	1	1	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-C-4	0.011	0.011	0	1	1	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-C-3	0.011	0.011	0	1	1	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-C-2	0.011	0.011	0	1	1	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-B-4	0.028	0.028	0	1	0	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-B-3	0.018	0.018	0	1	0	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-B-2	0.148	0.148	0	2	0	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-B-1	0.007	0.007	0	1	0	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-A-2	0.011	0.011	0	1	1	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-A-1	0.011	0.011	0	1	1	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-D-2	0.015	0.015	0	1	0	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-D-1	0.053	0.053	0	1	0	0	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1			
Cat-ROOF	0.423	0.423	0	5	0	0	AR&R 5 year, 15 minutes storm, average 81.3 mm/h, Zone 1			
100 Yr	0.252	0	0.252	1	22	0	AR&R 5 year, 1 hour storm, average 38.9 mm/h, Zone 1			
20 Yr	0.212	0	0.212	1	28	0	AR&R 5 year, 1 hour storm, average 38.9 mm/h, Zone 1			
10 Yr	0.218	0	0.218	1	27	0	AR&R 5 year, 1 hour storm, average 38.9 mm/h, Zone 1			
5 Yr	0.167	0	0.167	1	39	0	AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1			

Outflow Volumes for Total Catchment (2.44 impervious + 8.96 pervious = 11.4 total ha)										
Storm	Total Rainfall	Total Runoff	Impervious Runoff	Pervious Runoff						
	cu.m	cu.m (Runoff %)	cu.m (Runoff %)	cu.m (Runoff %)						
AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1	1206.84	273.10 (22.6%)	234.14 (90.6%)	38.96 (4.1%)						
AR&R 5 year, 10 minutes storm, average 97.5 mm/h, Zone 1	1853.02	610.10 (32.9%)	372.59 (93.8%)	237.51 (16.3%)						
AR&R 5 year, 15 minutes storm, average 81.3 mm/h, Zone 1	2317.7	951.59 (41.1%)	472.15 (95.1%)	479.44 (26.3%)						
AR&R 5 year, 20 minutes storm, average 70.8 mm/h, Zone 1	2691.16	1229.55 (45.7%)	552.16 (95.8%)	677.39 (32.0%)						
AR&R 5 year, 25 minutes storm, average 62.2 mm/h, Zone 1	2955.33	1411.96 (47.8%)	608.76 (96.1%)	803.19 (34.6%)						
AR&R 5 year, 30 minutes storm, average 57.4 mm/h, Zone 1	3272.72	1614.82 (49.3%)	676.77 (96.5%)	938.05 (36.5%)						
AR&R 5 year, 1 hour storm, average 38.9 mm/h, Zone 1	4435.85	2356.53 (53.1%)	925.97 (97.4%)	1430.56 (41.0%)						
AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1	5216.96	2775.03 (53.2%)	1093.32 (97.8%)	1681.71 (41.0%)						
AR&R 5 year, 3 hours storm, average 19.8 mm/h, Zone 1	6773.5	3587.00 (53.0%)	1426.81 (98.3%)	2160.19 (40.6%)						
PIPE DETAILS										
Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm					
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)						
Pipe-F-2	0.013	1.2	48.758	48.581	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1					
Pipe-F-1	0.066	1.7	48.464	48.414	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1					
Pipe-C-5	0.05	2.3	47.05	46.74	AR&R 5 year, 3 hours storm, average 19.8 mm/h, Zone 1					
Pipe-C-4	0.061	1.5	46.589	46.337	AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1					
Pipe-C-3	0.067	1.6	46.246	46.067	AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1					
Pipe-C-2	0.074	1.6	45.972	45.882	AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1					
Pipe-C-1	0.08	1.8	45.699	45.629	AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1					
Pipe-B-7	0.006	0	48.65	48.65	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1					
Pipe-B-6	0.01	0.1	48.651	48.687	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1					
Pipe-B-5	0.014	1.2	46.263	46.224	AR&R 5 year, 3 hours storm, average 19.8 mm/h, Zone 1					
Pipe-B-4	0.016	1	46.187	45.937	AR&R 5 year, 3 hours storm, average 19.8 mm/h, Zone 1					
Pipe-B-2	0.016	1	45.862	45.399	AR&R 5 year, 3 hours storm, average 19.8 mm/h, Zone 1					
Pipe-B-1	0.031	0.9	45.365	45.29	AR&R 5 year, 25 minutes storm, average 62.2 mm/h, Zone 1					
Pipe-A-2	0.006	0.7	48.569	48.415	AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1					
Pipe-A-1	0.013	0.9	48.377	48.197	AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1					
Pipe-D-2	0.014	0.1	48.732	48.732	AR&R 5 year, 25 minutes storm, average 62.2 mm/h, Zone 1					
Pipe-D-1	0.067	4.4	48.463	48.391	AR&R 5 year, 5 minutes storm, average 127 mm/h, Zone 1					
Pipe-E-1	0.423	0.8	48.391	48.391	AR&R 5 year, 15 minutes storm, average 81.3 mm/h, Zone 1					
CHANNEL DETAILS										
Name	Max Q	Max V	Chainage	Max	Due to Storm					
	(cu.m/s)	(m/s)	(m)	HGL (m)						

OVERFLOW ROUTE DETAILS										
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm		
OF-A-16	0	0	0	0	0	0	0			
OF-A-15	0	0	0	0	0	0	0			
OF-A-14	0	0	0.494	0	0	0	0			
OF-A-11	0	0	0.256	0	0	0	0			
OF-A-10	0	0	0.789	0	0	0	0			
OF-A-8	0	0	0.256	0	0	0	0			
OF-A-6	0	0	0.256	0	0	0	0			
OF-A-5	0.08	0.08	0.256	0.032	0.02	10.38	0.47	AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1		
OF-B-6	0.013	0.013	0.21	0.018	0	5.84	0.25	AR&R 5 year, 1 hour storm, average 38.9 mm/h, Zone 1		
OF6-B-6	0.076	0.076	0.256	0.032	0.01	10.38	0.45	AR&R 5 year, 3 hours storm, average 19.8 mm/h, Zone 1		
OF-B-5	0.002	0.002	0.256	0.009	0	2.84	0.19	AR&R 5 year, 3 hours storm, average 19.8 mm/h, Zone 1		
OF-B-4	0	0	0.256	0	0	0	0			
OF-B-2	0	0	0.917	0	0	0	0			
OF-B-1	0.11	0.11	0.496	0.028	0.02	9.43	0.82	AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1		
OF-A-1	0.08	0.08	0.256	0.032	0.02	10.38	0.47	AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1		
OF-A-9	0	0	0.256	0	0	0	0			
OF-A-3	0.08	0.08	0.302	0.03	0.02	10.02	0.53	AR&R 5 year, 1.5 hours storm, average 30.5 mm/h, Zone 1		
OF-A-7	0	0	0.302	0	0	0	0			
OF-A-4	0	0	0.256	0	0	0	0			
OF-A-2	0	0	0.917	0	0	0	0			
OF-A-13	0	0	0.256	0	0	0	0			
OF-A-12	0	0	0.543	0	0	0	0			
DETENTION BASIN DETAILS										
Name	Max WL	MaxVol	Max Q	Max Q	Max Q					
			Total	Low Level	High Level					
OSD	48.39	581.9	0.05	0.05	0					
Basin-B	48.69	124.2	0.016	0.014	0.002					

