

Evans & Langford LLP

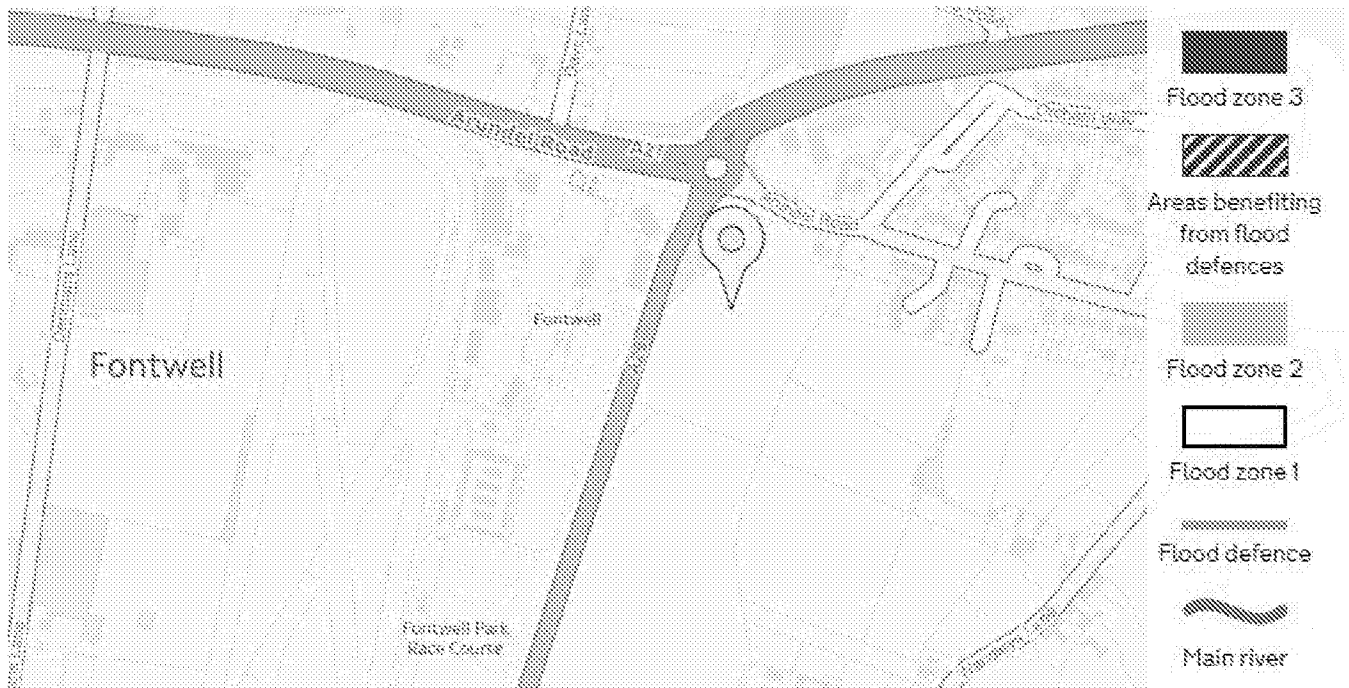
- ◆ Structural & Civil Engineers
- ◆ Land & Building Surveyors
- ◆ Geo-Environmental Engineers
- ◆ Project Managers
- ◆ CDM Consultants
- ◆ Contract Administrators

Surface Water Drainage Strategy – GTR Fontwell

Existing Site

The site for the proposed industrial units is located opposite Fontwell Racecourse approximately 6.5km to the north of Bognor Regis town centre. The site is centred on approximate National Grid Reference 495070, 106975. Currently the site is predominantly green open space.

The site is located in Flood Zone 1 (see below), and recommendations for surface water disposal utilising infiltration Suds are viable.



Extract from Flood Map for Planning (Gov.uk)

Drainage Design

The premise behind the surface water drainage system for GTR Fontwell is that rain falling on to the roof area and hardstandings is collected and channelled via permeable paving and underground pipes to a pond/basin and soakaway which discharges into clean natural gravel.

Winter groundwater testing has been completed, and this established that the natural level is below the proposed soakaway base with a suitable clearance zone. Infiltration drainage is used for surface water, and infiltration rates have been determined. For the drainage design, soil infiltration rates for the soils found in the region of the soakaway at boreholes 9 and 11 ($2.2 \times 10^{-5} \text{m/s}$) have been used.

Continued /

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Partners: S G Robertson / C P Shackleford
Associate: D P McLeish

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In general, the system has been designed in accordance with Non Statutory Technical Standards for Sustainable Drainage Systems, The SUDS Manual C753 by CIRIA and Sustainable Drainage Systems C609 also published by CIRIA. The system has been designed in WinDes Microdrainage to ensure that there is no flooding to any part of the site for all storms up to and including a 1 in 100 year storm, with a 40% allowance for climate change.

Figure 23.4 provides a typical design of a pond in plan view and profile. Figure 23.5 shows typical planted pond edge details and Figure 23.6 shows equivalent details for a typical non-planted pond.

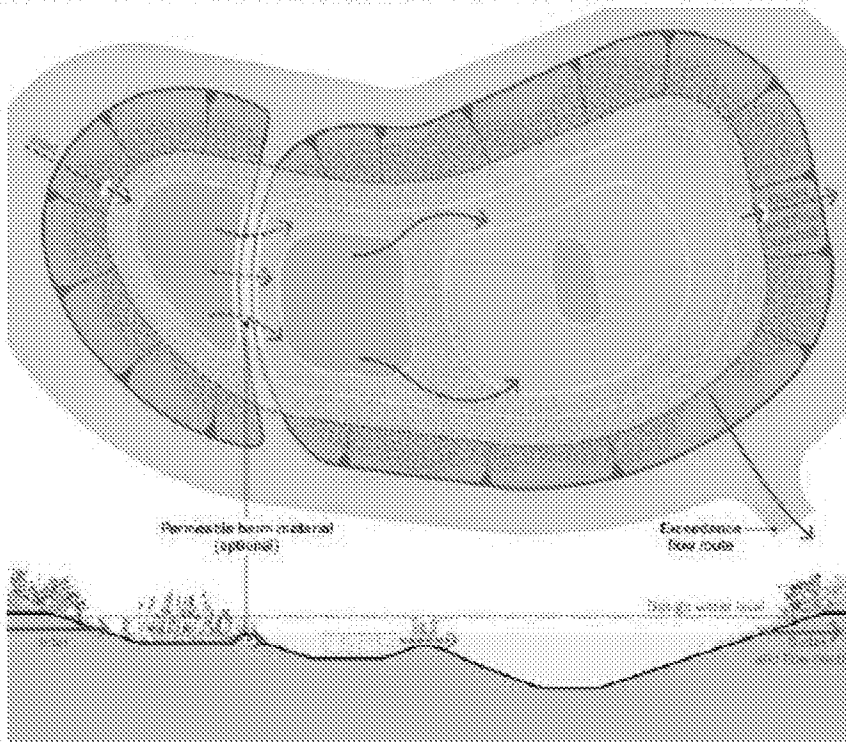
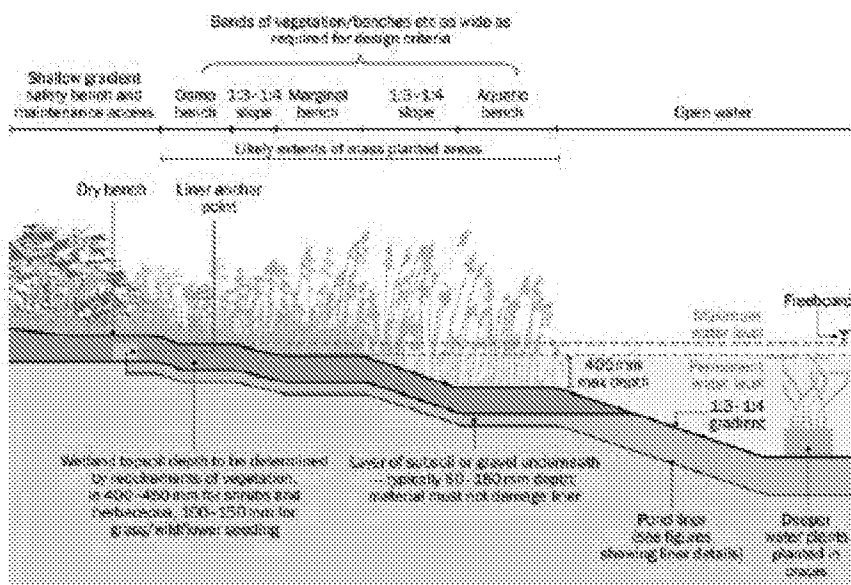


Figure 23.4 Plan view and profile of pond details

CIRIA SUDS Manual 2015



Note: Width, surfacing and extent of safety bench and maintenance access all dependent on site, size of pond, maintenance requirements etc.

Figure 23.5 Typical planted pond edge details

The design allows for the carpark to the east of the buildings, as well as that in the north west corner, to be constructed with permeable paving. Roof water is also routed through the paving sub-base to allow for utilisation of any infiltration to the underlying soils, although for the purposes of the calculations this benefit has not been included due to soil variability. The pavements are provided with overflow structures (typically weirs within the sub-base) that ultimately discharge through an attenuation pond/basin which in turn discharges into a linked below ground crate soakaway located in the south west corner of the site. Note that the crate soakaway is to discharge into a layer of gravels that has been identified through intrusive testing in the area of the soakaway, and for which the infiltration rate has been calculated.

Microdrainage calculations have been completed for the 100 year + 40% climate change event and the resulting size of crate soakaway obtained was 300m² x 1.2m deep. The calculations have been completed with each of the drainage elements cascaded, that is the permeable carparking with overflows into the pond and then ultimately to the crate soakaway. The half drain time of the carparks are 38 minutes for the eastern carpark, 15 minutes for the south western carpark and 809 minutes for the pond and soakaway. This demonstrates that the permeable pavements operate efficiently to transfer the surface water to the pond and soakaway.

The two uses which are potential sources for pollution hazard are the roof and commercial delivery areas. Based on the classifications of the Ciria SuDS Manual section 26, the use would be considered as a medium level hazard from the delivery yard. A number of mitigation measures have been provided to deliver adequate treatment. Use of the permeable paving and sub-base material will allow an initial filtering of any pollutants or sediments. It will be constructed with a filtration layer of at least 400mm thickness and with a geotextile at the base to separate the foundation.

Catchpits will also be constructed upstream of the soakaways to collect silt and leaves. An oil separator will also be provided to remove any further pollutants for car parking areas.

The planted pond will also provide a means of removing sediments and pollution. The attenuation pond is designed to provide additional benefits in the form of water quality, amenity and biodiversity enhancements through the planting of appropriate aquatic species.

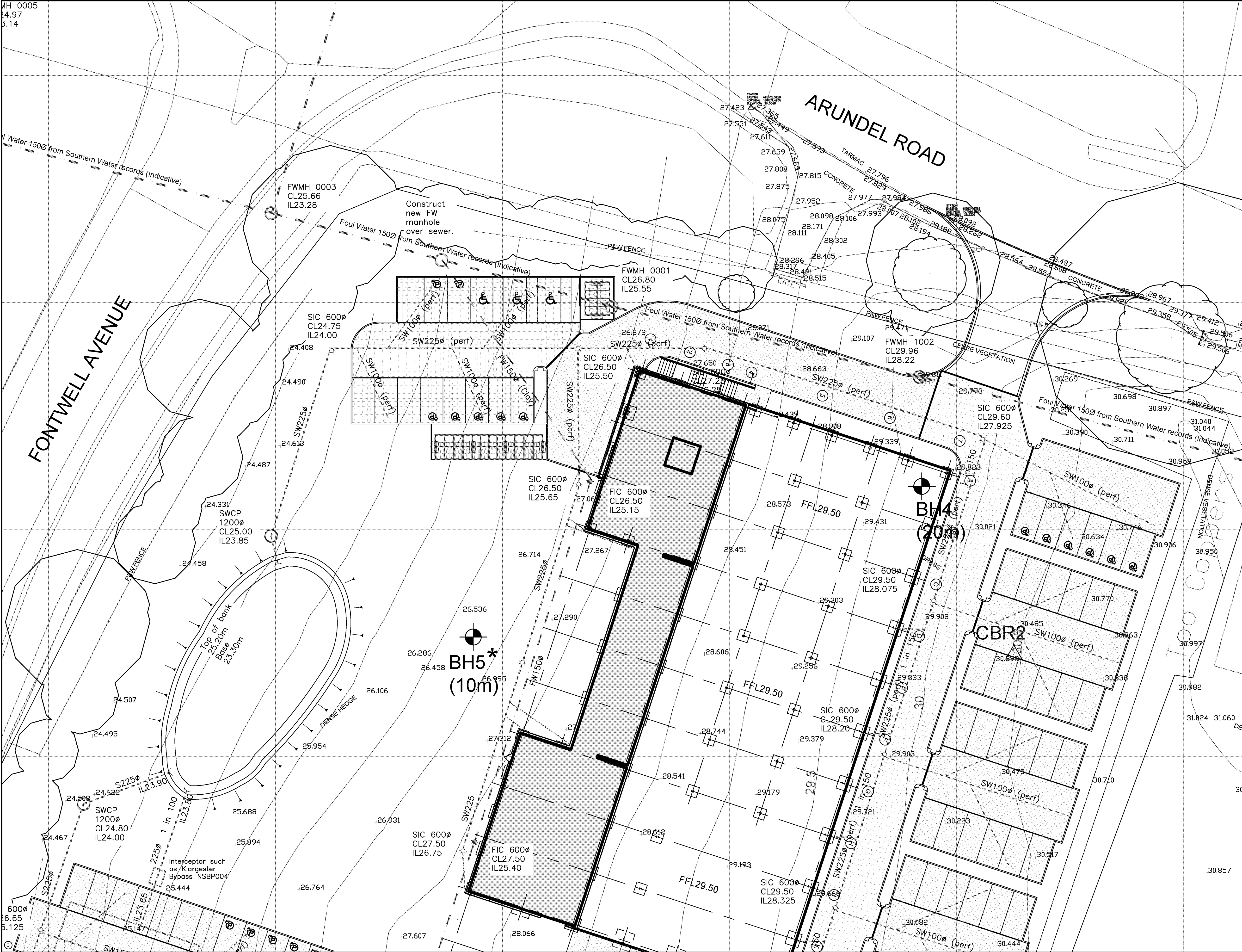
The soakaway and pond/basin half drain time provides a suitable residence time within the pond to allow for removal of any suspended solids not removed within the devices provided upstream, whilst also reducing the risk of base scour. It will also likely be designed to have a permanent shallow pond to support aquatic wildlife, but this element will be more ornamental in nature and is to be confirmed. The Ciria SuDS Manual C753 contains further details of the pond features, as shown in the extracts above. As with any surface water drainage system, to maintain best performance, regular maintenance and cleaning are required. A SUDs maintenance schedule has been prepared for the scheme and is appended to this report.

Foul water will be collected within its own gravity pipe system, which will be connected to the existing Southern Water sewer which crosses the site.

Collecting and discharging the surface water as detailed above is considered to be in accordance with the principals of sustainable urban drainage systems and the Ciria SuDS Manual C753.

Revision B - May 2021

4H 0005
14.97
3.14



Notes

This drawing is to be read in conjunction with all relevant Engineers and Architects drawings and the specification.

Do not scale the drawing.

All dimensions are in millimetres.
All levels are in metres.

All dimensions and levels to be checked on site and the engineer notified immediately of any discrepancies prior to commencement of the works.

All works within adoptable highways and footpaths to be undertaken in accordance with Kent County Council specifications.

All adoptable drainage works to be constructed as detailed in the Water Authorities Association Publication 'Sewers For Adoption 7th Edition' and Southern Water addendums.

All drain and sewer pipes are to be laid soffit to soffit, unless shown otherwise.

Pipework is 100mm Dia. unless noted otherwise.

Manholes are 450mm Dia. unless noted otherwise.

Drainage pipes to be bedded on granular material and backfilled in accordance with drainage details drawing or as advised by the Engineer.

All surface water manholes may be single seal cover and frames.

All manholes to have either SW or FW cast into the cover as appropriate.

Machinery/plant to be suitable for use and not detrimental to adjacent and surrounding structures and features.

Cutting of pavements, kerbs and channels shall be of an approved mechanical means.

All soft spots and voids shall be removed before construction and replaced with suitable fill material.

Where necessary all excavated spoil shall be disposed off-site at an approved tip.

Key :

- | | |
|---|---|
| SW 150dia 1in60 | Surface Water Drain |
| 225mm / 450mm / 600mm Surface Water Polypropylene Inspection Chamber | |
| Surface Water Manhole / Catchpit | |
| RWP | Rainwater Pipe with 100mØ connection pipe |
| RE | Rodding Eye |
| Channel Drain | |
| Surface Water Gully | |
| FW 100dia 1in60 | Foul Water Drain |
| 225mm / 450mm Foul Water Polypropylene Inspection Chamber | |
| SVP | Soil Vent Pipe with 100mØ connection pipe |
| SVP/AAV | Soil Vent Pipe or Air Admittance Valve |
| FG | Floor Gully to accessible shower |
| BN | Bull Nose Kerb |
| HB | Half Battered Kerb |
| 31.65 | Proposed Surface Level |
| 1/20 | Surfacing Gradient |
| Banking | |
| Permeable paving over Type 3 aggregate sub-base. Perforated pipes are to be fitted with filter socks. | |



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Revisions
A. Building and carpark layouts revised, drainage updated to suit.

Checked	Date
DPM	08.03.21

Revisions

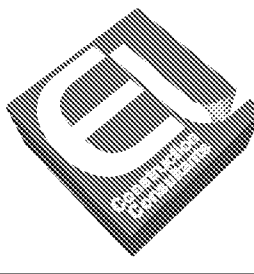
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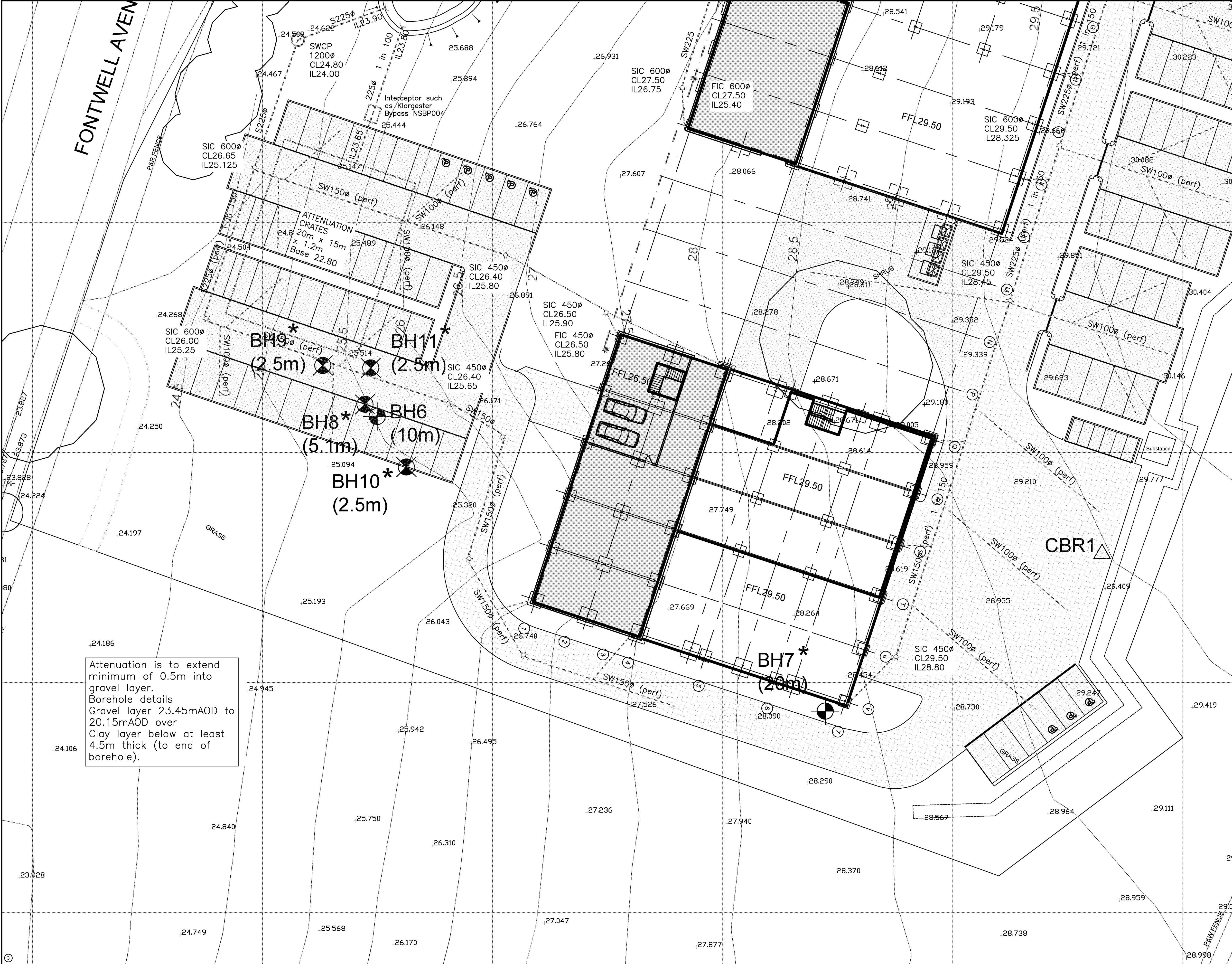
GTR Fontwell
Fontwell Avenue

Drainage Layout

Sheet 1

Scale 1:250 A1	Drawn DPM Date Nov 20 Checked Date Approved Date	Rev. A
Dwg No. 15104/20		





Attenuation is to extend minimum of 0.5m into gravel layer.
Borehole details
Gravel layer 23.45mAOD to 20.15mAOD over Clay layer below at least 4.5m thick (to end of borehole).

