1 Triton Square & St Anne's

Surface Water Drainage Proforma

December 2016

Issue 02

1 TRITON SQUARE & ST ANNE'S PLANNING DOCUMENTS

CONTENTS

1 INTRODUCTION

This statement serves to be read in conjunction with the Camden Surface Water Drainage Pro-forma. It provides reasoning and evidence for the application.

THE EXISTING SITE

The commercial office building (1 Triton Square) was originally designed by Arup Associates and completed in 1998. Both 1 Triton Square and St Anne's have a combined impermeable roof and terrace area of 0.58 ha and currently have no SuDs strategy in place. Foul and surface water are currently discharged with unrestricted flow into a combined sewer.

THE PROPOSED DEVELOPMENT

The development consists of an extension of the existing 1 Triton Square office building by three storeys for office use (B1), introduction of flexible retail (A1, A3, A4) and affordable workspace (B1), reprovision of gym space (D2); demolition of St Anne's and its replacement with a residential building (C3) of part 6, part 9 storeys; remodelling of the electricity substation; hard and soft landscaping; reconfigured vehicle and pedestrian accesses and works to the public highway; and all necessary ancillary and enabling works, plant and equipment.

No changes are to be made to the surrounding impermeable areas or existing road drainage strategies except for increased permeable area to Longford Place.

ST ANNE'S

The proposed building will occupy the site of the existing St Anne's which will be demolished and a new drainage system introduced. This offers improvements including a mixture of permeable surfaces and brown roofs. The proposed development includes a garden area which will be new and is built above a gravel/sand substrate. It is intended that the substrate acts as a soakaway to the garden, thereby reducing the total water volume discharged from the site.

Brown roofs will be provided at the 6th floor and roof of the proposed development. These roofs are also expected to have a buildup greater than 50mm and will act as an attenuation method for rainwater as it is discharged off the building rooftops. Please also see section 5 for the roof layout.

1 TRITON SQUARE

1 Triton Square is an office building and is proposed to have an extensive refurbishment and extension.

The drainage hierarchy has been considered in the overall design. Rainwater harvesting as well as greywater treatment and re-use aim to lower peak water demands and outflows.

Longford Place is proposed to have increased permeable area with more 'green' spaces allowing for greater infiltration and less run-off to sewer.

The surrounding exteriors of the building will be drained by existing drainage.

Brown roofs will be provided to the top of all cores. These roofs are expected to have a buildup greater than 50mm and will act as an attenuation method for rainwater as it is discharged off the building rooftops. Please see section 5 for the roof layout.

REPORT ADDENDUM

Following initial feedback from LBC, this report seeks to clarify:

- An attenuation tank in the basement with a fixed discharge rate (not variable discharge as stated in comments) will accommodate both St Anne's and 1 Triton Square attenuation needs. Please see Pro-forma and SuDs Plan View for more details.
- This tank, located in 1 Triton Square, has reduced-peak discharge by 70% and has been modelled in Microdrainage. Please see Table 2 and Microdrainage Calculations for more details. The maintenance requirements are listed in the Pro-forma.

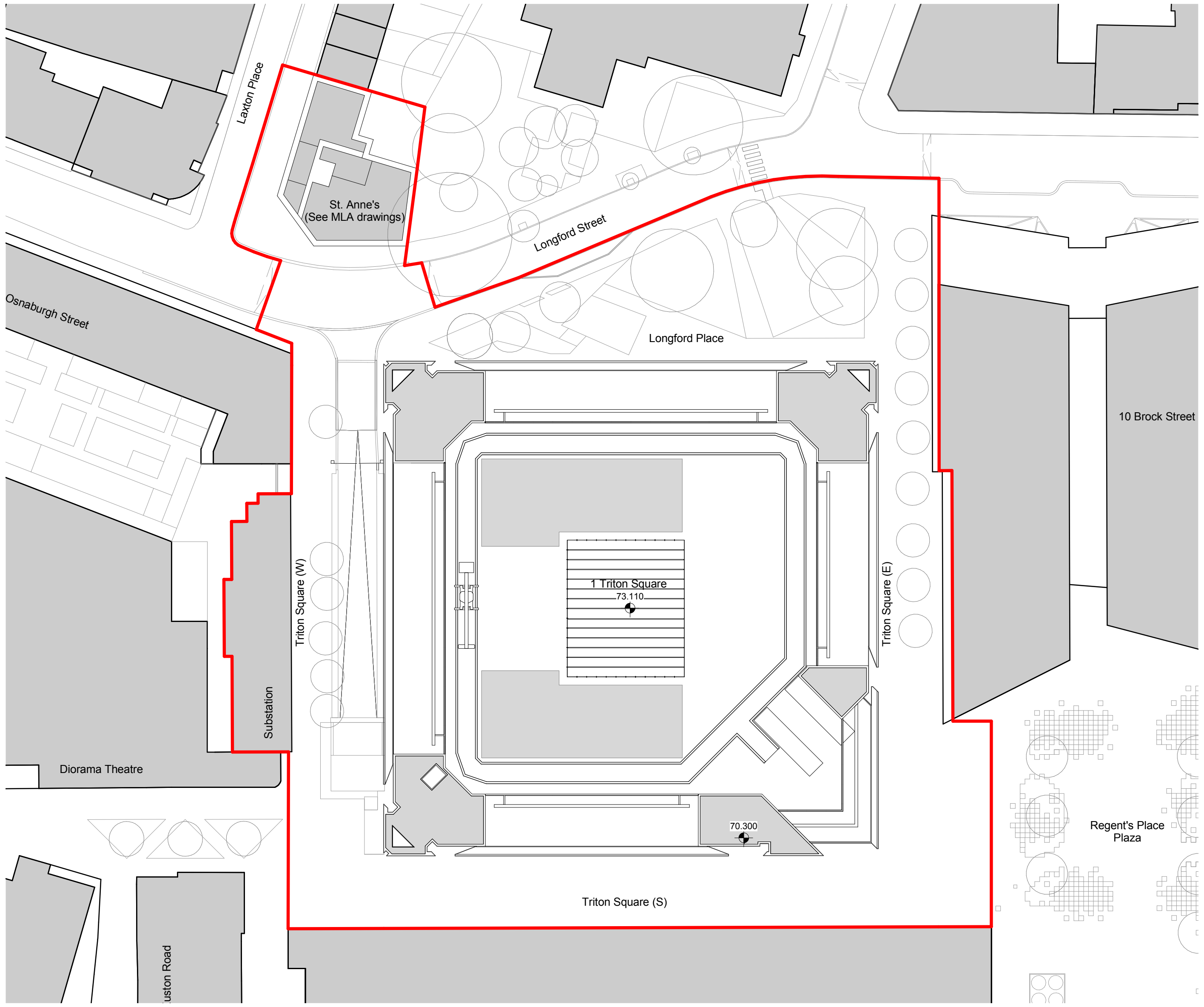


Figure 1 Site Boundary

2 DRAINAGE HIERARCHY

	Drainage Hierarchy	Existing Site	Proposed Site
1	Store rainwater for later use	No provision has been made for this method	1 Triton Square Rainwater harvesting for re-use (WC flushing and irrigation) is proposed. St Anne's church A portion of the rainwater onto the development will be stored for irrigation
2	Use infiltration techniques, such as porous surfaces in nonclay areas	No provision has been made for this method	1 Triton Square There are no permeable areas (roof and terraces consist of whole building site).There will be planters on all terraces, which will attenuate some surface water. There is also increased green landscaping on Longford Place. St Anne's church The garden area of the development will use infiltration
3	Attenuate rainwater in ponds or open water features for gradual release	No provision has been made for this method	This is not suitable for the proposed scheme
4	Attenuate rainwater by storing in tanks or sealed water features for gradual release	No provision has been made for this method	1 Triton Square Proposed basement storage with a pumped outflow to sewer
5	Discharge rainwater direct to a watercourse	There are no watercourses available to the development	There are no watercourses available to the development
6	Discharge rainwater to a surface water sewer/drain	Only combined sewers are available	Only combined sewers are available
7	Discharge rainwater to the combined sewer	This is how the existing site is drained	1 Triton Square Surface water not re-used on site will be discharged to combined sewer St Anne's church Surface water flows from hard areas and roofs will discharge directly to combined sewer

Table 1 Drainage Hierarchy

RAINFALL DRAINAGE AND EXPECTED FLOW-RATES

Rainfall from 1 Triton Square will be collected from the roof and terraces and stored in an attenuation tank in the basement. This attenuation tank will be sized to account for the combined site to provide an overall reduction in flows to sewer, allowing St Anne's surface water to flow unrestricted to the combined sewer.

The existing drainage at 1 Triton Square (Two 300 mm drains connecting to the combined sewer) can as a maximum allow for 250 L/s out flow. The proposed pumped drainage from the proposed site attenuation tank is 35 L/s.

The expected rainwater flow rates for the existing and proposed combined sites are shown below. These flowrates are based on a 2 minute storm duration.

The information in table below shows that there is at least a 70% reduction in the rainfall flow discharging into the local sewer system due to the proposed scheme. Please see the Appendix for design calculations.

Storm Type	St Anne's Existing Runoff Rate (l/s)	1 Triton Square Existing Runoff Rate (l/s)	Combined Development Existing Runoff Rate (l/s)	Proposed Runoff Rate (l/s)	% Reduction
1 in 1 Year Storm Rainfall	9	106	115	35	70
1 in 30 Year Storm Rainfall	22	250*	272	35	87
1:100 Year Storm Rainfall	30	250*	280	35	88
1:100 + CC Year Storm Rainfall	39	250*	289	35	88

*Note: * indicates maximum possible discharge from site based on maximum capacity of existing outfalls*

Table 2 Calculated rainwater flowrates from the proposed combined site

CONCLUSION

The proposed site has incorporated the Drainage Hierarchy for the design, but some criteria have not been suitable for the development. The use of ponds and open water features has not been possible to use due to the limited space. The use of water courses and surface water sewers are also unavailable to the project due to the absence of both these features. The proposed development holds significant advantages over the existing site, with a combination of harvesting surface water for re-use and storm water attenuation, the site will discharge lower flows of rainwater into the nearby sewers.

For the combined 1 Triton Square and St Anne's site an attenuation tank of approximately 280 m3 is required.

The attenuation stated is subject to design development and serves as an estimation that is accurate at the time of this study. Please see the Pro-forma for attenuation volumes.

3 PROFORMA

Surface Water Drainage Pro-forma for new developments

This pro-forma accompanies our advice note on surface water drainage. Developers should complete this form and submit it to the Local Planning Authority, referencing from where in their submission documents this information is taken. The pro-forma is supported by the Defra/EA guidance on Rainfall Runoff Management and uses the storage calculator on www.UKsuds.com. This pro-forma is based on current industry best practice and focuses on ensuring surface water drainage proposals meet national and local policy requirements. The pro-forma should be considered alongside other supporting SuDS Guidance.

1. Site Details

Site	1 TRITON SQUARE & ST ANNE'S CHURCH
Address & post code or LPA reference	1, 4, 7 TRITON SQUARE, NW1 3HF LONDON
Grid reference	TQ 2903882366
Is the existing site developed or Greenfield?	DEVELOPED, ADDITIONAL LEVELS TO AN EXISTING BUILDING
Is the development in a LFRZ or in an area known to be at risk of surface or ground water flooding? If yes, please demonstrate how this is managed, in line with DP23?	NO
Total Site Area served by drainage system (excluding open space) (Ha)*	0.58

* The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers
Impermeable area (ha)	0.58	0.58	0	If the proposed amount of impermeable surface is greater, then runoff rates and volumes will increase. Section 6 must be filled in. If proposed impermeability is equal or less than existing, then section 6 can be skipped and section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)	SEWER	SEWER	N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

*1 Triton Square has 2 no. of 300 mm combined sewer outfalls

3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers
Existing and proposed MicroDrainage calculations	X		Microdrainage calculations used for attenuation tank.	Please provide MicroDrainage calculations of existing and proposed run-off rates and volumes in accordance with a recognised methodology or the results of a full infiltration test (see line below) if infiltration is proposed.
Infiltration		X		e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse		X		e.g. Is there a watercourse nearby?
To surface water sewer	X		Pre-development enquiry has been submitted	Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above		X		e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.
Has the drainage proposal had regard to the SuDS hierarchy?	X		See Drainage Statement	Evidence must be provided to demonstrate that the proposed Sustainable Drainage strategy has had regard to the SuDS hierarchy as outlined in Section 2.5 above.
Layout plan showing where the sustainable drainage infrastructure will be located on site.	X		Plan lay out of surface water attenuation tank provided in basement of 1 Triton Square.	Please provide plan reference numbers showing the details of the site layout showing where the sustainable drainage infrastructure will be located on the site. If the development is to be constructed in phases this should be shown on a separate plan and confirmation should be provided that the sustainable drainage proposal for each phase can be constructed and can operate independently and is not reliant on any later phase of development.