CONTINUITY CHECK for AR&R 5 year, 1 hour storm, average 38.9 mm/h, Zone 1										
Node	Inflow	Outflow	Storage Change	Difference						
	(cu.m)	(cu.m)	(cu.m)	%						
Pit-E-2	14.44	14.44	0	0						
Pit-E-1	71.37	71.37	0	0						
OSD	618.63	273.48	345.41	0						
Pit-C-5	307.16	306.84	0	0.1						
Pit-C-4	318.44	318.11	0.02	0.1						
Pit-C-3	329.71	329.37	0.02	0.1						
Pit-C-2	340.97	340.63	0.02	0.1						
Pit-C-1	340.63	340.31	0	0.1						
Pit-B-7	29.58	3.25	26.18	0.5						
Pit-B-6	22.86	-2.45	25.32	0						
Basin-B	156.39	97.33	59.16	-0.1						
Pit B-4	97.33	97.22	0	0.1						
Pit-B-3	97.22	97.1	0	0.1						
Pit-B-2	127.9	127.78	0	0.1						
Pit-B-1	465.19	465.07	0	0						
N-1	463.75	463.75	0	0						
N-A-1	338.38	338.38	0	0						
N-A-5	0	0	0	0						
N-A-2	339.35	339.35	0	0						
N-A-4	0	0	0	0						
Pit-A-2	11.6	11.59	0.02	0						
Pit-A-1	23.19	23.17	0.02	0						
Pit-D-2	16.11	16.11	0	0						
Pit-D-1	73.52	73.52	0	0						
N-ROOF	473.75	473.75	0	0						
N493	362.37	362.37	0	0						
N512	358.65	358.65	0	0						
N513	359.33	359.33	0	0						
N514	350.21	350.21	0	0						

Run Log for TARGET 22 run at 16:33:36 on 22/12/2008

DRAINS Model Name and File Path: F:\AAMK0001-02\14-91 Target - Erskine Park\D-Calcs\Stormwater\TARGET 22-12-08.drn
DRAINS Version: 2008.12 - 12 Dec 08
Modeller's Name: Rick Andrew
Description: Target Distribution Facility, Erskine Park, Penrith **10 Year ARI Results**

DRAINS results prepared 22 December, 2008 from Version 2008.06

PIT / NODE DETAILS				Version 8			
Name	Max HGL	Max Pond	Max Surface	Max Pond	Min	Overflow	Constraint
		HGL	Flow Arriving	Volume	Freeboard	(cu.m/s)	
			(cu.m/s)	(cu.m)	(m)		
Pit-E-2	48.87		0.015		0.88	0	None
Pit-E-1	48.6		0.06		0.98	0	None
Pit-C-5	46.75	49.3	0.036	5.4	2.48	0	None
Pit-C-4	46.35	49.59	0.012	3.4	3.22	0	None
Pit-C-3	46.08	49.59	0.012	3.4	3.49	0	None
Pit-C-2	45.9	49.59	0.012	3.4	3.67	0	None
Pit-C-1	45.64		0				
Pit-B-7	48.65	48.65	0.031	30	-0.15	0.032	Outlet System
Pit-B-6	48.65	48.65	0.051	30	-0.15	0.088	Outlet System
Pit B-4	46.25		0.009		2.38	0	Inlet Capacity
Pit-B-3	45.97		0		3.33		None
Pit-B-2	45.41	49.72	0.008	1.2	4.29	0	None
Pit-B-1	45.3		0.088				
Pit-A-2	48.64	49.59	0.012	3.4	0.93	0	None
Pit-A-1	48.42	49.59	0.012	3.4	1.15	0	None
Pit-D-2	48.76	49.54	0.017	0.9	0.73	0	None
Pit-D-1	48.76		0.061		0.74	0	None
N-ROOF	48.58		0.483				

SUB-CATCHMENT DETAILS							
Name	Max	Paved	Grassed	Paved	Grassed	Supp.	Due to Storm
	Flow Q	Max Q	Max Q	Tc	Tc	Tc	
	(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)	
Cat-E-2	0.015	0.015	0	1	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-E-1	0.06	0.06	0	1	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-C-5	0.036	0.036	0	1	1	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-C-4	0.012	0.012	0	1	1	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-C-3	0.012	0.012	0	1	1	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-C-2	0.012	0.012	0	1	1	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-B-4	0.031	0.031	0	1	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-B-3	0.021	0.021	0	1	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-B-2	0.168	0.168	0	2	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-B-1	0.008	0.008	0	1	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-A-2	0.012	0.012	0	1	1	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-A-1	0.012	0.012	0	1	1	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-D-2	0.017	0.017	0	1	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-D-1	0.061	0.061	0	1	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat-ROOF	0.483	0.483	0	5	0	0	AR&R 10 year, 25 minutes storm, average 71.4 mm/h, Zone 1
100 Yr	0.321	0	0.321	1	22	0	AR&R 10 year, 2 hours storm, average 28.8 mm/h, Zone 1
20 Yr	0.268	0	0.268	1	28	0	AR&R 10 year, 1 hour storm, average 43.9 mm/h, Zone 1
10 Yr	0.275	0	0.275	1	27	0	AR&R 10 year, 1 hour storm, average 43.9 mm/h, Zone 1
5 Yr	0.221	0	0.221	1	39	0	AR&R 10 year, 2 hours storm, average 28.8 mm/h, Zone 1

Outflow Volumes for Total Catchment (2.44 impervious + 8.96 pervious = 11.4 total ha)