- Notes**
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All levels are in metres.
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- Manholes are 450mm Dia. unless noted otherwise.
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Checked	Date
DPM	08.03.21

Revisions

Checked	Date

GTR Fontwell
Fontwell Avenue

Drainage Layout

Sheet 2

Scale 1:250 A1	Drawn DPM Date Nov 20 Checked Date Approved Date
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Dwg No. 15104/21

Rev. A

Evans & Langford		Page 1			
91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C				
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by				
Causeway		Source Control 2017.1.2			
<u>Cascade Summary of Results for 15104 Soakaway cascade Rev C.SRCX</u>					
Upstream Structures		Outflow To Overflow To			
15104 Permeable south cascade Rev C.SRCX		(None)			
15104 Permeable north cascade Rev C.SRCX		(None)			
15104 Permeable top cascade Rev C.SRCX					
Half Drain Time : 809 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	23.528	0.528	4.9	150.6	O K
30 min Summer	23.752	0.752	5.2	214.4	O K
60 min Summer	24.008	1.008	5.4	287.3	O K
120 min Summer	24.549	1.549	5.7	361.8	O K
180 min Summer	24.659	1.659	5.8	408.6	O K
240 min Summer	24.722	1.722	5.9	436.4	O K
360 min Summer	24.797	1.797	6.0	469.7	O K
480 min Summer	24.818	1.818	6.0	479.6	O K
600 min Summer	24.820	1.820	6.0	480.4	O K
720 min Summer	24.817	1.817	6.0	478.8	O K
960 min Summer	24.800	1.800	6.0	471.1	O K
1440 min Summer	24.753	1.753	5.9	450.1	O K
2160 min Summer	24.679	1.679	5.8	417.4	O K
2880 min Summer	24.606	1.606	5.8	385.8	O K
4320 min Summer	24.143	1.143	5.6	325.9	O K
5760 min Summer	23.955	0.955	5.4	272.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
15 min Summer	127.747	0.0	102		
30 min Summer	86.691	0.0	135		
60 min Summer	56.129	0.0	164		
120 min Summer	35.009	0.0	204		
180 min Summer	26.112	0.0	242		
240 min Summer	21.070	0.0	278		
360 min Summer	15.587	0.0	366		
480 min Summer	12.563	0.0	484		
600 min Summer	10.618	0.0	590		
720 min Summer	9.248	0.0	644		
960 min Summer	7.430	0.0	764		
1440 min Summer	5.446	0.0	1026		
2160 min Summer	3.982	0.0	1432		
2880 min Summer	3.185	0.0	1848		
4320 min Summer	2.319	0.0	2644		
5760 min Summer	1.852	0.0	3456		
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91 King Street Maidstone Kent ME14 1BQ			GTR Fontwell Soakaway Rev C			
Date 08/03/2021 File 15104 Drainage system c...			Designed by DPM Checked by			
Causeway			Source Control 2017.1.2			
<u>Cascade Summary of Results for 15104 Soakaway cascade Rev C.SRCX</u>						
	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
	7200 min Summer	23.791	0.791	5.2	225.3	O K
	8640 min Summer	23.646	0.646	5.1	184.1	O K
	10080 min Summer	23.521	0.521	4.9	148.5	O K
	15 min Winter	23.609	0.609	5.0	173.4	O K
	30 min Winter	23.858	0.858	5.3	244.4	O K
	60 min Winter	24.139	1.139	5.6	324.5	O K
	120 min Winter	24.664	1.664	5.8	411.0	O K
	180 min Winter	24.781	1.781	6.0	462.8	O K
	240 min Winter	24.854	1.854	6.1	496.2	O K
	360 min Winter	24.948	1.948	6.2	540.6	O K
	480 min Winter	24.977	1.977	6.2	554.5	O K
	600 min Winter	24.990	1.990	6.2	560.6	O K
	720 min Winter	24.988	1.988	6.2	559.6	O K
	960 min Winter	24.966	1.966	6.2	549.2	O K
	1440 min Winter	24.911	1.911	6.1	522.9	O K
	2160 min Winter	24.812	1.812	6.0	476.7	O K
	2880 min Winter	24.705	1.705	5.9	428.8	O K
	4320 min Winter	24.186	1.186	5.6	338.0	O K
	5760 min Winter	23.909	0.909	5.3	259.1	O K
	7200 min Winter	23.674	0.674	5.1	192.1	O K
	8640 min Winter	23.475	0.475	4.9	135.3	O K
	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
	7200 min Summer	1.556	0.0	4184		
	8640 min Summer	1.350	0.0	4928		
	10080 min Summer	1.198	0.0	5648		
	15 min Winter	127.747	0.0	113		
	30 min Winter	86.691	0.0	144		
	60 min Winter	56.129	0.0	174		
	120 min Winter	35.009	0.0	216		
	180 min Winter	26.112	0.0	250		
	240 min Winter	21.070	0.0	284		
	360 min Winter	15.587	0.0	360		
	480 min Winter	12.563	0.0	470		
	600 min Winter	10.618	0.0	582		
	720 min Winter	9.248	0.0	690		
	960 min Winter	7.430	0.0	880		
	1440 min Winter	5.446	0.0	1100		
	2160 min Winter	3.982	0.0	1560		
	2880 min Winter	3.185	0.0	1996		
	4320 min Winter	2.319	0.0	2856		
	5760 min Winter	1.852	0.0	3640		
	7200 min Winter	1.556	0.0	4400		
	8640 min Winter	1.350	0.0	5104		
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C																					
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by																					
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<u>Cascade Summary of Results for 15104 Soakaway cascade Rev C.SRCX</u> <table border="0"> <thead> <tr> <th>Storm Event</th> <th>Max Level (m)</th> <th>Max Depth (m)</th> <th>Max Infiltration (l/s)</th> <th>Max Volume (m³)</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>10080 min Winter</td> <td>23.310</td> <td>0.310</td> <td>4.7</td> <td>88.4</td> <td>O K</td> </tr> </tbody> </table> <table border="0"> <thead> <tr> <th>Storm Event</th> <th>Rain (mm/hr)</th> <th>Flooded Volume (m³)</th> <th>Time-Peak (mins)</th> </tr> </thead> <tbody> <tr> <td>10080 min Winter</td> <td>1.198</td> <td>0.0</td> <td>5840</td> </tr> </tbody> </table>			Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	10080 min Winter	23.310	0.310	4.7	88.4	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	10080 min Winter	1.198	0.0	5840
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<u>Cascade Rainfall Details for 15104 Soakaway cascade Rev C.SRCX</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.800</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.330</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.010 <table> <thead> <tr> <th align="left" colspan="3">Time (mins) Area</th> <th align="left" colspan="3">Time (mins) Area</th> </tr> <tr> <th align="left">From:</th> <th align="left">To:</th> <th align="left">(ha)</th> <th align="left">From:</th> <th align="left">To:</th> <th align="left">(ha)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4</td> <td>0.000</td> <td>4</td> <td>8</td> <td>0.010</td> </tr> </tbody> </table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	19.800	Shortest Storm (mins)	15	Ratio R	0.330	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+40	Time (mins) Area			Time (mins) Area			From:	To:	(ha)	From:	To:	(ha)	0	4	0.000	4	8	0.010
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Causeway Source Control 2017.1.2		

Cascade Model Details for 15104 Soakaway cascade Rev C.SRCX

Storage is Online Cover Level (m) 25.000

Cellular Storage Structure

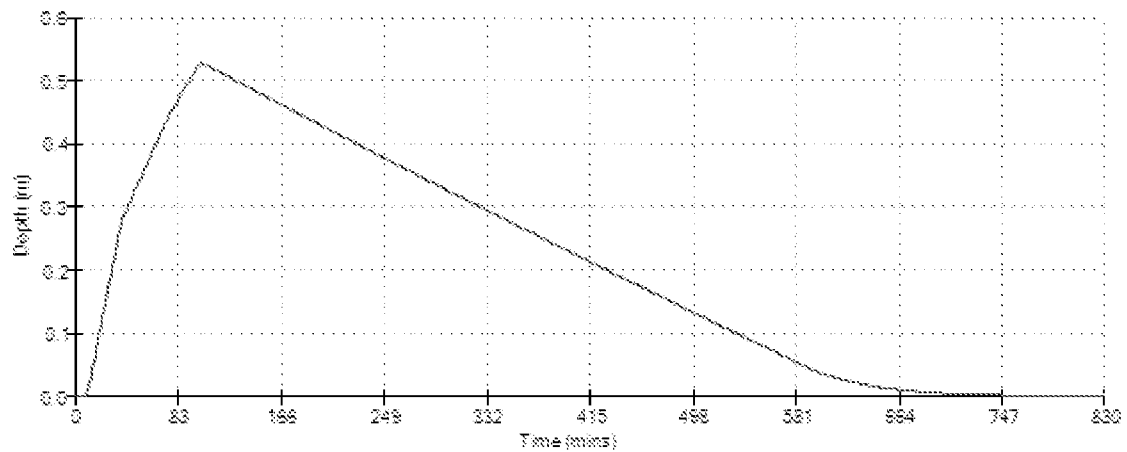
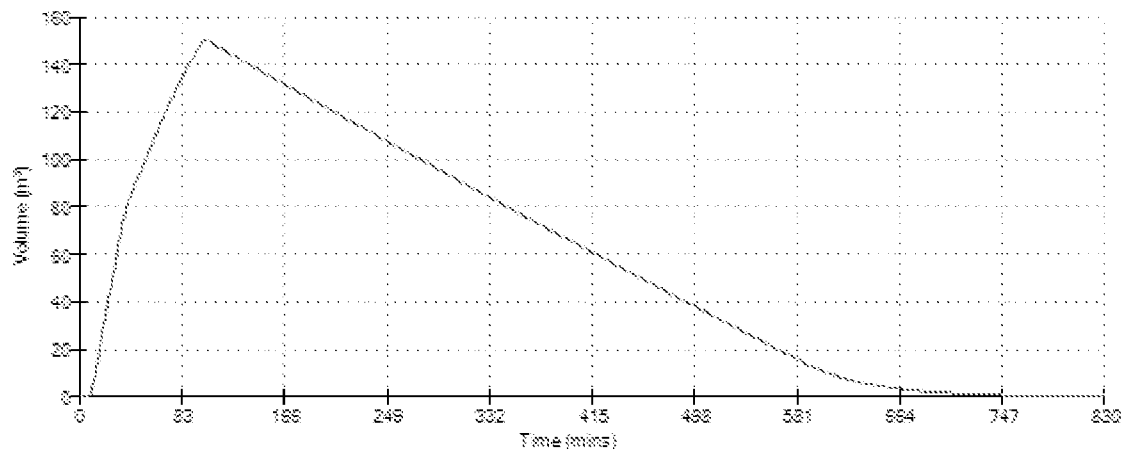
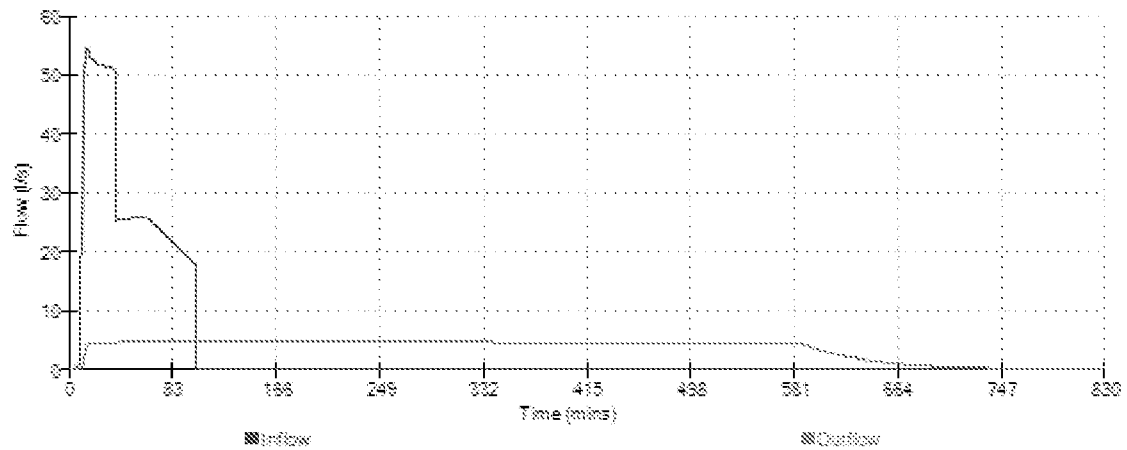
Invert Level (m) 23.000 Safety Factor 1.5
Infiltration Coefficient Base (m/hr) 0.07920 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.07920

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	300.0	300.0	1.500	0.0	383.2
1.200	300.0	383.1	1.501	429.0	383.2
1.201	0.0	383.2	2.000	515.0	426.5

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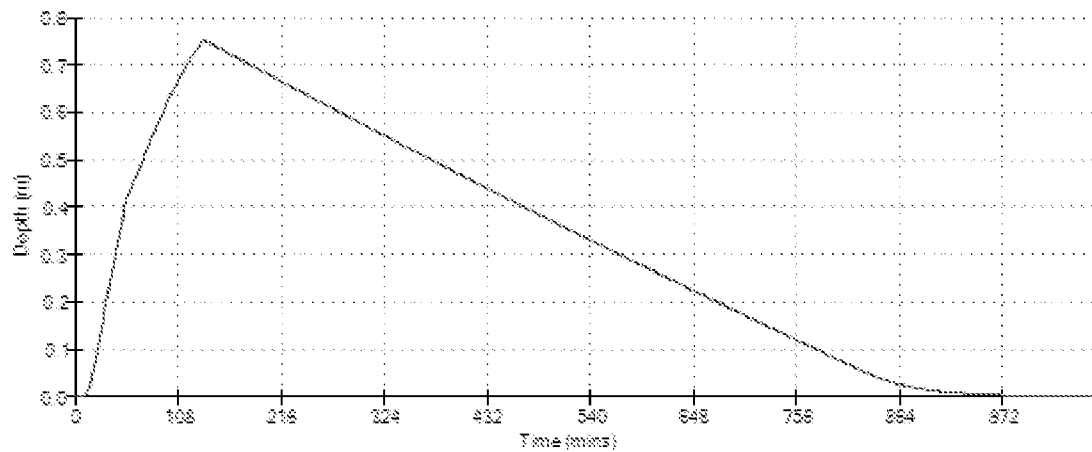
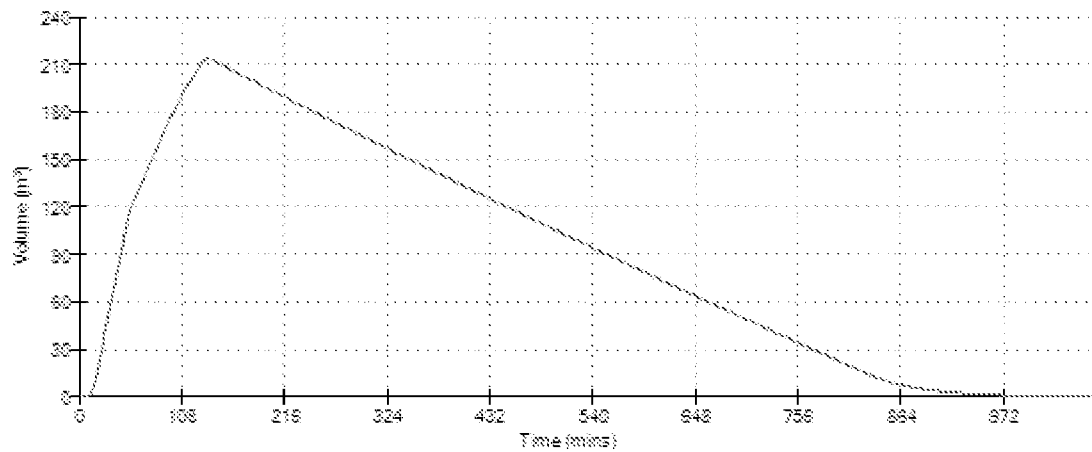
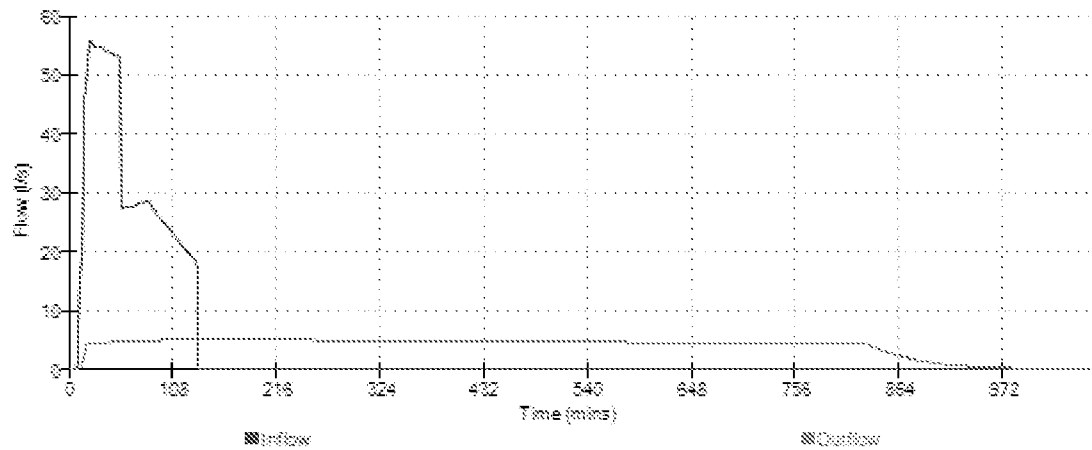
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Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 15 min Summer for 15104 Soakaway cascade Rev C.SRCX



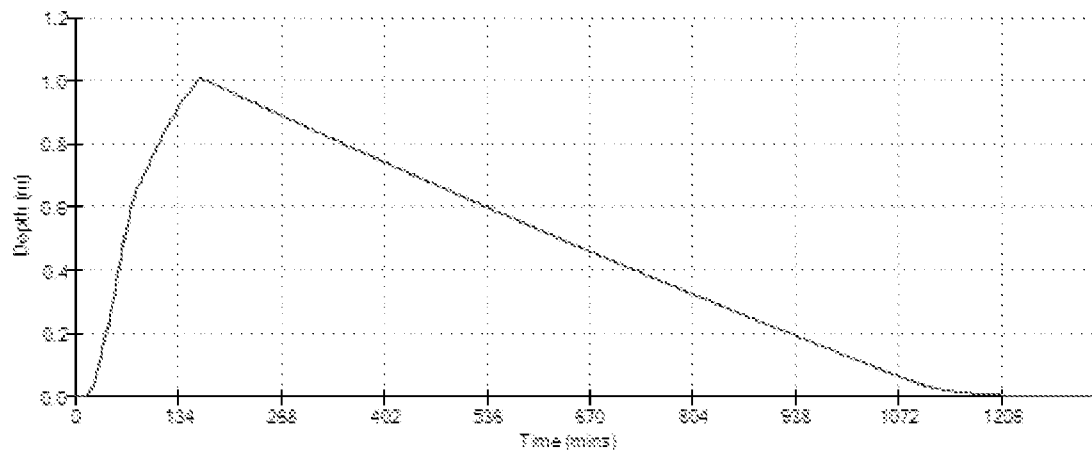
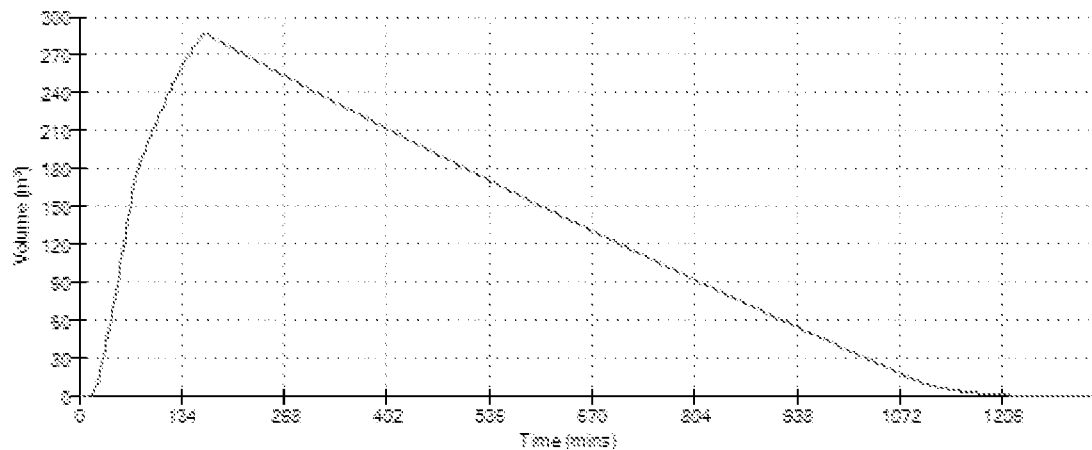
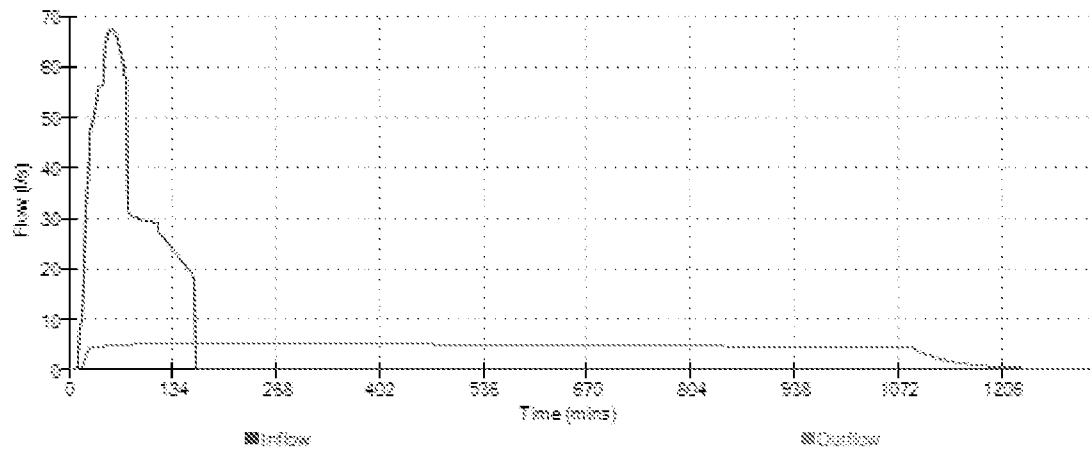
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 30 min Summer for 15104 Soakaway cascade Rev C.SRCX



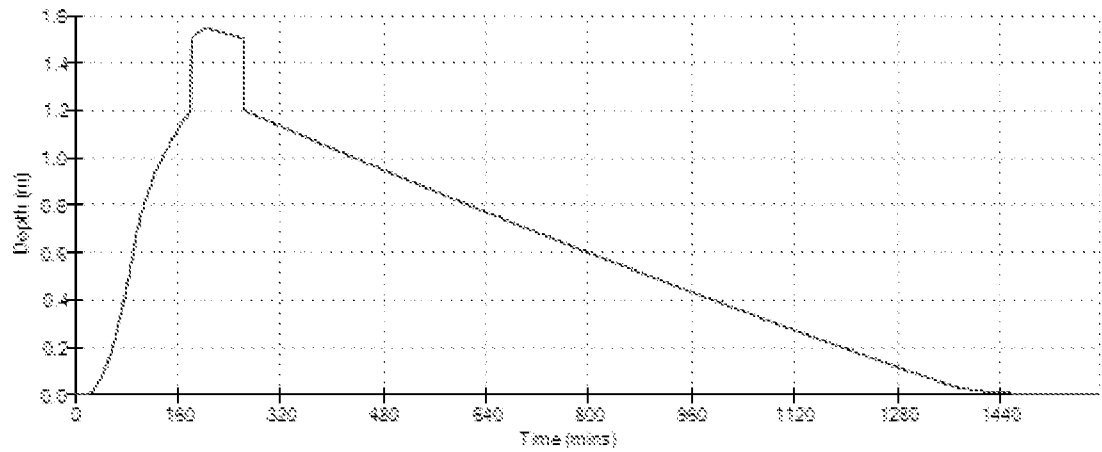
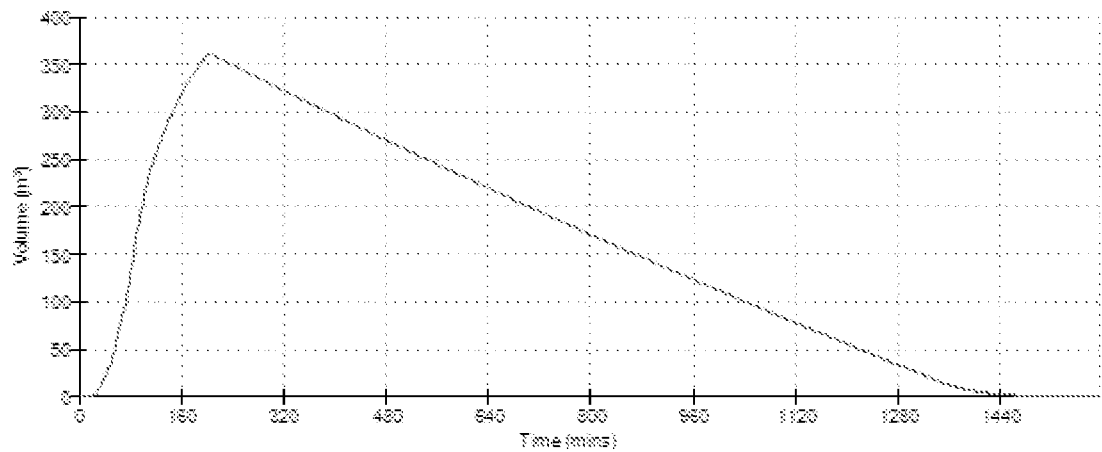
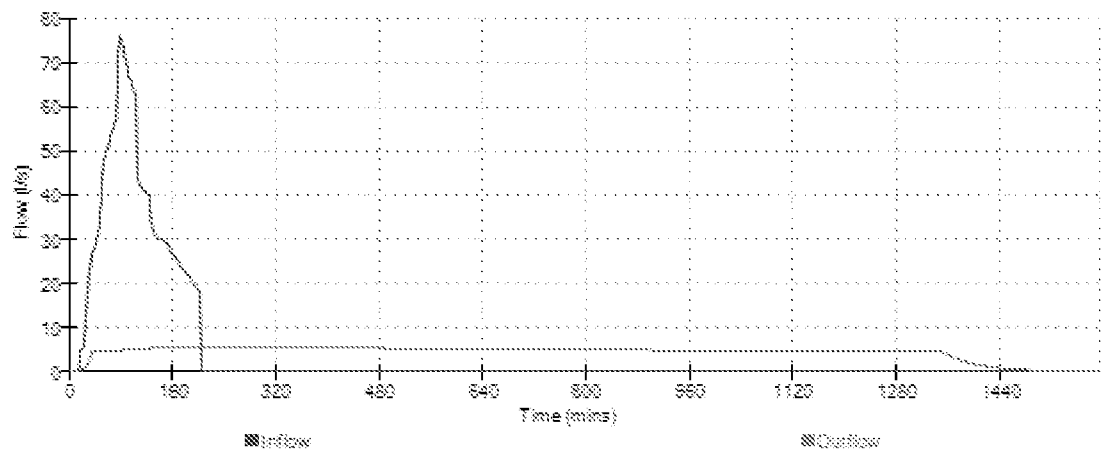
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway		Source Control 2017.1.2

