

Camden Medical Campus

Stormwater Management and Servicing
Strategy Report

May 2016

Camden Medical Campus

Stormwater Management and Servicing
Strategy Report

May 2016

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
A	27.04.2016	S. Reilly			Issued for Client Review
B	19.05.2016	S. Reilly	C. Avis	C. Avis	Issued for Approval

Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Contents

Chapter	Title	Page
1	Introduction	1
1.1	Purpose of Report _____	1
1.2	Site Location and Description _____	1
1.3	Basis of Report _____	1
2	Stormwater Management	2
2.1	Design Philosophy _____	2
2.2	Onsite Detention _____	2
2.3	Stormwater Modelling _____	4
2.3.1	Hydrologic Parameters _____	4
2.3.2	Pit Inlet Capacities _____	4
2.3.3	Pipe and Pit Friction Losses _____	4
2.3.4	Pipes _____	4
2.3.5	Catchments _____	5
2.3.6	Overland Flow Paths _____	5
2.3.7	Tailwater Levels _____	5
2.3.8	Detention _____	5
2.3.9	Results _____	6
2.4	Stormwater Quality Management _____	6
2.4.1	Proposed Treatments _____	7
2.4.2	Water Quality Modelling _____	8
2.4.3	MUSIC Results _____	9
2.5	Flooding _____	9
3	Servicing Strategy	11
3.1	Water _____	11
3.2	Sewer _____	11
3.3	Electricity _____	11
3.4	Gas _____	11
3.5	Telecommunications _____	12
	Appendices	13
	Appendix A. Drains Input/Output _____	14
	Appendix B. Flooding Plan _____	15

1 Introduction

1.1 Purpose of Report

This Stormwater Management and Servicing Strategy Report has been prepared by Mott MacDonald (MM) as part of the EIS submission for the proposed Camden Medical Campus located on Lot number 846 within the Gregory Hills Corporate Park development. This report describes the proposed stormwater management measures and review of the servicing strategy for the proposed site. The report has been prepared in response to SEARS Application specifically items 10, 14 and 15.

1.2 Site Location and Description

The site is located on Lot number 846 within the Gregory Hills Corporate Park development at Gregory Hills. The proposed site is bounded by the South Creek Tributary Way to the west, Digitaria Drive to the north, the Hermitage Way to the east and a proposed future medical centre to the south. The site generally has a fall from east to west with all of the site runoff directed towards the South Creek Tributary.

1.3 Basis of Report

The engineering detail in this report has been developed based on the following documentation:

- Existing site survey undertaken by Burton and Field Surveyors.
- Draft DP plan prepared by Burton and Field Surveyors.
- Civil engineering documentation prepared by Mott MacDonald for the Stage 3 to 6 Gregory Hills Corporate Park Development Application, DA 997/2014.
- Civil Engineering documentation for Stage 4 of Gregory Hills Corporate Park prepared by Mott MacDonald.
- Civil Engineering documentation for the South Creek Tributary works in the Gregory Hills Corporate Park site prepared by Mott MacDonald.
- Civil engineering DA drawings for Stage 2 of the Gregory Hills Corporate Park development prepared by Mott MacDonald submitted as DA 864/2014.
- Civil Engineering documentation for Stage 2 of Gregory Hills Corporate Park prepared by Mott MacDonald.
- Sydney Water drawings for Stage 4 of Gregory Hills Corporate Park prepared by Mott MacDonald.
- Civil engineering documentation prepared by Tribeca Homes for the residential Development to the east of the proposed site.

2 Stormwater Management

2.1 Design Philosophy

The stormwater drainage for the site has been designed in accordance with the following criteria that has been approved by council and is consistent with the overall estate design philosophy.

Approved Overall Estate Drainage Criteria:

- Road network drainage system designed to convey the 10 year ARI storm event runoff from the road areas as well as the detained flows from each of the individual development lots.
- Outlet pipes from each of the lots designed to convey the detained 10 year ARI storm event runoff from the lots. This is as a result of detention being required on each of the individual development lots so that the peak flow from the post developed site (including compensatory storage for the adjacent road area) does not exceed the pre developed flows for all storm events from the 1 year to the 100 year ARI storm events.

Proposed Site Drainage Criteria:

- Internal drainage system designed to convey the 10 year ARI storm event runoff from the site.
- Detention provided so that the peak flow from the post developed site (including compensatory storage for the adjacent road area) does not exceed the pre developed flows for all storm events from the 1 year to the 100 year ARI storm events. In accordance with detention sizing provided as part of the approved DA 997/2014.

To achieve this design criteria, drainage is proposed to collect runoff from the carpark and building areas discharging via a detention tank into the proposed external mains system in Digitaria Drive. The proposed drainage layout is shown on MM drawing numbers CA-0130 to CA-0134

2.2 Onsite Detention

The Turner Road Precinct Development Control Plan 2007 requires that the development attenuates the 100 year ARI peak post development flow back to the pre-development flow rates. In accordance with Camden Council Engineering Design Specification on site detention shall manage peak discharges for all storms up to the 100 year ARI event.

As documented in the “*Civil Engineering Report – Stage 3 to 6 Development Application, Mott MacDonald, March 2015*” which was prepared by Mott MacDonald as part of the DA submission, the basis for the lot based detention design for the Gregory Hills Corporate Park site is as follows:

- The general principles of on-site detention for each commercial lot are as approved in the development consent 277/2012 and 997/2014. The development consent states that “*if necessary an on-site detention system must be provided to restrict stormwater discharges from the site to pre*

development flows in accordance with Camden Council’s current Engineering Design Specifications”.

- The detention volume for each lot has been designed to provide compensatory detention for the adjacent road frontage including the proportion of Gregory Hills Drive adjacent to the site.
- The calculated proportion of adjacent road area that each individual lot provides compensatory storage for was taken as the percentage of the total lot area of each individual lot.
- Each lot was modelled so that the peak flow from the post developed site (including flows that bypass the detention basin from the adjacent road area) does not exceed the pre developed flows for all storm events from the 1 year to the 100 year ARI storm events.
- The assumed depth of the proposed detention tanks are taken as 1m.

From the calculations undertaken as part of the DA submission the following detention requirements have been calculated for Lot 846:

Detention Volume = **1,375 m³**

Orifice Diameter = **390 mm**

The following catchment data was used to calculate the detention volume required for the site.

Table 2.1: Lot 846 – Input Data

Item	Value
Pre Developed (Total) Area	5.175 ha
Lot Area	4.145 ha
Percentage of Total Lot Area	26.77%
Adjacent Road Area	1.030 ha

Source: *Civil Engineering Report – Stage 3 to 6 Development Application, Mott MacDonald, March 2015*

With the following allowable discharge required from the site:

Table 2.2: Lot 846 - Detention Calculations DRAINS Output

Storm Event	Pre Developed Flow (m ³ /s)	Post Developed Pipe Flow from Site (m ³ /s)	Post Developed Overland Flow from Site (m ³ /s)	Post Developed Flow Bypassing Detention (m ³ /s)	Total Post Developed Flow (m ³ /s)
1 year	0.396	0.189	0	0.207	0.396
10 year	1.270	0.275	0.008	0.367	0.650
100 year	2.070	0.310	0.910	0.513	1.733

Source: *Civil Engineering Report – Stage 3 to 6 Development Application, Mott MacDonald, March 2015*

Due to the layout of the site which results in not all of the runoff being able to be directed through the proposed detention system these calculations have been revisited as shown in Section 2.3.8.

2.3 Stormwater Modelling

Modelling of the proposed stormwater system was undertaken using the DRAINS software package. The following parameters were used in the model.

2.3.1 Hydrologic Parameters

The Intensity-Frequency-Duration (IFD) information from Camden Councils Engineering Design Specification was used. The proposed stormwater drainage system was analysed for a range of durations (between 5 minutes to 2 hours) to ascertain the effectiveness of the proposed system under multiple design rainfall scenarios.

Table 2.3 lists the loss parameters utilised in the DRAINS model. These parameters are as outlined in the Camden Council Engineering Design Specification.

Table 2.3: DRAINS Model Loss Parameters

Parameter	Value
Impervious (Paved) Depression Storage	1 mm
Pervious (Grassed) Depression Storage	5 mm
Soil Type	3

2.3.2 Pit Inlet Capacities

For all pits throughout the development, the pit capacity relationships within *DRAINS* were adopted. These relationships are based on published results of scale model testing. For the 100 year storm event a blockage factor of 50% was applied on all pits as per Camden Council requirements.

2.3.3 Pipe and Pit Friction Losses

A Manning's friction coefficient of 0.013 was adopted for reinforced concrete pipes and 0.009 for uPVC pipes as specified by Camden Council.

Pit loss values were derived from the Missouri chart as set out in the Camden Council Engineering Design Specification and are summarised in the DRAINS Input data.

2.3.4 Pipes

Proposed pipes were graded at a minimum slope of 1%, with a desirable minimum cover of 600mm over the pipe.

2.3.5 Catchments

Catchment areas for each pit are shown in the DRAINS Input data attached in Appendix A and on the Catchment Plan, MM drawing number CA-0210.

The DRAINS Input data in Appendix A lists the areas for each catchment and the adopted pervious and impervious percentages.

2.3.6 Overland Flow Paths

Typical cross-sections based on the gutter shape and pavement type were input to DRAINS representing the overland flow paths. Slopes were derived from the proposed pit surface levels.

2.3.7 Tailwater Levels

The tailwater level at the connection point to the downstream drainage system was set at the HGL level from the Stage 4 Gregory Hills Corporate Park design.

2.3.8 Detention

Using the design criteria as discussed in Section 2.2 the detention volume for the site was revisited due to areas of the site not able to be drained through the proposed detention system. The tank was sized to satisfy the following:

The post developed flow from the site including the flows bypassing detention + The external post developed flows from the public domain areas = The predeveloped flows for all flows from the 1 year to the 100 year storm event.

To meet these requirements it is proposed to install a detention tank with a high early discharge pit. The high early discharge pit has been utilised to provide a detention system with a smaller storage volume requirement but still however meeting the site discharge requirements. As a result the following detention system is proposed:

- Detention Volume = **1,000 m³**
- Orifice diameter for low flows = **340mm**
- Weir level = **RL 98.8**
- Outlet pipe diameter for high flows = **600mm**

The detention system is proposed to be an underground tank. Other options include utilising storage in the pipe system by upsizing the pipe size within the site. This can be investigated further during the detailed design phase.

The outflows from the site utilising the detention system as specified above are summarised in Section 2.3.9.

2.3.9 Results

The model was run to provide 150mm freeboard at all the pits during the 10 year ARI storm event. The results from the DRAINS model are attached in Appendix A. The total outflows from the site are summarised below against the required outflows as identified in Section 2.2.