Storm	Total Rainfall	Total Runoff	Impervious Runoff	Pervious Runoff
	cu.m	cu.m (Runoff %)	cu.m (Runoff %)	cu.m (Runoff %)
AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1	1368.38	353.12 (25.8%)	268.75 (91.7%)	84.37 (7.8%)
AR&R 10 year, 10 minutes storm, average 110 mm/h, Zone 1	2090.59	822.25 (39.3%)	423.49 (94.5%)	398.76 (24.3%)
AR&R 10 year, 15 minutes storm, average 91.9 mm/h, Zone 1	2619.89	1243.29 (47.5%)	536.89 (95.6%)	706.40 (34.3%)
AR&R 10 year, 20 minutes storm, average 80 mm/h, Zone 1	3040.85	1568.11 (51.6%)	627.09 (96.2%)	941.02 (39.4%)
AR&R 10 year, 25 minutes storm, average 71.4 mm/h, Zone 1	3392.45	1834.91 (54.1%)	702.42 (96.6%)	1132.49 (42.5%)
AR&R 10 year, 30 minutes storm, average 64.8 mm/h, Zone 1	3694.64	2018.13 (54.6%)	767.17 (96.9%)	1250.96 (43.1%)
AR&R 10 year, 1 hour storm, average 43.9 mm/h, Zone 1	5006.01	2903.98 (58.0%)	1048.14 (97.7%)	1855.84 (47.2%)
AR&R 10 year, 1.5 hours storm, average 34.4 mm/h, Zone 1	5884.05	3422.46 (58.2%)	1236.27 (98.1%)	2186.19 (47.3%)
AR&R 10 year, 2 hours storm, average 28.8 mm/h, Zone 1	6568.24	3803.00 (57.9%)	1382.85 (98.3%)	2420.14 (46.9%)
AR&R 10 year, 3 hours storm, average 22.4 mm/h, Zone 1	7662.95	4448.52 (58.1%)	1617.37 (98.5%)	2831.16 (47.0%)

PIPE DETAILS

Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)	
Pipe-F-2	0.015	1.3	48.762	48.601	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Pipe-F-1	0.075	0.9	48.581	48.581	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Pipe-C-5	0.054	2.4	47.054	46.753	AR&R 10 year, 3 hours storm, average 22.4 mm/h, Zone 1
Pipe-C-4	0.067	1.6	46.595	46.348	AR&R 10 year, 1.5 hours storm, average 34.4 mm/h, Zone 1
Pipe-C-3	0.074	1.6	46.252	46.079	AR&R 10 year, 1.5 hours storm, average 34.4 mm/h, Zone 1
Pipe-C-2	0.081	1.6	45.979	45.899	AR&R 10 year, 1.5 hours storm, average 34.4 mm/h, Zone 1
Pipe-C-1	0.088	1.8	45.706	45.636	AR&R 10 year, 1.5 hours storm, average 34.4 mm/h, Zone 1
Pipe-B-7	0.006	0	48.65	48.65	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Pipe-B-6	0.01	0.1	48.651	48.697	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Pipe-B-5	0.014	1.2	46.263	46.246	AR&R 10 year, 3 hours storm, average 22.4 mm/h, Zone 1
Pipe-B-4	0.023	1.1	46.201	45.966	AR&R 10 year, 3 hours storm, average 22.4 mm/h, Zone 1
Pipe-B-2	0.023	1.1	45.876	45.407	AR&R 10 year, 3 hours storm, average 22.4 mm/h, Zone 1
Pipe-B-1	0.034	0.8	45.373	45.298	AR&R 10 year, 25 minutes storm, average 71.4 mm/h, Zone 1
Pipe-A-2	0.007	0.8	48.572	48.423	AR&R 10 year, 25 minutes storm, average 71.4 mm/h, Zone 1
Pipe-A-1	0.015	1	48.383	48.203	AR&R 10 year, 25 minutes storm, average 71.4 mm/h, Zone 1
Pipe-D-2	0.016	0.1	48.76	48.759	AR&R 10 year, 25 minutes storm, average 71.4 mm/h, Zone 1
Pipe-D-1	0.076	1.3	48.581	48.581	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Pipe-E-1	0.483	0.9	48.581	48.581	AR&R 10 year, 25 minutes storm, average 71.4 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q	Max V	Chainage	Max	Due to Storm
	(cu.m/s)	(m/s)	(m)	HGL (m)	

OVERFLOW ROUTE DETAILS							
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V
OF-A-16	0	0	0	0	0	0	0
OF-A-15	0	0	0	0	0	0	0
OF-A-14	0	0	13.937	0	0	0	0
OF-A-11	0	0	7.665	0	0	0	0
OF-A-10	0	0	10.728	0	0	0	0
OF-A-8	0	0	7.665	0	0	0	0
OF-A-6	0	0	7.665	0	0	0	0
OF-A-5	0.088	0.088	7.665	0.034	0.02	10.74	0.47
OF-B-6	0.032	0.032	6.274	0.025	0.01	8.23	0.32
OF6-B-6	0.088	0.088	7.665	0.034	0.02	10.74	0.47
OF-B-5	0.009	0.009	7.665	0.015	0	4.94	0.26
OF-B-4	0	0	7.665	0	0	0	0
OF-B-2	0	0	10.001	0	0	0	0
OF-B-1	0.12	0.12	13.993	0.029	0.02	9.73	0.85
OF-A-1	0.088	0.088	7.665	0.034	0.02	10.74	0.47
OF-A-9	0	0	7.665	0	0	0	0
OF-A-3	0.088	0.088	9.037	0.032	0.02	10.38	0.52
OF-A-7	0	0	9.037	0	0	0	0
OF-A-4	0	0	7.665	0	0	0	0
OF-A-2	0	0	10.001	0	0	0	0
OF-A-13	0	0	7.665	0	0	0	0
OF-A-12	0	0	13.008	0	0	0	0

DETENTION BASIN DETAILS							
Name	Max WL	MaxVol	Max Q	Max Q	Max Q		
			Total	Low Level	High Level		
OSD	48.58	673.2	0.054	0.054	0		
Basin-B	48.7	140.8	0.023	0.014	0.009		