Cascade Event: 60 min Summer for 15104 Soakaway cascade Rev C.SRCX



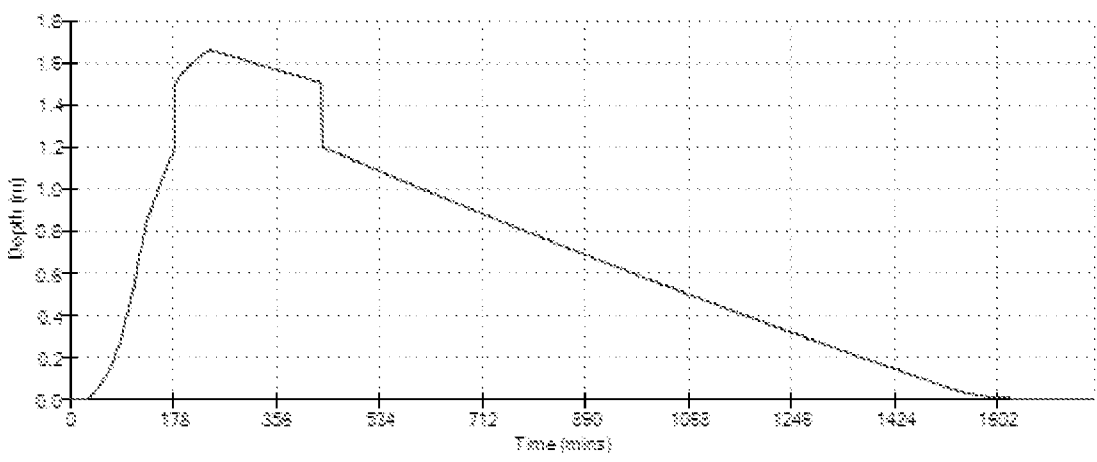
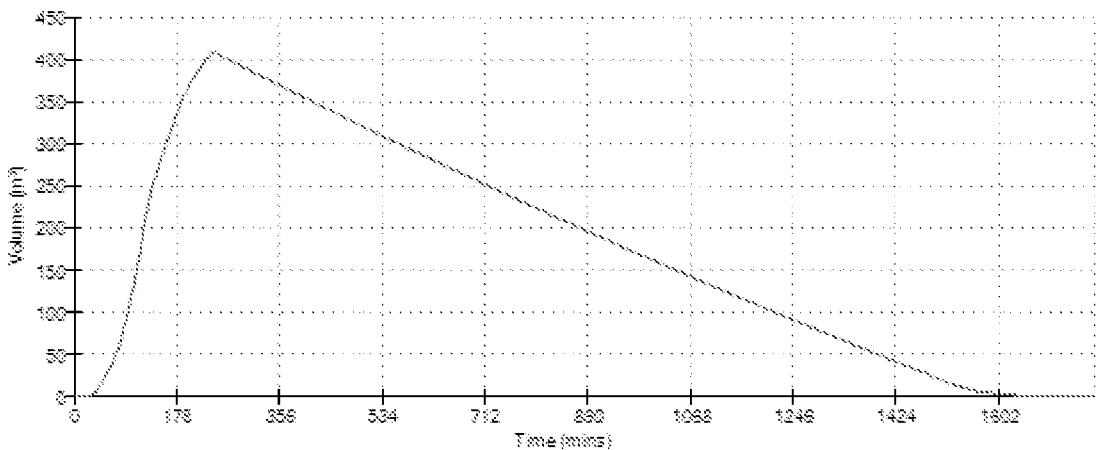
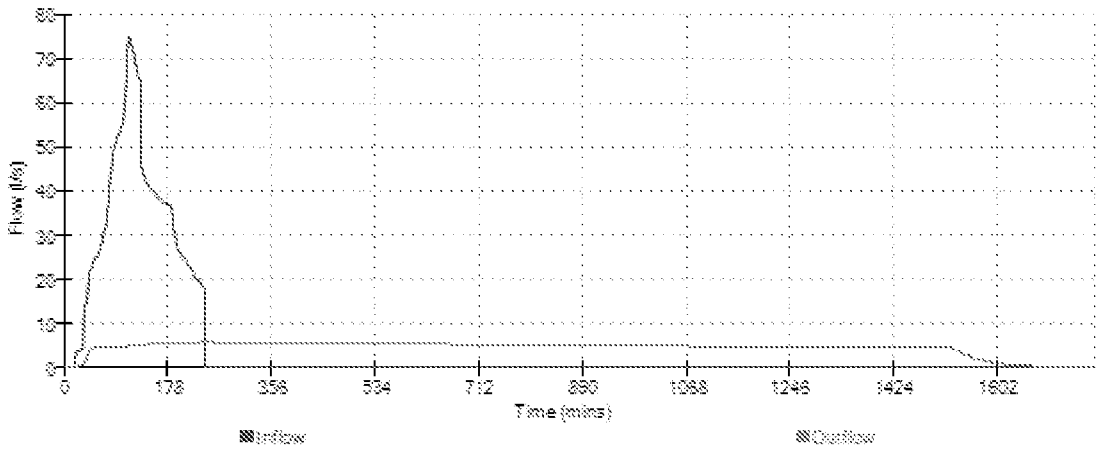
Evans & Langford		Page 9
91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 120 min Summer for 15104 Soakaway cascade Rev C.SRCX



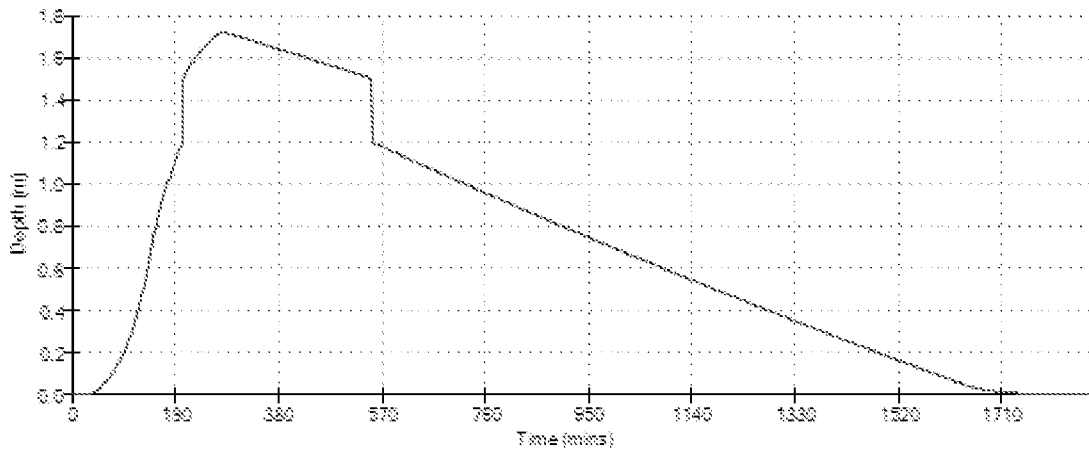
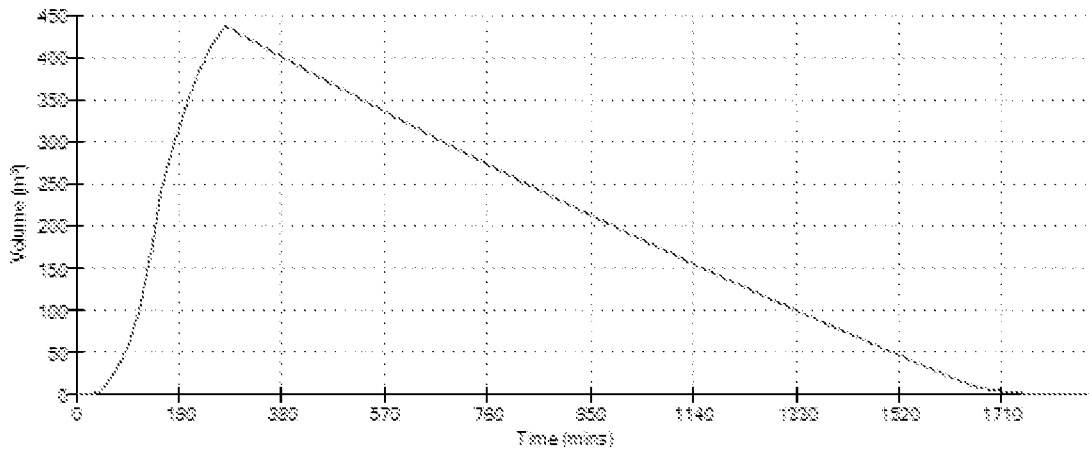
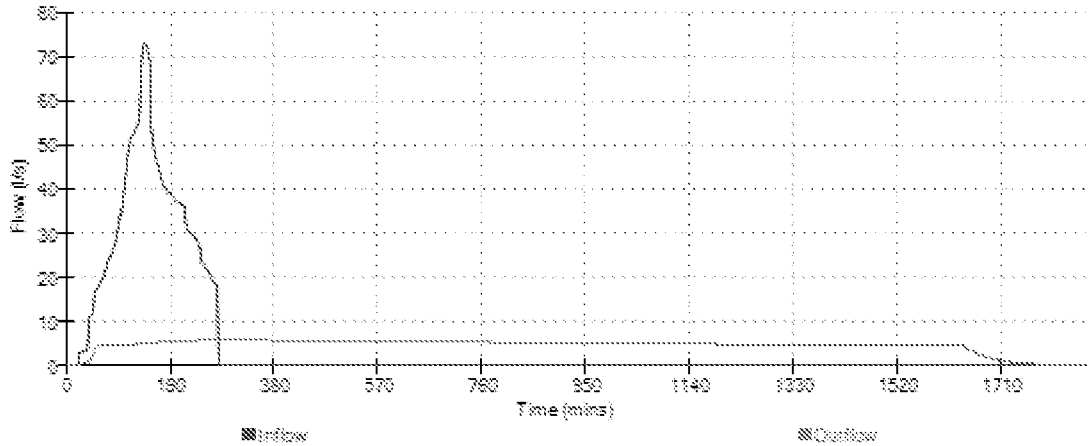
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway		Source Control 2017.1.2

Cascade Event: 180 min Summer for 15104 Soakaway cascade Rev C.SRCX



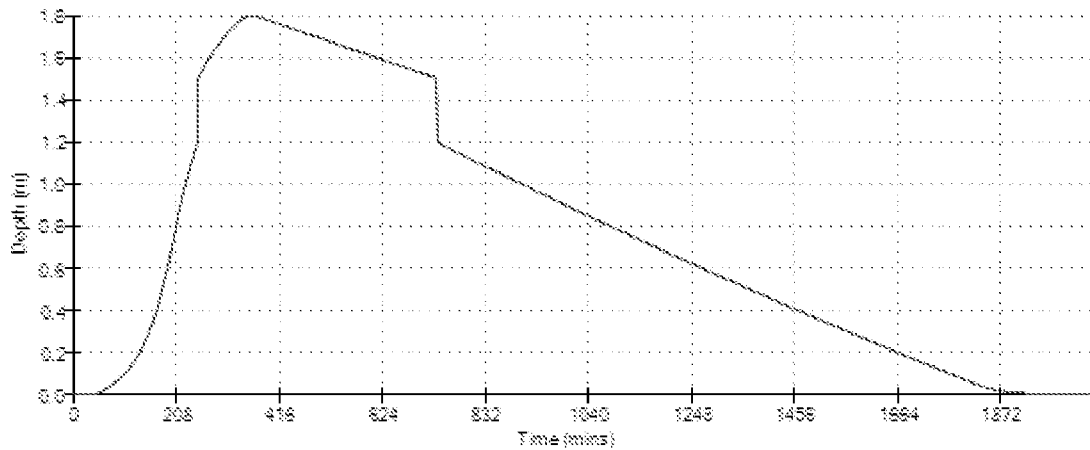
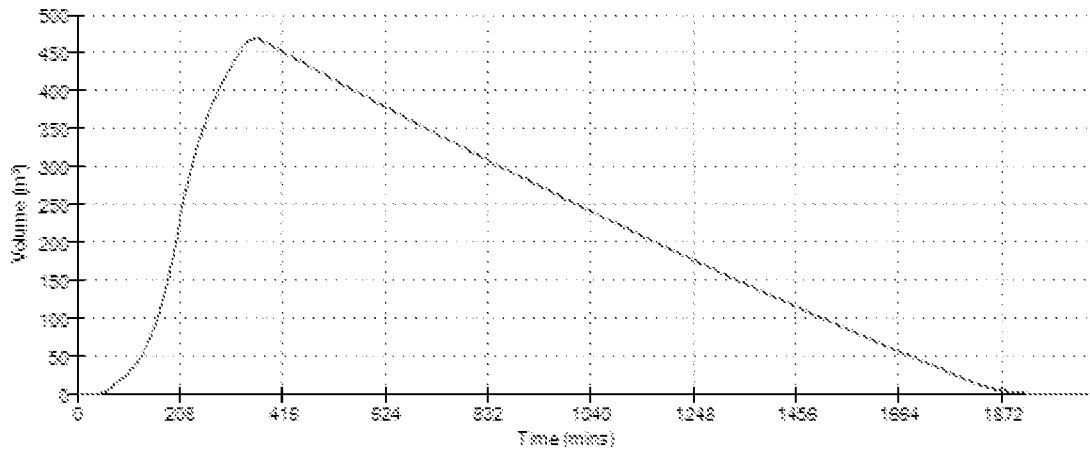
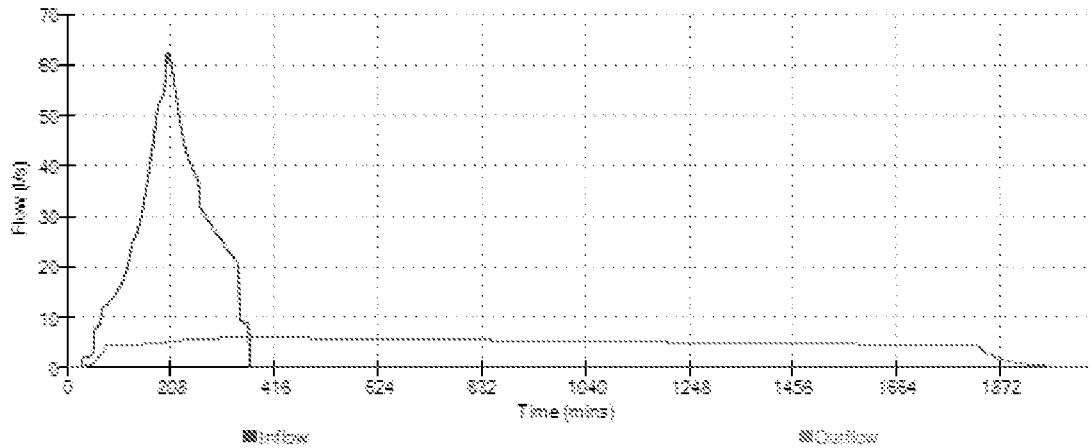
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 240 min Summer for 15104 Soakaway cascade Rev C.SRCX



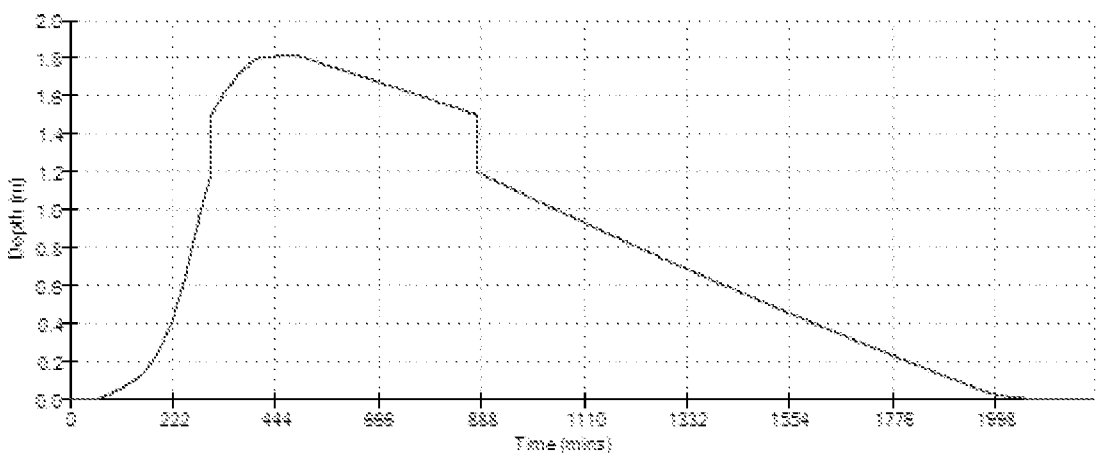
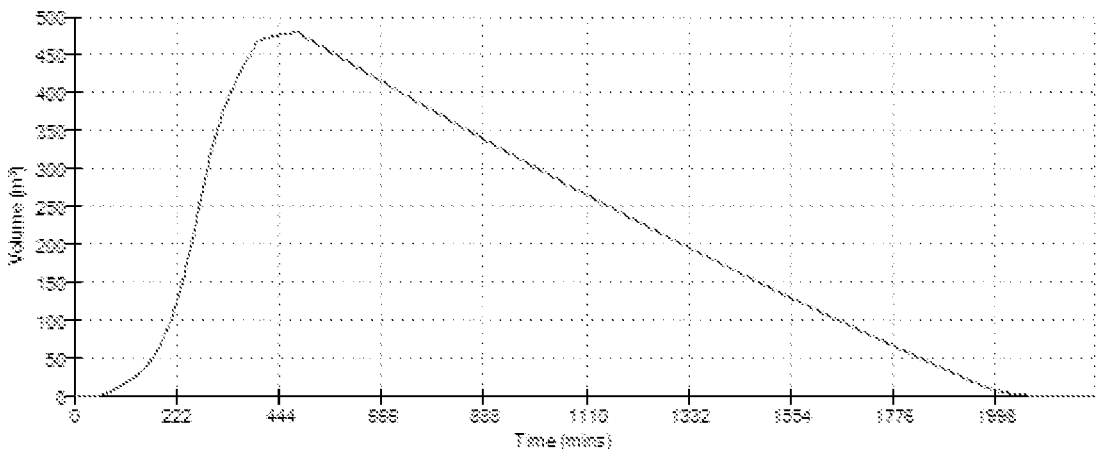
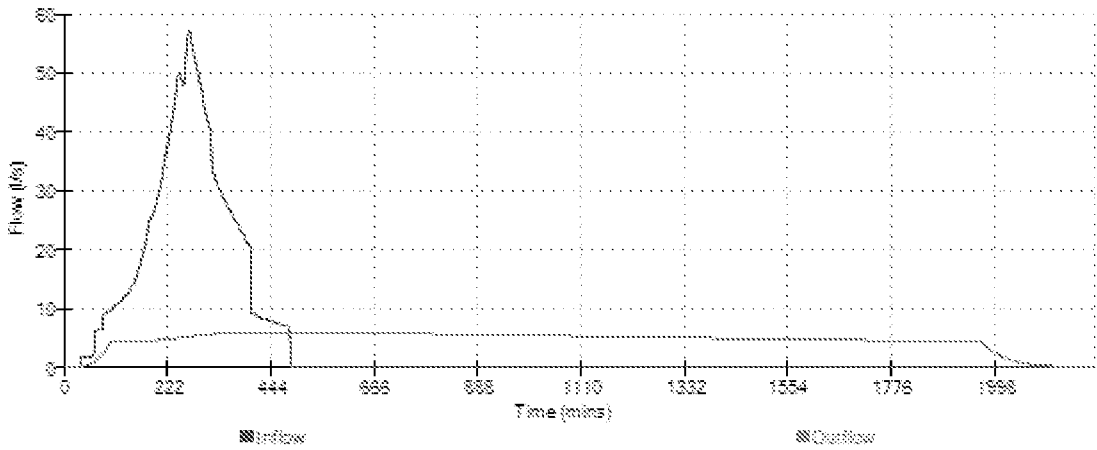
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway		Source Control 2017.1.2

Cascade Event: 360 min Summer for 15104 Soakaway cascade Rev C.SRCX



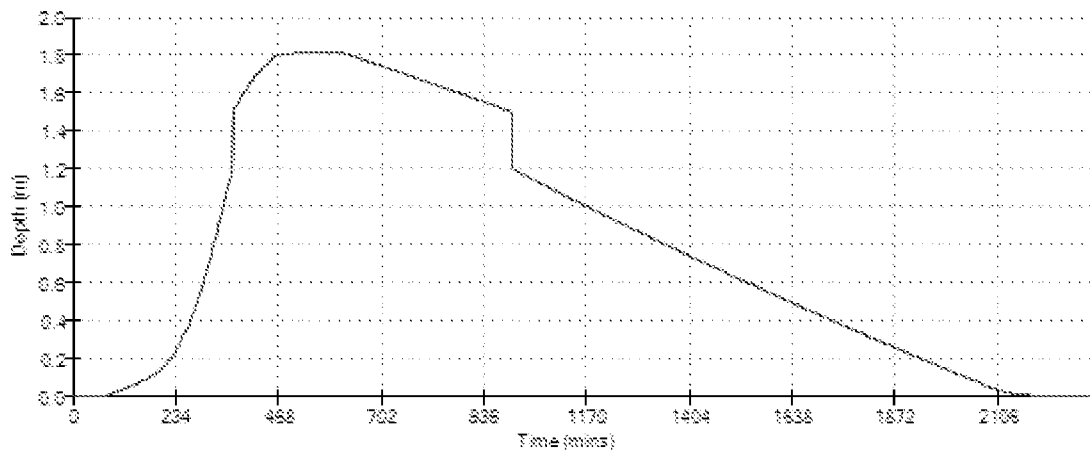
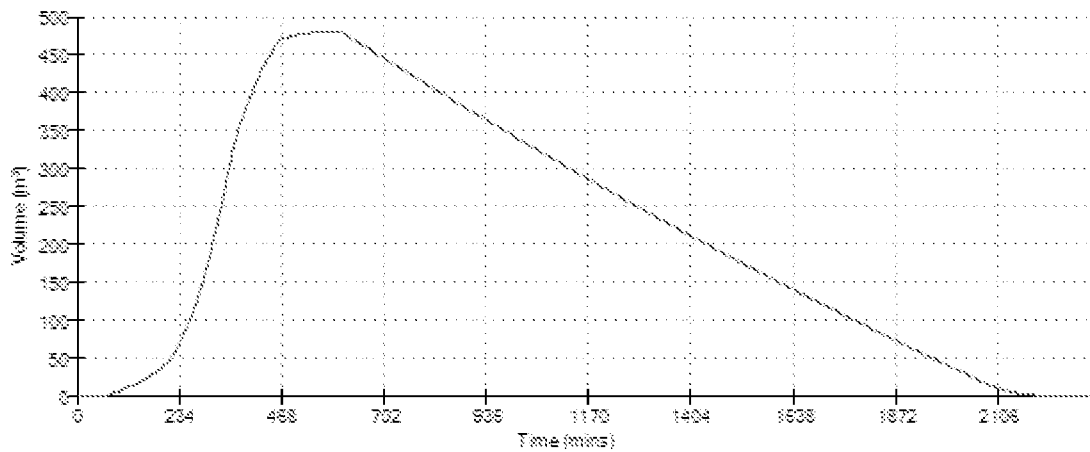
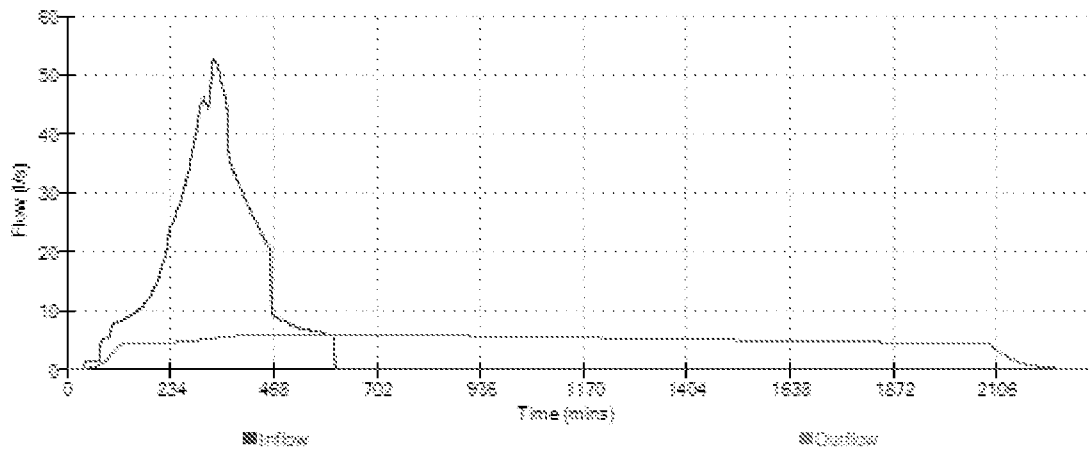
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 480 min Summer for 15104 Soakaway cascade Rev C.SRCX