*Peak Flowrates generated according to **2 minute storm duration,** with a proposed pumped discharge of 35 L/s

4. Peak Discharge Rates – This is the maximum flow rate at which storm water runoff leaves the site during a particular storm event.

	Existing Rates (l/s)	Proposed Rates (l/s)	Difference (l/s) (Proposed-Existing)	% Difference (difference /existing x 100)	Notes for developers
Greenfield QBAR	2.2	N/A	N/A	N/A	QBAR is approx. 1 in 2 storm event. Provide this if Section 6 (QBAR) is proposed.
1 in 1	114.7	35	-79.7	69	Proposed discharge rates (with mitigation) should aim to be equivalent to greenfield rates for all corresponding storm events. As a minimum, peak discharge rates must be reduced by 50% from the existing sites for all corresponding rainfall events.
1 in 30	286.8	35	-251.8	88	
1in 100	401.4	35	-366.5	91	
1 in 100 plus climate change	N/A	35	-366.5	91	The proposed 1 in 100 +CC peak discharge rate (with mitigation) should aim to be equivalent to greenfield rates. As a minimum, proposed 1 in 100 +CC peak discharge rate must be reduced by 50% from the existing 1 in 100 runoff rate sites.

*Climate change: 30%

5. Calculate additional volumes for storage –The total volume of water leaving the development site. New hard surfaces potentially restrict the amount of stormwater that can go to the ground, so this needs to be controlled so not to make flood risk worse to properties downstream.

	Greenfield runoff volume (m^3)	Existing Volume (m^3)	Proposed Volume (m^3)	Difference (m^3) (Proposed-Existing)	Notes for developers
1 in 1 2 min	1.2	14.1	14.1	0.0	Proposed discharge volumes (with mitigation) should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable and as a minimum should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30 6 hour	121.0	330.1	330.1	0.0	
1in 100 6 hour	167.0	466.6	466.6	0.0	
1 in 100 6 hour plus climate change	217.0	606.0	606.0	0.0	The proposed 1 in 100 +CC discharge volume should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable. As a minimum, to mitigate for climate change the proposed 1 in 100 +CC volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk increases under climate change.

*There are is no infiltration on 1 Triton Square, thus all the storm water is discharge to sewer, it will be attenuated in a 280 m3 storage tank located in the basement with a pumped discharge.

6. Calculate attenuation storage – Attenuation storage is provided to enable the rate of runoff from the site into the receiving watercourse to be limited to an acceptable rate to protect against erosion and flooding downstream. The attenuation storage volume is a function of the degree of development relative to the greenfield discharge rate.

		Notes for developers
Storage Attenuation volume (Flow rate control) required to meet greenfield run off rates (m^3)	-	Volume of water to attenuate on site if discharging at a greenfield run off rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to reduce rates by 50% (m^3)	-	Volume of water to attenuate on site if discharging at a 50% reduction from existing rates. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to meet [OTHER RUN OFF RATE (as close to greenfield rate as possible] (m^3)	280 m3	Volume of water to attenuate on site if discharging at a rate different from the above – please state in 1st column what rate this volume corresponds to. On previously developed sites, runoff rates should not be more than three times the calculated greenfield rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to retain rates as existing (m^3)	-	Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing
Percentage of attenuation volume stored above ground,	-	Percentage of attenuation volume which will be held above ground in swales/ponds/basins/green roofs etc. If 0, please demonstrate why.

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume does not get into the watercourses, or if it does it is at an exceptionally low rate. You can either infiltrate the stored water back to ground, or if this isn't possible hold it back with on site storage. Firstly, can infiltration work on site?

			Notes for developers
Infiltration	**State the Site's Geology and known Source Protection Zones (SPZ)**	N/A	Avoid infiltrating in made ground. Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?	N/A	Infiltration rates should be no lower than $1x10^{-6}$ m/s.
	State the distance between a proposed infiltration device base and the ground water (GW) level	N/A	Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.

	Were infiltration rates obtained by desk study or infiltration test?	N/A	Infiltration rates can be estimated from desk studies at most stages of the planning system if a back up attenuation scheme is provided..
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	N/A	Advice on contaminated Land in Camden can be found on our supporting documents webpage Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
In light of the above, is infiltration feasible?	**Yes/No? If the answer is No, please identify how the storm water will be stored prior to release**	INFILTRATION IS NOT FEASIBLE AS THE DEVELOPMENT SIZE (BUILDING) IS EQUAL TO TOTAL SITE AREA.	If infiltration is not feasible how will the additional volume be stored?. The applicant should then consider the following options in the next section.

Storage requirements

The developer must confirm that either of the two methods for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at the greenfield run off rate. This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers
Please confirm what option has been chosen and how much storage is required on site.	OPTION 1 - PROPOSED BASEMENT STORAGE	The developer at this stage should have an idea of the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

8. Please confirm

		Notes for developers
Which Drainage Systems measures have been used, including green roofs?	ATTENUATION TANK, RAINWATER HARVESTING, GREYWATER TREATMENT PLANT FOR WATER RE-USE	SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C697.
Drainage system can contain in the 1 in 30 storm event without flooding	YES	This a requirement for sewers for adoption & is good practice even where drainage system is not adopted.
Will the drainage system contain the 1 in 100 +CC storm event? If no please demonstrate how buildings and utility plants will be protected.	YES, 1 in 100 + 30 CC	National standards require that the drainage system is designed so that flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.
Any flooding between the 1 in 30 & 1 in 100 plus climate change storm events will be safely contained on site.	YES	**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters must drain away at section 6 rates. Existing rates can be used where runoff volumes are not increased.
How will exceedance events be catered on site without increasing flood risks (both on site and outside the development)?	ATTENUATION TANK WITH OVERFLOW DIRECTED TO SEWER.	**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters must drain away at section 6 rates. Existing rates can be used where runoff volumes are not increased. Exceedance events are defined as those larger than the 1 in 100 +CC event.
How are rates being restricted (vortex control, orifice etc)	PRESSURE SYSTEM (PUMPS)	Detail of how the flow control systems have been designed to avoid pipe blockages and ease of maintenance should be provided.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.	BRITISH LAND PROPERTY MANAGEMENT LIMITED	If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma.
How is the entire drainage system to be maintained?	YES, SUPPORT WILL BE BASED ON PERIODIC CLEANING OF THE ATTENUATION TANK AND SERVICING OF PUMPS. PRESSURIZED DISCHARGE WILL BE CONNECTED TO THE MONITORING SYSTEM OF BMS. AT LEAST A 2 PUMP SYSTEM WILL BE PROVIDED TO DRAIN THE WATER OUT OF THE BUILDING	If the features are to be maintained directly by the owners as stated in answer to the above question please answer yes to this question and submit the relevant maintenance schedule for each feature. If it is to be maintained by others than above please give details of each feature and the maintenance schedule. Clear details of the maintenance proposals of all elements of the proposed drainage system must be provided. Details must demonstrate that maintenance and operation requirements are economically proportionate. Poorly maintained drainage can lead to increased flooding problems in the future.

9. Evidence Please identify where the details quoted in the sections above were taken from. i.e. Plans, reports etc. Please also provide relevant drawings that need to accompany your proforma, in particular exceedance routes and ownership and location of SuDS (maintenance access strips etc

Pro-forma Section	Document reference where details quoted above are taken from	Page Number
Section 2	SURFACE WATER DRAINAGE STATEMENT	
Section 3		
Section 4	SURFACE WATER DRAINAGE STATEMENT	
Section 5	SURFACE WATER DRAINAGE STATEMENT	
Section 6	SURFACE WATER DRAINAGE STATEMENT	
Section 7		
Section 8		

The above form should be completed using evidence from the Flood Risk Assessment and site plans. It should serve as a summary sheet of the drainage proposals and should clearly show that the proposed rate and volume as a result of development will not be increasing. If there is an increase in rate or volume, the rate or volume section should be completed to set out how the additional rate/volume is being dealt with.

This form is completed using factual information from the Flood Risk Assessment and Site Plans and can be used as a summary of the surface water drainage strategy on this site.

Form Completed By..BARTLOMIEJ GUMULA..
Qualification of person responsible for signing off this pro-forma SENIOR ENGINEER..

Company..ARUP...
On behalf of (Client's details) BRITISH LAND PROPERTY MANAGEMENT LIMITED, YORK HOUSE, 45 SEYMOUR STREET, W1H 7LX LONDON
Date:...

4 APPENDIX

Greenfield Runoff Rates

	1 Triton Square (L/s)	St Anne's (L/s)
Qbar	2.2	0.42
1/1	1.9	0.35
1/30	5.1	0.96
1/100	7.1	1.33
1/100 + 30%	9.2	1.73

***A minimum of 5 L/s from site was used as the basis of design as is good engineering practise.**

2 minute Storm duration

Storm return period	Intensity	Unit
1/1	0.02	l/s/m2
1/30	0.05	l/s/m2
1/100	0.07	l/s/m2
1/100 + 30%	0.09	l/s/m2

***All values taken from BS 12056 – 3 for a 2 minute storm duration. These are therefore very intense flow ratesw**

FEH data used for 6 hr storm duration

Storm return period	Rainfall (mm)	Storm duration (hr)
1/30	57.1	6
1/100	80.7	6
1/100 + 30%	104.9	6