CONTINUITY CHECK for AR&R 10 year, 2 hours storm, average 28.8 mm/h, Zone 1							
Node	Inflow	Outflow	Storage Change	Difference			
	(cu.m)	(cu.m)	(cu.m)	%			
Pit-E-2	21.57	21.57	0	0			
Pit-E-1	106.58	106.58	0	0			
OSD	923.87	475.67	448.5	0			
Pit-C-5	525.96	525.59	0	0.1			
Pit-C-4	542.92	542.53	0.01	0.1			
Pit-C-3	559.86	559.47	0.01	0.1			
Pit-C-2	576.8	576.42	0.01	0.1			
Pit-C-1	576.42	576.04	0	0.1			
Pit-B-7	44.18	14.14	30	0.1			
Pit-B-6	43.36	13.36	30	0			
Basin-B	249.24	172.09	77.56	-0.2			
Pit B-4	172.09	171.96	0	0.1			
Pit-B-3	171.86	171.74	0	0.1			
Pit-B-2	217.75	217.64	0	0.1			
Pit-B-1	790.31	790.19	0	0			
N-1	788.72	788.72	0	0			
N-A-1	573.8	573.8	0	0			
N-A-5	0	0	0	0			
N-A-2	574.92	574.92	0	0			
N-A-4	0	0	0	0			
Pit-A-2	17.33	17.31	0.01	0			
Pit-A-1	34.64	34.63	0.01	0			
Pit-D-2	24.06	24.05	0	0			
Pit-D-1	109.79	109.79	0	0			
N-ROOF	707.5	707.5	0	0			
N493	606.96	606.96	0	0			
N512	605.68	605.68	0	0			
N513	605.95	605.95	0	0			
N514	601.55	601.55	0	0			

Run Log for TARGET 22 run at 16:38:51 on 22/12/2008

DRAINS Model Name and File Path: F:\AAMK0001-02\14-91 Target - Erskine Park\D-Calcs\Stormwater\TARGET 22-12-08.drn
DRAINS Version: 2008.12 - 12 Dec 08
Modeller's Name: Rick Andrew
Description: Target Distribution Facility, Erskine Park, Penrith **20 Year ARI Results**

DRAINS results prepared 22 December, 2008 from Version 2008.06

PIT / NODE DETAILS				Version 8						
Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint			
Pit-E-2	48.88		0.018		0.87	0	None			
Pit-E-1	48.73		0.069		0.85	0	None			
Pit-C-5	46.81	49.31	0.044	10.5	2.42	0	None			
Pit-C-4	46.4	49.6	0.014	3.8	3.17	0	None			
Pit-C-3	46.36	49.6	0.014	3.8	3.21	0	None			
Pit-C-2	46.35	49.6	0.014	3.8	3.22	0	None			
Pit-C-1	46.33		0							
Pit-B-7	48.65	48.65	0.036	30	-0.15	0.034	Outlet System			
Pit-B-6	48.65	48.65	0.054	30	-0.15	0.1	Outlet System			
Pit B-4	46.27		0.02		2.36	0.004	Inlet Capacity			
Pit-B-3	46.12		0		3.18		None			
Pit-B-2	46.1	49.72	0.009	1.4	3.6	0	None			
Pit-B-1	46.1		0.098							
Pit-A-2	48.65	49.6	0.014	3.8	0.92	0	None			
Pit-A-1	48.43	49.6	0.014	3.8	1.14	0	None			
Pit-D-2	48.85	49.54	0.02	1	0.64	0	None			
Pit-D-1	48.84		0.07		0.66	0	None			
N-ROOF	48.73		0.557							

SUB-CATCHMENT DETAILS										
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm			
Cat-E-2	0.018	0.018	0	1	0	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-E-1	0.069	0.069	0	1	0	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-C-5	0.041	0.041	0	1	1	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-C-4	0.014	0.014	0	1	1	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-C-3	0.014	0.014	0	1	1	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-C-2	0.014	0.014	0	1	1	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-B-4	0.036	0.036	0	1	0	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-B-3	0.024	0.024	0	1	0	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-B-2	0.193	0.193	0	2	0	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-B-1	0.009	0.009	0	1	0	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-A-2	0.014	0.014	0	1	1	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-A-1	0.014	0.014	0	1	1	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-D-2	0.02	0.02	0	1	0	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-D-1	0.07	0.07	0	1	0	0	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1			
Cat-ROOF	0.557	0.557	0	5	0	0	AR&R 20 year, 25 minutes storm, average 82.2 mm/h, Zone 1			
100 Yr	0.409	0	0.409	1	22	0	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1			
20 Yr	0.341	0	0.341	1	28	0	AR&R 20 year, 1 hour storm, average 50.5 mm/h, Zone 1			
10 Yr	0.35	0	0.35	1	27	0	AR&R 20 year, 1 hour storm, average 50.5 mm/h, Zone 1			
5 Yr	0.279	0	0.279	1	39	0	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1			

Outflow Volumes for Total Catchment (2.44 impervious + 8.96 pervious = 11.4 total ha)										
Storm	Total Rainfall	Total Runoff	Impervious Runoff	Pervious Runoff						
	cu.m	cu.m (Runoff %)	cu.m (Runoff %)	cu.m (Runoff %)						
AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1	1577.44	483.72 (30.7%)	313.54 (92.8%)	170.17 (13.7%)						
AR&R 20 year, 10 minutes storm, average 127 mm/h, Zone 1	2413.68	1130.33 (46.8%)	492.71 (95.3%)	637.61 (33.6%)						
AR&R 20 year, 15 minutes storm, average 105.9 mm/h, Zone 1	3019	1631.25 (54.0%)	622.41 (96.2%)	1008.84 (42.5%)						
AR&R 20 year, 20 minutes storm, average 92.1 mm/h, Zone 1	3500.78	2016.44 (57.6%)	725.63 (96.7%)	1290.81 (46.9%)						
AR&R 20 year, 25 minutes storm, average 82.2 mm/h, Zone 1	3905.6	2333.53 (59.7%)	812.36 (97.1%)	1521.17 (49.6%)						
AR&R 20 year, 30 minutes storm, average 74.6 mm/h, Zone 1	4253.39	2558.45 (60.2%)	886.89 (97.3%)	1671.56 (50.0%)						
AR&R 20 year, 1 hour storm, average 50.5 mm/h, Zone 1	5758.62	3631.52 (63.1%)	1209.39 (98.0%)	2422.13 (53.5%)						
AR&R 20 year, 1 hour storm, average 50.5 mm/h, Zone 1	5758.62	3631.52 (63.1%)	1209.39 (98.0%)	2422.13 (53.5%)						
AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1	7571.72	4780.22 (63.1%)	1597.87 (98.5%)	3182.36 (53.5%)						
AR&R 20 year, 3 hours storm, average 25.7 mm/h, Zone 1	8791.87	5547.68 (63.1%)	1859.32 (98.7%)	3688.36 (53.4%)						