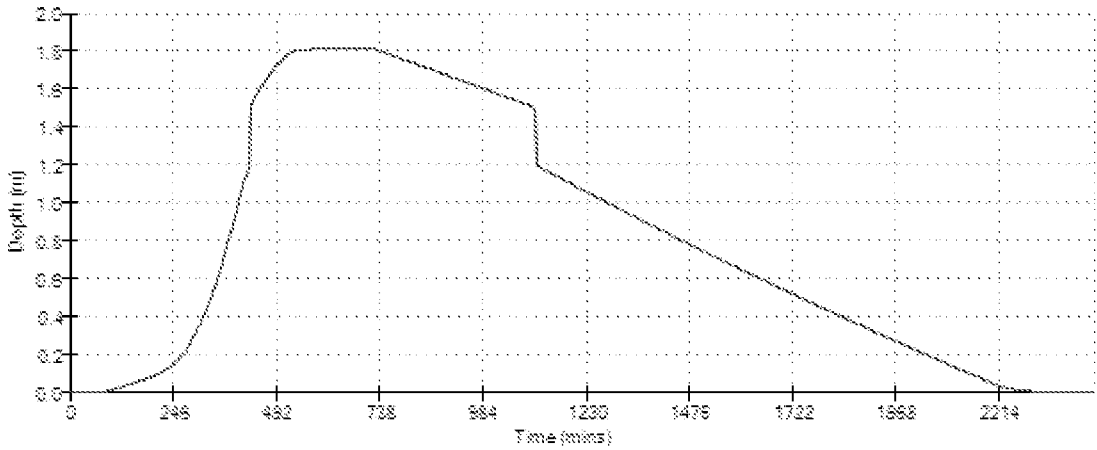
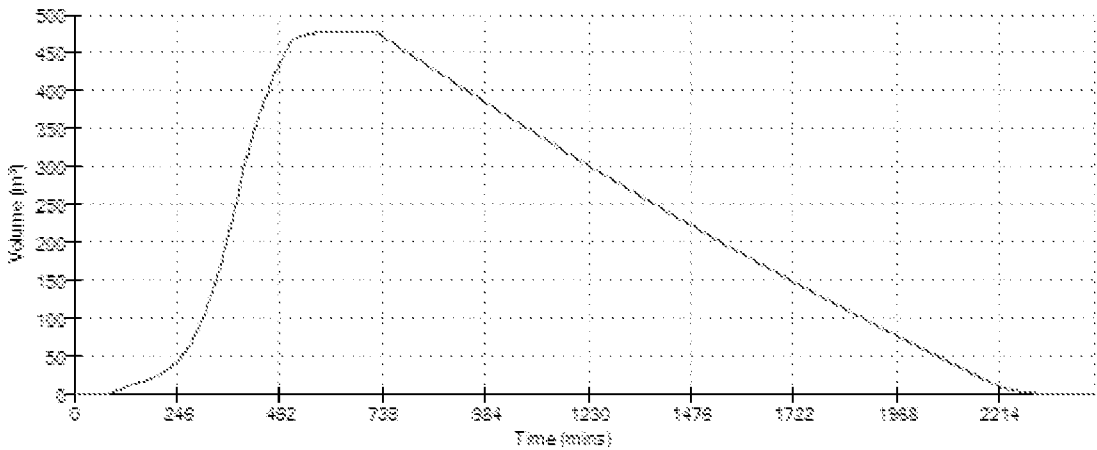
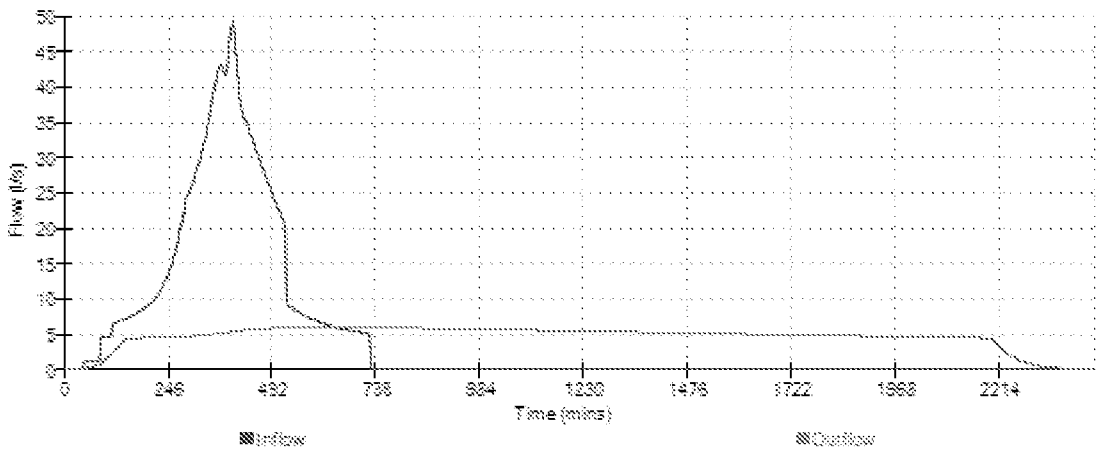
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway		Source Control 2017.1.2

Cascade Event: 600 min Summer for 15104 Soakaway cascade Rev C.SRCX



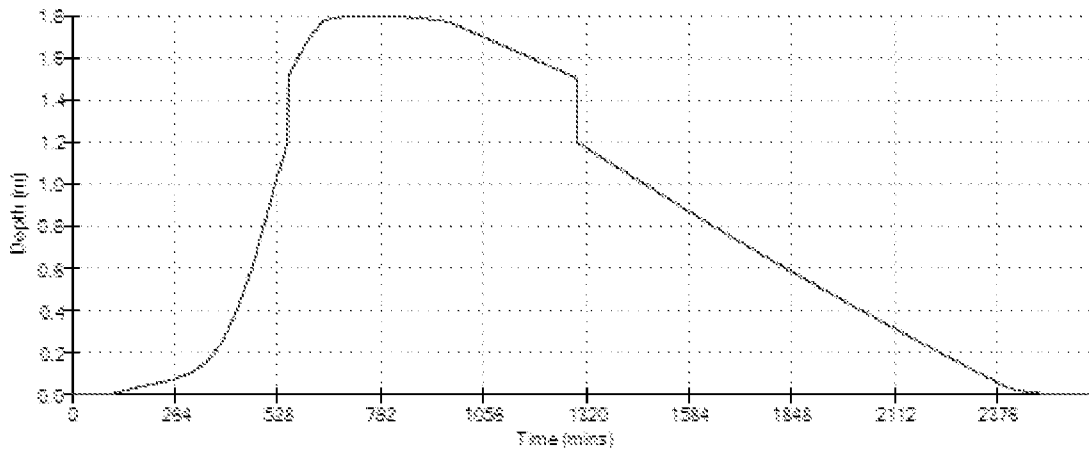
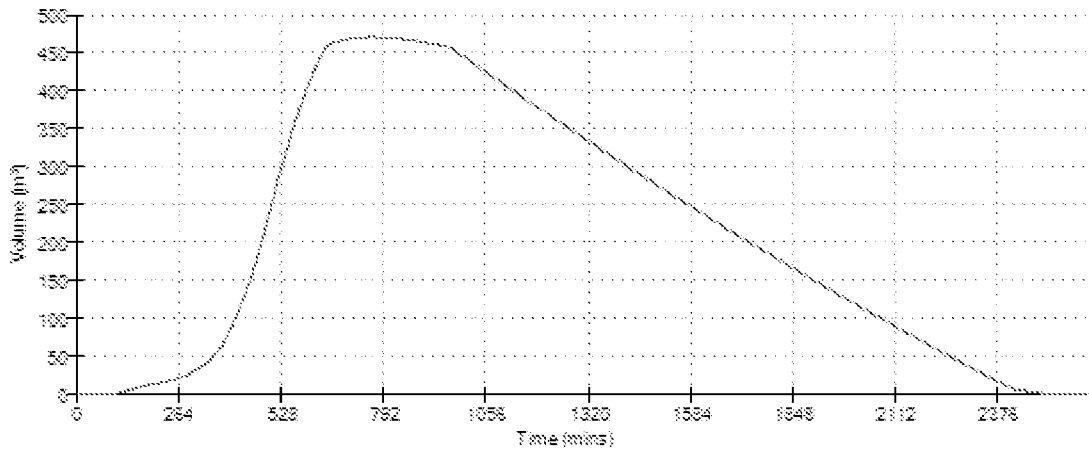
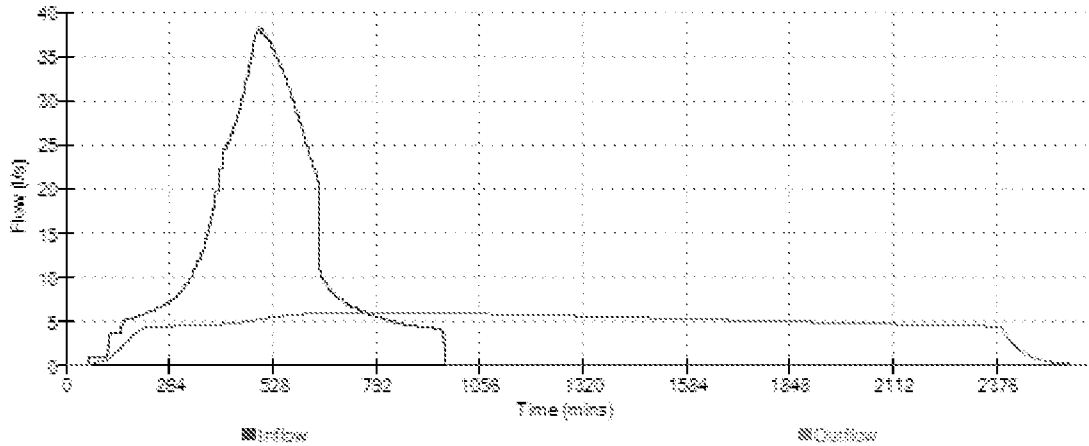
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway		Source Control 2017.1.2

Cascade Event: 720 min Summer for 15104 Soakaway cascade Rev C.SRCX



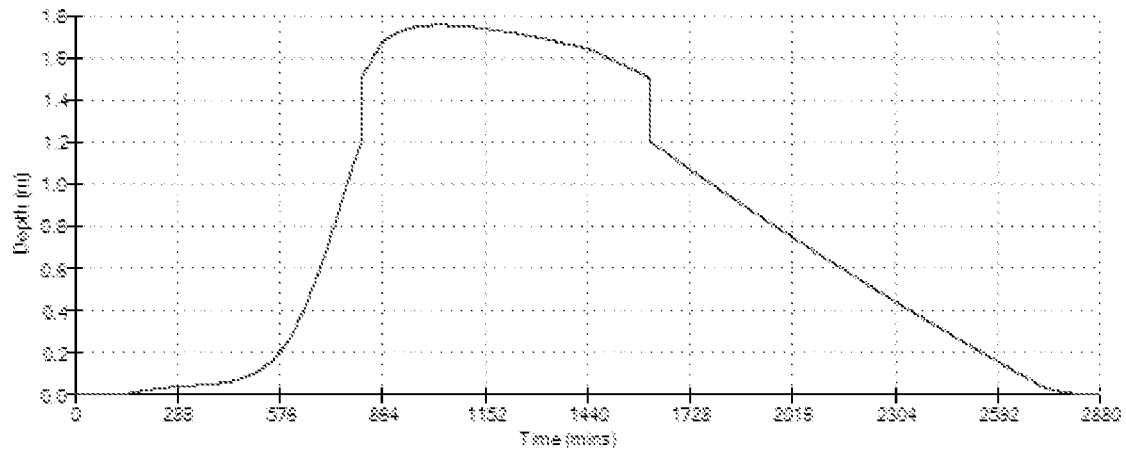
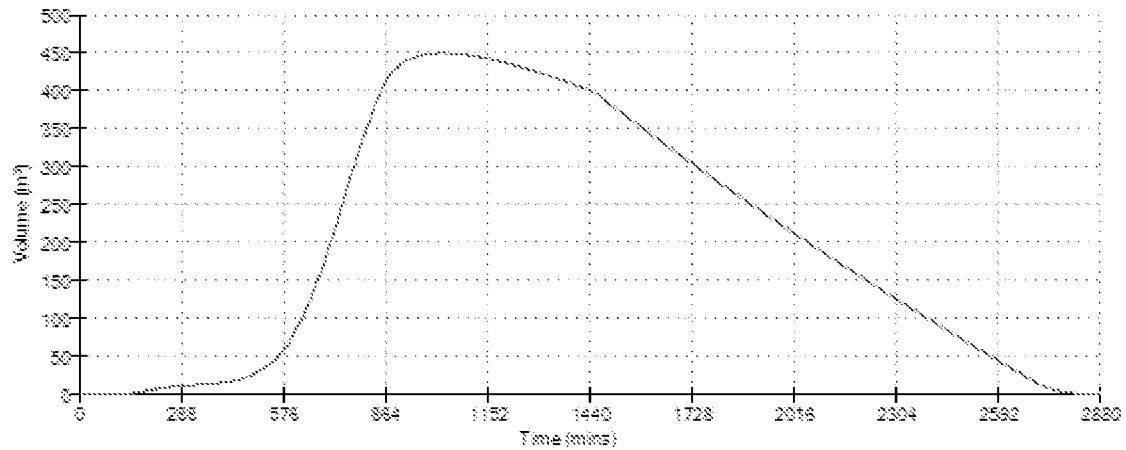
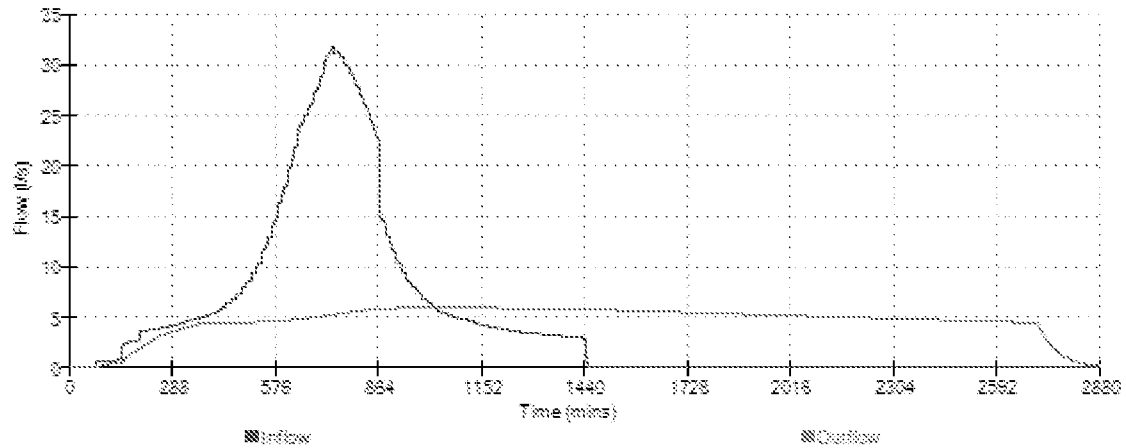
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 960 min Summer for 15104 Soakaway cascade Rev C.SRCX



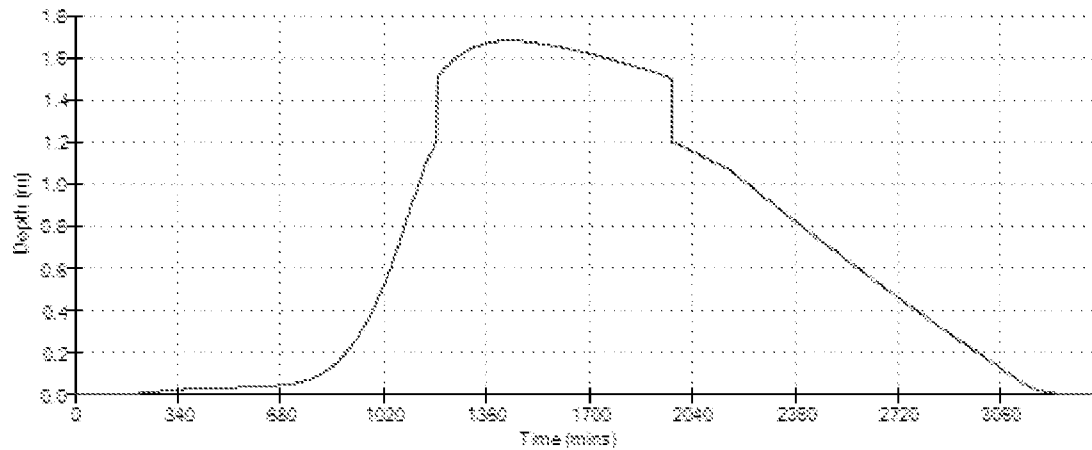
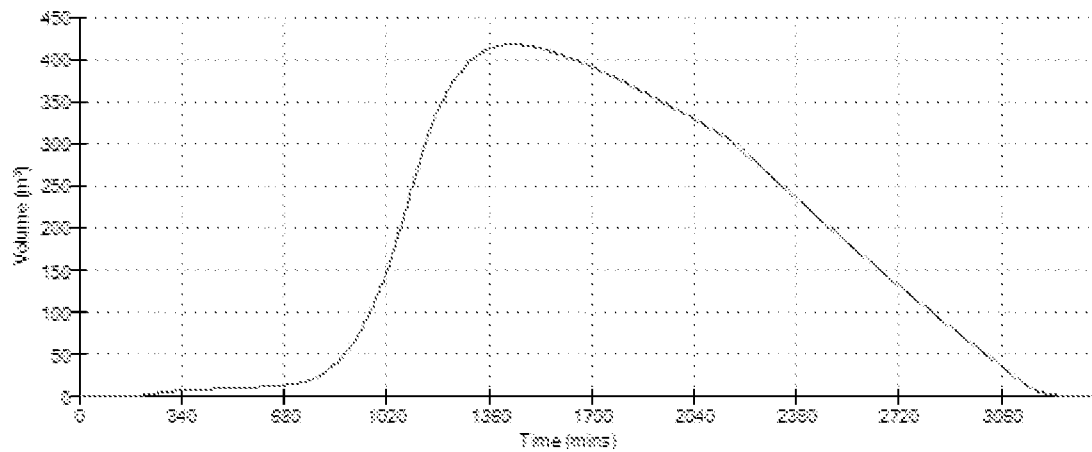
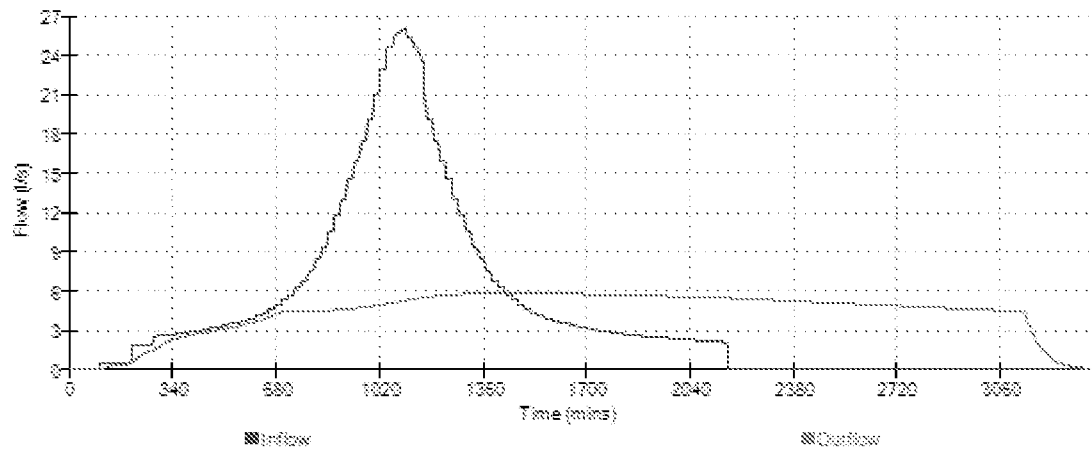
Evans & Langford		Page 17
91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 1440 min Summer for 15104 Soakaway cascade Rev C.SRCX



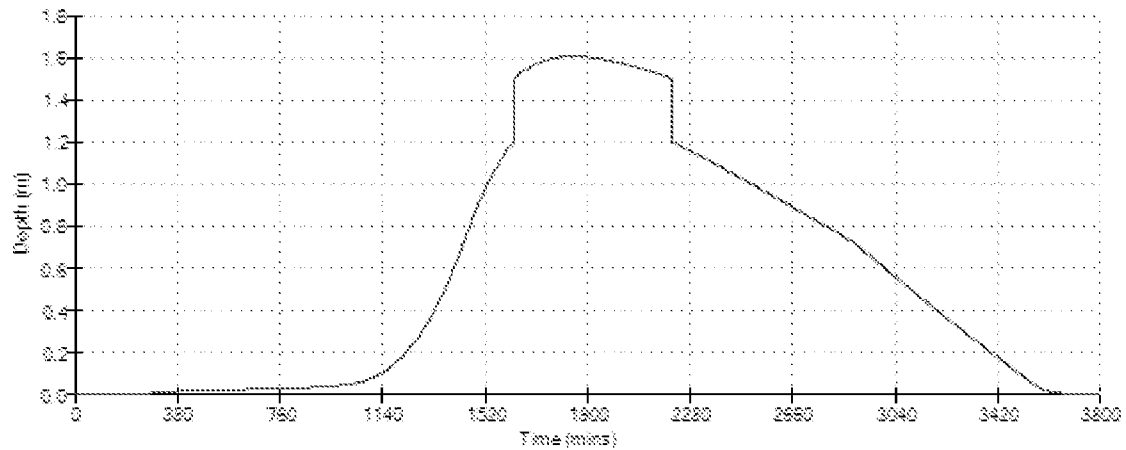
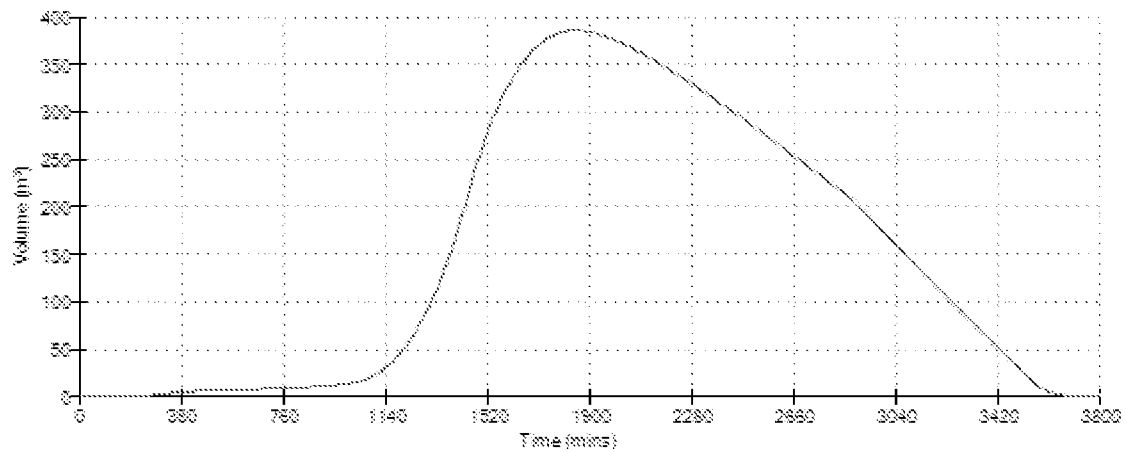
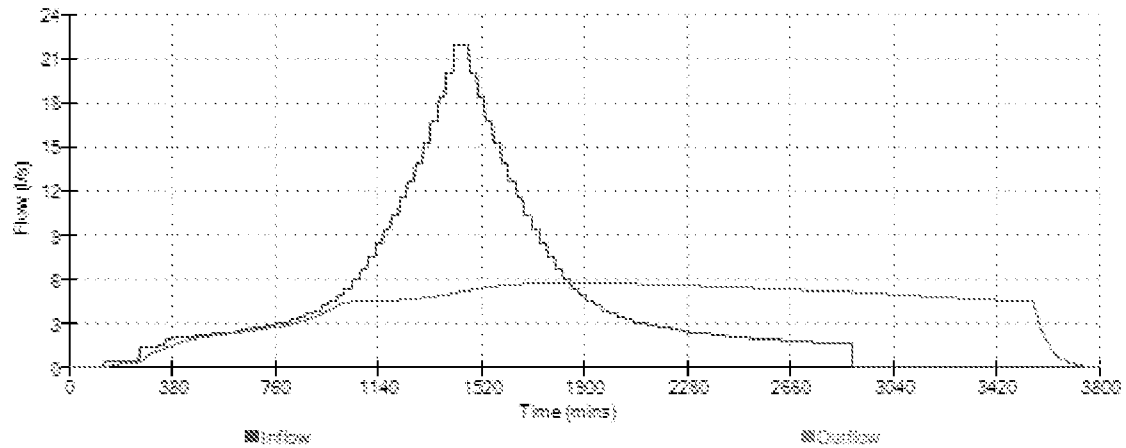
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 2160 min Summer for 15104 Soakaway cascade Rev C.SRCX