Table 2.4: DRAINS Output

Storm Event	Pre Developed Flow (m3/s)	Post Developed Flow Bypassing OSD from external to site (m3/s)	Post Developed Flow Piped from Site (m3/s)	Post Developed Overland Flow from OSD (m3/s)	Post Developed Flow Bypassing OSD from Site (m3/s)	Total Post Developed Flow (m3/s)
1 year	0.396	0.207	0.160	0	0.025	0.392
10 year	1.27	0.367	0.542	0	0.067	0.976
100 year	2.07	0.513	0.985	0.287	0.214	1.999

2.4 Stormwater Quality Management

As part of this development it is proposed to provide an onsite water quality management system to meet the requirements in accordance with Camden Councils guidelines as summarised in Table 2.5 below:

Table 2.5: Camden Council Water Quality Targets

Pollutant	% Reduction in Pollutant Loads
Gross Pollutants (>5mm)	90%
Total Suspended Solids	85%
Total Phosphorus	65%
Total Nitrogen	45%

Source: Camden Council Engineering Design Specification

The above objectives are expressed as the reduction in pollutant loads required, compared to the proposed development with no stormwater control measures.

As approved in the Gregory Hills Corporate Park Development Consent for the whole estate, a development condition shall be imposed on all private lot developments to manage water quality onsite prior to discharging flows into the public domain system. The runoff within the public domain is being treated with a separate at source treatment on the public domain roads prior to entry into the piped system.

2.4.1 Proposed Treatments

To achieve the required pollutant reductions to satisfy Camden Councils requirements, the following water quality treatment train is proposed. A HumeGard® GPT will be used as the primary treatment followed by a JellyFish® filter as a tertiary treatment device. The proposed treatment train is discussed in more detail in the following sections.

2.4.1.1 HumeGard® Gross Pollutant Trap (GPT)

For primary treatment of the stormwater runoff, a HumeGard® Gross Pollutant Trap is to be provided. The HumeGard is a pollution control device specifically designed to remove gross pollutants and coarse sediments in residential and commercial developments. The MUSIC node from Hume's was used for this model with the input data as summarised below.

Table 2.6: HumeGard® GPT MUSIC Input Parameters

Pollutant	Input	Output	Adopted Rate
Suspended Solids (mg/L)	500	295	41%
Phosphorus (mg/L)	5	3.3	34%
Nitrogen (mg/L)	5	3.8	24%
Gross Pollutants (kg/ML)	15	2.2	85%

Source: *Humes*

2.4.1.2 HumeCeptor® Oil and Silt Arrestor

For secondary treatment of the stormwater runoff, a HumeCeptor® oil and silt arrestor is to be provided. The HumeCeptor is a pollution control device specifically designed to remove Total Suspended Solids and hydrocarbons from runoff. The MUSIC node from Hume's was used for this model with the input data as summarised below.

Table 2.7: HumeCeptor® MUSIC Input Parameters

Pollutant	Input	Output	Adopted Rate
Suspended Solids (mg/L)	500.3	100.3	80%
Phosphorus (mg/L)	4.998	3.519	30%
Nitrogen (mg/L)	5.0	3.5	30%
Gross Pollutants (kg/ML)	15.1	14.9	1.3%

Source: *Humes*

2.4.1.3 JellyFish® Filter

The JellyFish® filter are to be provided to be used as a final treatment device for stormwater runoff from the proposed development. Using filtration cartridges the JellyFish® filter is able to capture a high level of

stormwater pollutants including total suspended solids, total nitrogen, total phosphorous, total copper and total zinc. In developing the MUSIC model for the proposed development, a JellyFish® JF3000-16-4 cartridge system by Hume's with a treatable flow rate of 88L/s has been proposed as an end-of-line treatment prior to discharge. The position of the JellyFish® system has been proposed to maximise flows and allow easy access for maintenance. The MUSIC node from Hume's was used for this model with the input data as summarised below.

Table 2.8: JellyFish® Filter MUSIC Input Parameters

Pollutant	Input	Output	Adopted Rate
Suspended Solids (mg/L)	200	22	89%
Phosphorus (mg/L)	0.4	0.14	65%
Nitrogen (mg/L)	7	3.2	54%
Gross Pollutants (kg/ML)	100	1	99%

Source: Humes

2.4.2 Water Quality Modelling

A MUSIC (Version 6) model was created for the site to ensure the treatment measures provided onsite achieve the pollutant removal objectives as set by Camden Council. The following methodology and parameters were incorporated in the MUSIC model:

- The MUSIC model's default pluviograph data for Sydney 6 minute interval was utilised within the model. This was deemed acceptable for the site since the years utilised had both wet and dry periods and were close to the site.
- A MUSIC model was setup to represent the post developed site. The site was split up into 3 sub catchments representing the landscaped area, the carpark and sealed footpath area and the roofed areas.

Table 2.9: MUSIC Post-Developed Catchments

Post-Developed Region	Area (Ha)
Roof water discharging to water quality treatment	1.928 ha
Sealed road and footpath discharging to water quality treatment	1.354 ha
Landscaping discharging to water quality treatment	0.681 ha
Landscaping Bypass	0.121 ha
Sealed road and footpath bypass	0.060 ha

For the MUSIC catchment plan, refer to MM drawing number CA-0220.

- Pollutant concentration parameters used within the model were based on the recommended model defaults for different land use categories as specified in the MUSIC modeling guidelines prepared for the Sydney Catchment Authority (SCA). These are summarised in the following table:

Table 2.10: Post-Development Areas – MUSIC Node Classification

MUSIC Node	Category
Roof	“Roof Area”
Hardstand	“Roads”
Landscaping	“Pervious”

Source: NSW MUSIC modeling guidelines.

- A treatment train was designed to incorporate a series of treatment nodes including a HumeGard, HumeCeptor and a JellyFish Filter. The effectiveness of the proposed treatments is summarised in Section 2.4.3.

2.4.3 MUSIC Results

The following results were achieved within the model.

Table 2.11: MUSIC Results of Total Site

Pollutant	Post – Development (kg/yr)		Removal Rate (%)	Target Removal (%)
	Untreated	Residual		
Suspended Solids	11,800	781	93.4	85
Phosphorus	20.2	5.36	73.4	65
Nitrogen	111	73.4	66.7	45
Gross Pollutants	1130	36.2	96.8	90

According to the results of the MUSIC analysis the water quality treatment train provided will provide adequate treatment for the proposed development runoff from the proposed development in accordance with the water quality targets as set out by Camden Council.

2.5 Flooding

As part of the design works for the proposed South Creek Tributary a HEC-RAS model was prepared to determine the flood levels within the proposed creek alignment. The design of the creek tributary is as documented in the “*Civil Engineering Report – South Creek Tributary CC, Mott MacDonald, September 2015*”. A plan summarising the results from the HEC-RAS model taken from the above mentioned report is attached in Appendix B. As per council requirements a minimum freeboard of 300mm is required above the 100 year ARI flood level for all habitable floor levels. Further to this advice was received from council in response to the initial SEARS application stating that the site was to have a minimum freeboard of 2.3m above the riparian corridor.

Table 2.12: Flooding Levels – 100 Year ARI

Location	Minimum Creek Surface Level RL (m)	100 Year Flood Level RL (m)	Minimum Allowable Floor Level with 300mm Freeboard (m)	Minimum Allowable Floor Level 2.3m above Creek Level (m)
North western corner of the site	95.22	95.99	96.29	97.52
South western corner of the site	97.19	97.85	98.15	99.49

Source: *Civil Engineering Report – Tributary CC, Mott MacDonald, September 2015*

The proposed finished floor level for the site is RL 102.50 which is acceptable in accordance with council’s requirements. The proposed basement located adjacent to the north eastern corner of the site is to be located at RL 99.50 this is also above the required freeboard level and is acceptable. The proposed multi deck carpark has a minimum proposed level of RL 100.55 in the south western corner of the site, which is above the minimum allowable floor level.

3 Servicing Strategy

The following section provides a summary of the proposed servicing strategy for the site. It is noted that the servicing infrastructure as discussed below is currently under construction and will be in place well before construction commences on the subject site.

3.1 Water

A 150mm diameter DICL water main is to be constructed as part of the Stage 4 works of the Gregory Hills Corporate Park development on the northern side of Digitaria Drive. 2 x 150mm diameter tees are to be constructed off this main to provide a connection point to Lot 846 in the north western corner of the site, for both potable water and fire services. The design of these works has been undertaken by Mott MacDonald as the water servicing coordinators for the proposed development. A 150mm diameter PVC is also located on the eastern side of the Hermitage Way, with connection also being able to be provided to this pipe if required. Connections provided to the site are sufficient for the proposed hospital site, with no amplification required. This is to be confirmed by Sydney Water during the detailed design stage.

3.2 Sewer

An existing 375mm diameter PVC main runs within the South Creek tributary along the western boundary of the subject site. As part of the Stage 4 works of the Gregory Hills Corporate Park development, a 225mm diameter PVC pipe with terminal maintenance shaft is to be provided off the 375mm diameter main for the connection of Lot 846. The design of these works has been undertaken by Mott MacDonald as the water servicing coordinators for the proposed development. Connections provided to the site are sufficient for the proposed hospital site, with no amplification required. This is to be confirmed by Sydney Water during the detailed design stage.

3.3 Electricity

An underground electrical network is to be constructed as part of the Stage 4 works of the Gregory Hills Corporate Park development within Digitaria Drive and the Hermitage Way on both sides of the road. The design of these works has been undertaken by Estate Power Design Pty Ltd with allowance made for the connection of Lot 846. An electrical substation is to be provided for the hospital site along Digitaria Drive. The size and location of this substation is to be confirmed during the detailed design phase once the usage requirements for the site have been determined.

3.4 Gas

A 110mm gas main is located along the eastern boundary of the site on the eastern side of the Hermitage Way. Connection to this main is proposed for the site. Connection requirements are to be determined during the detailed design phase once usage requirements have been determined.

3.5 Telecommunications

An underground telecommunications network is to be constructed as part of the Stage 4 works of the Gregory Hills Corporate Park development within Digitaria Drive and the Hermitage way on both sides of the road. Connection to these cables is proposed for this development.