5 ROOF PLANS

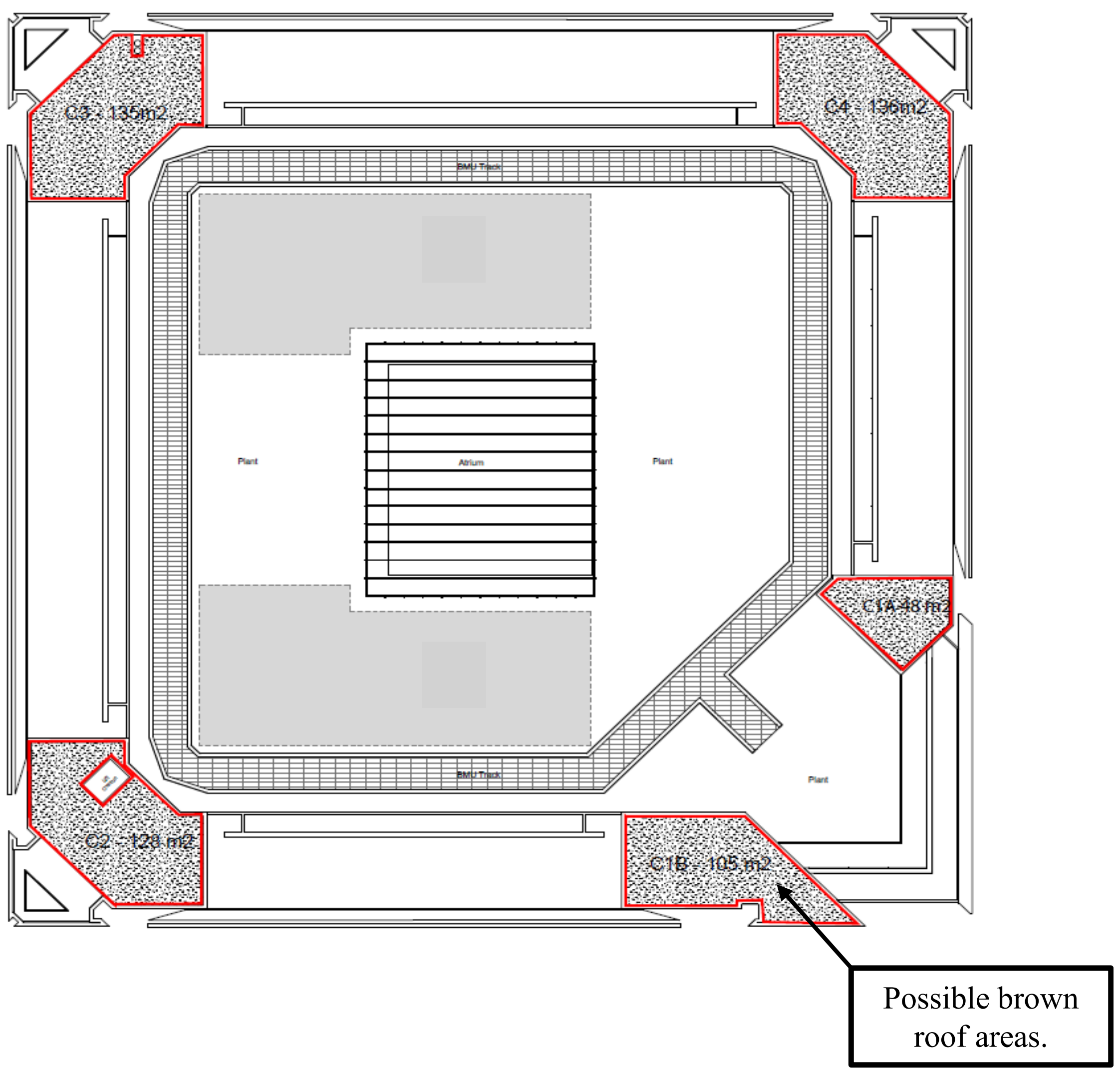


Figure 2 1 Triton Square

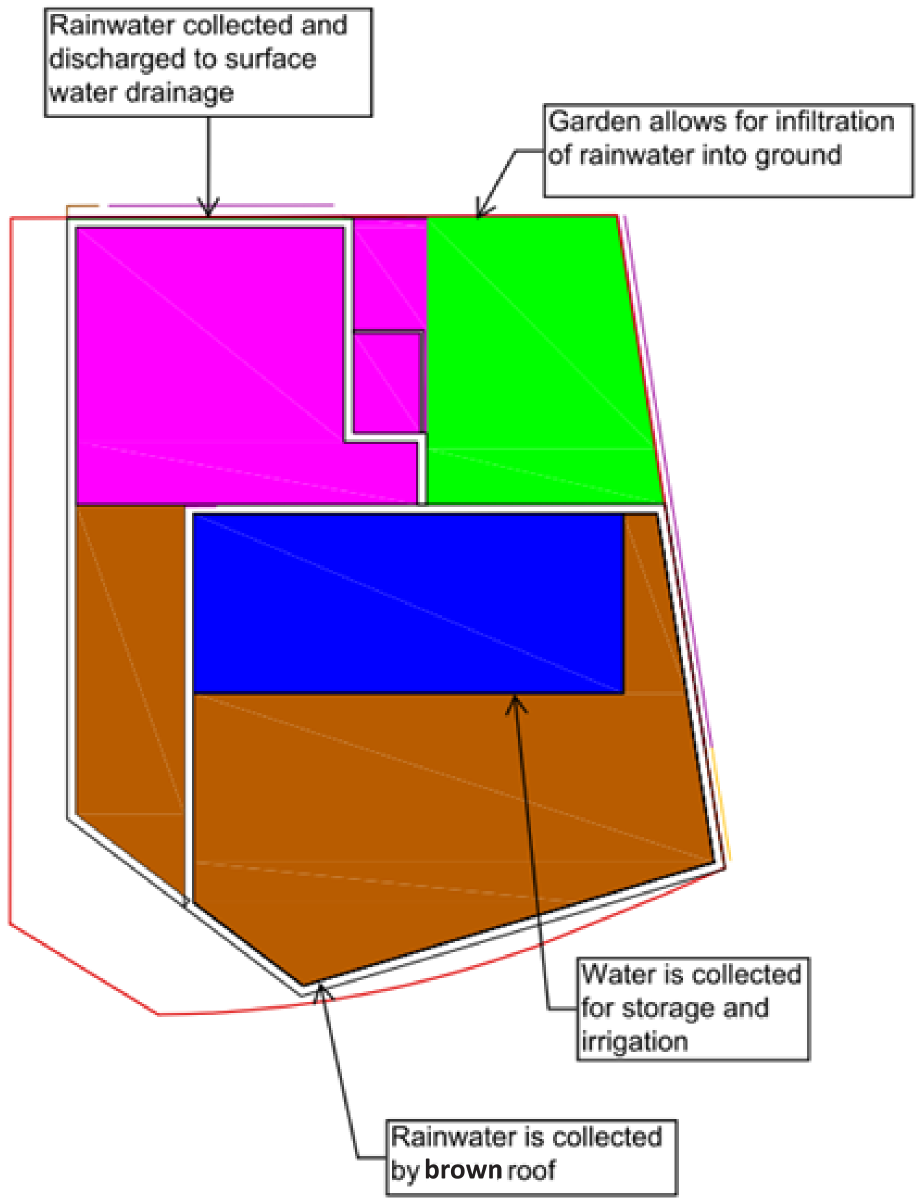
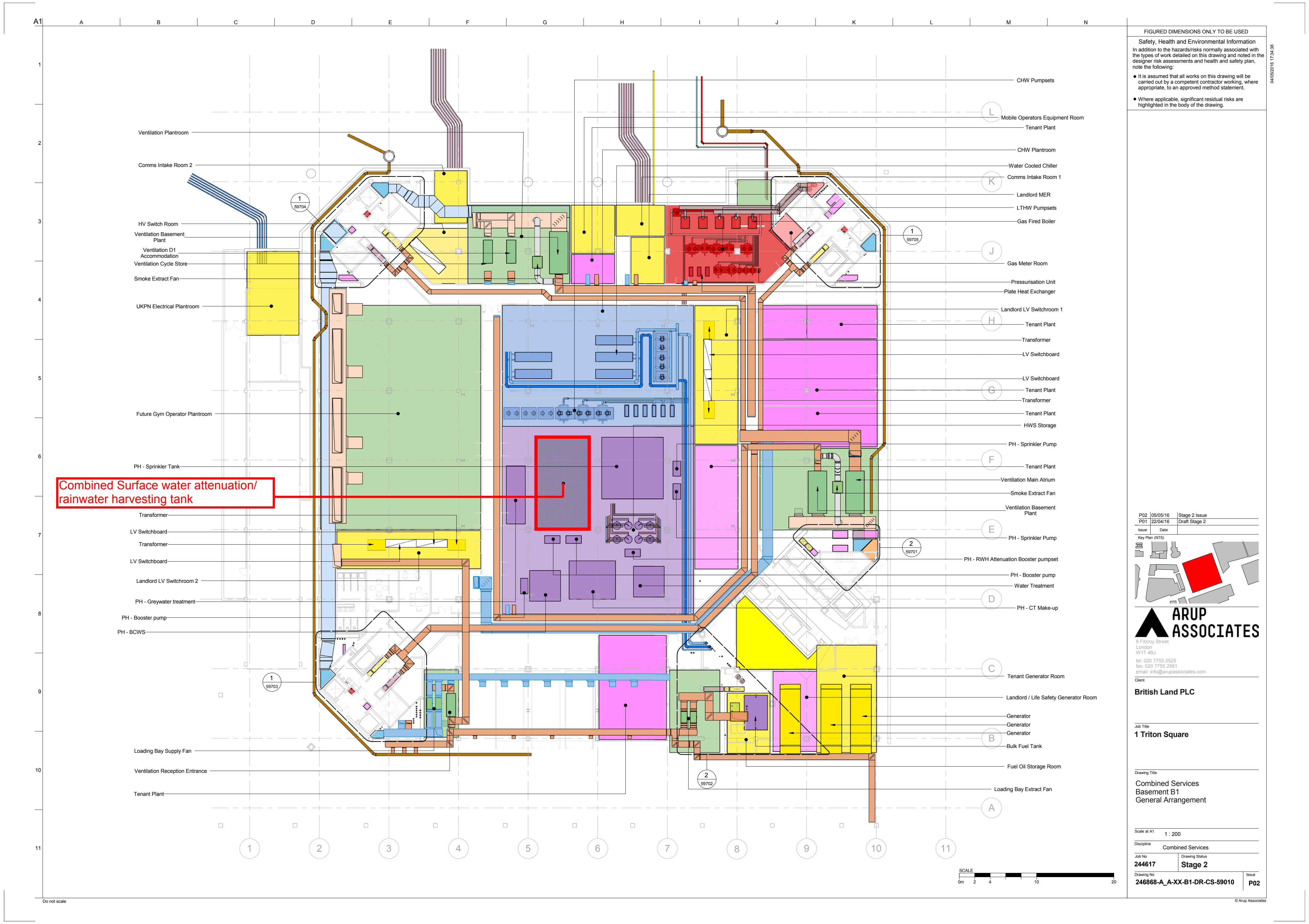


Figure 3 St Anne's

6 SUDS PLAN VIEW



7 MICRODRAINAGE CALCULATION SHEET FOR ATTENUATION TANK

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	2.056	2.056	35.0	0.0	35.0	197.4	O K
30 min Summer	2.230	2.230	35.0	0.0	35.0	214.1	O K
60 min Summer	2.218	2.218	35.0	0.0	35.0	213.0	O K
120 min Summer	2.011	2.011	35.0	0.0	35.0	193.0	O K
180 min Summer	1.809	1.809	35.0	0.0	35.0	173.6	O K
240 min Summer	1.618	1.618	35.0	0.0	35.0	155.3	O K
360 min Summer	1.272	1.272	35.0	0.0	35.0	122.1	O K
15 min Winter	2.339	2.339	35.0	0.0	35.0	224.6	O K
30 min Winter	2.557	2.557	35.0	0.0	35.0	245.5	O K
60 min Winter	2.586	2.586	35.0	0.0	35.0	248.3	O K
120 min Winter	2.316	2.316	35.0	0.0	35.0	222.4	O K
180 min Winter	2.020	2.020	35.0	0.0	35.0	194.0	O K
240 min Winter	1.727	1.727	35.0	0.0	35.0	165.8	O K
360 min Winter	1.194	1.194	35.0	0.0	35.0	114.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	216.993	0.0	236.0	0.0	23
30 min Summer	125.705	0.0	273.4	0.0	35
60 min Summer	72.822	0.0	316.8	0.0	58
120 min Summer	42.186	0.0	367.0	0.0	90
180 min Summer	30.653	0.0	400.0	0.0	124
240 min Summer	24.439	0.0	425.2	0.0	158
360 min Summer	17.758	0.0	463.5	0.0	222
15 min Winter	216.993	0.0	264.3	0.0	23
30 min Winter	125.705	0.0	306.2	0.0	36
60 min Winter	72.822	0.0	354.8	0.0	60
120 min Winter	42.186	0.0	411.1	0.0	98
180 min Winter	30.653	0.0	448.0	0.0	134
240 min Winter	24.439	0.0	476.3	0.0	170
360 min Winter	17.758	0.0	519.1	0.0	236

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.239	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.331	Shortest Storm (mins)	15
Site Location		F (1km)	2.503	Longest Storm (mins)	360
C (1km)	-0.026	Summer Storms	Yes	Climate Change %	+30
D1 (1km)	0.332	Winter Storms	Yes		
D2 (1km)	0.292	Cv (Summer)	0.750		

Time Area Diagram

Total Area (ha) 0.580

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.193	4	8	0.193	8	12	0.193

Model Details

Storage is Online Cover Level (m) 3.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	96.0	3.000	96.0