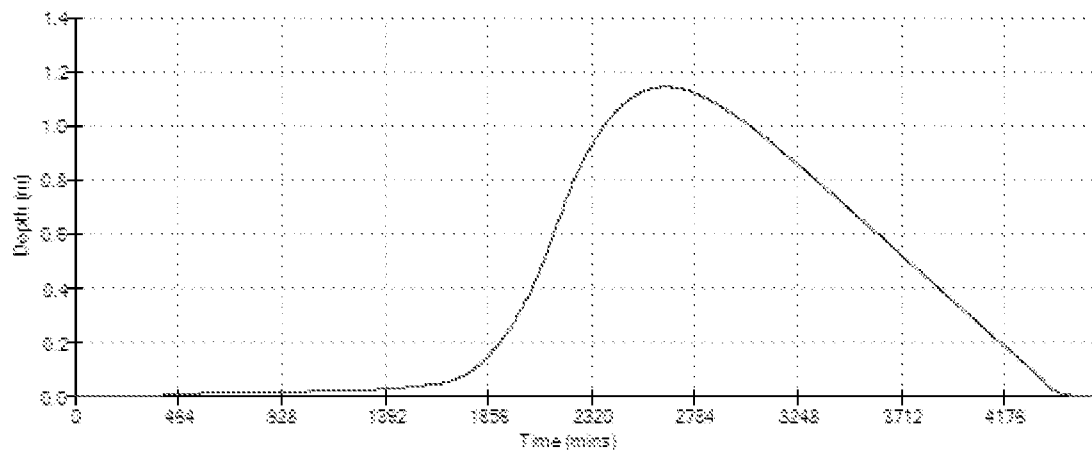
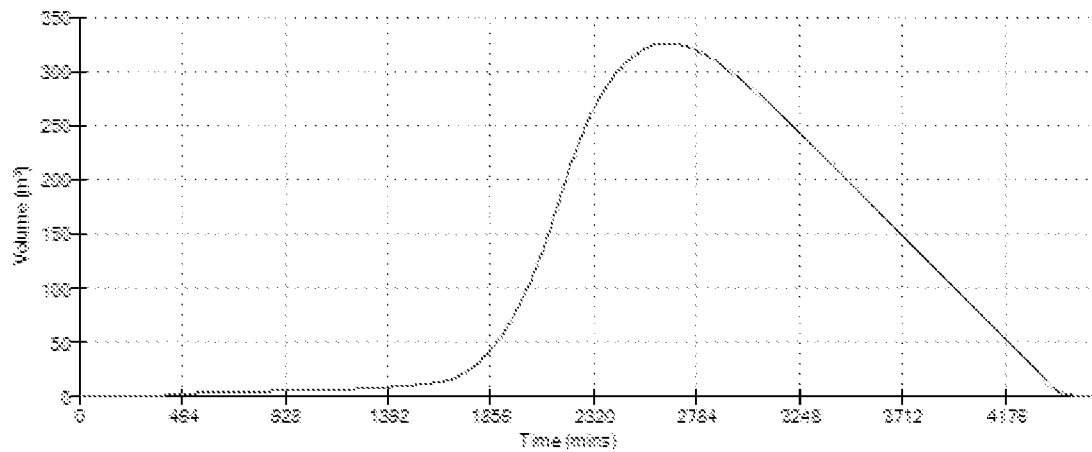
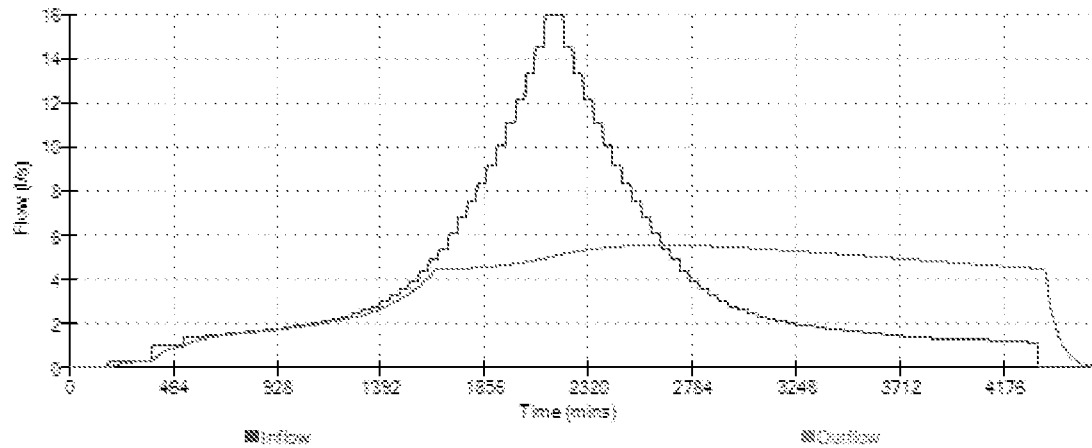
Evans & Langford		Page 19
91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 2880 min Summer for 15104 Soakaway cascade Rev C.SRCX



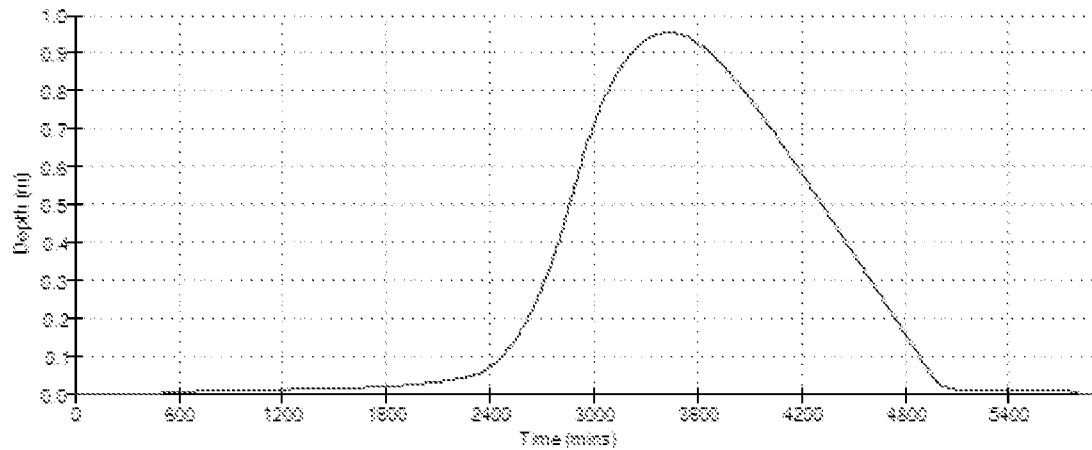
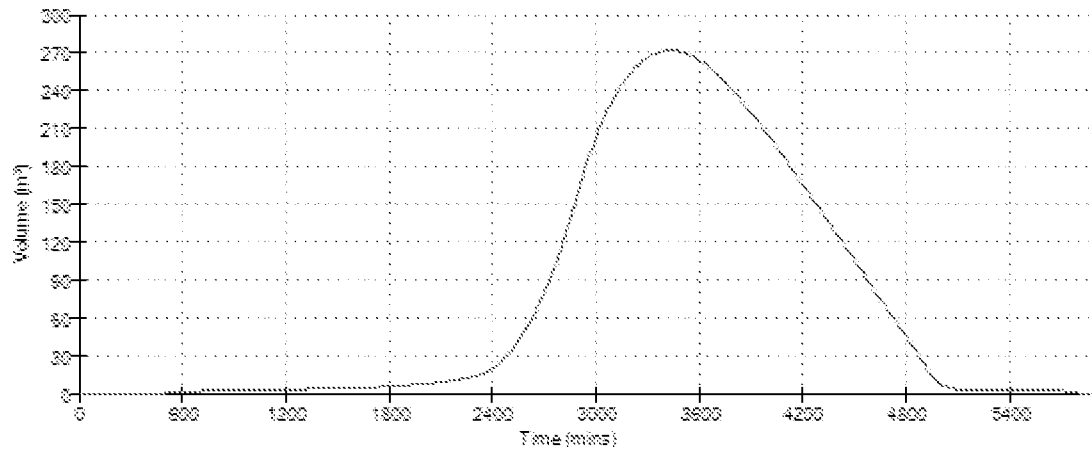
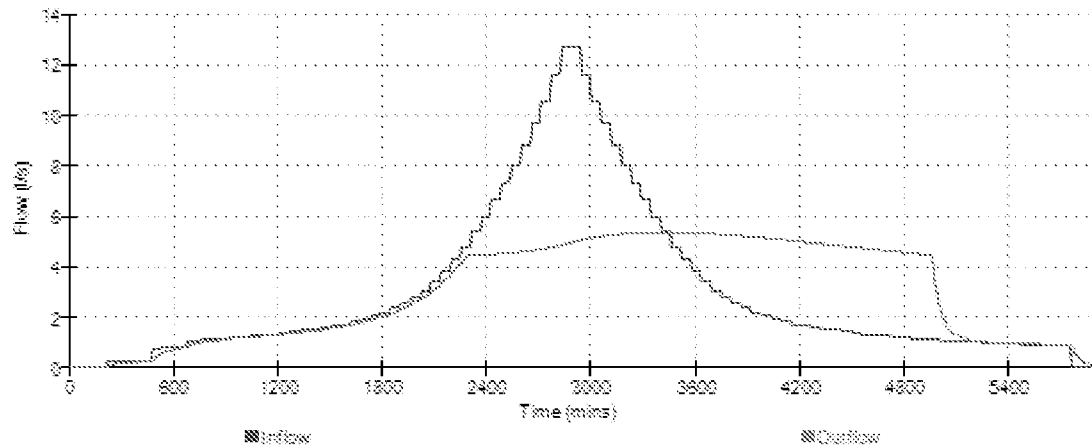
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91 King Street	GTR Fontwell	
Maidstone	Soakaway	
Kent ME14 1BQ	Rev C	
Date 08/03/2021	Designed by DPM	
File 15104 Drainage system c...	Checked by	
Causeway	Source Control 2017.1.2	

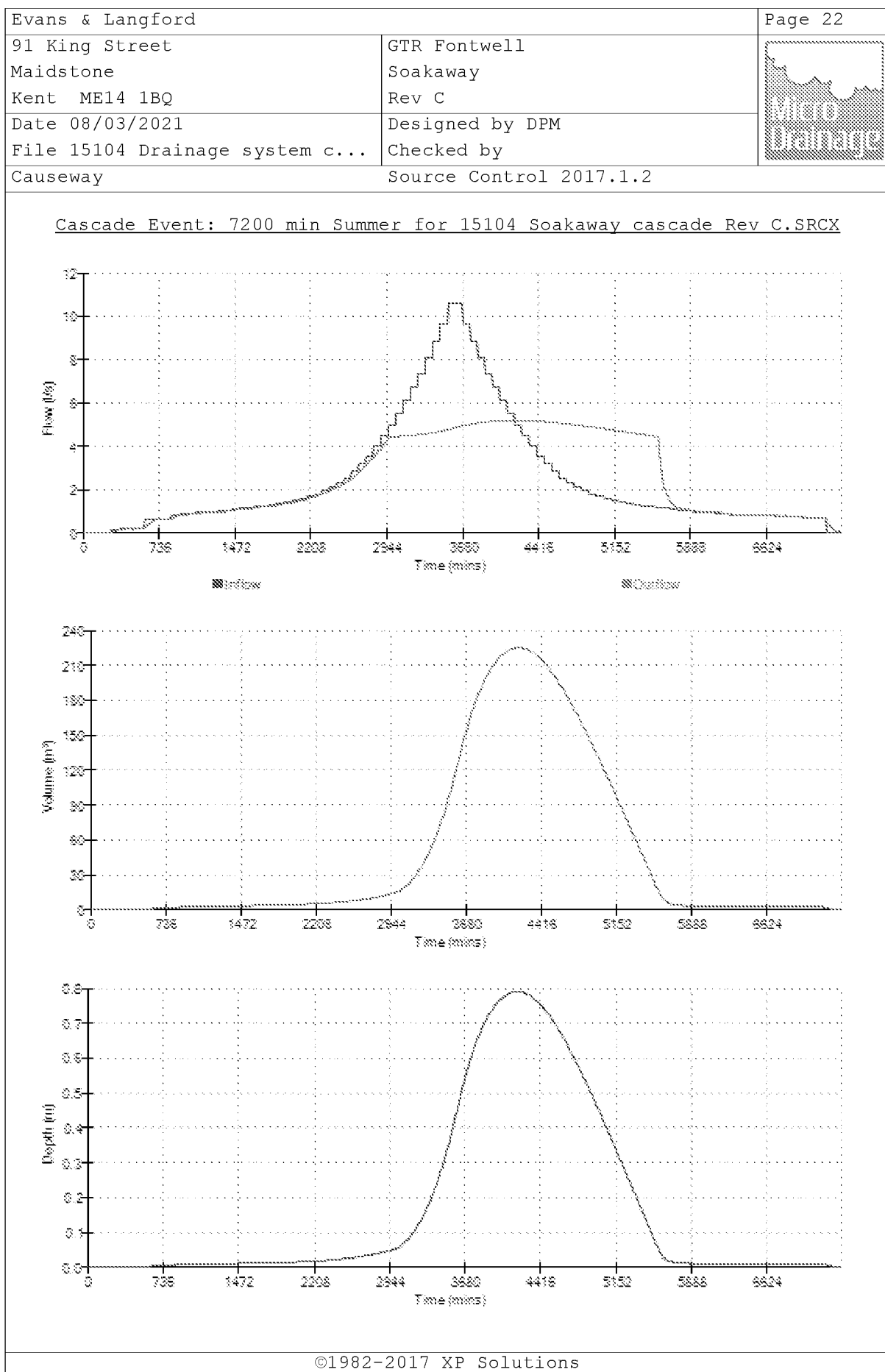
Cascade Event: 4320 min Summer for 15104 Soakaway cascade Rev C.SRCX



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91 King Street	GTR Fontwell	
Maidstone	Soakaway	
Kent ME14 1BQ	Rev C	
Date 08/03/2021	Designed by DPM	
File 15104 Drainage system c...	Checked by	
Causeway	Source Control 2017.1.2	

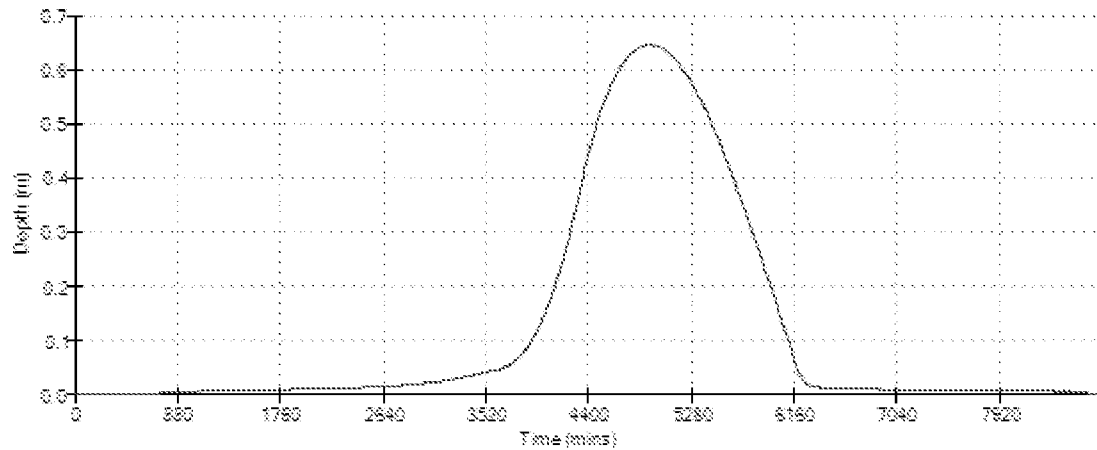
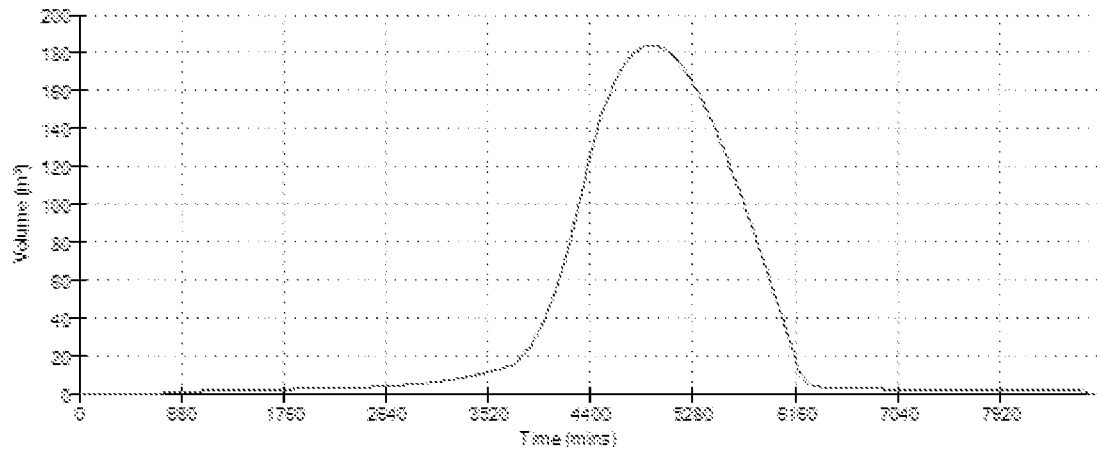
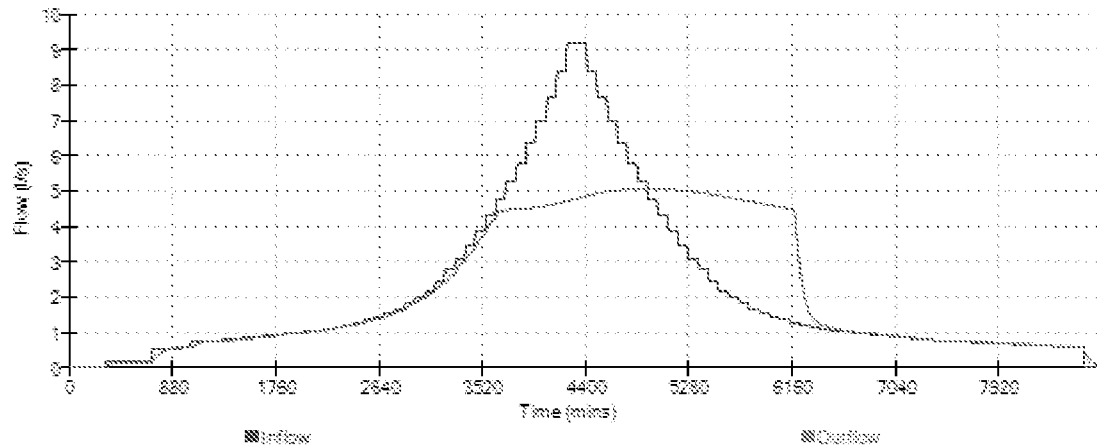
Cascade Event: 5760 min Summer for 15104 Soakaway cascade Rev C.SRCX





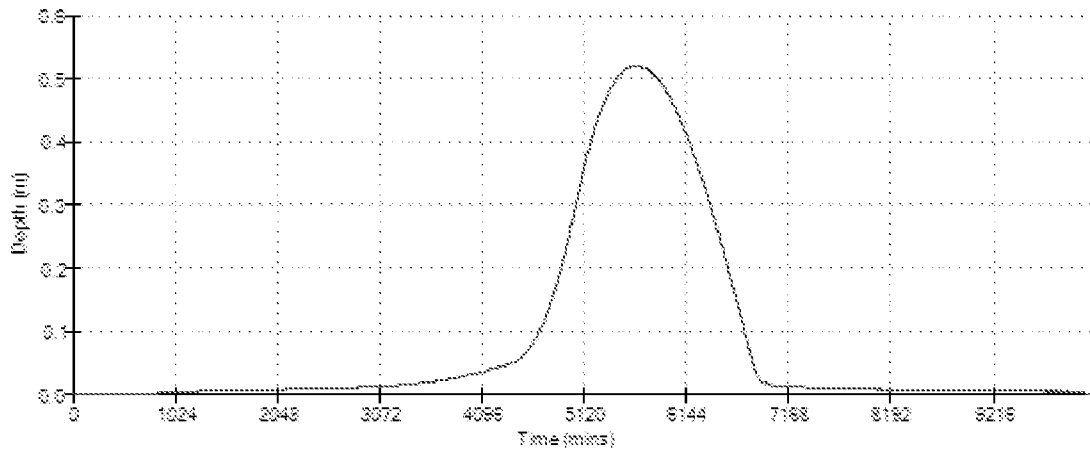
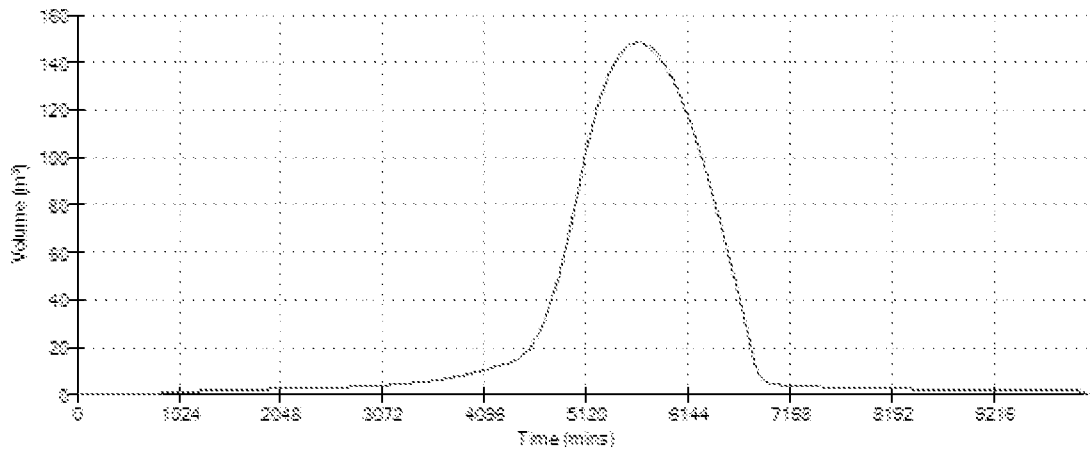
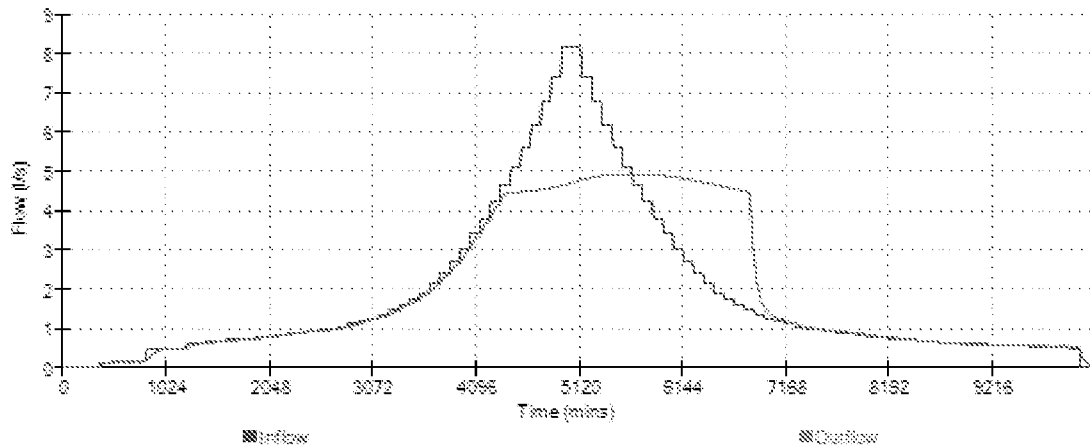
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 8640 min Summer for 15104 Soakaway cascade Rev C.SRCX