Appendices

Appendix A. Drains Input/Output	14
Appendix B. Flooding Plan	15

Appendix A. Drains Input/Output

OFD1	PIID1	OSDA4	0.1					Dummy	0.2	0.05	0.6	1	0	573	10
OF OSD	OSDA4	OSDWeir	0.1	98.8	5	1.704		Dummy	0.2	0.05	0.6	1	0	8371194	1
OF4A	OSDWeir	NOut	0.1	100	5	1.704		Dummy	0.2	0.05	0.6	1	0	24862794	13
Bypass1	NBypass1	NBypassSum	0.1					Dummy	0.2	0.05	0.6	1	0	298	10
Bypass2	NByp2B3Out	NBypassSum	0.1					Dummy	0.2	0.05	0.6	1	0	408	10
BypassTotal	NBypassSum	NBypassOut	0.1					Dummy	0.2	0.05	0.6	1	0	292	10
OFB1	PIIB1	NBypassSum	0.2					Dummy	0.2	0.05	0.6	1	0	454	20
OFB5	PIIB5	NByp3B5Out	0.2					Dummy	0.2	0.05	0.6	1	0	520	25
OFB4	PIIB4	PIIB3	0.2					Dummy	0.2	0.05	0.6	1	0	508	22
OFB3	PIIB3	NByp2B3Out	0.1					Dummy	0.2	0.05	0.6	1	0	446	5
OFB2	PIIB2	PIIB1	0.2					Dummy	0.2	0.05	0.6	1	0	378	24.6
Bypass3	NByp3B5Out	NBypassSum	0.1					Dummy	0.2	0.05	0.6	1	0	517	10
Bypass4	NByp4B6B7	NBypassSum	0.1					Dummy	0.2	0.05	0.6	1	0	544	10
OFB8	PIIB8	PIIB7	0.2					Dummy	0.2	0.05	0.6	1	0	562	30
OFB7	PIIB7	NByp4B6B7	0.1					Dummy	0.2	0.05	0.6	1	0	556	5
OFB6	PIIB6	NByp4B6B7	0.1					Dummy	0.2	0.05	0.6	1	0	542	5
OFH1	PIIA8	PIIA8	0.2					Dummy	0.2	0.05	0.6	1	0	635	30
OFAT7	PIIA7	PIIA8	0.2					Dummy	0.2	0.05	0.6	1	0	647	21.2
OFA5	PIIA5	OSDA4	0.4					Dummy	0.2	0.05	0.6	1	0	339397	50
Bypass5	NBypass5	NBypassSum	0.1					Dummy	0.2	0.05	0.6	1	0	657	5
Bypass7	NByp7E2Out	NBypassSum	0.6					Dummy	0.2	0.05	0.6	1	0	168321	80
OF3C	PIIC3	PIIC2	0.1					Dummy	0.2	0.05	0.6	1	0	168402	9.9
OF2C	PIIC2	PIIC1	0.2					Dummy	0.2	0.05	0.6	1	0	168408	19.7
OF1C1	PIIC1	PIIA9	0.4					Dummy	0.2	0.05	0.6	1	0	168395	35.6
OFA9	PIIA9	PIIA8	0.3					Dummy	0.2	0.05	0.6	1	0	339404	41.4
OFA8	PIIA8	PIIA7	0.2					Dummy	0.2	0.05	0.6	1	0	649	21.2
OFM1	PIIJ1	PIIJ1	0.1					Dummy	0.2	0.05	0.6	1	0	168467	12
OFJ1	PIIJ1	PIIA11	0.1					Dummy	0.2	0.05	0.6	1	0	168457	2.8
OFA11	PIIA11	PIIA11	0.1					Dummy	0.2	0.05	0.6	1	0	168452	2.8
OFA10	PIIA10	PIIA11	0.1					Dummy	0.2	0.05	0.6	1	0	168429	16.8
OFF1	PIIF1	PIIF2	0.1					Dummy	0.2	0.05	0.6	1	0	168517	11.9
OFA13	PIIA13	PIIA12	0.1					Dummy	0.2	0.05	0.6	1	0	168494	16.5
OFA12	PIIA12	PIIA11	0.1					Dummy	0.2	0.05	0.6	1	0	168483	16.6
OFK1	PIIK1	PIIF1	0.1					Dummy	0.2	0.05	0.6	1	0	168562	8
OFA15	PIIA15	PIIA16	0.1					Dummy	0.2	0.05	0.6	1	0	168591	18.3
OFA14	PIIA14	PIIA13	0.2					Dummy	0.2	0.05	0.6	1	0	168535	27.4
OF11	PII11	PIIA16	0.2					Dummy	0.2	0.05	0.6	1	0	168576	21
OFA16	PIIA16	PIIF2	0.1					Dummy	0.2	0.05	0.6	1	0	168594	10
OFN1	PIIN1	NBypassSum	0.1					Dummy	0.2	0.05	0.6	1	0	4899877	10
Bypass6	NBypass6	NBypassSum	0.6					Dummy	0.2	0.05	0.6	1	0	4899879	50
OF3	PIE3	NBypassSum	0.5					Dummy	0.2	0.05	0.6	1	0	16955486	60
OF2	PIE2	NByp7E2Out	0.2					Dummy	0.2	0.05	0.6	1	0	168351	20

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover (m)	Cover (m)
PipeD2-D1	RCP	300	0.6	0.3 Unsafe
PipeD1-A4	RCP	300	0.6	-3.72 Unsafe
P OSD	RCP	450	0.6	-0.49 Unsafe
Pipe A4-A3	RCP	600	0.6	-0.64 Unsafe
PipeA3-A2	RCP	600	0.6	1.22
PipeA2-A1	RCP	600	0.6	1.11
PipeA1-A0	RCP	600	0.6	0.98
PipeA0-NOut	RCP	750	0.6	0.63
PipeG1-A4	RCP	300	0.6	-0.72 Unsafe
PipeRoof5-B1	RCP	375	0.6	0.79
PipeB1-A4	RCP	600	0.6	-1.12 Unsafe
PipeRoof4-B5	RCP	375	0.6	0.23 Unsafe
PipeB5-B4	RCP	450	0.6	0.3 Unsafe
PipeB4-B3	RCP	525	0.6	0.6
PipeB3-B2	RCP	525	0.6	0.3 Unsafe
PipeB2-B1	RCP	525	0.6	0.32 Unsafe
PipeB8-B7	RCP	300	0.6	0.3 Unsafe
PipeB7-B6	RCP	300	0.6	0.6
PipeB6-B5	RCP	300	0.6	0.34 Unsafe
PipeH1-A7	RCP	300	0.6	0.47 Unsafe
PipeA7-A6	RCP	600	0.6	2.12
PipeA6-A5	RCP	675	0.6	2.36
PipeA5-A4	RCP	675	0.6	-1.08 Unsafe
PipeRoof1-A6	RCP	375	0.6	2.7
PipeRoof2-A4	RCP	375	0.6	-0.83 Unsafe
PipeC3-C2	RCP	300	0.6	0.6
PipeC2-C1	RCP	300	0.6	0.68
PipeC1-A9	RCP	375	0.6	1.3
PipeA9-A8	RCP	600	0.6	1.66
PipeA8-A7	RCP	600	0.6	1.69
PipeM1-C1	RCP	300	0.6	0.6
PipeJ1-A11	RCP	300	0.6	0.6
PipeA11-A10	RCP	375	0.6	0.99
PipeA10-A9	RCP	375	0.6	1.36
PipeF2-F1	RCP	300	0.6	0.6
PipeF1-A13	RCP	300	0.6	0.86
PipeA13-A12	RCP	300	0.6	1.09
PipeA12-A11	RCP	300	0.6	1.05
PipeK1-A15	RCP	300	0.6	0.6
PipeA15-A14	RCP	300	0.6	1.11
PipeA14-A13	RCP	300	0.6	1.12
PipeL1-A15	RCP	300	0.6	0.6
PipeA16-A15	RCP	300	0.6	0.6
PipeRoof3-A7	RCP	375	0.6	0.49 Unsafe
PipeN1-A6	RCP	300	0.6	0.3 Unsafe
PipeE3-E2	RCP	300	0.6	0.3 Unsafe
PipeE2-E1	RCP	300	0.6	0.63
PipeE1-A9	RCP	300	0.6	1.95

DRAINS Output - 1 Year ARI Storm Event

DRAINS results prepared from Version 2016.03

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
PitD2	101.48		0.011		0.52	0.001	Inlet Capacity
PitD1	101.19	101.75	0.019	1.2	0.51	0	Inlet Capacity
PitA3	97.84		0		1.86		None
PitA2	97.75		0		1.65		None
PitA1	97.68		0		1.52		None
PitA0	97.6		0		1.4		None
NOut	97.45		0				
PitG1	98.5		0.003		2.5		None
NRooF5	98.67		0.088				
PitB1	98.66	99.51	0.004	0.2	0.84	0	Inlet Capacity
NRooF4	100.77		0.093				
PitB5	100.54	101.13	0.004	0.2	0.58	0	Inlet Capacity
PitB4	99.73		0.012		0.95	0.001	Inlet Capacity
PitB3	99.49		0.021		1.01	0.004	Inlet Capacity
PitB2	98.85	99.5	0.002	0.1	0.65	0	Inlet Capacity
PitB8	101.77		0.01		0.53	0	Inlet Capacity
PitB7	100.98		0.002		0.88	0	None
PitB6	100.75		0.009		0.85	0	Inlet Capacity
PitH1	101.31		0.021		0.69	0.004	Inlet Capacity
PitA7	99.47		0.008		2.33	0	None
PitA6	99.24		0		2.76		None
PitA5	98.85	101.62	0.033	0.7	2.7	0	Inlet Capacity
NRooF1	99.26		0.111				
NRooF2	98.49		0.055				
PitC3	101.48	102.35	0.005	0.3	0.86	0	Inlet Capacity
PitC2	101.41		0.038		0.89	0.013	Inlet Capacity
PitC1	100.61		0.022		1.49	0.005	Inlet Capacity
PitA9	99.96		0.012		2.04	0.001	Inlet Capacity
PitA8	99.55	101.66	0.026	0.7	2.05	0	Inlet Capacity
PitM1	100.96	101.77	0.032	1.2	0.74	0	Inlet Capacity
PitJ1	100.87	101.77	0.002	0.1	0.9	0	Inlet Capacity
PitA11	100.53	101.79	0.009	0.4	1.24	0	Inlet Capacity
PitA10	100.34		0.004		1.61	0	None
PitF2	101.27	102.15	0.011	0.5	0.85		Inlet Capacity
PitF1	101.14		0.002		1.1	0	None
PitA13	100.89		0.006		1.33	0	None
PitA12	100.7		0.005		1.3	0	None
PitK1	102.01	102.91	0.002	0.1	0.89	0	Inlet Capacity
PitA15	101.35		0.006		1.35	0	None
PitA14	101.16		0.001		1.84	0	None
PitL1	102.02	102.91	0.002	0.1	0.88	0	Inlet Capacity
PitA16	101.54		0.007		0.86	0	None
NRooF3	101.13		0.109				
PitN1	99.54	100.12	0.008	0.2	0.56	0	Inlet Capacity
PitE3	100.59	101.18	0.003	0.1	0.58	0	Inlet Capacity
PitE2	100.37		0.009		0.88	0	Inlet Capacity
PitE1	100.13		0		2.31		None