Pump Outflow Control

Invert Level (m) 0.000

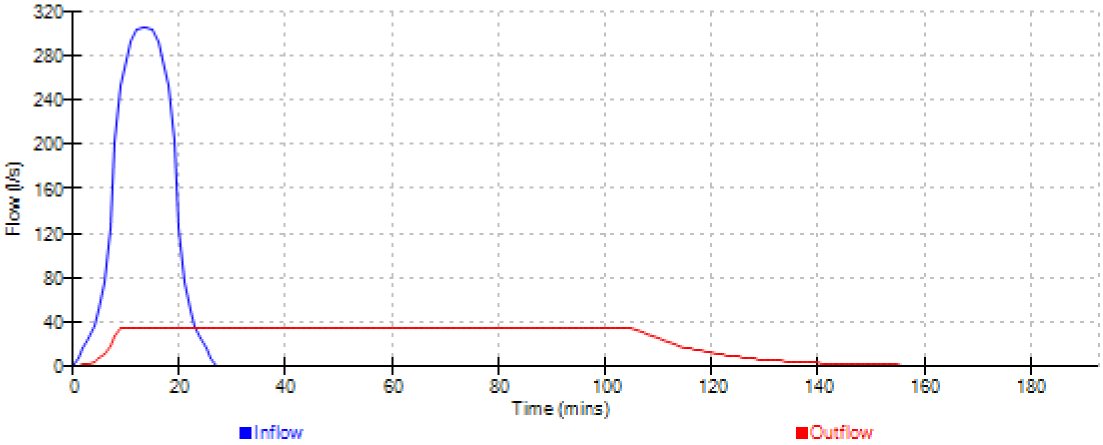
Depth (m)	Flow (l/s)
0.300	35.0000

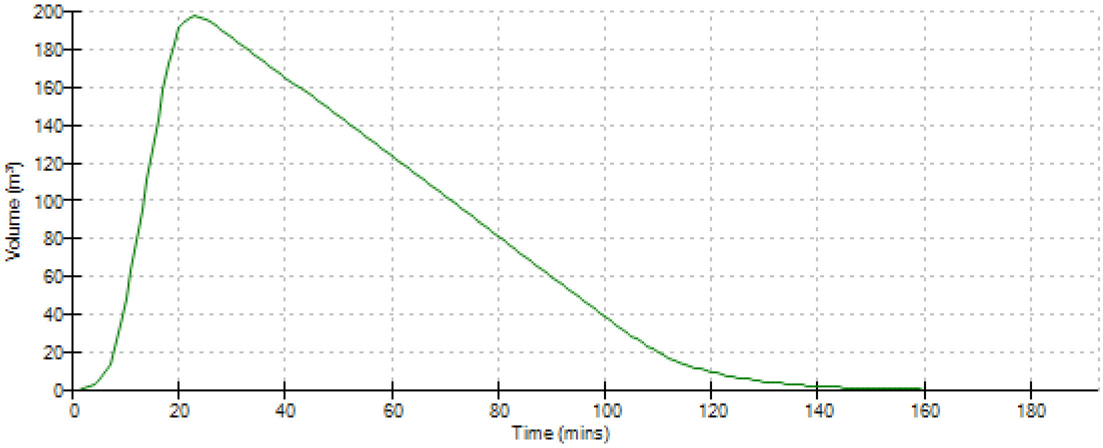
Pump Overflow Control

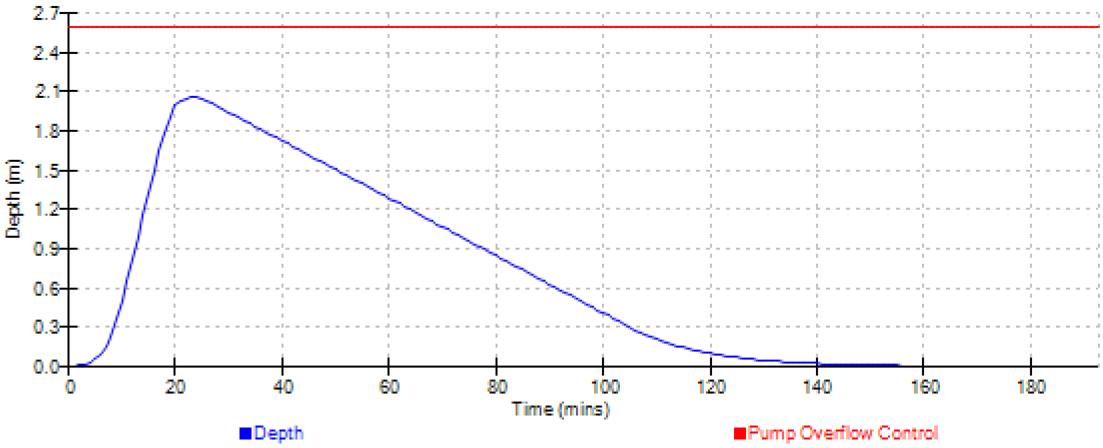
Invert Level (m) 2.600

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
2.600	70.0000	3.000	70.0000