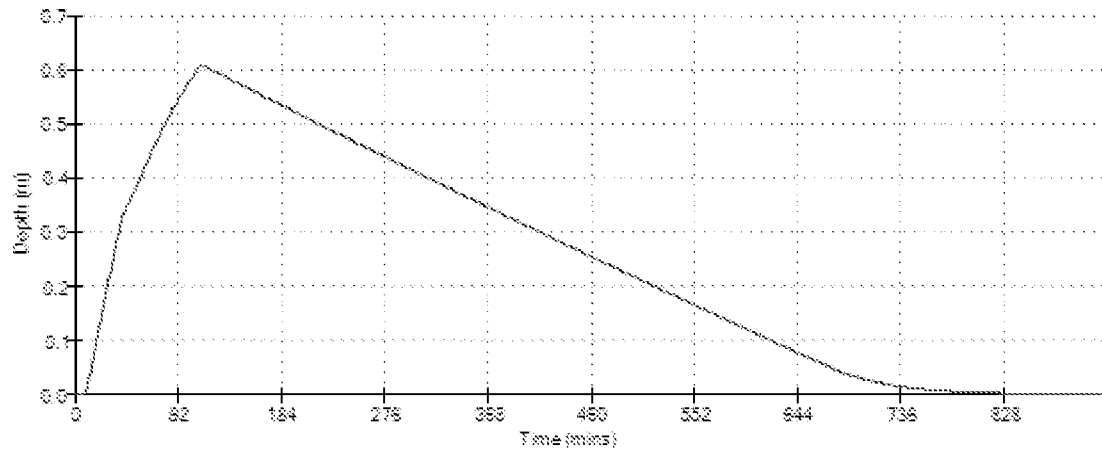
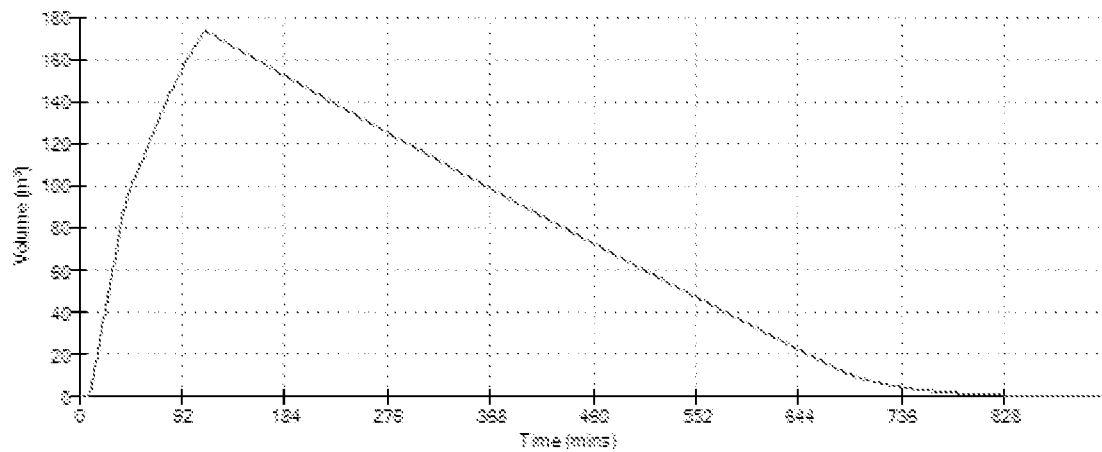
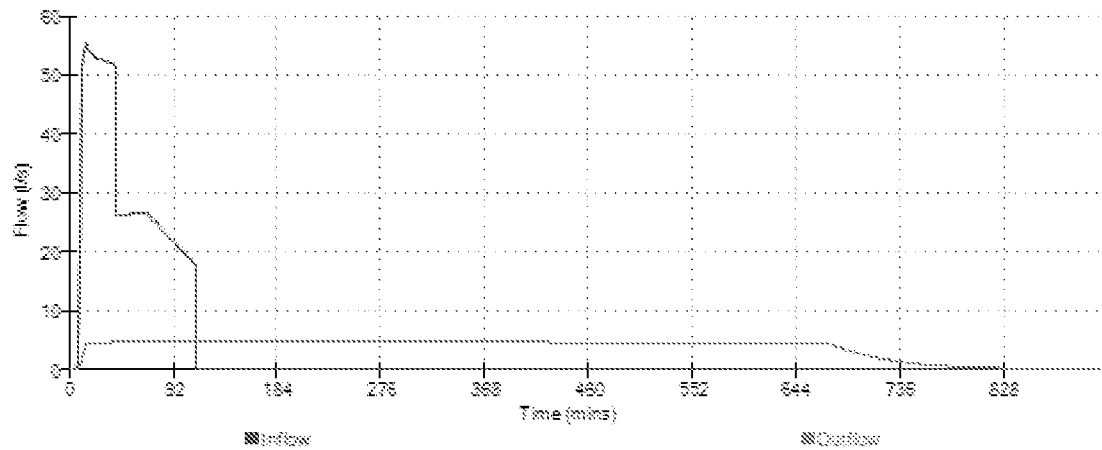
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91 King Street	GTR Fontwell	
Maidstone	Soakaway	
Kent ME14 1BQ	Rev C	
Date 08/03/2021	Designed by DPM	
File 15104 Drainage system c...	Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 10080 min Summer for 15104 Soakaway cascade Rev C.SRCX



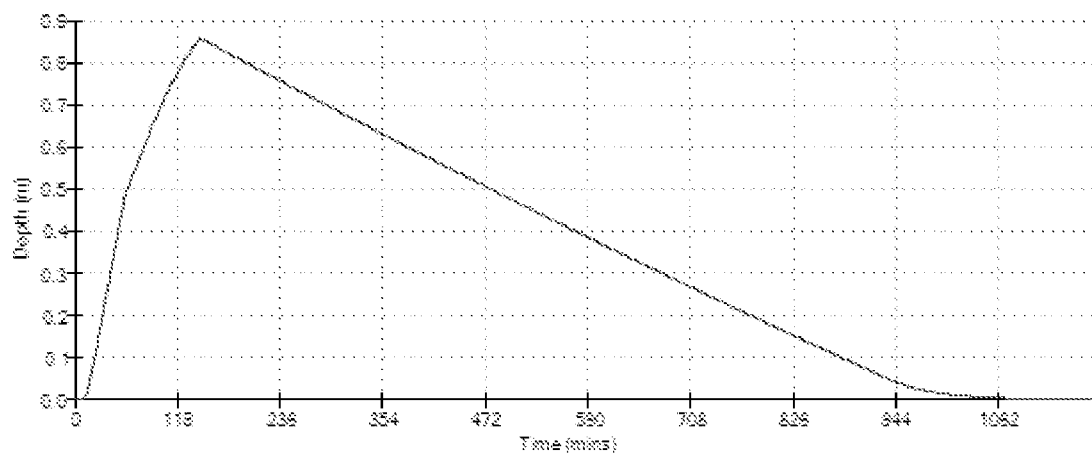
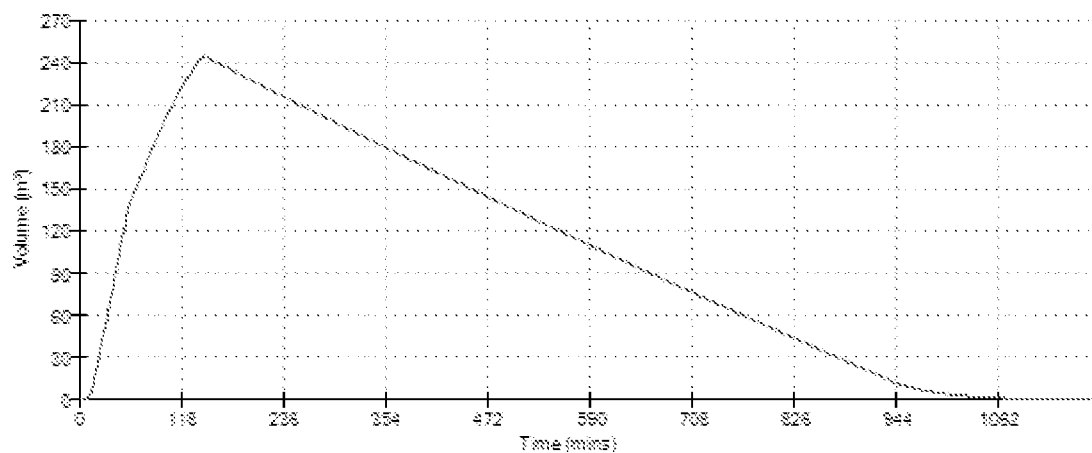
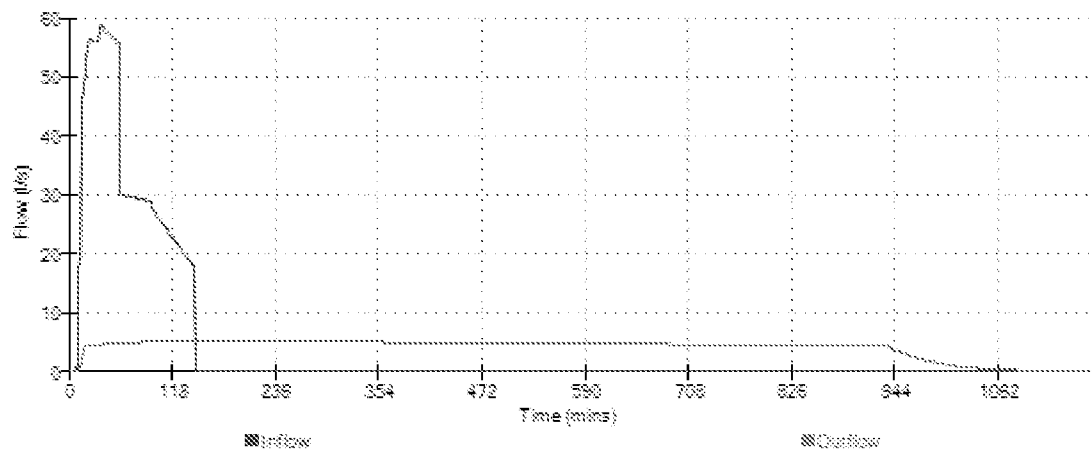
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 15 min Winter for 15104 Soakaway cascade Rev C.SRCX



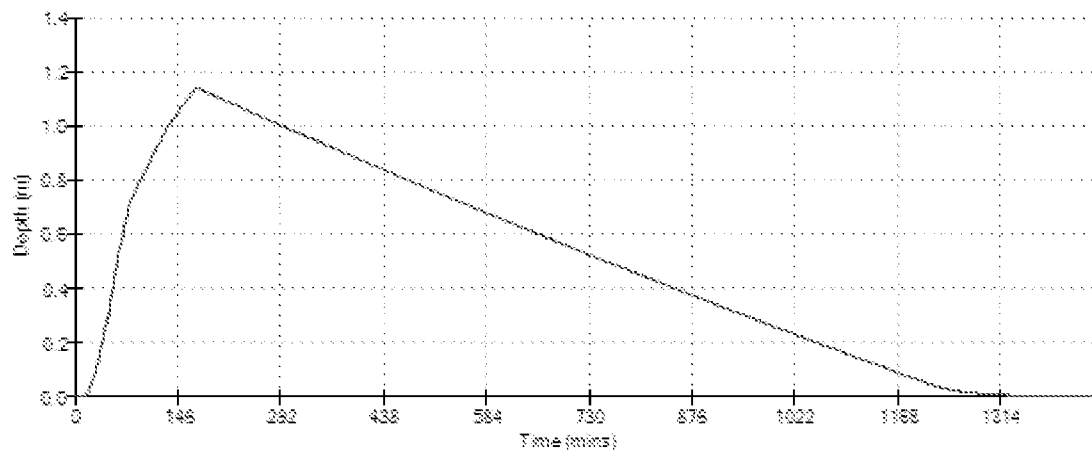
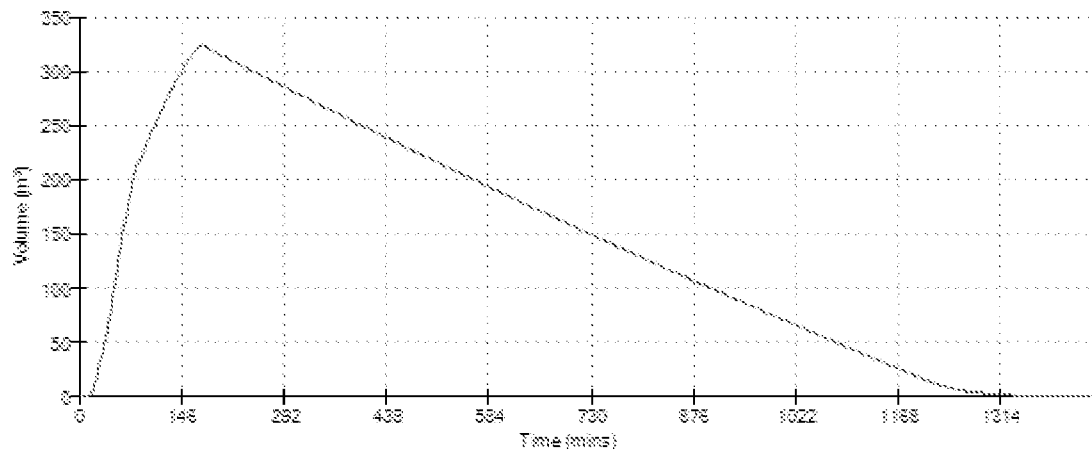
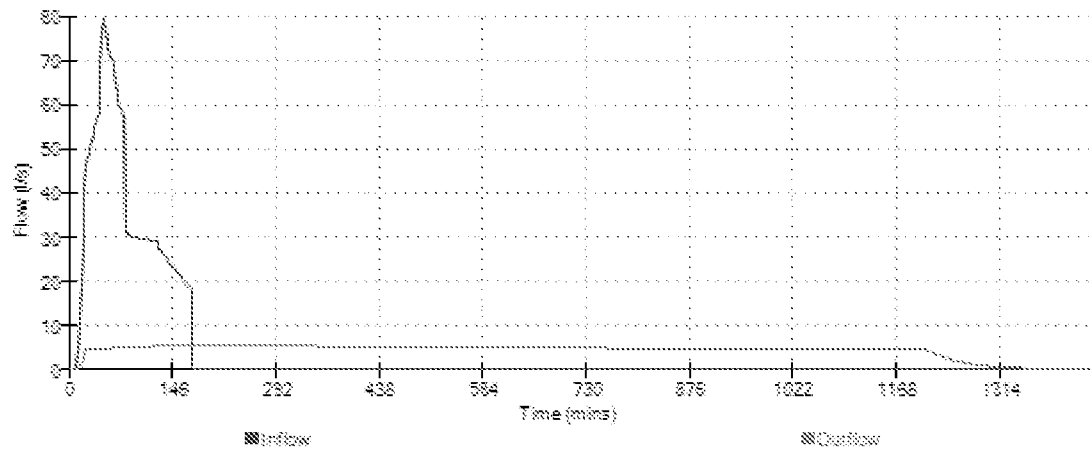
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway		Source Control 2017.1.2

Cascade Event: 30 min Winter for 15104 Soakaway cascade Rev C.SRCX



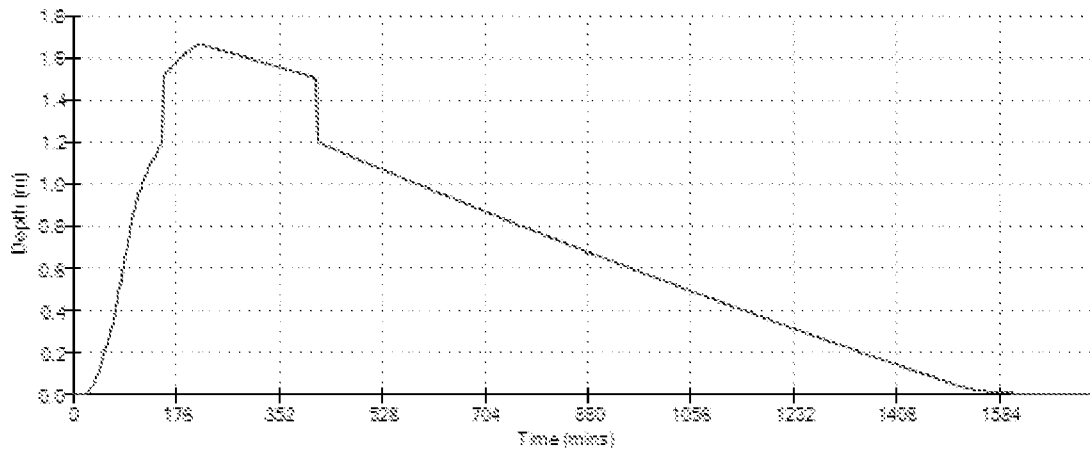
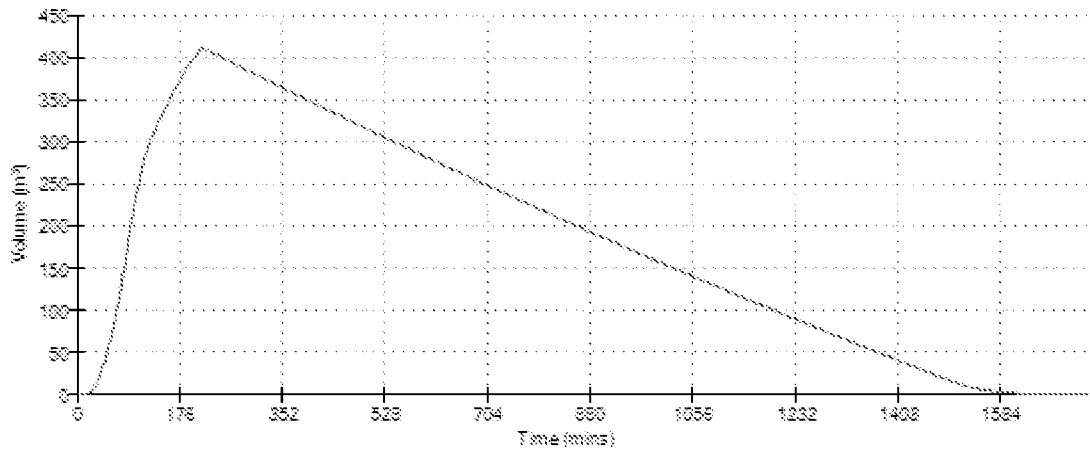
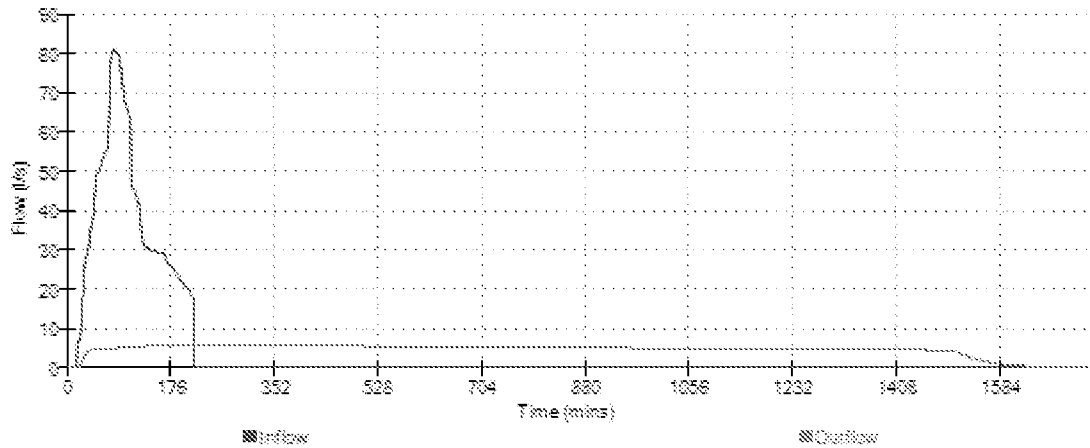
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 60 min Winter for 15104 Soakaway cascade Rev C.SRCX