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
CatD2	0.011	0.011	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatD1	0.018	0.018	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatA4	0.024	0.024	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatBypass1	0.009	0.009	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatBypass2	0.001	0.001	0	5	0	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatG1	0.003	0.003	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatRoof5	0.088	0.088	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatB1	0.004	0	0.004	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatRoof4	0.093	0.093	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatB5	0.004	0	0.004	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatB4	0.012	0.012	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatB3	0.02	0.019	0.001	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatB2	0.002	0	0.002	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatBypass3	0.002	0.002	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatBypass4	0.002	0.002	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatB8	0.01	0	0.01	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatB7	0.001	0.001	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatB6	0.009	0.009	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatH1	0.021	0.021	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatA7	0.008	0.007	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatA5	0.033	0.033	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatBypass5	0.003	0	0.003	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatRoof1	0.111	0.111	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatRoof2	0.055	0.055	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatBypass7	0.001	0.001	0.001	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatC3	0.005	0	0.005	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatC2	0.038	0.037	0.001	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatC1	0.01	0.009	0.001	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatA9	0.012	0.011	0.001	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatA8	0.021	0.02	0.001	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatM1	0.028	0.027	0.001	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatJ1	0.002	0	0.002	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatA11	0.009	0.009	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatA10	0.004	0.004	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatF2	0.011	0.011	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatF1	0.002	0.002	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatA13	0.006	0.006	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatA12	0.005	0.005	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatK1	0.002	0	0.002	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatA15	0.006	0.006	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatA14	0.001	0.001	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatL1	0.002	0	0.002	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatA16	0.007	0.007	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatRoof3	0.109	0.109	0	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
CatN1	0.008	0	0.008	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatBypass6	0.006	0	0.006	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatE3	0.003	0	0.003	5	10	0	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
CatE2	0.009	0.007	0.002	5	10	0	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1

Outflow Volumes for Total Catchment (3.34 impervious + 0.79 pervious = 4.14 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 1 year, 5 minutes storm, average 87.8 mm/h, Zone 1	302.65	211.17 (69.8%)	211.17 (86.3%)	0.00 (0.0%)
AR&R 1 year, 10 minutes storm, average 67.3 mm/h, Zone 1	463.97	344.36 (74.2%)	341.55 (91.1%)	2.81 (3.2%)
AR&R 1 year, 15 minutes storm, average 56.2 mm/h, Zone 1	581.17	448.67 (77.2%)	436.27 (92.9%)	12.40 (11.1%)
AR&R 1 year, 20 minutes storm, average 48.9 mm/h, Zone 1	674.24	531.32 (78.8%)	511.49 (93.9%)	19.83 (15.3%)

AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1	753.25	600.24 (79.7%)	575.34 (94.5%)	24.90 (17.2%)
AR&R 1 year, 30 minutes storm, average 39.7 mm/h, Zone 1	821.08	654.90 (79.8%)	630.17 (95.0%)	24.73 (15.7%)
AR&R 1 year, 45 minutes storm, average 31.8 mm/h, Zone 1	986.54	798.54 (80.9%)	763.89 (95.8%)	34.65 (18.3%)
AR&R 1 year, 1 hour storm, average 27 mm/h, Zone 1	1116.84	912.81 (81.7%)	869.20 (96.3%)	43.61 (20.4%)
AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1	1290.6	1053.54 (81.6%)	1009.63 (96.8%)	43.91 (17.7%)
AR&R 1 year, 2 hours storm, average 17.3 mm/h, Zone 1	1431.18	1171.89 (81.9%)	1123.24 (97.1%)	48.65 (17.7%)
AR&R 1 year, 3 hours storm, average 13.2 mm/h, Zone 1	1638.14	1335.19 (81.5%)	1290.52 (97.5%)	44.67 (14.2%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
PipeD2-D4	0.01	1.06	101.429	101.187	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeD1-A4	0.027	1.73	101.132	101.108	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
P OSD	0.16	1.01	98.065	98.059	AR&R 1 year, 1 hour storm, average 27 mm/h, Zone 1
Pipe A4-A3	0.16	1.42	97.853	97.843	AR&R 1 year, 1 hour storm, average 27 mm/h, Zone 1
PipeA3-A2	0.16	1.44	97.799	97.793	AR&R 1 year, 1 hour storm, average 27 mm/h, Zone 1
PipeA2-A1	0.16	1.44	97.709	97.703	AR&R 1 year, 1 hour storm, average 27 mm/h, Zone 1
PipeA1-A0	0.16	1.44	97.639	97.633	AR&R 1 year, 1 hour storm, average 27 mm/h, Zone 1
PipeA0-NOut	0.16	1.79	97.552	97.452	AR&R 1 year, 1 hour storm, average 27 mm/h, Zone 1
PipeG1-A4	0.003	0.04	98.495	98.493	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeRoof5-B1	0.088	0.88	98.671	98.662	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeB1-A4	0.218	2.74	98.535	98.493	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeRoof4-B5	0.093	1.61	100.775	100.674	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeB5-B4	0.106	2.04	100.493	99.754	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeB4-B3	0.117	1.76	99.691	99.487	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeB3-B2	0.131	2.44	99.426	98.853	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeB2-B1	0.131	1.76	98.808	98.662	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeB8-B7	0.009	1.19	101.72	100.984	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
PipeB7-B6	0.011	1.06	100.971	100.746	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
PipeB6-B5	0.017	1.16	100.728	100.544	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
PipeH1-A7	0.017	3.5	101.236	100.947	AR&R 1 year, 20 minutes storm, average 48.9 mm/h, Zone 1
PipeA7-A6	0.275	2.32	99.302	99.242	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeA6-A5	0.382	4.81	98.995	98.852	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeA5-A4	0.408	2.33	98.771	98.493	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeRoof1-A6	0.111	1.11	99.259	99.242	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeRoof2-A4	0.055	0.5	98.495	98.493	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeC3-C2	0.005	0.76	101.455	101.415	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
PipeC2-C1	0.027	1.29	101.392	101.199	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeC1-A9	0.073	2.72	100.499	100.455	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeA9-A8	0.151	2.75	99.849	99.548	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeA8-A7	0.165	1.58	99.508	99.467	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeM1-C1	0.03	1.22	100.885	100.613	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeJ1-A11	0.001	0.64	100.862	100.838	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
PipeA11-A10	0.045	3.52	100.435	100.343	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeA10-A9	0.05	2.28	100.274	100.057	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeF2-F1	0.01	4.93	101.21	101.136	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeF1-A13	0.012	0.94	101.122	100.891	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeA13-A12	0.031	3.7	100.803	100.7	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeA12-A11	0.037	1.52	100.673	100.529	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeA11-A15	0.002	1.04	101.992	101.801	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
PipeA15-A14	0.015	1.68	101.315	101.164	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeA14-A13	0.015	1	101.128	100.891	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeL1-A15	0.002	0.74	101.997	101.8	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
PipeA16-A15	0.007	1.05	101.516	101.354	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeRoof3-A7	0.109	1.67	101.134	101.114	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
PipeN1-A6	0.007	3.87	99.489	99.326	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
PipeE3-E2	0.004	0.79	100.575	100.366	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
PipeE2-E1	0.011	1.81	100.332	100.131	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
PipeE1-A9	0.01	0.89	100.106	99.959	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1

CHANNEL DETAILS

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

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
OFD2	0.001	0.001	0.256	0.006	0	1.95	0.14	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
OFD1	0	0	0.256	0	0	0	0	
OF OSD	0	0	0.256	0	0	0	0	
OFA4	0	0	0.256	0	0	0	0	
Bypass1	0.009	0.009	0.256	0.014	0	4.64	0.27	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
Bypass2	0.005	0.005	0.256	0.011	0	3.74	0.23	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
BypassTotal	0.025	0.025	0.256	0.021	0.01	7.03	0.34	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
OFB1	0	0	0.256	0	0	0	0	
OFB5	0	0	0.256	0	0	0	0	
OFB4	0.001	0.001	0.256	0.007	0	2.25	0.15	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
OFB3	0.004	0.004	0.256	0.01	0	3.44	0.24	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
OFB2	0	0	0.256	0	0	0	0	
Bypass3	0.002	0.002	0.256	0.008	0	2.54	0.18	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
Bypass4	0.003	0.003	0.256	0.009	0	2.84	0.21	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
OFB8	0	0	0.256	0	0	0	0	
OFB7	0	0	0.256	0	0	0	0	
OFB6	0	0	0.256	0	0	0	0	
OFH1	0.004	0.004	0.256	0.01	0	3.44	0.23	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
OFA7	0	0	0.256	0	0	0	0	
OFA5	0	0	0.256	0	0	0	0	
Bypass5	0.003	0.003	0.256	0.009	0	2.84	0.21	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
Bypass7	0.002	0.002	0.256	0.008	0	2.54	0.17	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
OFC3	0	0	0.256	0	0	0	0	
OFC2	0.013	0.013	0.256	0.017	0	5.54	0.27	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
OFC1	0.005	0.005	0.256	0.011	0	3.74	0.22	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
OFA9	0.001	0.001	0.256	0.007	0	2.25	0.15	AR&R 1 year, 25 minutes storm, average 43.7 mm/h, Zone 1
OFA8	0	0	0.256	0	0	0	0	
OFM1	0	0	0.256	0	0	0	0	
OFJ1	0	0	0.256	0	0	0	0	
OFA11	0	0	0.256	0	0	0	0	
OFA10	0	0	0.256	0	0	0	0	
OFF1	0	0	0.256	0	0	0	0	
OFA13	0	0	0.256	0	0	0	0	
OFA12	0	0	0.256	0	0	0	0	
OFK1	0	0	0.256	0	0	0	0	
OFA15	0	0	0.256	0	0	0	0	
OFA14	0	0	0.256	0	0	0	0	
OFL1	0	0	0.256	0	0	0	0	
OFA16	0	0	0.256	0	0	0	0	
OFN1	0	0	0.256	0	0	0	0	
Bypass6	0.006	0.006	0.256	0.012	0	4.04	0.23	AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1
OFE3	0	0	0.256	0	0	0	0	
OFE2	0	0	0.256	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSDA4	98.49	529.7	0.16	0.16	0
OSDWeir	98.06	0.5	0.16	0.16	0