PIPE DETAILS										
Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm					
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)						
Pipe-F-2	0.018	1.3	48.767	48.726	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1					
Pipe-F-1	0.087	0.8	48.726	48.725	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1					
Pipe-C-5	0.057	2.4	47.056	46.808	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1					
Pipe-C-4	0.093	1.7	46.62	46.397	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1					
Pipe-C-3	0.095	0.9	46.36	46.36	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1					
Pipe-C-2	0.096	0.4	46.354	46.347	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1					
Pipe-C-1	0.098	0.3	46.332	46.33	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1					
Pipe-B-7	0.007	0	48.65	48.65	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1					
Pipe-B-6	0.01	0.1	48.651	48.707	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1					
Pipe-B-5	0.014	1.1	46.266	46.266	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1					
Pipe-B-4	0.03	1.1	46.215	46.117	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1					
Pipe-B-2	0.03	0.3	46.109	46.1	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1					
Pipe-B-1	0.038	0.1	46.1	46.1	AR&R 20 year, 25 minutes storm, average 82.2 mm/h, Zone 1					
Pipe-A-2	0.009	0.8	48.576	48.432	AR&R 20 year, 25 minutes storm, average 82.2 mm/h, Zone 1					
Pipe-A-1	0.017	1	48.389	48.209	AR&R 20 year, 25 minutes storm, average 82.2 mm/h, Zone 1					
Pipe-D-2	0.018	0.2	48.844	48.843	AR&R 20 year, 25 minutes storm, average 82.2 mm/h, Zone 1					
Pipe-D-1	0.087	0.8	48.726	48.725	AR&R 20 year, 5 minutes storm, average 166 mm/h, Zone 1					
Pipe-E-1	0.557	1	48.726	48.725	AR&R 20 year, 25 minutes storm, average 82.2 mm/h, Zone 1					

CHANNEL DETAILS										
Name	Max Q	Max V	Chainage	Max	Due to Storm					
	(cu.m/s)	(m/s)	(m)	HGL (m)						

OVERFLOW ROUTE DETAILS										
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm		
OF-A-16	0	0	0	0	0	0	0			
OF-A-15	0	0	0	0	0	0	0			
OF-A-14	0.04	0.04	0.494	0.019	0.01	6.44	0.65	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1		
OF-A-11	0	0	0.256	0	0	0	0			
OF-A-10	0	0	0.789	0	0	0	0			
OF-A-8	0	0	0.256	0	0	0	0			
OF-A-6	0	0	0.256	0	0	0	0			
OF-A-5	0.098	0.098	0.256	0.035	0.02	10.91	0.5	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1		
OF-B-6	0.034	0.034	0.21	0.026	0.01	8.53	0.32	AR&R 20 year, 1 hour storm, average 50.5 mm/h, Zone 1		
OF6-B-6	0.1	0.1	0.256	0.035	0.02	10.91	0.51	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1		
OF-B-5	0.02	0.02	0.256	0.019	0.01	6.44	0.33	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1		
OF-B-4	0.004	0.004	0.256	0.01	0	3.44	0.23	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1		
OF-B-2	0	0	0.917	0	0	0	0			
OF-B-1	0.132	0.132	0.496	0.03	0.03	10.02	0.88	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1		
OF-A-1	0.098	0.098	0.256	0.035	0.02	10.91	0.5	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1		
OF-A-9	0	0	0.256	0	0	0	0			
OF-A-3	0.098	0.098	0.302	0.033	0.02	10.56	0.55	AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1		
OF-A-7	0	0	0.302	0	0	0	0			
OF-A-4	0	0	0.256	0	0	0	0			
OF-A-2	0	0	0.917	0	0	0	0			
OF-A-13	0	0	0.256	0	0	0	0			
OF-A-12	0	0	0.543	0	0	0	0			
DETENTION BASIN DETAILS										
Name	Max WL	MaxVol	Max Q	Max Q	Max Q					
			Total	Low Level	High Level					
OSD	48.73	743.2	0.097	0.057	0.04					
Basin-B	48.71	161	0.034	0.014	0.02					

CONTINUITY CHECK for AR&R 20 year, 2 hours storm, average 33.2 mm/h, Zone 1										
Node	Inflow	Outflow	Storage Change	Difference						
	(cu.m)	(cu.m)	(cu.m)	%						
Pit-E-2	24.92	24.92	0	0						
Pit-E-1	123.15	123.15	0	0						
OSD	1067.52	547.04	520.75	0						
Pit-C-5	605.15	604.75	0	0.1						
Pit-C-4	624.76	624.35	0.01	0.1						
Pit-C-3	644.37	643.96	0.01	0.1						
Pit-C-2	663.97	663.56	0.01	0.1						
Pit-C-1	663.56	663.15	0	0.1						
Pit-B-7	51.04	21.04	30	0						
Pit-B-6	54.8	24.78	30	0						
Basin-B	306.19	221.47	85.34	-0.2						
Pit B-4	221.47	221.34	0	0.1						
Pit-B-3	211.77	211.65	0	0.1						
Pit-B-2	264.82	264.7	0	0						
Pit-B-1	924.2	924.08	0	0						
N-1	922.5	922.5	0	0						
N-A-1	660.72	660.72	0	0						
N-A-5	0	0	0	0						
N-A-2	661.93	661.93	0	0						
N-A-4	0	0	0	0						
Pit-A-2	20.02	20.01	0.01	0						
Pit-A-1	40.03	40.01	0.01	0						
Pit-D-2	27.8	27.79	0	0						
Pit-D-1	126.86	126.86	0	0						
N-ROOF	817.5	817.5	0	0						
N493	798.17	798.17	0	0						
N512	796.14	796.14	0	0						
N513	796.43	796.43	0	0						
N514	791.61	791.61	0	0						

Run Log for TARGET 22 run at 16:43:09 on 22/12/2008

DRAINS Model Name and File Path: F:\AAMK0001-02\14-91 Target - Erskine Park\D-Calcs\Stormwater\TARGET 22-12-08.drn
DRAINS Version: 2008.12 - 12 Dec 08
Modeller's Name: Rick Andrew
Description: Target Distribution Facility, Erskine Park, Penrith **100 Year ARI Results**