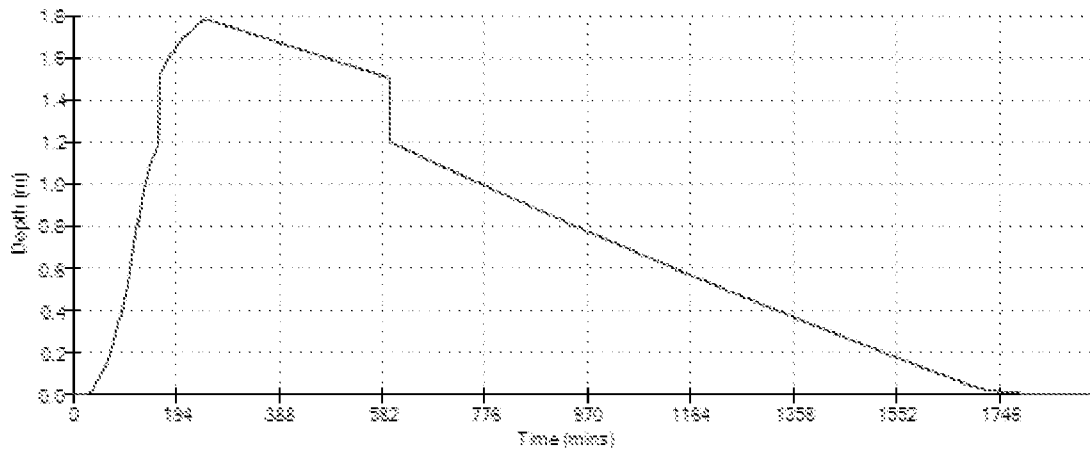
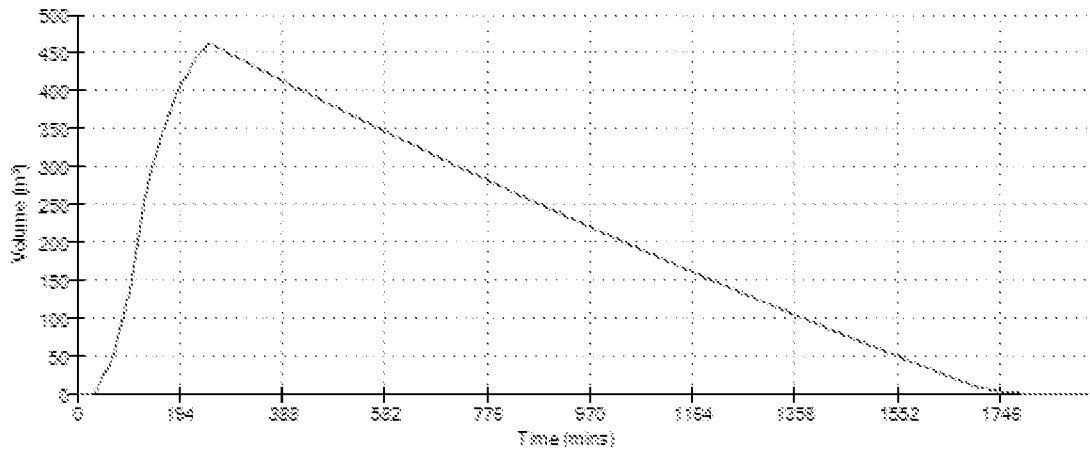
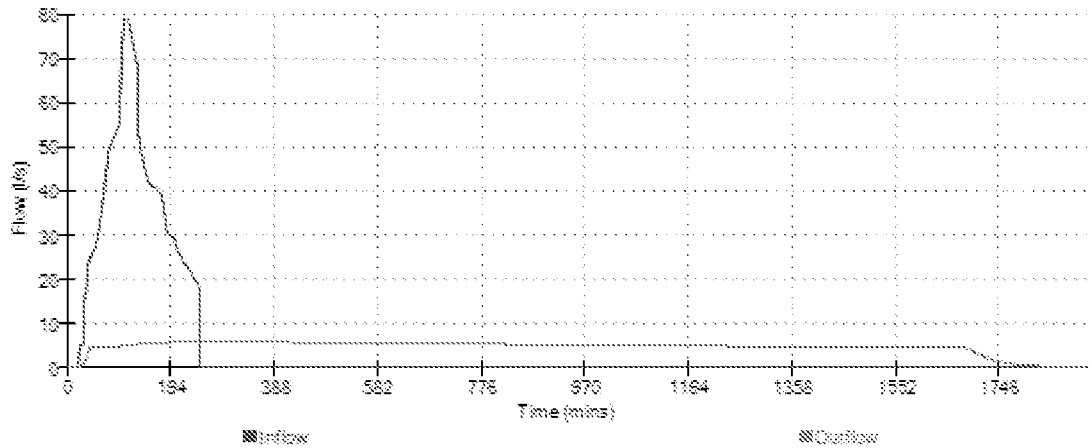
Evans & Langford		Page 28
91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 120 min Winter for 15104 Soakaway cascade Rev C.SRCX



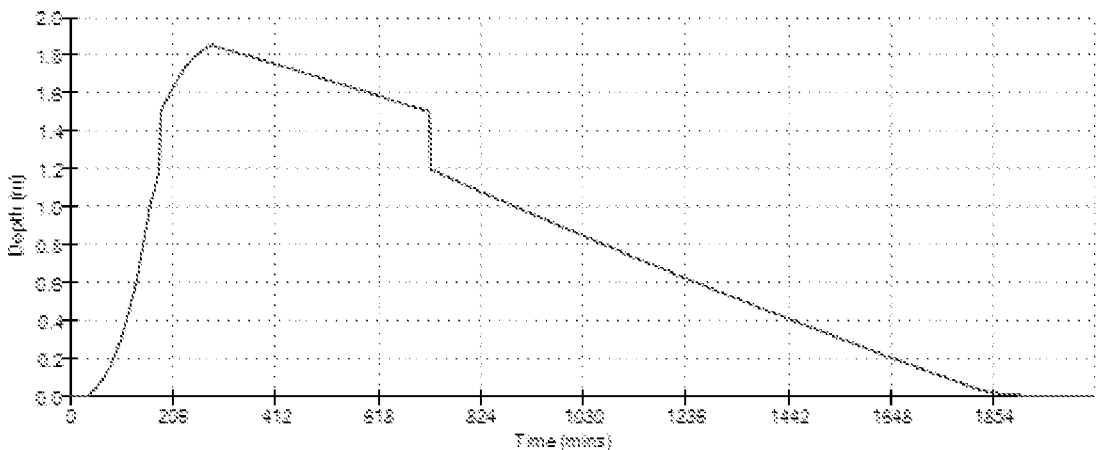
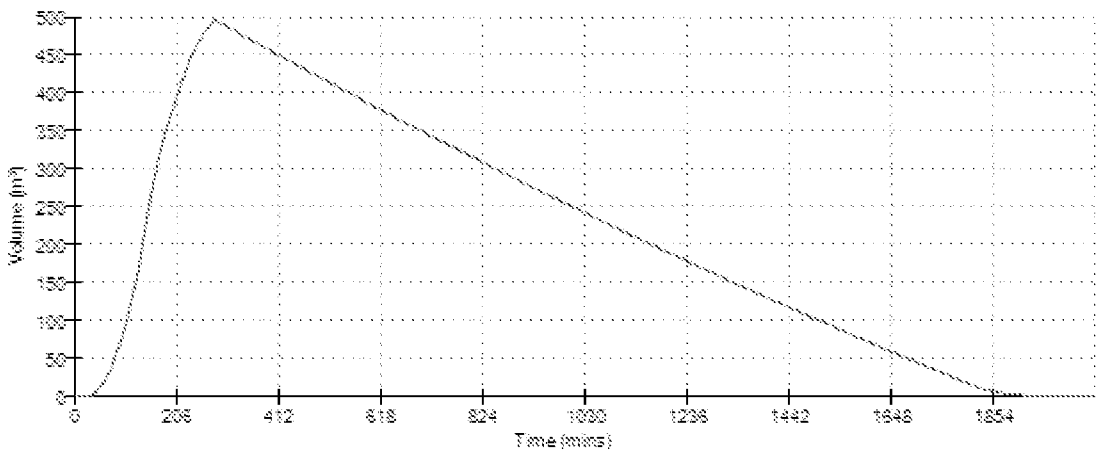
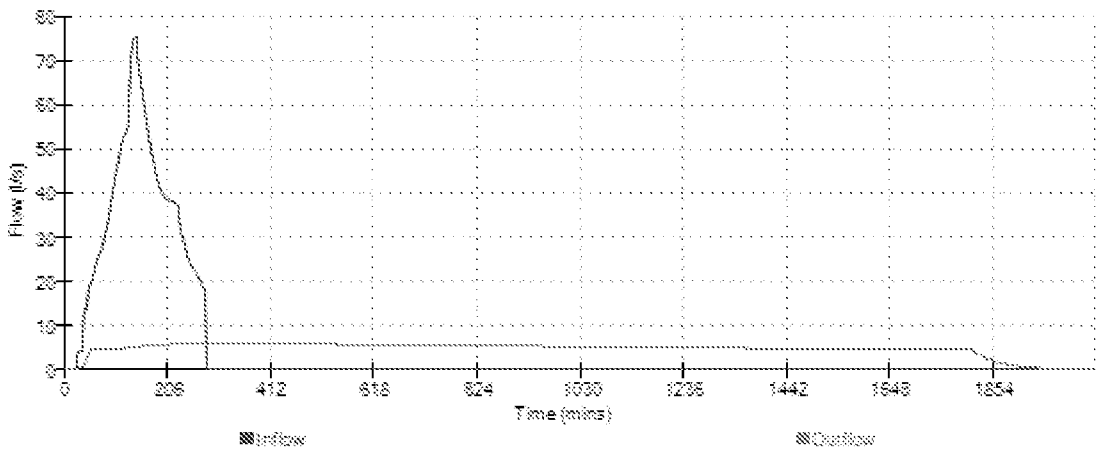
Evans & Langford		Page 29
91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 180 min Winter for 15104 Soakaway cascade Rev C.SRCX



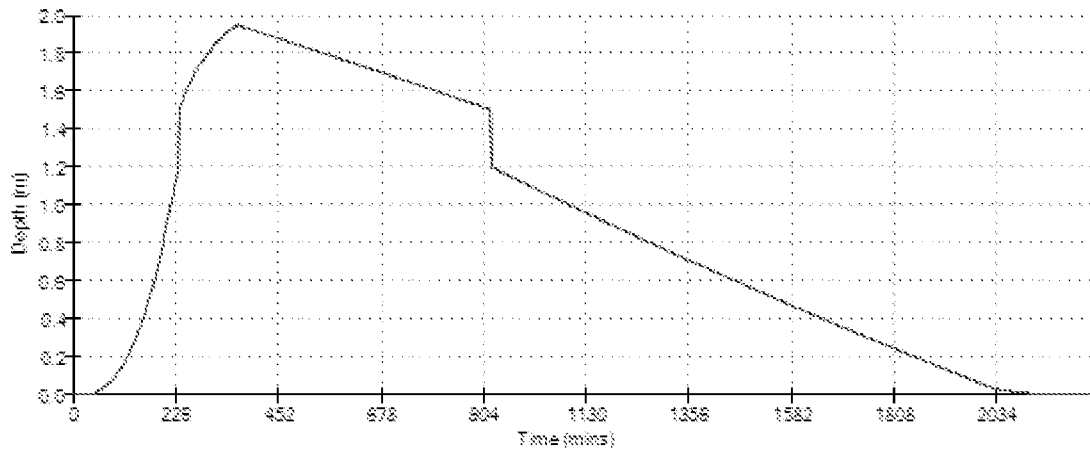
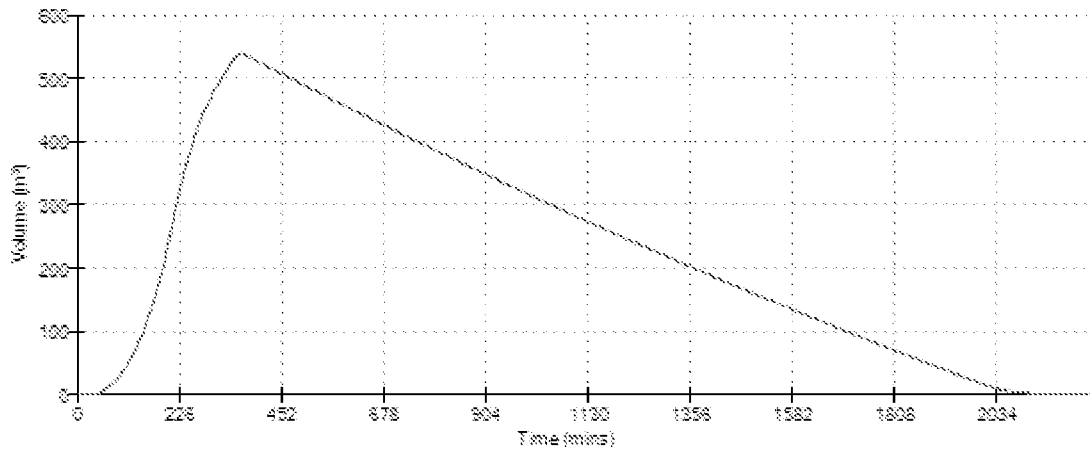
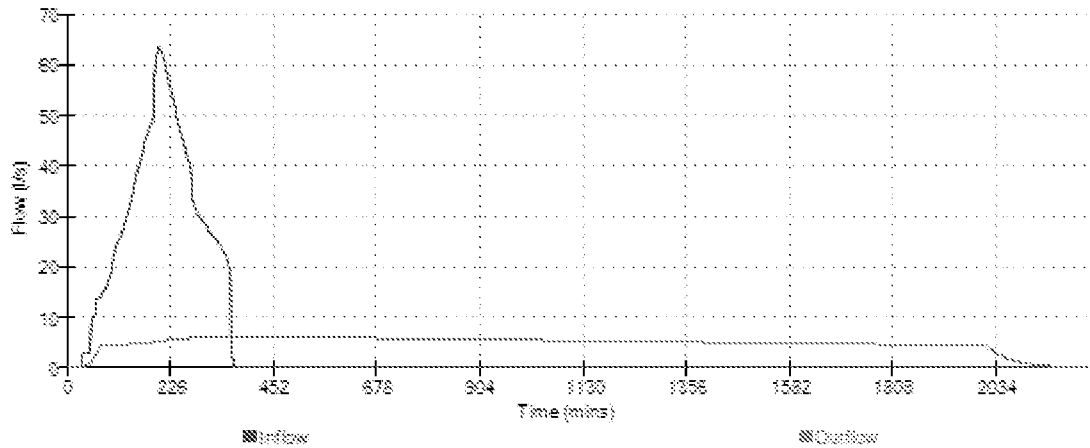
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91 King Street Maidstone Kent ME14 1BQ	GTR Fontwell Soakaway Rev C	
Date 08/03/2021 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway	Source Control 2017.1.2	

Cascade Event: 240 min Winter for 15104 Soakaway cascade Rev C.SRCX



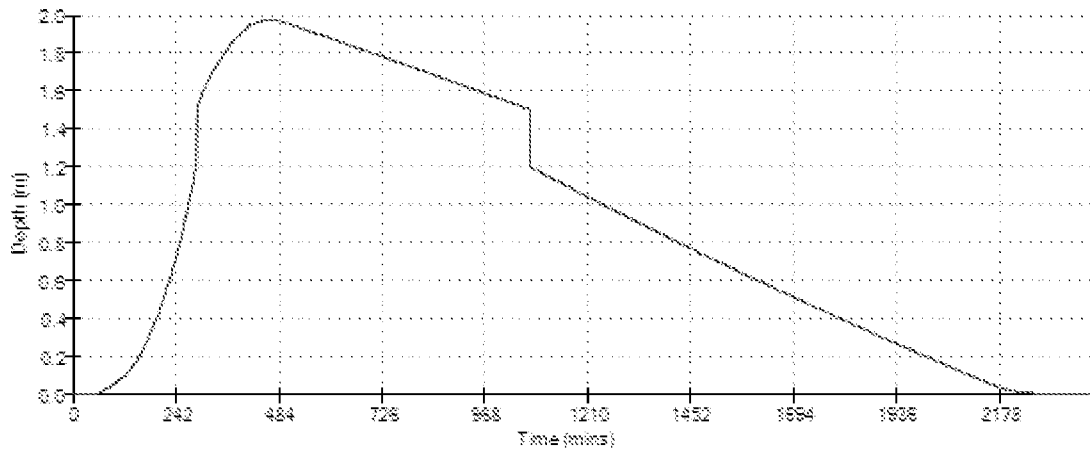
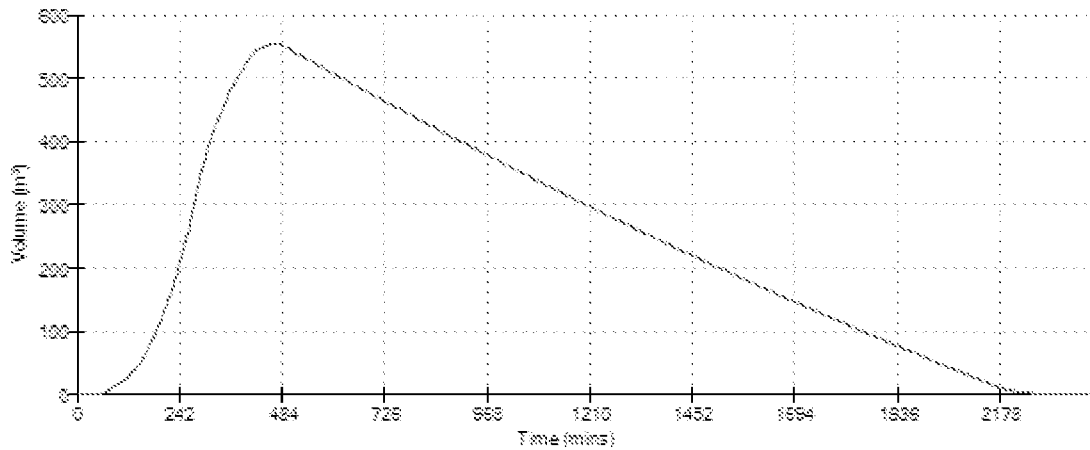
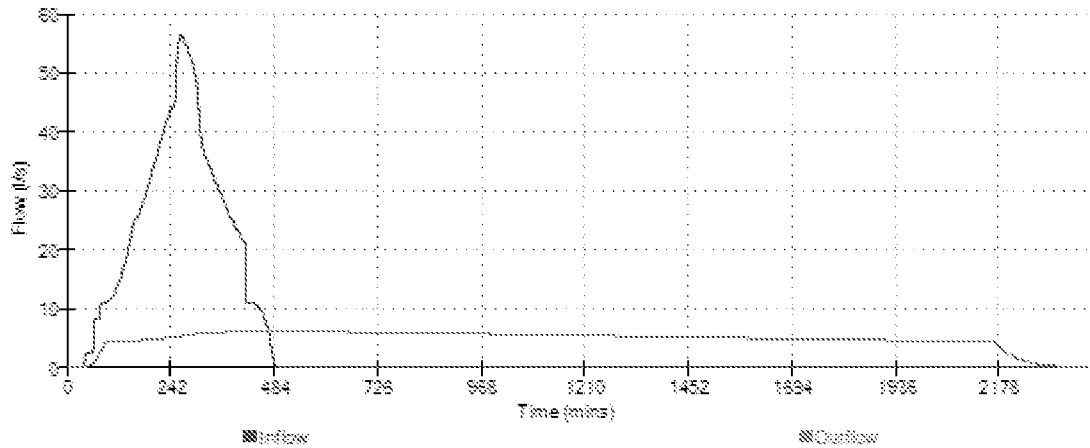
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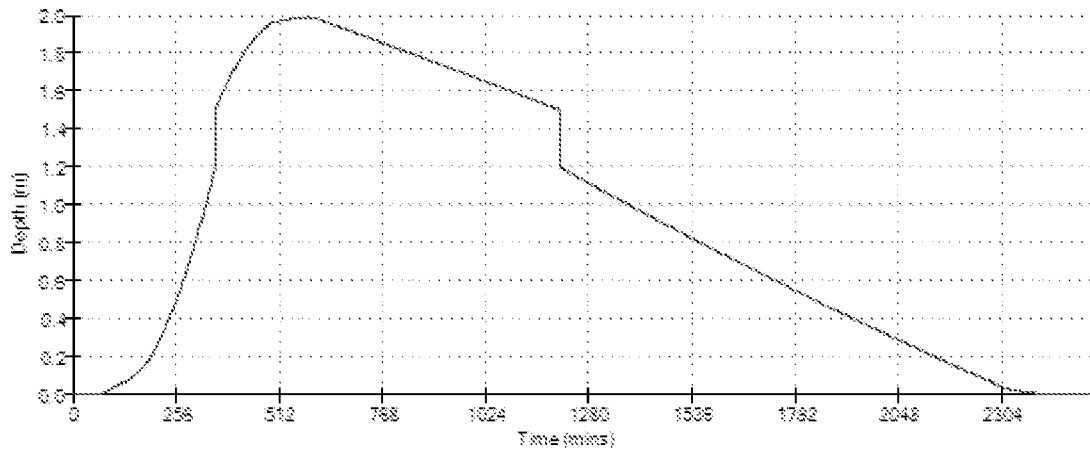
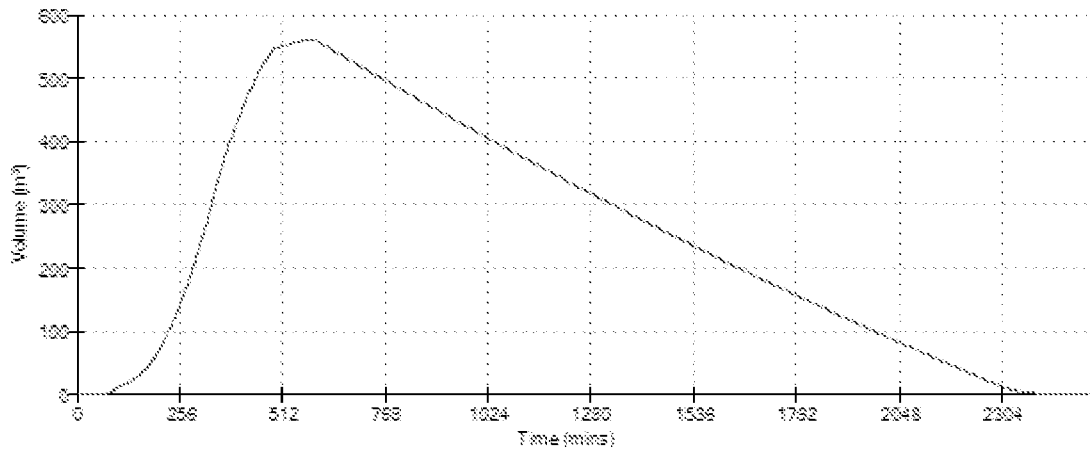
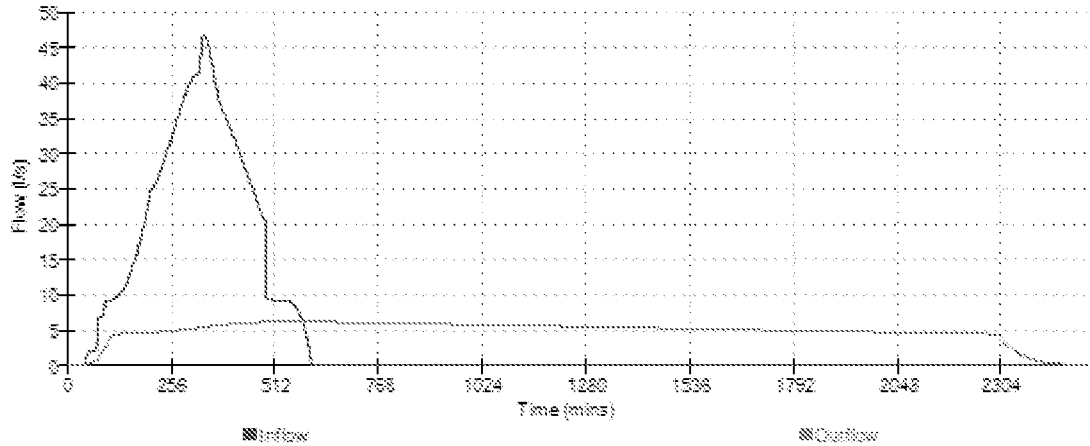
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Causeway		Source Control 2017.1.2