CONTINUITY CHECK for AR&R 1 year, 1.5 hours storm, average 20.8 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
PitD2	14.32	14.3	0	0.1
PitD1	37.32	37.25	0	0.2
OSDA4	1015.73	1012.4	3.34	0
OSDWeir	1012.4	1012.17	0.23	0
PitA3	1012.17	1012.11	0	0
PitA2	1012.11	1012.04	0	0
PitA1	1012.04	1011.96	0	0
PitA0	1011.96	1011.74	0	0
NOut	1011.74	1011.74	0	0
NBypass1	11.3	11.3	0	0
NByp2B3Out	1.96	1.96	0	0
NBypassSum	25.95	25.95	0	0
NBypassOut	25.95	25.95	0	0
PitG1	3.47	3.45	0	0.6
NRoof5	112.35	112.33	0	0
PitB1	296.51	293.46	0	1
NRoof4	118.63	118.64	0	0
PitB5	141.29	141.06	0	0.2
PitB4	156.7	156.62	0	0.1
PitB3	181.45	181.23	0	0.1
PitB2	181.33	181.41	0	0
NByp3B5Out	2.16	2.16	0	0
NByp4B6B7	2.93	2.93	0	0
PitB8	7.02	6.98	0	0.6
PitB7	8.73	8.77	0	-0.5
PitB6	19.92	19.9	0	0.1
PitH1	26.15	26.14	0	0.1
PitA7	397.75	397.12	0	0.2
PitA6	544.65	543.58	0	0.2
PitA5	586.1	580.28	0	1
NBypass5	1.88	1.88	0	0
NRoof1	142.16	142.09	0	0
NRoof2	70.61	70.44	0	0.2
NByp7E2Out	1.67	1.67	0	0
PitC3	3.5	3.46	0	1.1
PitC2	52.12	52.14	0	0
PitC1	100.31	100.12	0	0.2
PitA9	196.85	197.3	0	-0.2
PitA8	224.64	224.24	0	0.2
PitM1	35.87	35.84	0	0.1
PitJ1	1.1	1.09	0	0.6
PitA11	64.37	64.46	0	-0.1
PitA10	69.17	68.98	0	0.3
PitF2	13.84	13.8	0	0.3
PitF1	16.82	16.78	0	0.2
PitA13	45.26	45.34	0	-0.2
PitA12	51.53	51.38	0	0.3
PitK1	1.63	1.64	0	-1.1
PitA15	20.22	20.2	0	0.1
PitA14	21.31	21.3	0	0.1
PitL1	1.71	1.7	0	0.4
PitA16	8.7	8.65	0	0.5
NRoof3	138.65	138.81	0	-0.1
PitN1	5.47	5.44	0	0.5
NBypass6	4.06	4.06	0	0
PitE3	2.16	2.16	0	0.1
PitE2	13.15	13.06	0	0.7
PitE1	13.05	13.09	0	-0.3

Run Log for 368851 2016 run at 14:38:39 on 27/4/2016

No water upwelling from any pit. Freeboard was adequate at all pits.
Flows were safe in all overflow routes.

The following detention basins have little effect (less than 2%) in reducing peak discharge: OSDWeir You might consider upsizing these, or removing them from the model.

DRAINS Output - 10 Year ARI Storm Event

DRAINS results prepared from Version 2016.03

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
PitD2	101.5		0.019		0.5	0.003	Inlet Capacity
PitD1	101.24	101.77	0.033	2.2	0.46	0	Inlet Capacity
PitA3	98.19		0		1.51		None
PitA2	98.08		0		1.32		None
PitA1	97.97		0		1.23		None
PitA0	97.82		0		1.18		None
NOut	97.63		0				
PitG1	98.93		0.004		2.07		None
NRooF5	98.97		0.145				
PitB1	98.97	99.53	0.012	0.5	0.53	0	Inlet Capacity
NRooF4	100.85		0.153				
PitB5	100.64	101.15	0.012	0.7	0.48	0	Inlet Capacity
PitB4	99.82		0.021		0.86	0.004	Inlet Capacity
PitB3	99.57		0.038		0.93	0.012	Inlet Capacity
PitB2	99.02	99.51	0.005	0.3	0.48	0	Inlet Capacity
PitB8	101.83		0.031		0.47	0.009	Inlet Capacity
PitB7	101.04		0.01		0.82	0	Inlet Capacity
PitB6	100.81		0.014		0.79	0.002	Inlet Capacity
PitH1	101.33		0.034		0.67	0.01	Inlet Capacity
PitA7	100.05		0.014		1.75	0.002	Inlet Capacity
PitA6	99.62		0		2.38		None
PitA5	99.12	101.65	0.055	1.1	2.43	0	Inlet Capacity
NRooF1	99.67		0.184				
NRooF2	98.93		0.091				
PitC3	101.54	102.38	0.016	1	0.8	0	Inlet Capacity
PitC2	101.45		0.065		0.85	0.035	Inlet Capacity
PitC1	100.74		0.052		1.36	0.021	Inlet Capacity
PitA9	100.3		0.023		1.7	0.005	Inlet Capacity
PitA8	100.12	101.7	0.053	1.4	1.48	0	Inlet Capacity
PitM1	101.08	101.81	0.068	2.6	0.62	0	Inlet Capacity
PitJ1	100.9	101.78	0.005	0.3	0.87	0	Inlet Capacity
PitA11	100.63	101.81	0.016	0.6	1.14	0	Inlet Capacity
PitA10	100.46		0.006		1.49	0	None
PitF2	101.31	102.17	0.019	1	0.81		Inlet Capacity
PitF1	101.16		0.004		1.08	0	None
PitA13	100.98		0.009		1.24	0	Inlet Capacity
PitA12	100.78		0.009		1.22	0	Inlet Capacity
PitK1	102.04	102.92	0.007	0.4	0.86	0	Inlet Capacity
PitA15	101.42		0.011		1.28	0.001	Inlet Capacity
PitA14	101.23		0.001		1.77	0	None
PitL1	102.05	102.92	0.008	0.4	0.85	0	Inlet Capacity
PitA16	101.58		0.012		0.82	0.001	Inlet Capacity
NRooF3	101.24		0.179				
PitN1	99.66	100.16	0.024	0.7	0.44	0	Inlet Capacity
PitE3	100.64	101.2	0.01	0.2	0.53	0	Inlet Capacity
PitE2	100.43		0.019		0.82	0.004	Inlet Capacity
PitE1	100.37		0		2.07		None

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
CatD2	0.019	0.019	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatD1	0.03	0.03	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatA4	0.04	0.04	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatBypass1	0.015	0.015	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatBypass2	0.001	0.001	0	5	0	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatG1	0.004	0.004	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatRoof5	0.145	0.145	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatB1	0.012	0	0.012	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatRoof4	0.153	0.153	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatB5	0.012	0	0.012	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatB4	0.021	0.02	0.001	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatB3	0.034	0.031	0.003	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatB2	0.005	0	0.005	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatBypass3	0.003	0.003	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatBypass4	0.005	0.003	0.001	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatB8	0.031	0	0.031	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatB7	0.002	0.002	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatB6	0.014	0.014	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatH1	0.034	0.034	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatA7	0.014	0.012	0.002	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatA5	0.055	0.055	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatBypass5	0.008	0	0.008	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatRoof1	0.184	0.184	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatRoof2	0.091	0.091	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatBypass7	0.003	0.002	0.002	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatC3	0.016	0	0.016	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatC2	0.065	0.062	0.004	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatC1	0.017	0.015	0.002	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatA9	0.023	0.019	0.004	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatA8	0.036	0.032	0.004	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatM1	0.047	0.044	0.003	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatJ1	0.005	0	0.005	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatA11	0.015	0.015	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatA10	0.006	0.006	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatF2	0.018	0.018	0.001	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatF1	0.004	0.004	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatA13	0.009	0.009	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatA12	0.009	0.008	0.001	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatK1	0.007	0	0.007	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatA15	0.011	0.01	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatA14	0.001	0.001	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatL1	0.008	0	0.008	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatA16	0.011	0.011	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatRoof3	0.179	0.179	0	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
CatN1	0.024	0	0.024	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatBypass6	0.018	0	0.018	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatE3	0.01	0	0.01	5	10	0	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
CatE2	0.019	0.012	0.007	5	10	0	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1

Outflow Volumes for Total Catchment (3.34 impervious + 0.79 pervious = 4.14 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 10 year, 5 minutes storm, average 145.3 mm/h, Zone 1	500.85	392.22 (78.3%)	371.36 (91.7%)	20.86 (21.7%)
AR&R 10 year, 10 minutes storm, average 111.1 mm/h, Zone 1	765.93	641.81 (83.8%)	585.59 (94.6%)	56.22 (38.3%)
AR&R 10 year, 15 minutes storm, average 92.7 mm/h, Zone 1	958.62	822.43 (85.8%)	741.32 (95.7%)	81.10 (44.1%)
AR&R 10 year, 20 minutes storm, average 80.7 mm/h, Zone 1	1112.7	966.58 (86.9%)	865.86 (96.3%)	100.73 (47.2%)

AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1	1242.66	1084.27 (87.3%)	970.88 (96.7%)	113.38 (47.6%)
AR&R 10 year, 30 minutes storm, average 65.5 mm/h, Zone 1	1354.69	1184.85 (87.5%)	1061.43 (96.9%)	123.43 (47.5%)
AR&R 10 year, 45 minutes storm, average 52.4 mm/h, Zone 1	1625.62	1431.87 (88.1%)	1280.39 (97.5%)	151.47 (48.6%)
AR&R 10 year, 1 hour storm, average 44.4 mm/h, Zone 1	1836.58	1622.76 (88.4%)	1450.89 (97.7%)	171.87 (48.8%)
AR&R 10 year, 1.5 hours storm, average 34.4 mm/h, Zone 1	2134.41	1886.86 (88.4%)	1691.58 (98.1%)	195.28 (47.7%)
AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1	2357.77	2083.67 (88.4%)	1872.11 (98.2%)	211.56 (46.8%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
PipeD2-D1	0.015	1.18	101.441	101.239	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeD1-A4	0.045	1.76	101.167	101.143	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
P OSD	0.202	1.27	98.594	98.486	AR&R 10 year, 1.5 hours storm, average 34.4 mm/h, Zone 1
Pipe A4-A3	0.542	1.92	98.205	98.19	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeA3-A2	0.542	2.02	98.136	98.08	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeA2-A1	0.542	2.08	98.007	97.971	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeA1-A0	0.542	2.29	97.858	97.861	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeA0-NOut	0.542	2.5	97.729	97.629	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeG1-A4	0.004	0.06	98.926	98.926	AR&R 10 year, 15 minutes storm, average 92.7 mm/h, Zone 1
PipeRoof5-B1	0.145	1.31	98.973	98.973	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeB1-A4	0.386	1.36	98.94	98.926	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeRoof4-B5	0.153	1.78	100.853	100.754	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeB5-B4	0.2	2.41	100.563	99.825	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeB4-B3	0.216	2.11	99.761	99.572	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeB3-B2	0.239	2.88	99.484	99.017	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeB2-B1	0.245	1.45	98.991	98.973	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeB8-B7	0.022	1.54	101.748	101.043	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeB7-B6	0.032	1.41	101.017	100.814	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeB6-B5	0.042	1.36	100.786	100.638	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeH1-A7	0.025	3.9	101.244	100.963	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeA7-A6	0.489	1.73	99.752	99.624	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeA6-A5	0.671	2.02	99.403	99.123	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeA5-A4	0.738	2.13	99.068	98.926	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeRoof1-A6	0.183	1.66	99.661	99.624	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeRoof2-A4	0.091	0.83	98.928	98.926	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeC3-C2	0.014	0.99	101.488	101.454	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeC2-C1	0.045	1.46	101.424	101.233	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeC1-A9	0.135	2.55	100.571	100.529	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeA9-A8	0.28	1.1	100.209	100.125	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeA8-A7	0.325	1.15	100.099	100.047	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeM1-C1	0.063	1.5	100.943	100.744	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeJ1-A11	0.005	1.51	100.866	100.854	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeA11-A10	0.087	2.18	100.516	100.456	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeA10-A9	0.1	1.75	100.372	100.3	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeF2-F1	0.018	4.15	101.223	101.165	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeF1-A13	0.021	1.1	101.146	100.978	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeA13-A12	0.061	3.37	100.841	100.783	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeA12-A11	0.069	1.5	100.745	100.631	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeA11-A15	0.007	2.5	101.996	101.817	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeA15-A14	0.034	1.66	101.359	101.226	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeA14-A13	0.032	1.24	101.169	100.978	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeA1-A15	0.007	1.04	102.016	101.816	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeA16-A15	0.011	0.92	101.537	101.417	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeRoof3-A7	0.179	1.84	101.236	101.21	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeN1-A6	0.028	0.75	99.624	99.624	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeE3-E2	0.01	1	100.601	100.427	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
PipeE2-E1	0.026	1.27	100.388	100.367	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
PipeE1-A9	0.034	0.48	100.361	100.3	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1