DRAINS results prepared 22 December, 2008 from Version 2008.06

PIT / NODE DETAILS				Version 8						
Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint			
Pit-E-2	48.91		0.023		0.84	0	None			
Pit-E-1	48.78		0.091		0.8	0	None			
Pit-C-5	46.91	49.38	0.166	30	2.32	0.074	None			
Pit-C-4	46.72	49.6	0.018	4.5	2.85	0	None			
Pit-C-3	46.68	49.6	0.018	4.5	2.89	0	None			
Pit-C-2	46.65	49.6	0.018	4.5	2.92	0	None			
Pit-C-1	46.6		0.074							
Pit-B-7	48.65	48.65	0.047	30	-0.15	0.047	Outlet System			
Pit-B-6	48.65	48.65	0.073	30	-0.15	0.148	Outlet System			
Pit B-4	46.39		0.049		2.24	0.02	Inlet Capacity			
Pit-B-3	46.38		0		2.92		None			
Pit-B-2	46.35	49.73	0.012	1.7	3.35	0	None			
Pit-B-1	46.35		0.236							
Pit-A-2	48.66	49.6	0.018	4.5	0.91	0	None			
Pit-A-1	48.45	49.6	0.018	4.5	1.12	0	None			
Pit-D-2	48.9	49.55	0.026	1.3	0.59	0	None			
Pit-D-1	48.9		0.091		0.6	0	None			
N-ROOF	48.78		0.712							

SUB-CATCHMENT DETAILS										
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm			
Cat-E-2	0.023	0.023	0	1	0	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-E-1	0.091	0.091	0	1	0	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-C-5	0.054	0.054	0	1	1	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-C-4	0.018	0.018	0	1	1	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-C-3	0.018	0.018	0	1	1	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-C-2	0.018	0.018	0	1	1	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-B-4	0.047	0.047	0	1	0	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-B-3	0.031	0.031	0	1	0	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-B-2	0.253	0.253	0	2	0	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-B-1	0.012	0.012	0	1	0	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-A-2	0.018	0.018	0	1	1	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-A-1	0.018	0.018	0	1	1	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-D-2	0.026	0.026	0	1	0	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-D-1	0.091	0.091	0	1	0	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
Cat-ROOF	0.712	0.712	0	5	0	0	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1			
100 Yr	0.56	0	0.56	1	22	0	AR&R 100 year, 1 hour storm, average 65.8 mm/h, Zone 1			
20 Yr	0.493	0	0.493	1	28	0	AR&R 100 year, 1 hour storm, average 65.8 mm/h, Zone 1			
10 Yr	0.503	0	0.503	1	27	0	AR&R 100 year, 1 hour storm, average 65.8 mm/h, Zone 1			
5 Yr	0.394	0	0.394	1	39	0	AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1			

Outflow Volumes for Total Catchment (2.44 impervious + 8.96 pervious = 11.4 total ha)										
Storm	Total Rainfall	Total Runoff	Impervious Runoff	Pervious Runoff						
	cu.m	cu.m (Runoff %)	cu.m (Runoff %)	cu.m (Runoff %)						
AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1	2062.08	898.89 (43.6%)	417.38 (94.5%)	481.51 (29.7%)						
AR&R 100 year, 10 minutes storm, average 166 mm/h, Zone 1	3154.89	1847.73 (58.6%)	651.52 (96.4%)	1196.22 (48.3%)						
AR&R 100 year, 15 minutes storm, average 138.2 mm/h, Zone 1	3939.81	2525.96 (64.1%)	819.69 (97.1%)	1706.26 (55.1%)						
AR&R 100 year, 20 minutes storm, average 120 mm/h, Zone 1	4561.28	3046.89 (66.8%)	952.85 (97.5%)	2094.05 (58.4%)						
AR&R 100 year, 25 minutes storm, average 107.1 mm/h, Zone 1	5088.68	3454.87 (67.9%)	1065.84 (97.8%)	2389.03 (59.7%)						
AR&R 100 year, 30 minutes storm, average 97.3 mm/h, Zone 1	5547.66	3806.57 (68.6%)	1164.18 (97.9%)	2642.39 (60.6%)						
AR&R 100 year, 1 hour storm, average 65.8 mm/h, Zone 1	7503.31	5314.39 (70.8%)	1583.21 (98.5%)	3731.18 (63.3%)						
AR&R 100 year, 1.5 hours storm, average 51.6 mm/h, Zone 1	8826.08	6292.74 (71.3%)	1866.62 (98.7%)	4426.12 (63.8%)						
AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1	9852.36	7020.79 (71.3%)	2086.48 (98.8%)	4934.31 (63.7%)						
AR&R 100 year, 3 hours storm, average 33.5 mm/h, Zone 1	11460.22	8132.19 (71.0%)	2431.02 (99.0%)	5701.18 (63.3%)						
PIPE DETAILS										
Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm					
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)						
Pipe-F-2	0.023	1.3	48.782	48.782	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1					
Pipe-F-1	0.114	1	48.779	48.779	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1					
Pipe-C-5	0.058	2.4	47.057	46.913	AR&R 100 year, 3 hours storm, average 33.5 mm/h, Zone 1					
Pipe-C-4	0.151	1.4	46.716	46.716	AR&R 100 year, 3 hours storm, average 33.5 mm/h, Zone 1					
Pipe-C-3	0.157	0.6	46.701	46.684	AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1					
Pipe-C-2	0.163	0.6	46.668	46.65	AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1					
Pipe-C-1	0.169	0.6	46.604	46.6	AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1					
Pipe-B-7	0.007	0	48.65	48.65	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1					
Pipe-B-6	0.009	0.1	48.651	48.728	AR&R 100 year, 15 minutes storm, average 138.2 mm/h, Zone 1					
Pipe-B-5	0.014	0.2	46.395	46.395	AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1					
Pipe-B-4	0.044	0.4	46.387	46.377	AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1					
Pipe-B-2	0.044	0.3	46.367	46.35	AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1					
Pipe-B-1	0.058	0.1	46.35	46.35	AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1					
Pipe-A-2	0.011	0.9	48.582	48.448	AR&R 100 year, 25 minutes storm, average 107.1 mm/h, Zone 1					
Pipe-A-1	0.021	1.1	48.4	48.22	AR&R 100 year, 25 minutes storm, average 107.1 mm/h, Zone 1					
Pipe-D-2	0.023	0.2	48.901	48.899	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1					
Pipe-D-1	0.115	1	48.78	48.779	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1					
Pipe-E-1	0.712	1.3	48.78	48.779	AR&R 100 year, 5 minutes storm, average 217 mm/h, Zone 1					
CHANNEL DETAILS										
Name	Max Q	Max V	Chainage	Max	Due to Storm					
	(cu.m/s)	(m/s)	(m)	HGL (m)						