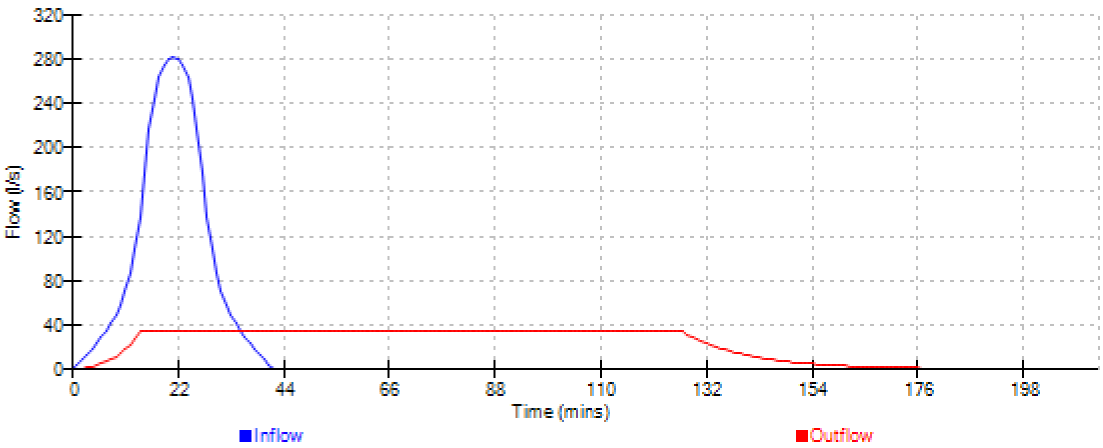
Event: 15 min Summer

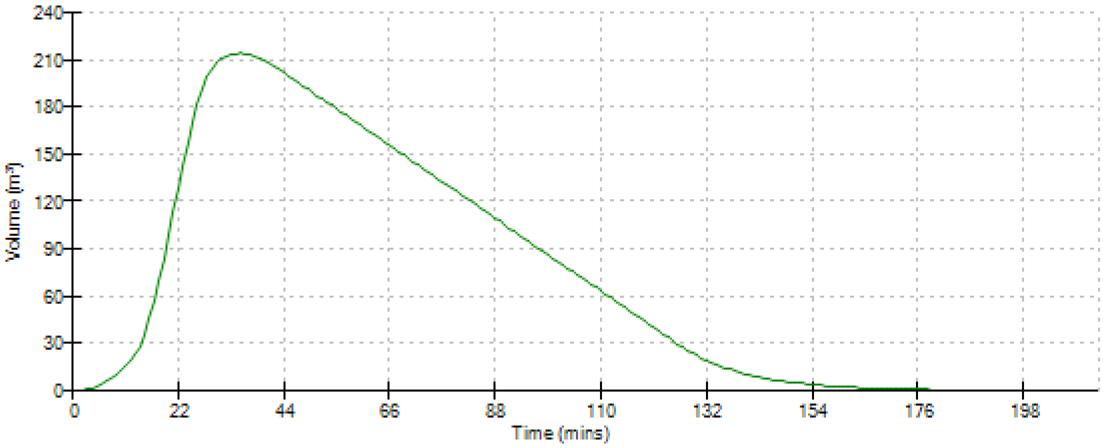


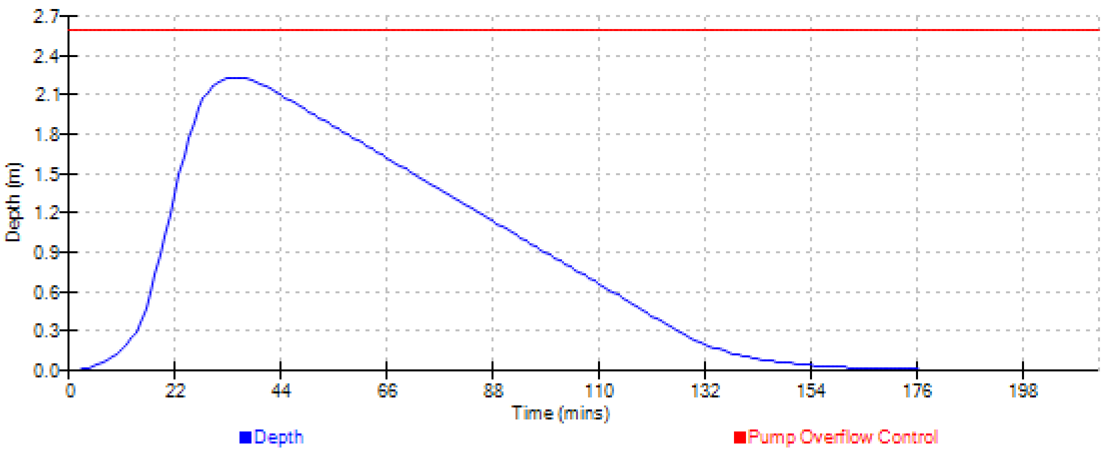




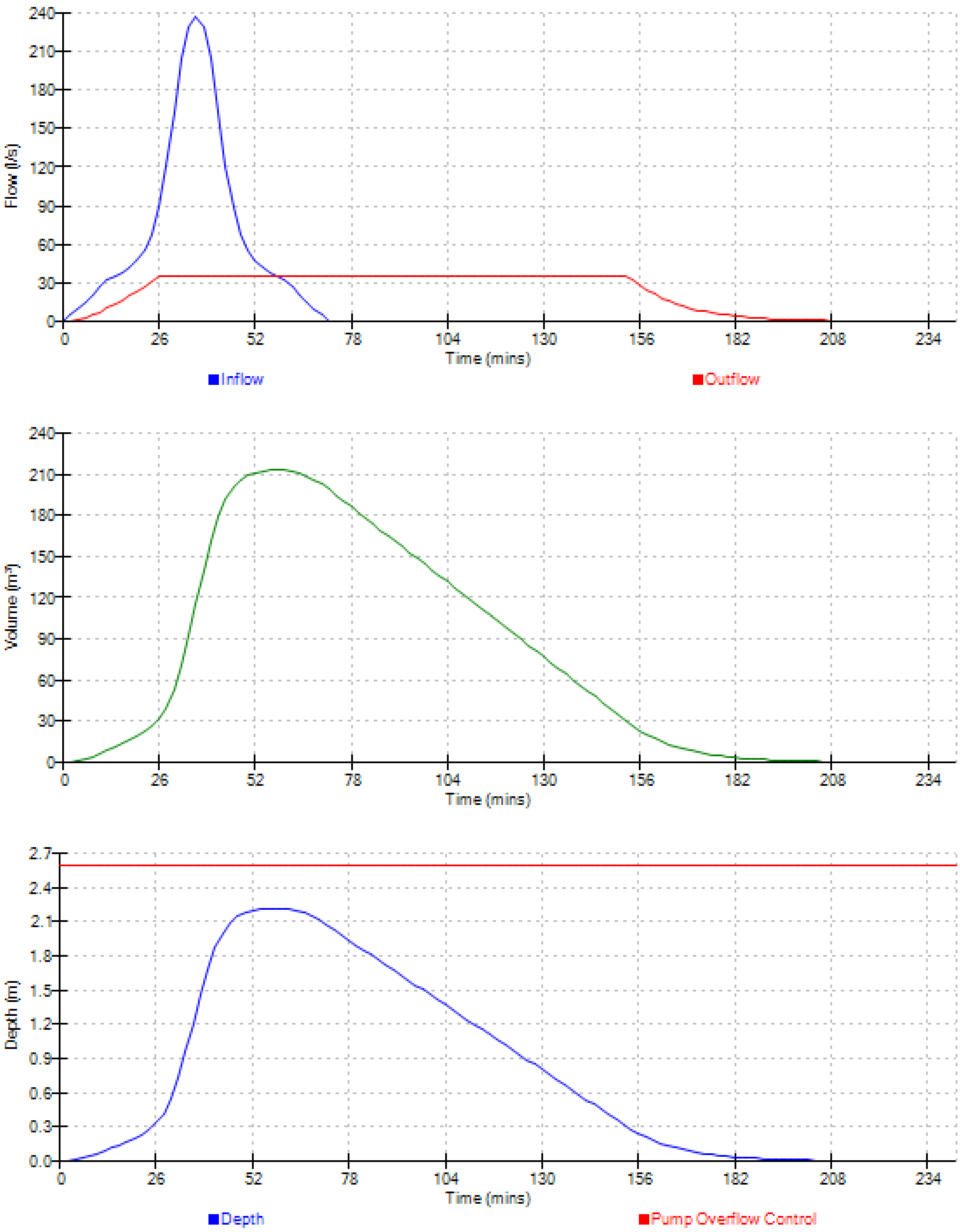
Event: 30 min Summer



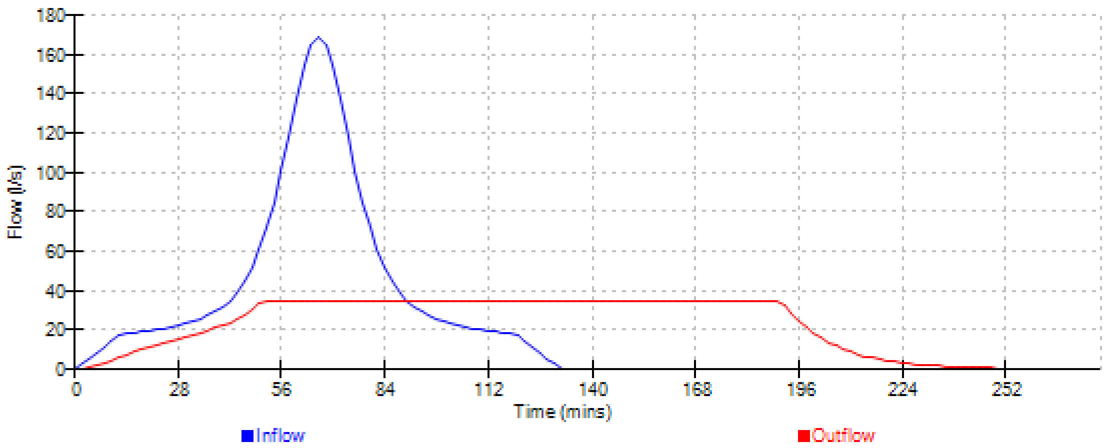


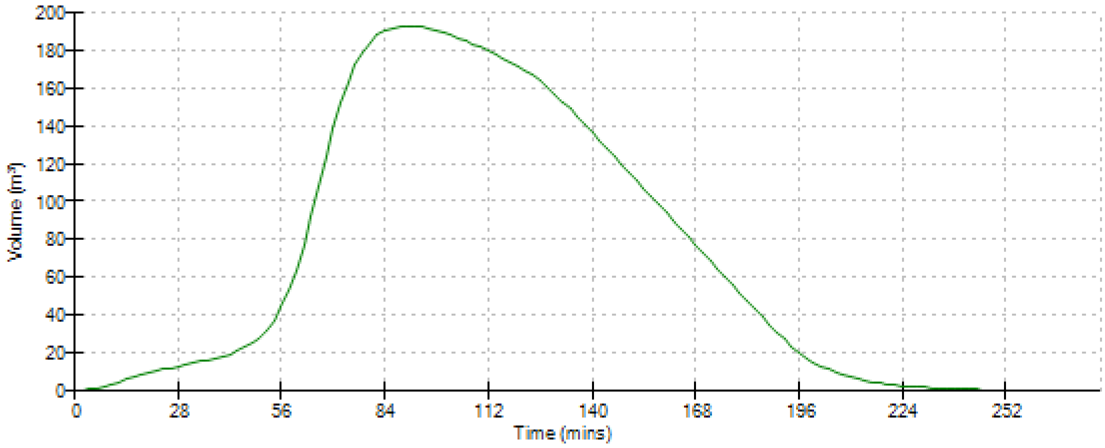


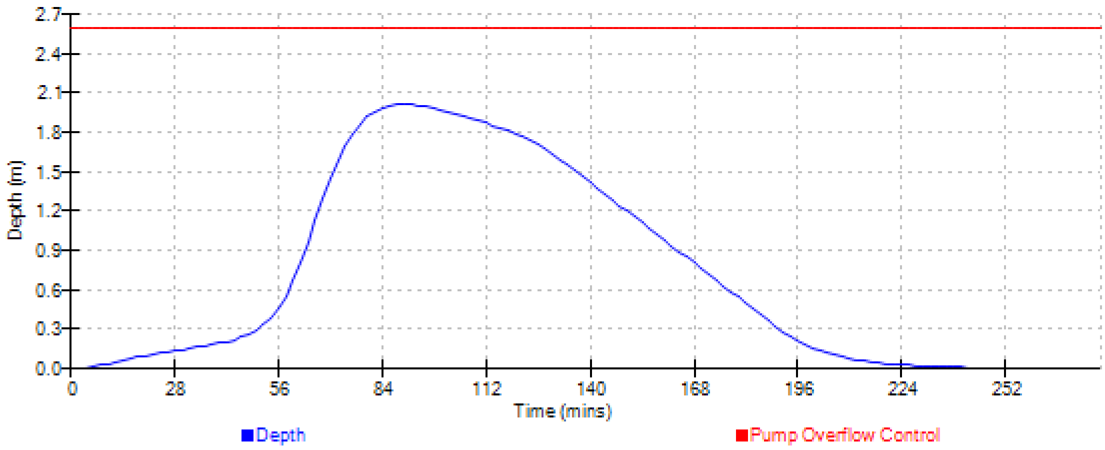
Event: 60 min Summer



Event: 120 min Summer

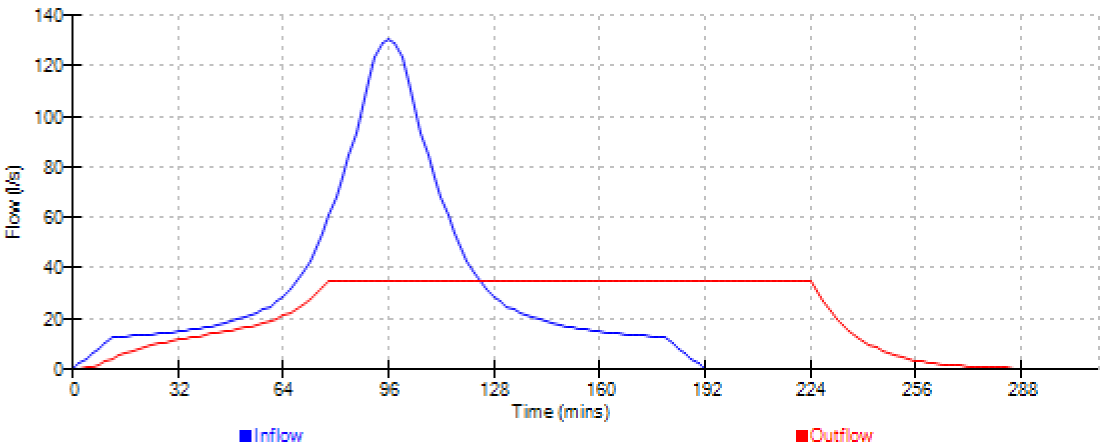


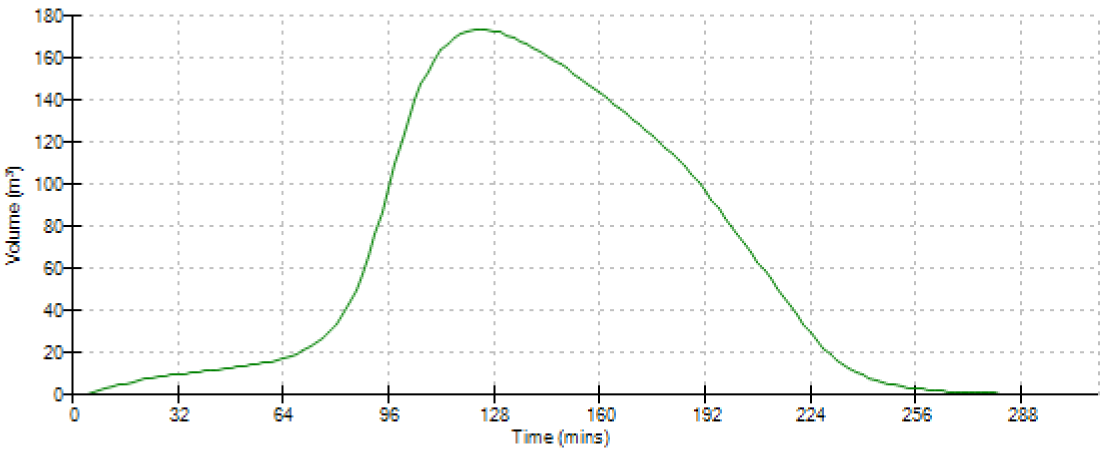


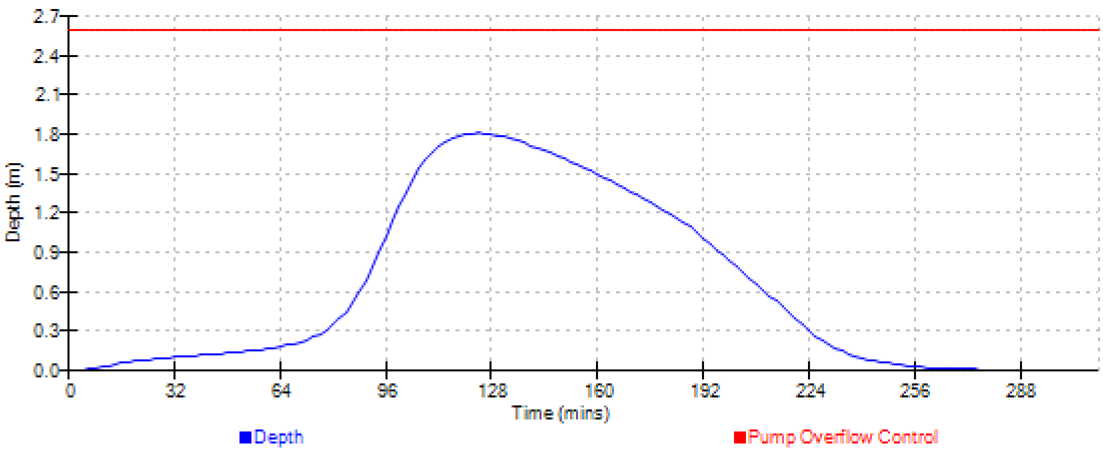


Ove Arup & Partners International Ltd		Page 8
The Arup Campus Blyth Gate Solihull B90 8AE		
Date 08/12/2016 14:37 File TRITON.SRCX	Designed by kate-a.anderson Checked by	
XP Solutions	Source Control 2015.1	