CHANNEL DETAILS

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

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
OFD2	0.003	0.003	0.256	0.01	0	3.44	0.19	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFD1	0	0	0.256	0	0	0	0	
OF OSD	0.381	0.381	0.256	0.059	0.04	15.76	0.73	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
OFA4	0	0	0.256	0	0	0	0	
Bypass1	0.015	0.015	0.256	0.018	0.01	5.84	0.29	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
Bypass2	0.014	0.014	0.256	0.017	0	5.54	0.29	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
Bypass Total	0.067	0.067	0.256	0.03	0.01	10.02	0.44	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFB1	0	0	0.256	0	0	0	0	
OFB5	0	0	0.256	0	0	0	0	
OFB4	0.004	0.004	0.256	0.011	0	3.74	0.21	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFB3	0.012	0.012	0.256	0.016	0	5.24	0.3	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFB2	0	0	0.256	0	0	0	0	
Bypass3	0.003	0.003	0.256	0.009	0	3.14	0.2	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
Bypass4	0.006	0.006	0.256	0.013	0	4.34	0.23	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFB8	0.009	0.009	0.256	0.014	0	4.64	0.27	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
OFB7	0	0	0.256	0	0	0	0	
OFB6	0.002	0.002	0.256	0.008	0	2.54	0.19	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFH1	0.01	0.01	0.256	0.015	0	4.94	0.28	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFA7	0.002	0.002	0.256	0.008	0	2.54	0.17	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFA5	0	0	0.256	0	0	0	0	
Bypass5	0.008	0.008	0.256	0.014	0	4.64	0.26	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
Bypass7	0.007	0.007	0.256	0.013	0	4.34	0.23	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFC3	0	0	0.256	0	0	0	0	
OFC2	0.035	0.035	0.256	0.024	0.01	7.93	0.37	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFC1	0.021	0.021	0.256	0.019	0.01	6.44	0.34	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFA9	0.005	0.005	0.256	0.011	0	3.74	0.23	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFA8	0	0	0.256	0	0	0	0	
OFM1	0	0	0.256	0	0	0	0	
OFJ1	0	0	0.256	0	0	0	0	
OFA11	0	0	0.256	0	0	0	0	
OFA10	0	0	0.256	0	0	0	0	
OFF1	0	0	0.256	0	0	0	0	
OFA13	0	0	0.256	0	0	0	0	
OFA12	0	0	0.256	0	0	0	0	
OFK1	0	0	0.256	0	0	0	0	
OFA15	0.001	0.001	0.256	0.006	0	1.95	0.13	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFA14	0	0	0.256	0	0	0	0	
OFL1	0	0	0.256	0	0	0	0	
OFA16	0.001	0.001	0.256	0.006	0	1.95	0.18	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1
OFN1	0	0	0.256	0	0	0	0	
Bypass6	0.018	0.018	0.256	0.018	0.01	6.14	0.32	AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1
OFE3	0	0	0.256	0	0	0	0	
OFE2	0.004	0.004	0.256	0.01	0	3.44	0.2	AR&R 10 year, 25 minutes storm, average 72.1 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSDA4	98.93	854.5	0.582	0.202	0.381
OSDWeir	98.49	0.9	0.542	0	0

CONTINUITY CHECK for AR&R 10 year, 2 hours storm, average 28.5 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
ByPass	20.94	20.94	0	0
PitD2	26.54	26.5	0	0.2
PitD1	69.18	68.93	0	0.3
OSDA4	1995.81	1988.8	7.03	0
OSDWeir	1988.8	1988.47	0.33	0
PitA3	1988.47	1988.59	0	0
PitA2	1988.59	1988.44	0	0
PitA1	1988.44	1988.36	0	0
PitA0	1988.36	1988.26	0	0
NOut	1988.26	1988.26	0	0
NBypass1	20.94	20.94	0	0
NByp2B3Out	6.23	6.23	0	0
NBypassSum	71.95	71.95	0	0
NBypassOut	71.95	71.95	0	0
PitG1	6.44	6.4	0	0.7
NRooF5	208.32	208.64	0	-0.2
PitB1	590.06	588.05	0	0.3
NRooF4	219.97	219.92	0	0
PitB5	290.46	289.72	0	0.3
PitB4	319.75	319.53	0	0.1
PitB3	367.54	366.98	0	0.2
PitB2	368.18	368.06	0	0
NByp3B5Out	4.23	4.23	0	0
NByp4B6B7	6.73	6.73	0	0
PitB8	33.81	33.75	0	0.2
PitB7	36.99	37.07	0	-0.2
PitB6	57.68	57.56	0	0.2
PitH1	48.5	48.26	0	0.5
PitA7	785.6	784.47	0	0.1
PitA6	1074.25	1070.98	0	0.3
PitA5	1149.83	1144.41	0	0.5
NBypass5	9.04	9.04	0	0
NRooF1	263.59	263.79	0	-0.1
NRooF2	130.93	130.8	0	0.1
NByp7E2Out	5.2	5.2	0	0
PitC3	16.88	16.78	0	0.6
PitC2	109.57	109.54	0	0
PitC1	206.51	206.03	0	0.2
PitA9	409.59	409.14	0	0.1
PitA8	464.85	464.45	0	0.1
PitM1	72.86	72.61	0	0.3
PitJ1	5.31	5.28	0	0.5
PitA11	134.18	134.08	0	0.1
PitA10	142.82	142.97	0	-0.1
PitF2	26.3	26.16	0	0.5
PitF1	31.76	31.67	0	0.3
PitA13	94.58	94.39	0	0.2
PitA12	106.78	106.83	0	-0.1
PitK1	7.84	7.89	0	-0.7
PitA15	47.59	47.49	0	0.2
PitA14	49.51	49.58	0	-0.1
PitL1	8.24	8.2	0	0.5
PitA16	16.18	16.07	0	0.7
NRooF3	257.1	257.39	0	-0.1
PitN1	26.35	26.28	0	0.2
NBypass6	19.57	19.57	0	0
PitE3	10.43	10.49	0	-0.6
PitE2	35.72	35.36	0	1
PitE1	34.32	34.44	0	-0.4

Run Log for 368851 2016 run at 14:41:05 on 27/4/2016

No water upwelling from any pit. Freeboard was adequate at all pits.

The maximum flow exceeded the safe value in the following overflow routes: OF OSD

The following detention basins have little effect (less than 2%) in reducing peak discharge: OSDWeir You might consider upsizing these, or removing them from the model.
The following detention basins have little effect (less than 2%) in reducing peak discharge: OSDWeir You might consider upsizing these, or removing them from the model.

DRAINS Output - 100 Year ARI Storm Even

DRAINS results prepared from Version 2016.03

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
PitD2	101.52		0.027		0.48	0.006	Inlet Capacity
PitD1	101.28	101.79	0.05	3.4	0.42	0	Inlet Capacity
PitA3	99.13		0		0.57		None
PitA2	98.77		0		0.63		None
PitA1	98.41		0		0.79		None
PitA0	98.05		0		0.95		None
NOut	97.81		0.287				
PitG1	99.12		0.007		1.88		None
NRooF5	99.48		0.214				
PitB1	99.44	99.55	0.02	0.8	0.06	0	Inlet Capacity
NRooF4	100.99		0.226				
PitB5	100.72	101.17	0.02	1.3	0.4	0	Inlet Capacity
PitB4	99.92		0.03		0.76	0.008	Inlet Capacity
PitB3	99.77		0.056		0.73	0.024	Inlet Capacity
PitB2	99.6	99.58	0.009	2.6	-0.1	0	Outlet System
PitB8	101.85		0.051		0.45	0.02	Inlet Capacity
PitB7	101.08		0.023		0.78	0.005	Inlet Capacity
PitB6	100.86		0.021		0.74	0.004	Inlet Capacity
PitH1	101.38		0.05		0.62	0.02	Inlet Capacity
PitA7	101.07		0.02		0.73	0.004	Inlet Capacity
PitA6	100.44		0		1.56		None
PitA5	99.67	101.68	0.081	1.5	1.88	0	Inlet Capacity
NRooF1	100.54		0.271				
NRooF2	99.12		0.134				
PitC3	101.65	102.4	0.025	1.7	0.69	0	Inlet Capacity
PitC2	101.62		0.094		0.68	0.062	Inlet Capacity
PitC1	101.54		0.086		0.56	0.054	Inlet Capacity
PitA9	101.34		0.032		0.66	0.009	Inlet Capacity
PitA8	101.18	101.73	0.083	2.1	0.42	0	Inlet Capacity
PitM1	101.75	101.85	0.122	4.3	-0.05	0.06	Outlet System
PitJ1	101.82	101.87	0.067	4.3	-0.05	0.044	Outlet System
PitA11	101.81	101.89	0.064	2.9	-0.04	0	Outlet System
PitA10	101.58		0.009		0.37	0	Inlet Capacity
PitF2	102.18	102.22	0.033	3.1	-0.06		Outlet System
PitF1	102.17		0.006		0.07	0	None
PitA13	102.19		0.014		0.03	0.002	Inlet Capacity
PitA12	101.97		0.014		0.03	0.002	Inlet Capacity
PitK1	102.44	102.93	0.012	0.7	0.46	0	Inlet Capacity
PitA15	102.39		0.016		0.31	0.002	Inlet Capacity
PitA14	102.32		0.002		0.68	0	None
PitL1	102.44	102.93	0.012	0.8	0.46	0	Inlet Capacity
PitA16	102.39		0.019		0.01	0.008	Inlet Capacity
NRooF3	101.35		0.264				
PitN1	100.3	100.3	0.04	4.3	-0.2	0.079	Outlet System
PitE3	101.26	101.27	0.016	1.7	-0.09	0.01	Outlet System
PitE2	101.25		0.028		0	0.058	Outlet System
PitE1	101.33		0		1.11		None