OVERFLOW ROUTE DETAILS										
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm		
OF-A-16	0	0	0	0	0	0	0			
OF-A-15	0	0	0	0	0	0	0			
OF-A-14	0.155	0.155	13.937	0.032	0.03	10.38	0.92	AR&R 100 year, 3 hours storm, average 33.5 mm/h, Zone 1		
OF-A-11	0.074	0.074	7.665	0.031	0.01	10.2	0.46	AR&R 100 year, 3 hours storm, average 33.5 mm/h, Zone 1		
OF-A-10	0	0	10.728	0	0	0	0			
OF-A-8	0	0	7.665	0	0	0	0			
OF-A-6	0	0	7.665	0	0	0	0			
OF-A-5	0.236	0.236	7.665	0.048	0.03	13.61	0.65	AR&R 100 year, 3 hours storm, average 33.5 mm/h, Zone 1		
OF-B-6	0.047	0.047	6.274	0.028	0.01	9.43	0.36	AR&R 100 year, 1.5 hours storm, average 51.6 mm/h, Zone 1		
OF6-B-6	0.148	0.148	7.665	0.04	0.02	11.99	0.57	AR&R 100 year, 1.5 hours storm, average 51.6 mm/h, Zone 1		
OF-B-5	0.049	0.049	7.665	0.027	0.01	9.13	0.4	AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1		
OF-B-4	0.02	0.02	7.665	0.019	0.01	6.44	0.32	AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1		
OF-B-2	0	0	10.001	0	0	0	0			
OF-B-1	0.289	0.289	13.993	0.041	0.04	12.17	1.07	AR&R 100 year, 1 hour storm, average 65.8 mm/h, Zone 1		
OF-A-1	0.236	0.236	7.665	0.048	0.03	13.61	0.65	AR&R 100 year, 3 hours storm, average 33.5 mm/h, Zone 1		
OF-A-9	0.074	0.074	7.665	0.031	0.01	10.2	0.46	AR&R 100 year, 3 hours storm, average 33.5 mm/h, Zone 1		
OF-A-3	0.236	0.236	9.037	0.045	0.03	13.07	0.72	AR&R 100 year, 3 hours storm, average 33.5 mm/h, Zone 1		
OF-A-7	0.074	0.074	9.037	0.029	0.02	9.73	0.52	AR&R 100 year, 3 hours storm, average 33.5 mm/h, Zone 1		
OF-A-4	0	0	7.665	0	0	0	0			
OF-A-2	0	0	10.001	0	0	0	0			
OF-A-13	0	0	7.665	0	0	0	0			
OF-A-12	0	0	13.008	0	0	0	0			
DETENTION BASIN DETAILS										
Name	Max WL	MaxVol	Max Q	Max Q	Max Q					
			Total	Low Level	High Level					
OSD	48.78	768.9	0.213	0.058	0.155					
Basin-B	48.73	207.6	0.063	0.014	0.049					

CONTINUITY CHECK for AR&R 100 year, 2 hours storm, average 43.2 mm/h, Zone 1										
Node	Inflow	Outflow	Storage Change	Difference						
	(cu.m)	(cu.m)	(cu.m)	%						
Pit-E-2	32.55	32.55	0	0						
Pit-E-1	160.82	160.82	0	0						
OSD	1394.03	858.92	535.41	0						
Pit-C-5	934.81	934.4	0	0						
Pit-C-4	906.55	906.12	0.01	0						
Pit-C-3	932.26	931.83	0.01	0						
Pit-C-2	957.97	957.96	0.01	0						
Pit-C-1	1011.95	1011.54	0	0						
Pit-B-7	66.65	36.65	30	0						
Pit-B-6	80.73	50.71	30	0						
Basin-B	479.11	378.14	101.6	-0.1						
Pit B-4	378.14	378.01	0	0						
Pit-B-3	304.21	304.1	0	0						
Pit-B-2	373.53	373.53	0	0						
Pit-B-1	1381.36	1381.24	0	0						
N-1	1379.64	1379.64	0	0						
N-A-1	1009.07	1009.07	0	0						
N-A-5	53.99	53.99	0	0						
N-A-2	1010.3	1010.3	0	0						
N-A-4	53.99	53.99	0	0						
Pit-A-2	26.14	26.13	0.01	0						
Pit-A-1	52.27	52.25	0.01	0						
Pit-D-2	36.3	36.29	0	0						
Pit-D-1	165.66	165.7	0	0						
N-ROOF	1067.5	1067.5	0	0						
N493	1237.9	1237.9	0	0						
N512	1234.16	1234.16	0	0						
N513	1234.78	1234.78	0	0						
N514	1227.46	1227.46	0	0						

Run Log for TARGET 22 run at 16:26:54 on 22/12/2008

Upwelling occurred at Pit-B-6, Pit-B-7

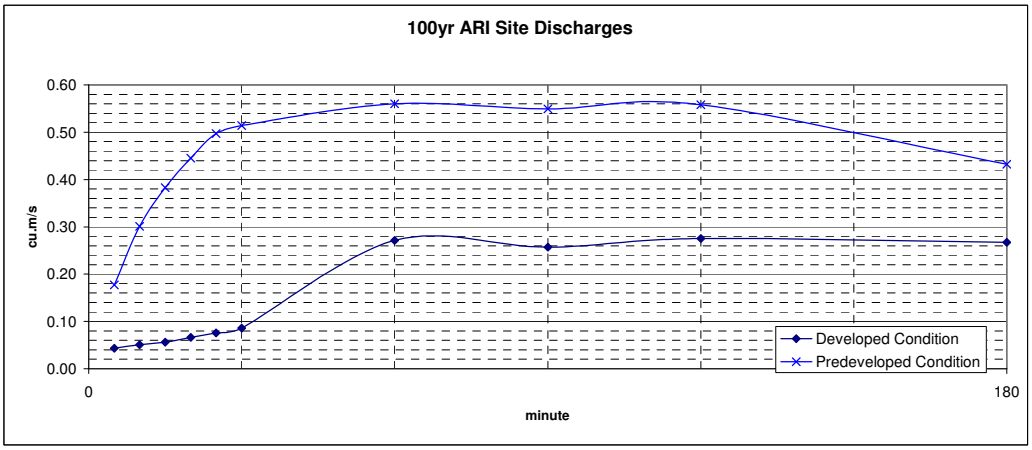
Appendix D

Pre- and Post-Development Comparison Graphs

Drains Model F:\AAMK0001-02\14-91 Target - Erskine Park\D-Calcs\Stormwater\Taget Drains. Opt4
Drains version 15Dec2008