Event: 180 min Summer

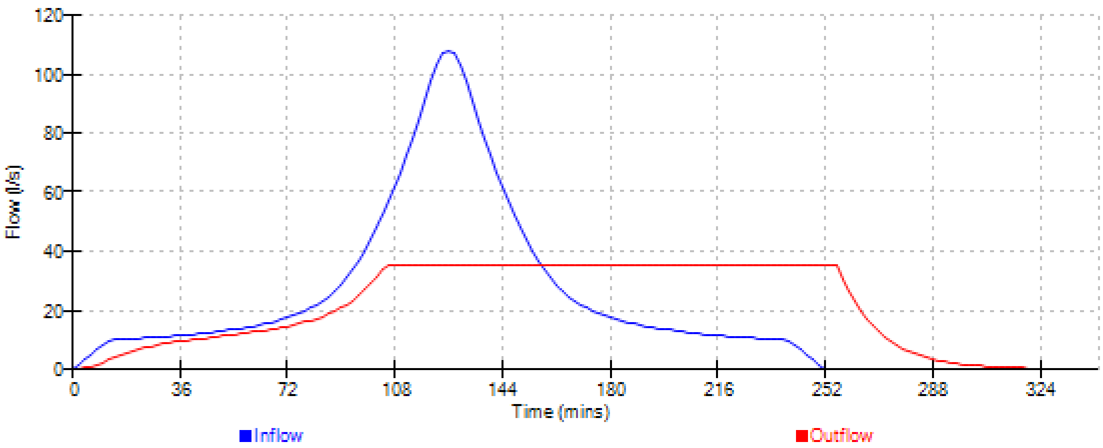


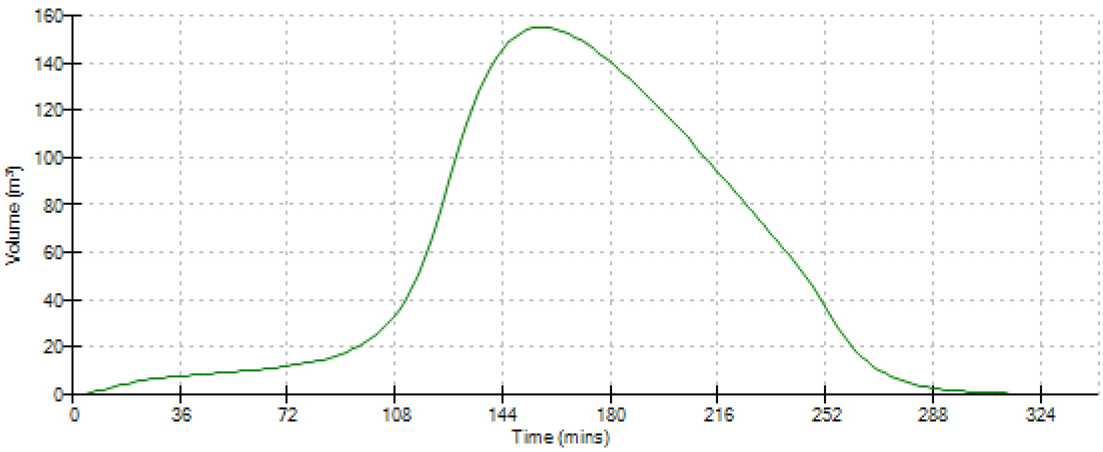


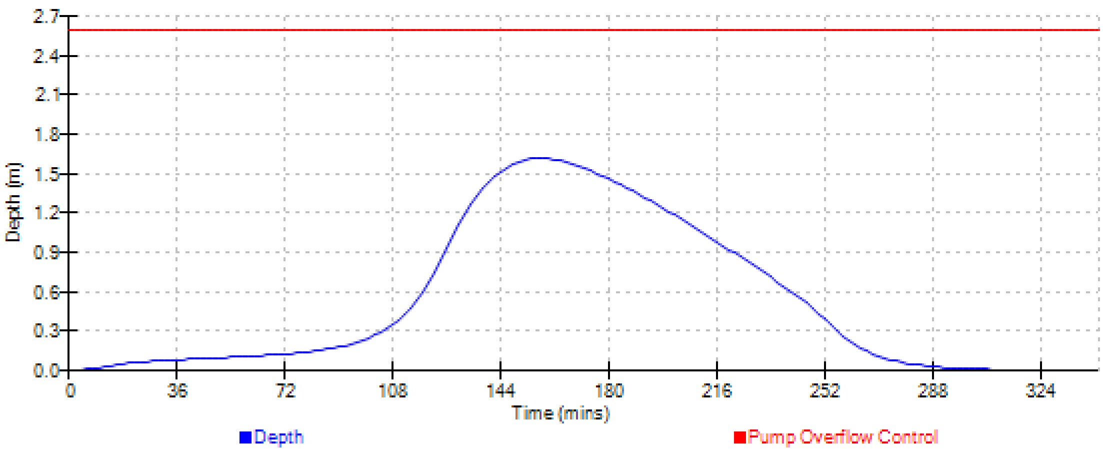


Ove Arup & Partners International Ltd		Page 9
The Arup Campus Blyth Gate Solihull B90 8AE		Micro Drainage
Date 08/12/2016 14:37 File TRITON.SRCX	Designed by kate-a.anderson Checked by	
XP Solutions	Source Control 2015.1	