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
CatD2	0.027	0.027	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatD1	0.044	0.044	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatA4	0.059	0.059	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatBypass1	0.021	0.021	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatBypass2	0.002	0.002	0	5	0	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatG1	0.007	0.007	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatRoof5	0.214	0.214	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatB1	0.02	0	0.02	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatRoof4	0.226	0.226	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatB5	0.02	0	0.02	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatB4	0.03	0.029	0.001	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatB3	0.048	0.046	0.002	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatB2	0.009	0	0.009	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatBypass3	0.004	0.004	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatBypass4	0.007	0.005	0.002	5	10	0	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
CatB8	0.051	0	0.051	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatB7	0.003	0.003	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatB6	0.021	0.021	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatH1	0.05	0.05	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatA7	0.02	0.016	0.003	5	10	0	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
CatA5	0.081	0.081	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatBypass5	0.014	0	0.014	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatRoof1	0.271	0.271	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatRoof2	0.134	0.134	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatBypass7	0.005	0.002	0.003	5	10	0	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
CatC3	0.025	0	0.025	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatC2	0.094	0.091	0.003	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatC1	0.024	0.021	0.004	5	10	0	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
CatA9	0.032	0.026	0.007	5	10	0	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
CatA8	0.051	0.048	0.003	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatM1	0.068	0.065	0.003	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatJ1	0.008	0	0.008	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatA11	0.023	0.023	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatA10	0.009	0.009	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatF2	0.027	0.026	0.001	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatF1	0.006	0.006	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatA13	0.014	0.014	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatA12	0.012	0.01	0.002	5	10	0	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
CatK1	0.012	0	0.012	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatA15	0.016	0.015	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatA14	0.002	0.002	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatL1	0.012	0	0.012	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatA16	0.017	0.017	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatRoof3	0.264	0.264	0	5	10	0	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
CatN1	0.04	0	0.04	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatBypass6	0.029	0	0.029	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatE3	0.016	0	0.016	5	10	0	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
CatE2	0.028	0.016	0.011	5	10	0	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1

Outflow Volumes for Total Catchment (3.34 impervious + 0.79 pervious = 4.14 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1	754.56	644.80 (85.5%)	576.40 (94.5%)	68.40 (47.3%)
AR&R 100 year, 10 minutes storm, average 167.3 mm/h, Zone 1	1153.38	1027.74 (89.1%)	898.73 (96.4%)	129.01 (58.3%)
AR&R 100 year, 15 minutes storm, average 139.5 mm/h, Zone 1	1442.58	1303.80 (90.4%)	1132.46 (97.1%)	171.34 (61.9%)
AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1	1673.88	1523.85 (91.0%)	1319.40 (97.5%)	204.45 (63.7%)
AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1	1866.57	1703.76 (91.3%)	1475.13 (97.8%)	228.63 (63.9%)
AR&R 100 year, 30 minutes storm, average 98.4 mm/h, Zone 1	2035.13	1861.87 (91.5%)	1611.36 (98.0%)	250.52 (64.2%)
AR&R 100 year, 45 minutes storm, average 78.7 mm/h, Zone 1	2441.54	2242.87 (91.9%)	1939.82 (98.3%)	303.05 (64.7%)
AR&R 100 year, 1 hour storm, average 66.7 mm/h, Zone 1	2759.01	2540.20 (92.1%)	2196.40 (98.5%)	343.81 (65.0%)
AR&R 100 year, 1.5 hours storm, average 51.7 mm/h, Zone 1	3207.81	2956.50 (92.2%)	2559.11 (98.7%)	397.39 (64.6%)

AR&R 100 year, 2 hours storm, average 42.9 mm/h, Zone 1 3549.07 3271.39 (92.2%) 2834.94 (98.8%) 436.46 (64.1%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
PipeD2-D1	0.021	1.3	101.453	101.285	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
PipeP1-A4	0.062	1.92	101.19	101.174	AR&R 100 year, 15 minutes storm, average 139.5 mm/h, Zone 1
P OSD	0.203	1.27	100.09	100.104	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
Pipe A4-A3	0.985	3.48	99.177	99.125	AR&R 100 year, 1.5 hours storm, average 51.7 mm/h, Zone 1
PipeA3-A2	0.985	3.48	98.816	98.766	AR&R 100 year, 1.5 hours storm, average 51.7 mm/h, Zone 1
PipeA2-A1	0.985	3.48	98.457	98.407	AR&R 100 year, 1.5 hours storm, average 51.7 mm/h, Zone 1
PipeA1-A0	0.985	3.48	98.097	98.047	AR&R 100 year, 1.5 hours storm, average 51.7 mm/h, Zone 1
PipeA0-NOut	0.985	3.15	97.859	97.815	AR&R 100 year, 1.5 hours storm, average 51.7 mm/h, Zone 1
PipeG1-A4	0.007	0.09	99.117	99.116	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
PipeRoof5-B1	0.214	1.94	99.477	99.439	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
PipeB1-A4	0.545	1.93	99.232	99.116	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeRoof4-B5	0.227	2.16	100.986	100.818	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
PipeB5-B4	0.281	2.81	100.601	99.916	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeB4-B3	0.31	2.05	99.856	99.769	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeB3-B2	0.33	1.77	99.692	99.597	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeB2-B1	0.337	1.56	99.55	99.439	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeB8-B7	0.03	1.68	101.76	101.08	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
PipeB7-B6	0.048	1.54	101.045	100.858	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
PipeB6-B5	0.062	1.45	100.823	100.715	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeH1-A7	0.036	1.82	101.297	101.073	AR&R 100 year, 15 minutes storm, average 139.5 mm/h, Zone 1
PipeA7-A6	0.637	2.25	100.627	100.439	AR&R 100 year, 15 minutes storm, average 139.5 mm/h, Zone 1
PipeA6-A5	0.869	2.43	99.963	99.672	AR&R 100 year, 15 minutes storm, average 139.5 mm/h, Zone 1
PipeA5-A4	0.945	2.64	99.532	99.116	AR&R 100 year, 15 minutes storm, average 139.5 mm/h, Zone 1
PipeRoof1-A6	0.278	2.52	100.535	100.439	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
PipeRoof2-A4	0.135	1.22	99.122	99.116	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
PipeC3-C2	0.024	0.44	101.628	101.623	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeC2-C1	0.059	0.83	101.609	101.544	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
PipeC1-A9	0.166	1.51	101.391	101.341	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
PipeA9-A8	0.356	1.26	101.258	101.175	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeA8-A7	0.399	1.41	101.137	101.073	AR&R 100 year, 15 minutes storm, average 139.5 mm/h, Zone 1
PipeM1-C1	0.09	1.28	101.641	101.544	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
PipeJ1-A11	0.04	0.57	101.81	101.81	AR&R 100 year, 15 minutes storm, average 139.5 mm/h, Zone 1
PipeA11-A10	0.146	1.32	101.665	101.584	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeA10-A9	0.151	1.36	101.483	101.341	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeF2-F1	0.037	0.52	102.175	102.173	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeF1-A13	0.04	0.56	102.172	102.185	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
PipeA13-A12	0.093	1.32	102.074	101.969	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeA12-A11	0.099	1.4	101.932	101.81	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeK1-A15	0.015	0.22	102.435	102.387	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeA15-A14	0.059	0.84	102.345	102.324	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeA14-A13	0.061	0.87	102.282	102.185	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeL1-A15	0.017	0.25	102.43	102.387	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeA16-A15	0.042	0.59	102.387	102.387	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
PipeRoof3-A7	0.275	2.54	101.349	101.255	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
PipeN1-A6	0.075	1.07	100.3	100.439	AR&R 100 year, 1.5 hours storm, average 51.7 mm/h, Zone 1
PipeE3-E2	0.037	0.52	101.257	101.25	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
PipeE2-E1	0.052	0.73	101.25	101.335	AR&R 100 year, 15 minutes storm, average 139.5 mm/h, Zone 1
PipeE1-A9	0.054	0.77	101.333	101.341	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1

CHANNEL DETAILS

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

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxDV	Max Width	Max V	Due to Storm
OFD2	0.006	0.006	7.665	0.013	0	4.34	0.23	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
OFD1	0	0	7.665	0	0	0	0	
OF OSD	1.515	1.515	7.665	0.104	0.11	24.74	1.06	AR&R 100 year, 1.5 hours storm, average 51.7 mm/h, Zone 1
OFA4	0.287	0.287	7.665	0.053	0.04	14.51	0.67	AR&R 100 year, 1.5 hours storm, average 51.7 mm/h, Zone 1
Bypass1	0.021	0.021	7.665	0.02	0.01	6.74	0.32	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
Bypass2	0.026	0.026	7.665	0.021	0.01	7.03	0.35	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
BypassTotal	0.214	0.214	7.665	0.046	0.03	13.25	0.63	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
OFB1	0	0	7.665	0	0	0	0	
OFB5	0	0	7.665	0	0	0	0	
OFB4	0.008	0.008	7.665	0.014	0	4.64	0.25	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
OFB3	0.024	0.024	7.665	0.021	0.01	7.03	0.33	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
OFB2	0	0	7.665	0	0	0	0	
Bypass3	0.004	0.004	7.665	0.01	0	3.44	0.24	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
Bypass4	0.015	0.015	7.665	0.018	0.01	5.84	0.29	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
OFB8	0.02	0.02	7.665	0.019	0.01	6.44	0.33	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
OFB7	0.005	0.005	7.665	0.011	0	3.74	0.23	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
OFB6	0.004	0.004	7.665	0.011	0	3.74	0.21	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
OFH1	0.02	0.02	7.665	0.019	0.01	6.44	0.32	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
OFA7	0.004	0.004	7.665	0.01	0	3.44	0.22	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
OFA5	0	0	7.665	0	0	0	0	
Bypass5	0.014	0.014	7.665	0.017	0	5.54	0.29	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
Bypass7	0.062	0.062	7.665	0.029	0.01	9.73	0.44	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
OFC3	0	0	7.665	0	0	0	0	
OFC2	0.062	0.062	7.665	0.029	0.01	9.73	0.44	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
OFC1	0.054	0.054	7.665	0.028	0.01	9.43	0.41	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
OFA9	0.009	0.009	7.665	0.015	0	4.94	0.25	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
OFA8	0	0	7.665	0	0	0	0	
OFM1	0.06	0.06	7.665	0.029	0.01	9.73	0.42	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
OFJ1	0.044	0.044	7.665	0.026	0.01	8.53	0.4	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
OFA11	0	0	7.665	0	0	0	0	
OFA10	0	0	7.665	0	0	0	0	
OFF1	0	0	7.665	0	0	0	0	
OFA13	0.002	0.002	7.665	0.008	0	2.54	0.16	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
OFA12	0.002	0.002	7.665	0.008	0	2.54	0.16	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
OFK1	0	0	7.665	0	0	0	0	
OFA15	0.002	0.002	7.665	0.009	0	2.84	0.19	AR&R 100 year, 5 minutes storm, average 218.9 mm/h, Zone 1
OFA14	0	0	7.665	0	0	0	0	
OFF1	0	0	7.665	0	0	0	0	
OFA16	0.008	0.008	7.665	0.014	0	4.64	0.25	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
OFN1	0.079	0.079	7.665	0.032	0.01	10.38	0.47	AR&R 100 year, 1.5 hours storm, average 51.7 mm/h, Zone 1
Bypass6	0.029	0.029	7.665	0.022	0.01	7.33	0.36	AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1
OFE3	0.01	0.01	7.665	0.015	0	4.94	0.26	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1
OFE2	0.058	0.058	7.665	0.028	0.01	9.43	0.43	AR&R 100 year, 25 minutes storm, average 108.3 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSDA4	99.12	997.1	1.717	0.203	1.515
OSDWeir	100.1	2.5	1.272	0.985	0.287