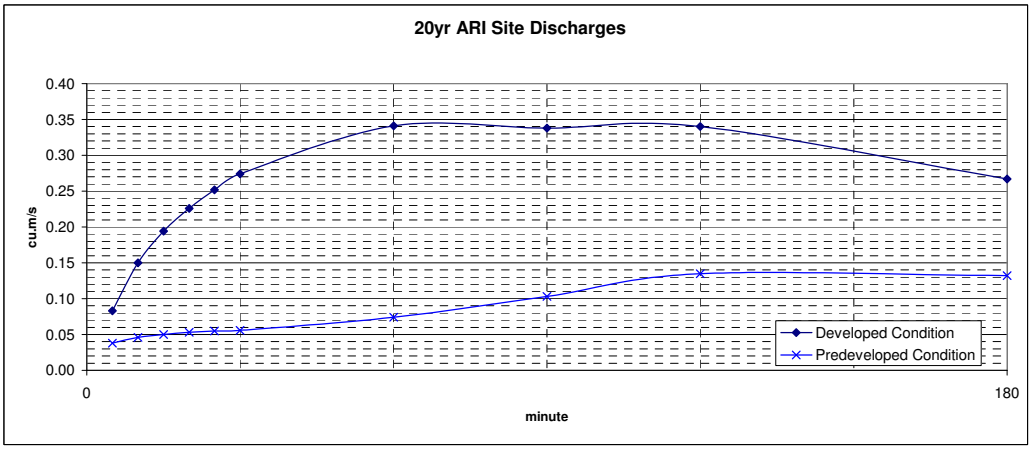
Time (m)	Pre-Site Flow (m^3/s)	Post-Site Flow (m^3/s)
5	0.18	0.04
10	0.30	0.05
15	0.38	0.06
20	0.45	0.07
25	0.50	0.08
30	0.51	0.09
60	0.56	0.27
90	0.55	0.26
120	0.56	0.28
180	0.43	0.27
Worst Case	0.46	0.28

Target - Erskine Park



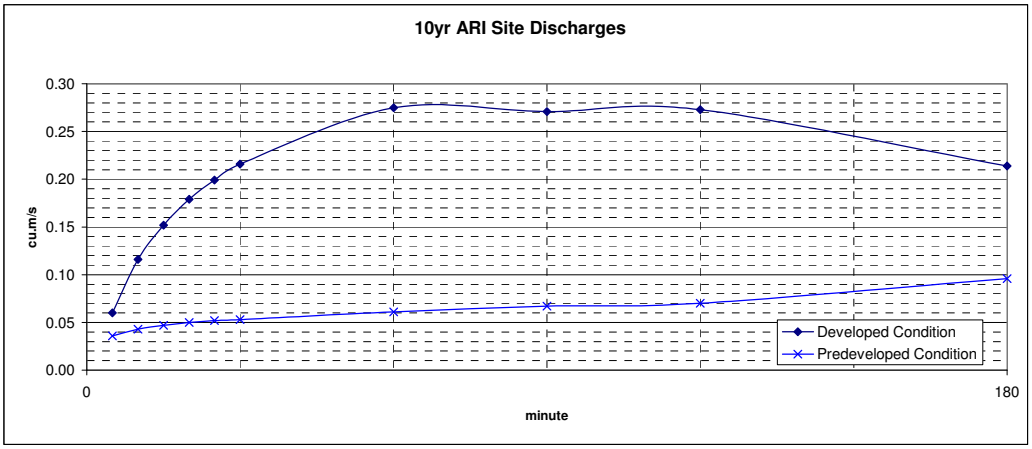
Time (m)	Pre-Site Flow (m^3/s)	Post-Site Flow (m^3/s)
5	0.08	0.04
10	0.15	0.05
15	0.19	0.05
20	0.23	0.05
25	0.25	0.06
30	0.27	0.06
60	0.34	0.07
90	0.34	0.10
120	0.34	0.14
180	0.27	0.13
Worst Case	0.28	0.13

Target - Erskine Park



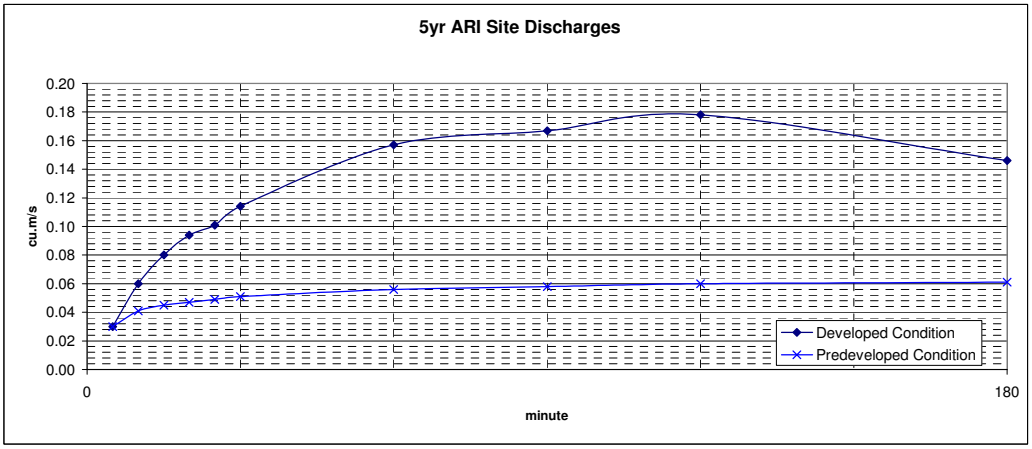
Time (m)	Pre-Site Flow (m^3/s)	Post-Site Flow (m^3/s)
5	0.06	0.04
10	0.12	0.04
15	0.15	0.05
20	0.18	0.05
25	0.20	0.05
30	0.22	0.05
60	0.28	0.06
90	0.27	0.07
120	0.27	0.07
180	0.21	0.10
Peak Flow	0.32	0.07

Target - Erskine Park



Time (m)	Pre-Site Flow (m^3/s)	Post-Site Flow (m^3/s)
5	0.03	0.03
10	0.06	0.04
15	0.08	0.05
20	0.09	0.05
25	0.10	0.05
30	0.11	0.05
60	0.16	0.06
90	0.17	0.06
120	0.18	0.06
180	0.15	0.06
Peak Flow	0.18	0.06

Target - Erskine Park



Drawings

DA00 – Cover Sheet and Notes

DA01 – Erosion and Sediment Control Plan

DA02 – Siteworks and Stormwater Drainage Plan

DA03 – Pavement, Signage and Linemarking Plan

DA04 – Roofwater Drainage Layout Plan

DA05 – Details Sheet

DA06 – Rainwater OSD Tank Detail Sheet 1

DA07 – Rainwater OSD Tank Detail Sheet 2

DA08 – Overall Site Plan

DA10 – Access Road and Siteworks and Stormwater Drainage Plan

DA11 – Public Access Road Long section