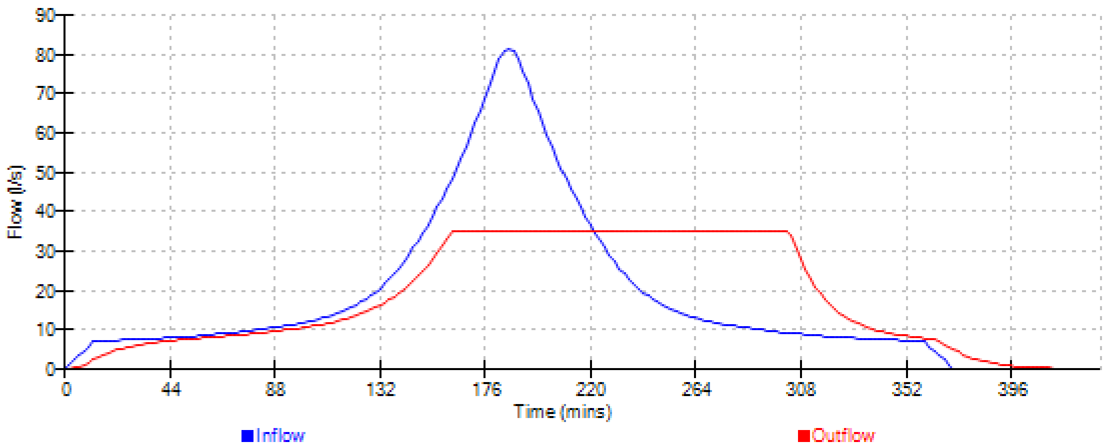
Event: 240 min Summer

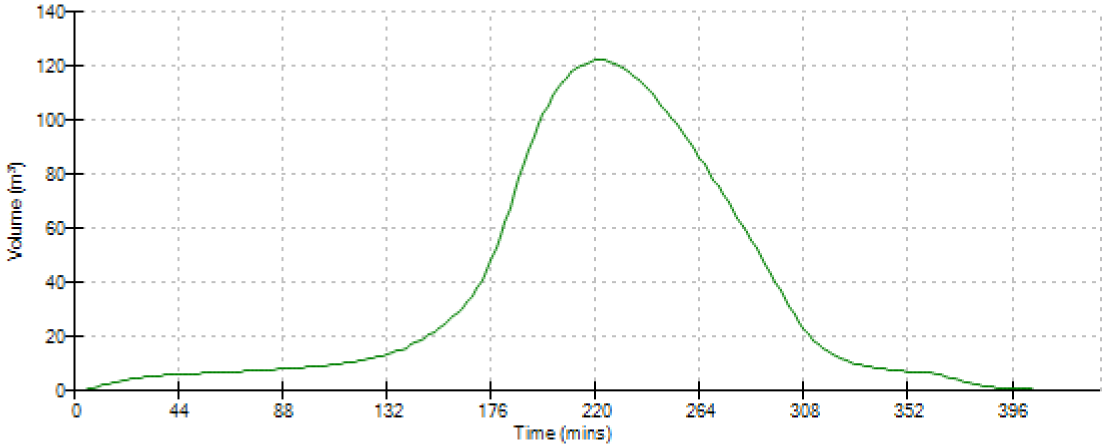


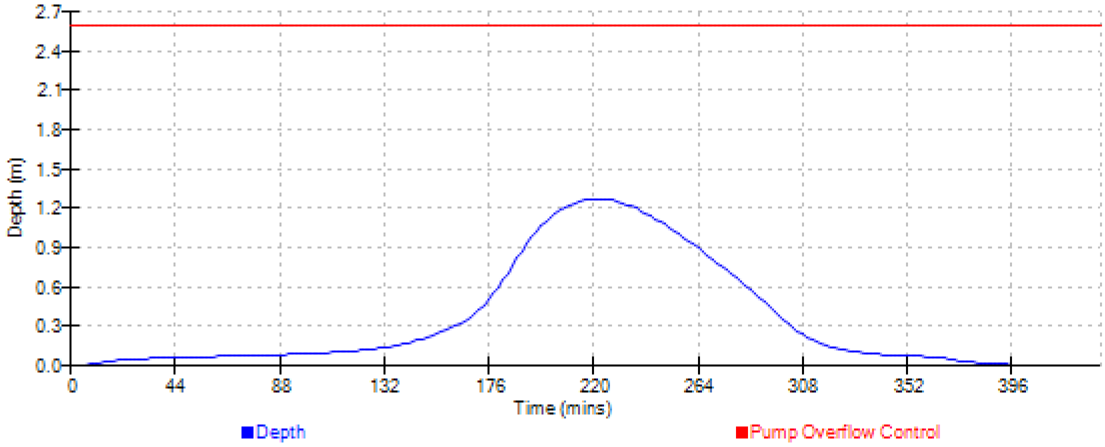




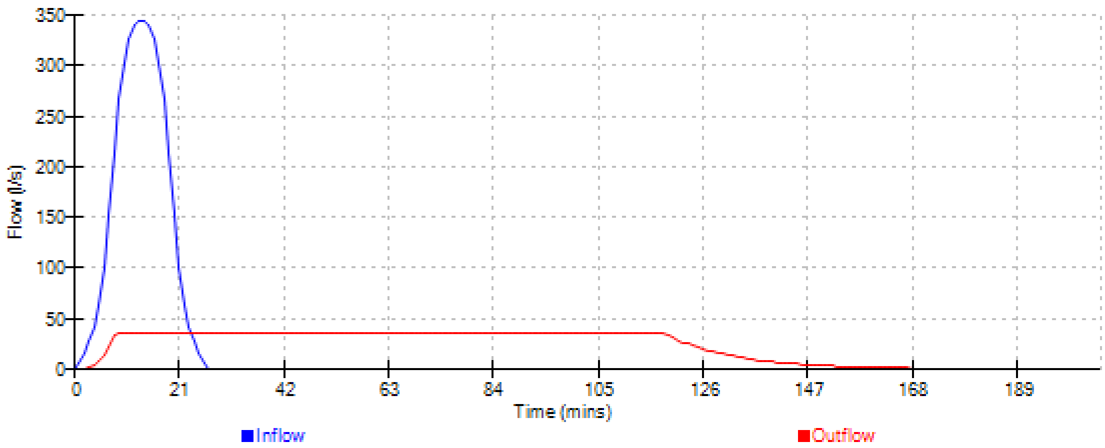
Event: 360 min Summer

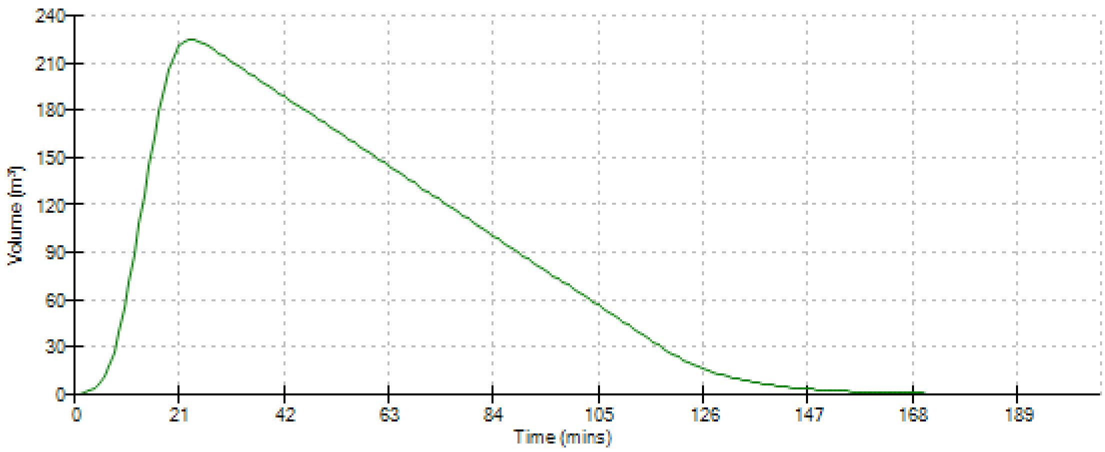


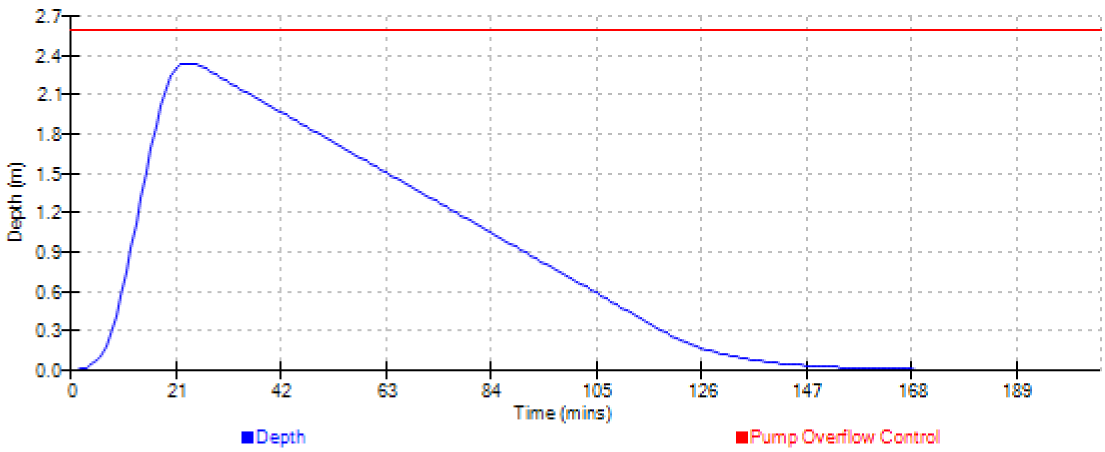




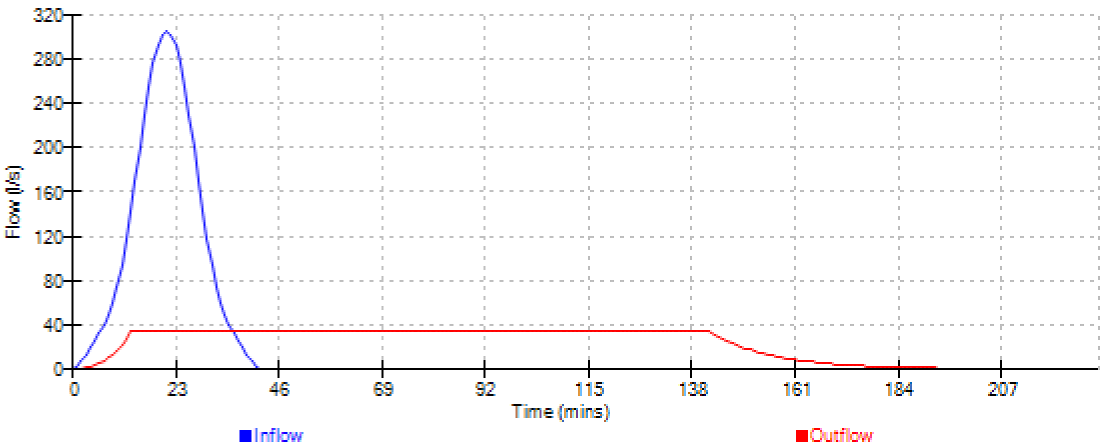
Event: 15 min Winter

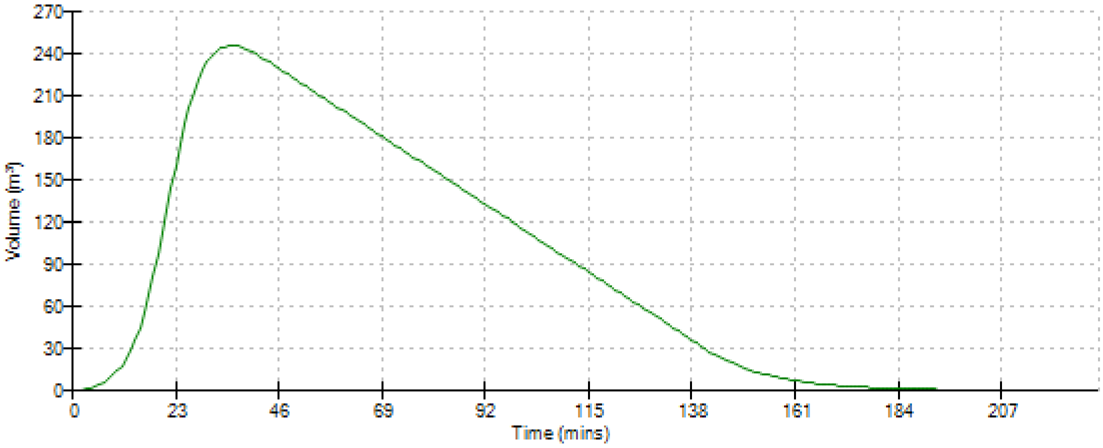


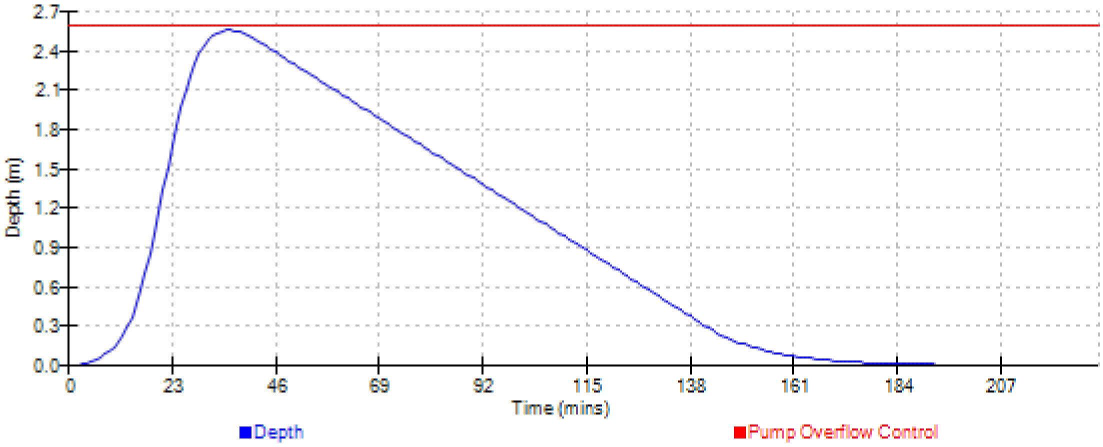




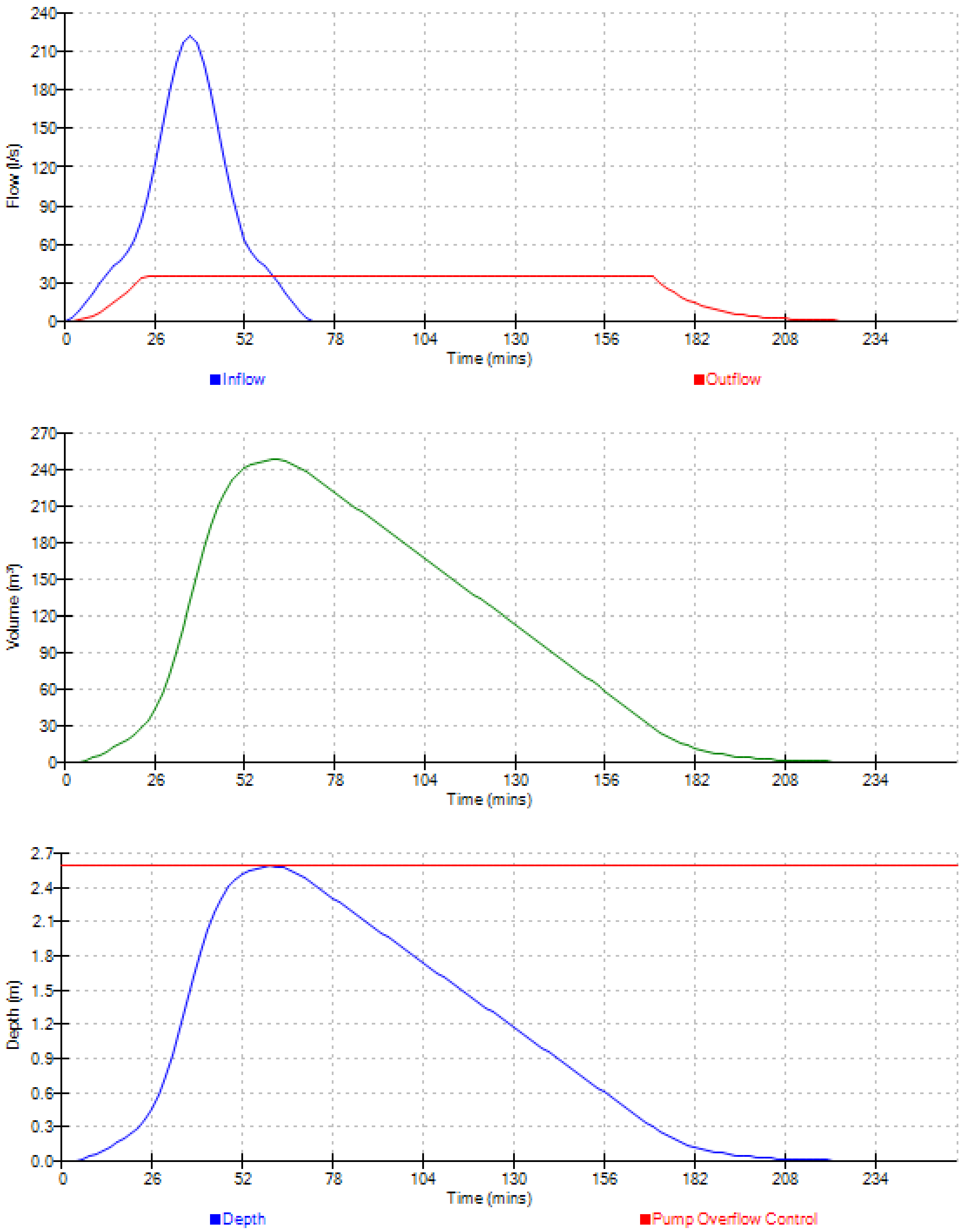
Event: 30 min Winter