CONTINUITY CHECK for AR&R 100 year, 20 minutes storm, average 121.4 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
PHD2	18.71	18.64	0	0.4
PHD1	48.71	48.46	0	0.5
OSDA4	1409.98	1265.23	144.75	0
OSDWeir	1265.23	1264.28	0.95	0
PHA3	1264.28	1264.36	0	0
PHA2	1264.36	1264.15	0	0
PHA1	1264.15	1263.87	0	0
PHAO	1263.87	1263.53	0	0

NOut	1263.53	1263.53	0	0
NBypass1	14.76	14.76	0	0
NByp2B3Out	13.08	13.08	0	0
NBypassSum	89.11	89.11	0	0
NBypassOut	89.11	89.11	0	0
PitG1	4.54	4.55	0	-0.3
NRoof5	146.82	146.87	0	0
PitB1	422.06	417.25	0	1.1
NRoof4	155.03	154.9	0	0.1
PitB5	214.31	213.11	0	0.6
PitB4	234.71	234.21	0	0.2
PitB3	268.88	268.38	0	0.2
PitB2	262.08	262.28	0	-0.1
NByp3B5Out	3.08	3.08	0	0
NByp4B6B7	8.09	8.09	0	0
PitB8	32.68	32.6	0	0.2
PitB7	34.89	34.99	0	-0.3
PitB6	48.07	48.28	0	-0.4
PitH1	34.18	34.19	0	0
PitA7	564.84	562.89	0	0.3
PitA6	767.33	762.64	0	0.6
PitA5	818.21	807.41	0	1.3
NBypass5	8.74	8.74	0	0
NRoof1	185.77	185.71	0	0
NRoof2	92.27	91.98	0	0.3
NByp7E2Out	14.92	14.92	0	0
PitC3	16.31	16.49	0	-1.1
PitC2	82.98	82.9	0	0.1
PitC1	158.29	157.8	0	0.3
PitA9	296.59	296.14	0	0.2
PitA8	344.72	344.4	0	0.1
PitM1	70.81	70.51	0	0.4
PitJ1	18.05	18.4	0	-2
PitA11	114.57	114.26	0	0.3
PitA10	120.42	120.85	0	-0.4
PitF2	19.78	19.71	0	0.4
PitF1	23.66	23.59	0	0.3
PitA13	71.42	71.62	0	-0.3
PitA12	80.74	80.62	0	0.1
PitK1	7.58	7.6	0	-0.3
PitA15	37.81	37.73	0	0.2
PitA14	38.45	38.44	0	0
PitL1	7.96	8.01	0	-0.6
PitA16	12.11	12.21	0	-0.9
NRoof3	181.19	181.4	0	-0.1
PitN1	25.46	25.88	0	-1.6
NBypass6	18.91	18.91	0	0
PitE3	10.08	10.37	0	-2.9
PitE2	28.22	28.04	0	0.6
PitE1	16.51	16.72	0	-1.3

Run Log for 368851 2016 run at 14:43:38 on 27/4/2016

Upwelling occurred at PitE3 PitN1 PitE2 PitB2

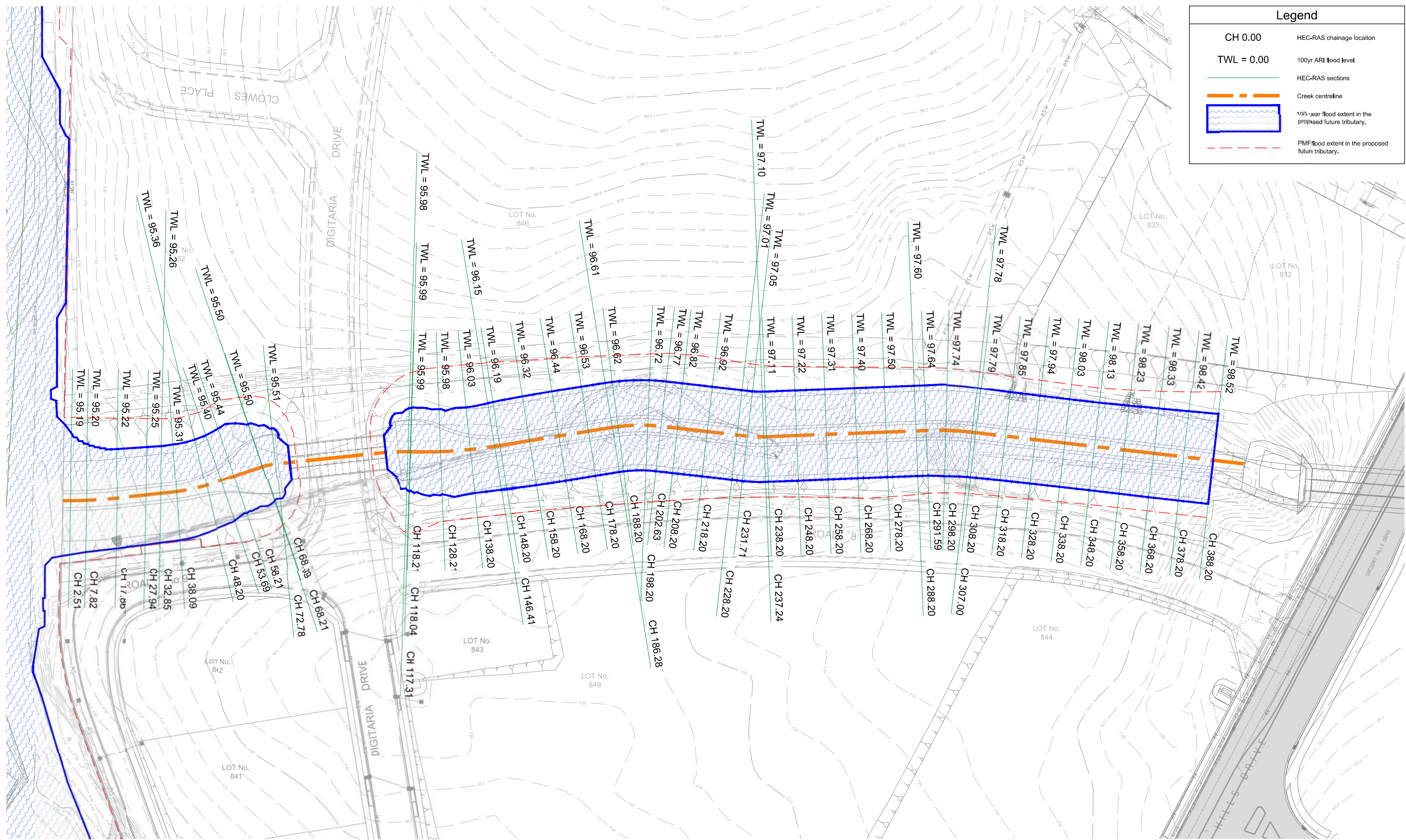
Freeboard was less than 0.15m at PitA16 PitF2 PitF1 PitA13 PitA12 PitA11 PitJ1 PitM1 PitB1
Flows were safe in all overflow routes.

The following detention basins have little effect (less than 2%) in reducing peak discharge: OSDWeir You might consider upsizing these, or removing them from the model.

The following overflow routes carried water uphill (adding energy): OF OSD OFM1 OFJ1

These results may be invalid. You should check for water flowing round in circles at these locations. You may need to reformulate the model.

Appendix B. Flooding Plan



Legend

- CH 0.00 HEC-RAS chainage location
- TWL = 0.00 100yr ARI flood level
- HEC-RAS sections
- Creek centerline
- 100-year flood extent in the proposed future tributary.
- PMF flood extent in the proposed future tributary.

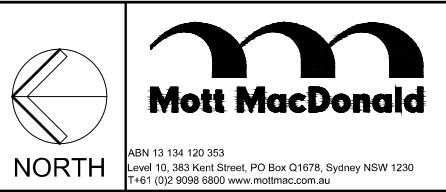
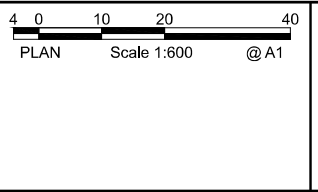
Issued for information

P1	Issued for information	28.08.15	MMc	GC	SR	CJA
Rev	Amendment / Reason For Issue	Date	Drawing Completed by	Designed & Checked by	Verified by X=Not verified	Issue Authorised (*)

Copyright
This drawing remains the property of Mott MacDonald Pty. Ltd. It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagement for that commission. Mott MacDonald denies any liability or responsibility for loss or damage caused by the inappropriate use of this drawing.

* Drawing Status Warning: Unless there is an authorised Mott MacDonald signature at *, this drawing is not authorised for issue.

This Drawing may have been prepared using **COLOUR**, and may be incomplete if copied to **BLACK & WHITE**



Project
Gregory Hills Corporate Park South Creek Tributary Works

Client
Gregory Hills Development Company Pty Ltd
Architect/Project Manager
Gregory Hills Development Company Pty Ltd

Drawing Title HEC-RAS Sections	
Drawing No. MMD-343049-C-SK-075	Sheet or P1
Date: 28-08-15	Time: 7:33am