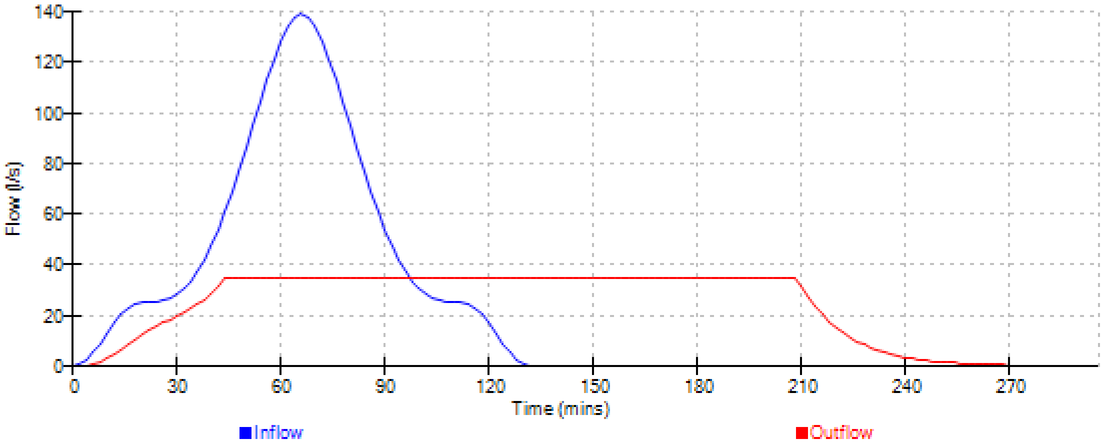


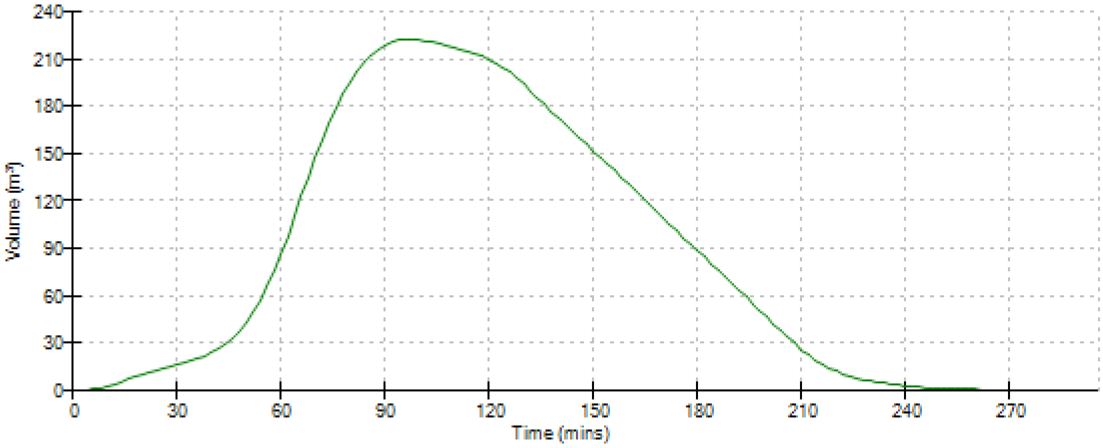


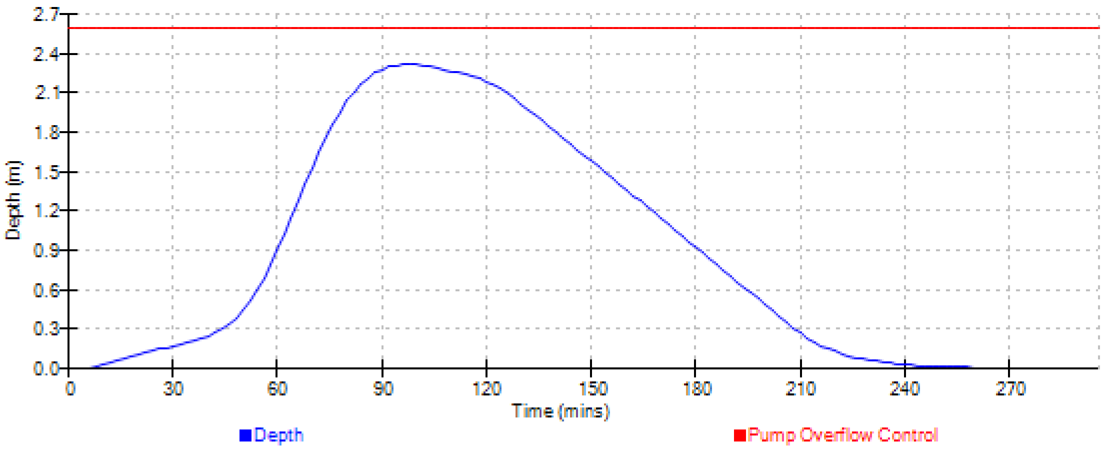
Event: 60 min Winter



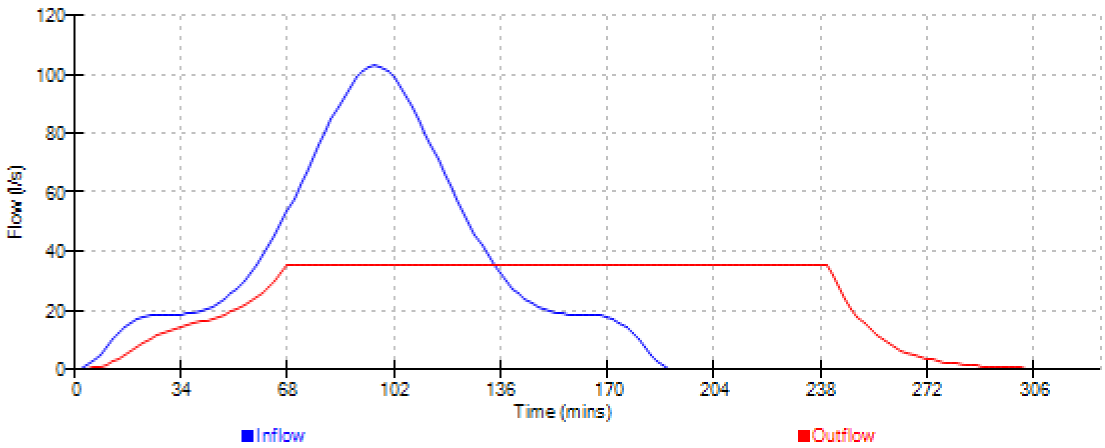
Event: 120 min Winter

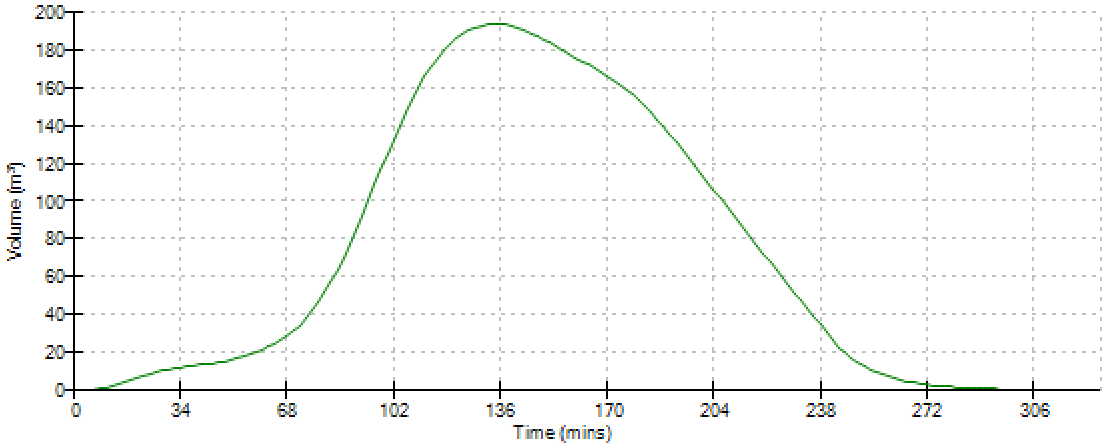


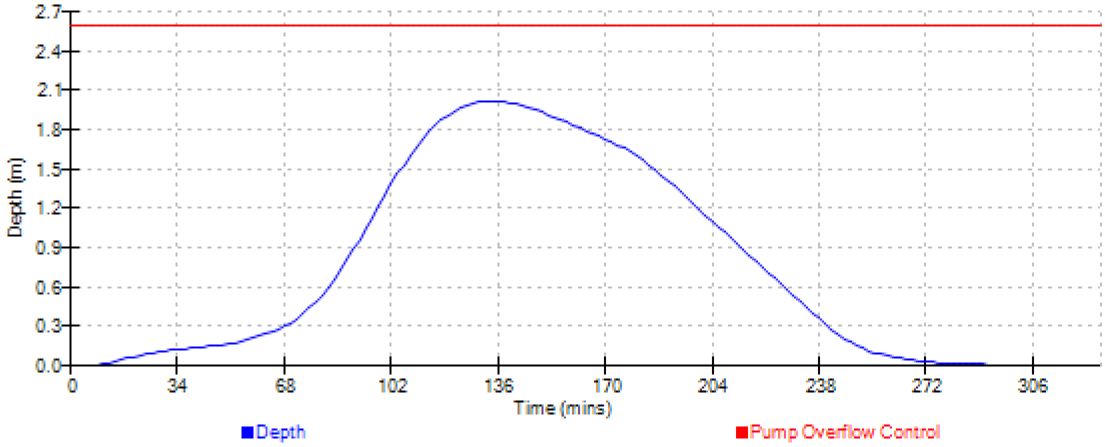




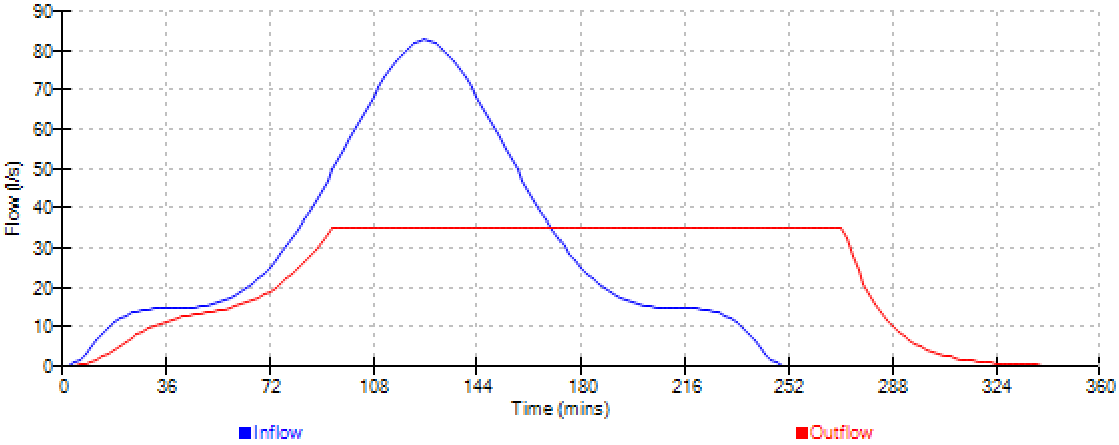
Event: 180 min Winter

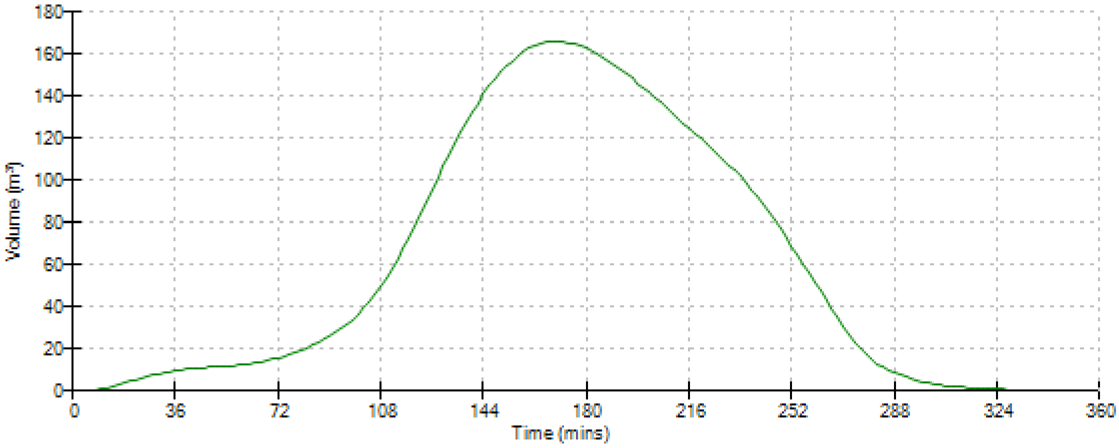


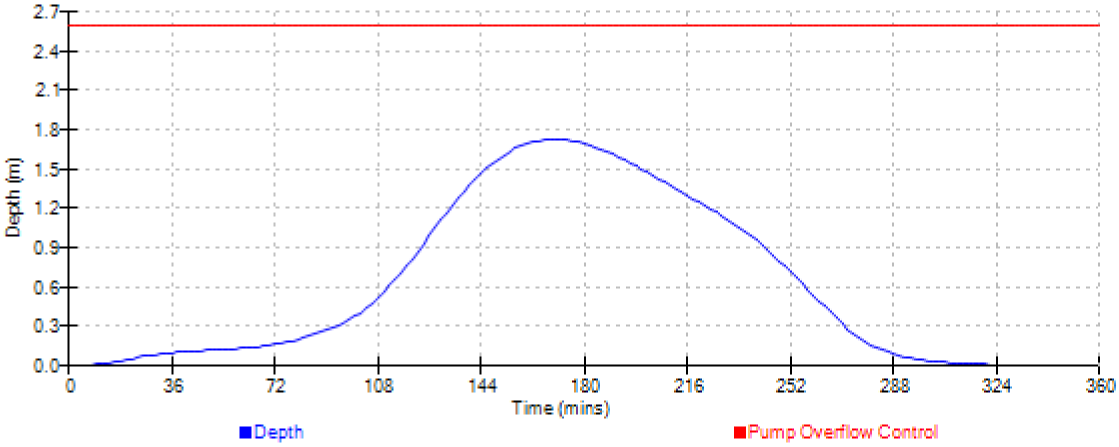




Event: 240 min Winter







Event: 360 min Winter