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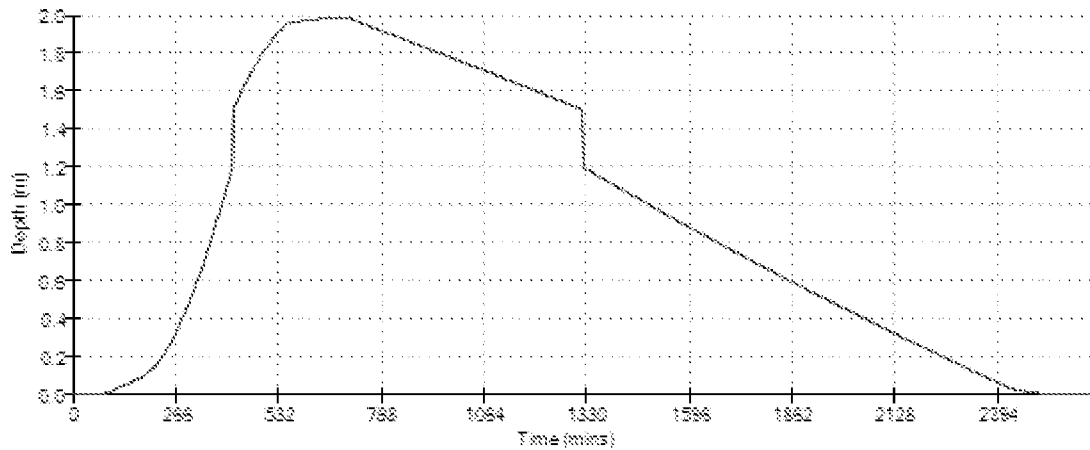
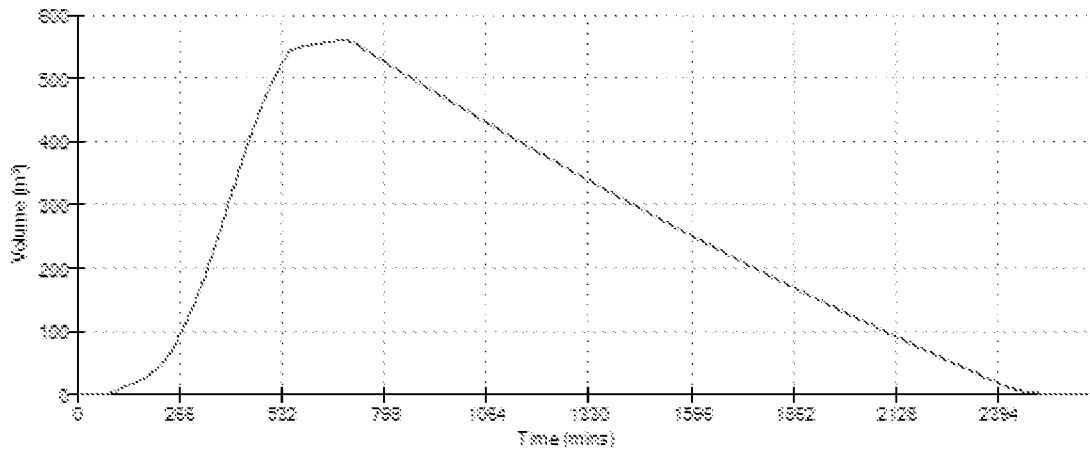
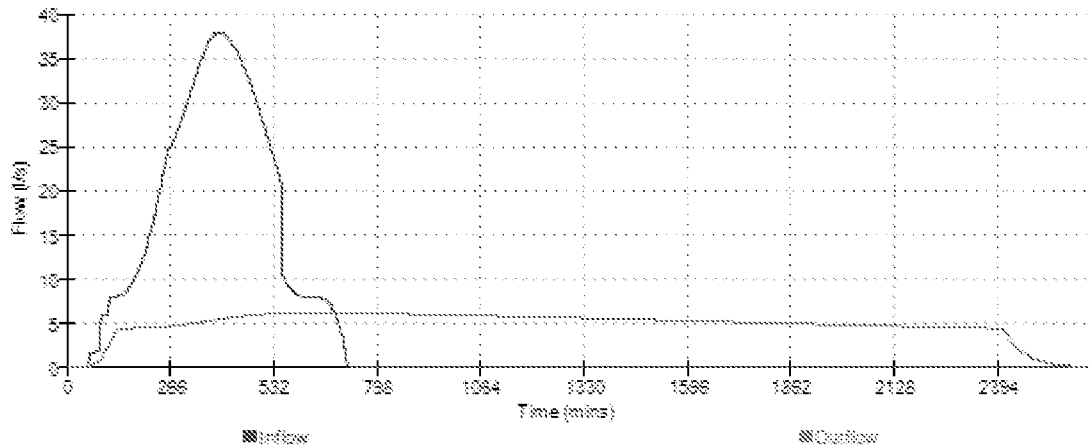
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Causeway		Source Control 2017.1.2

Cascade Event: 600 min Winter for 15104 Soakaway cascade Rev C.SRCX



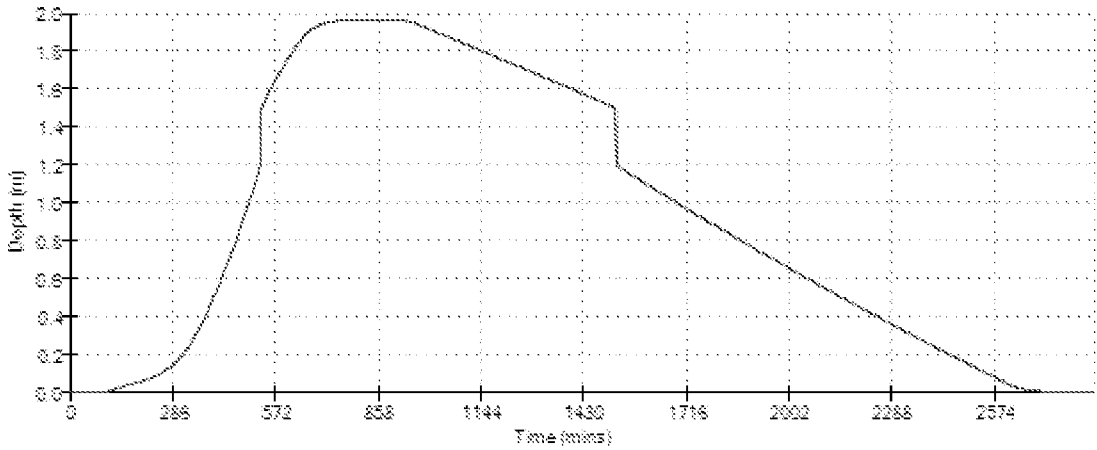
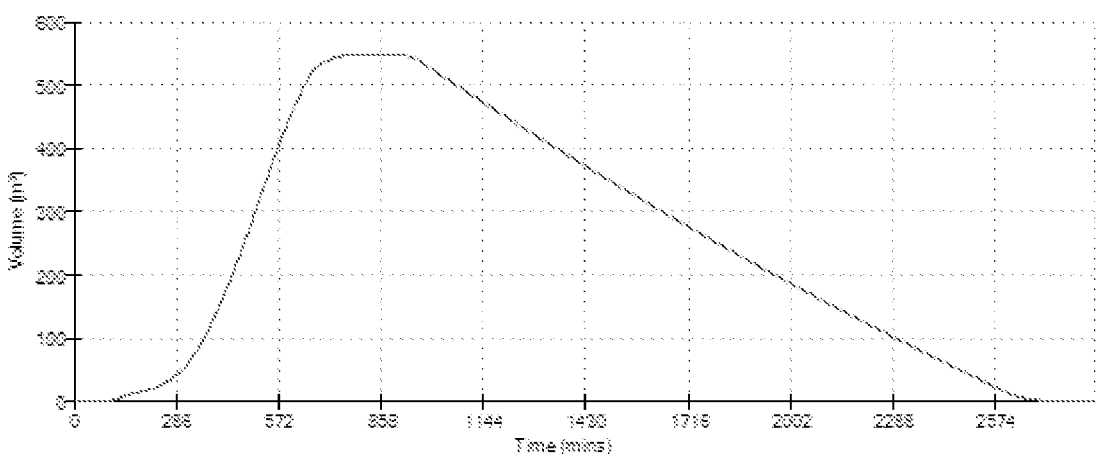
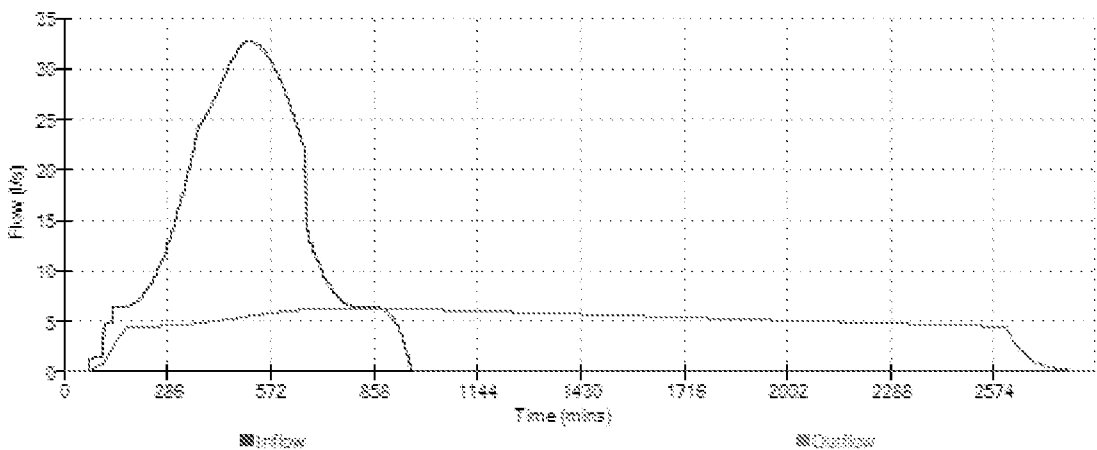
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Cascade Event: 720 min Winter for 15104 Soakaway cascade Rev C.SRCX



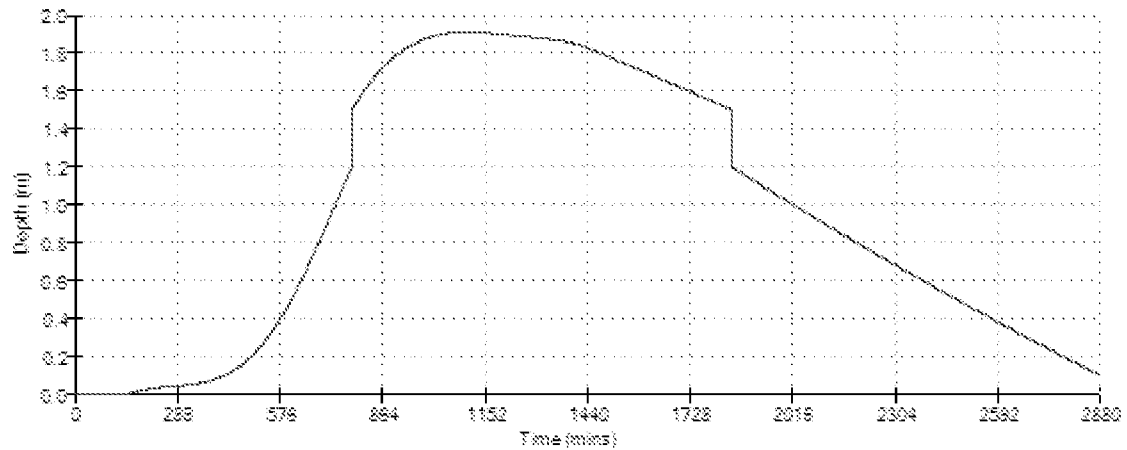
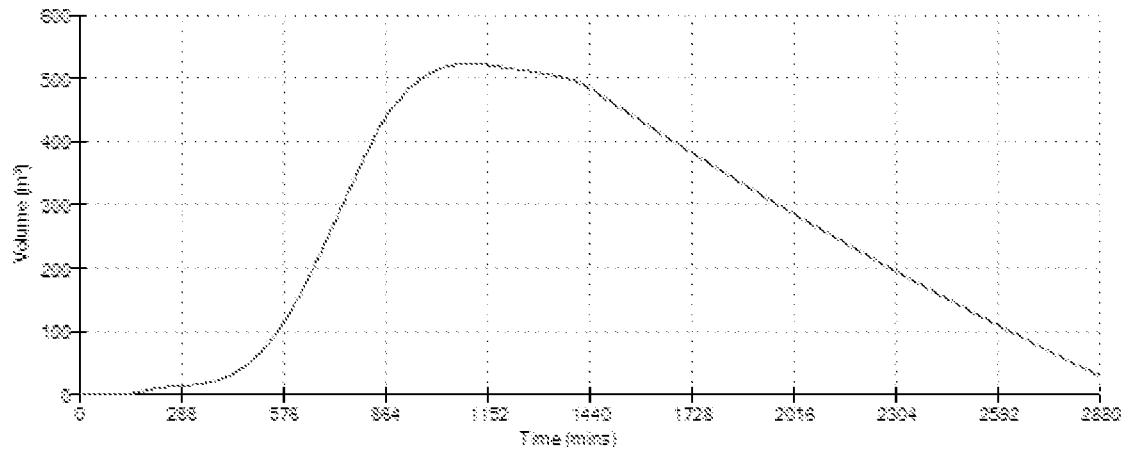
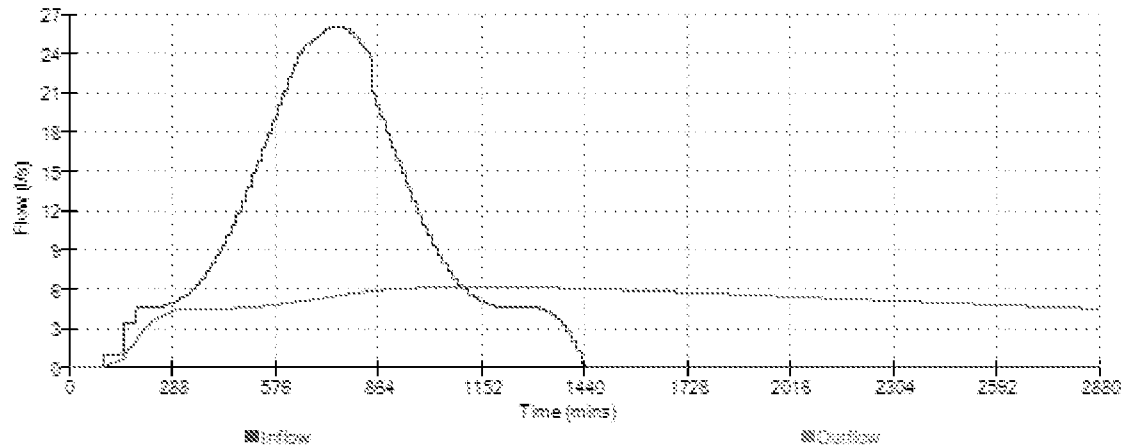
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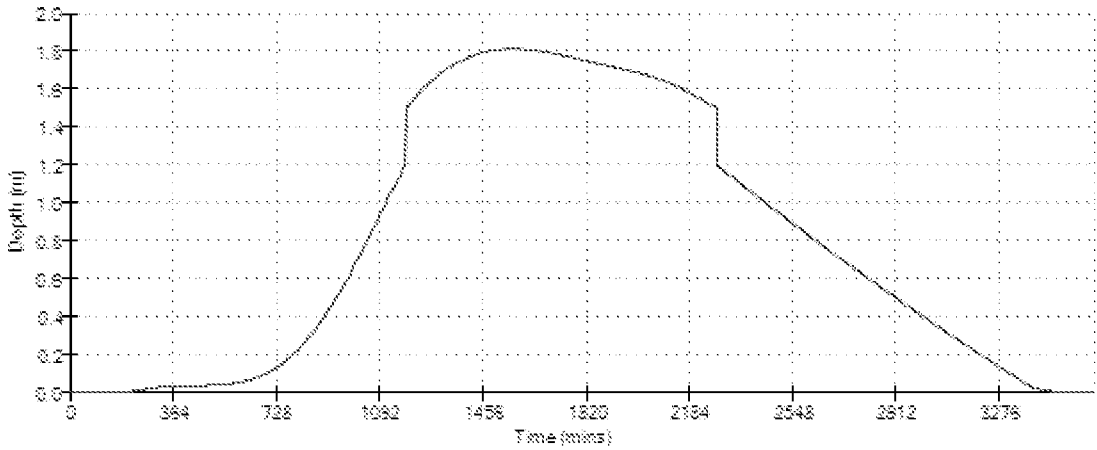
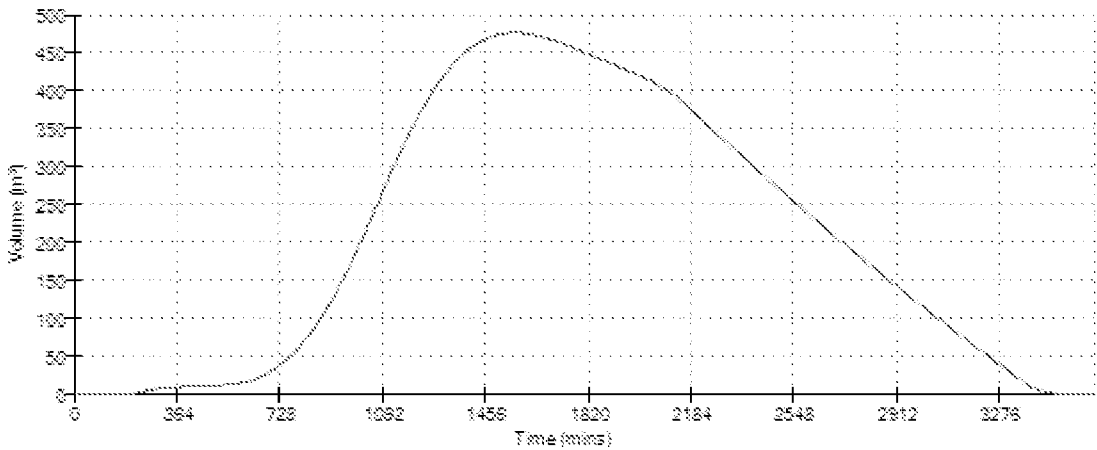
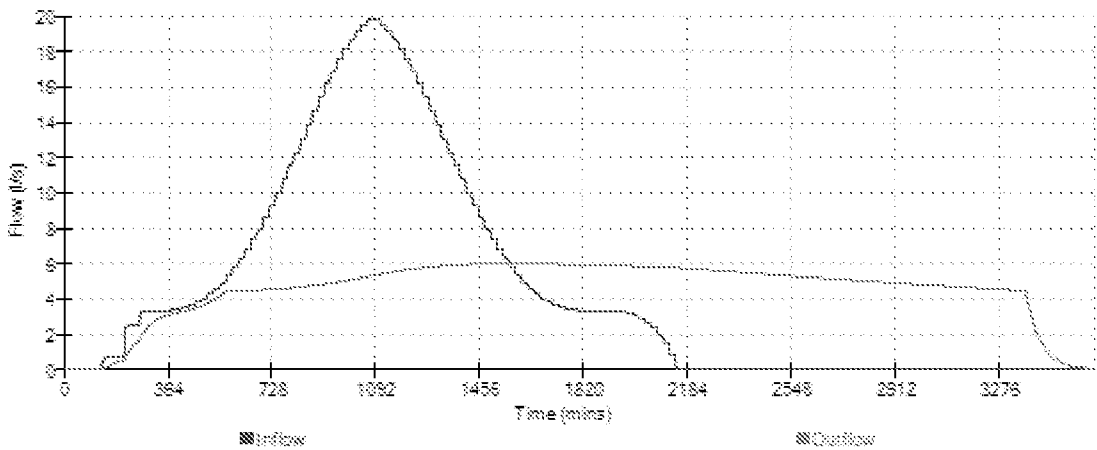
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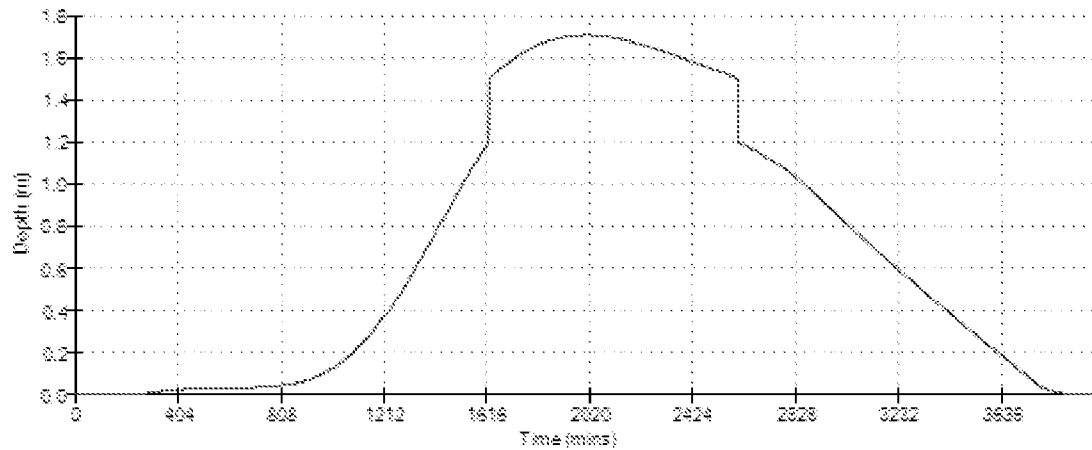
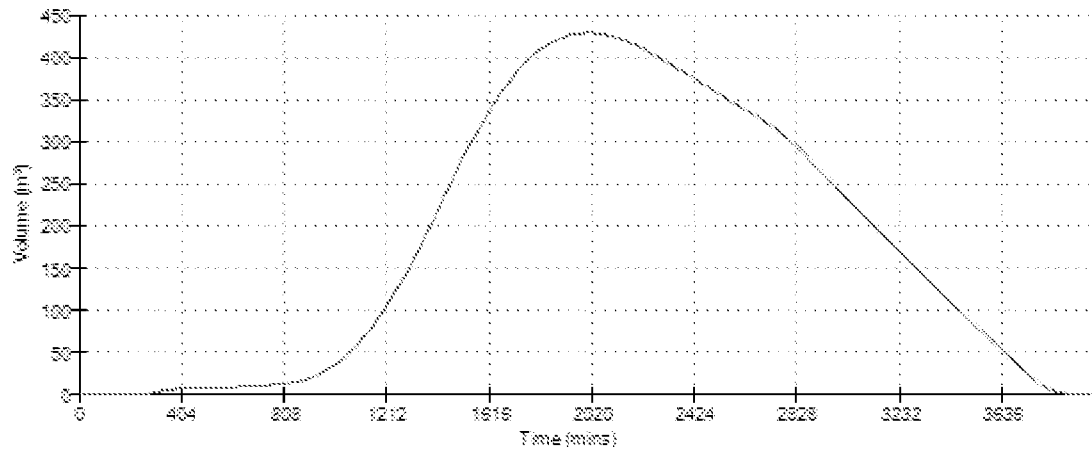
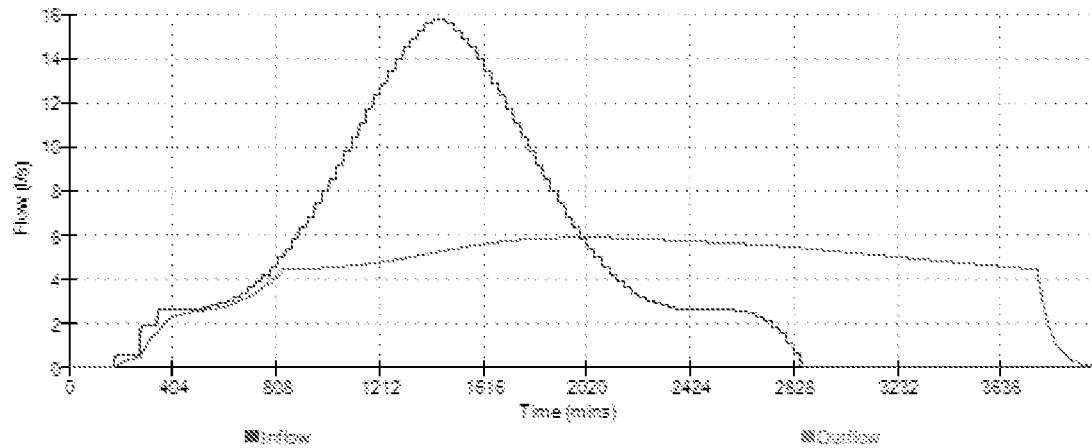
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Cascade Event: 2160 min Winter for 15104 Soakaway cascade Rev C.SRCX



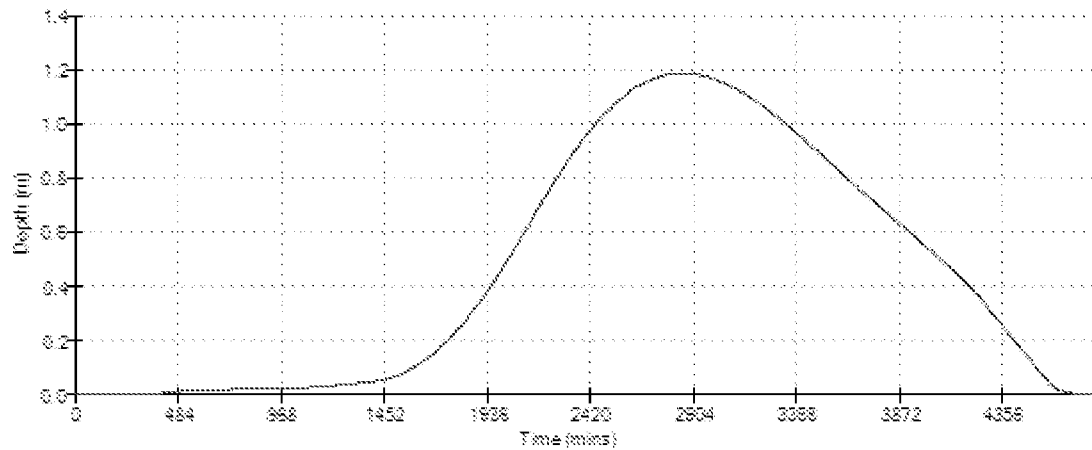
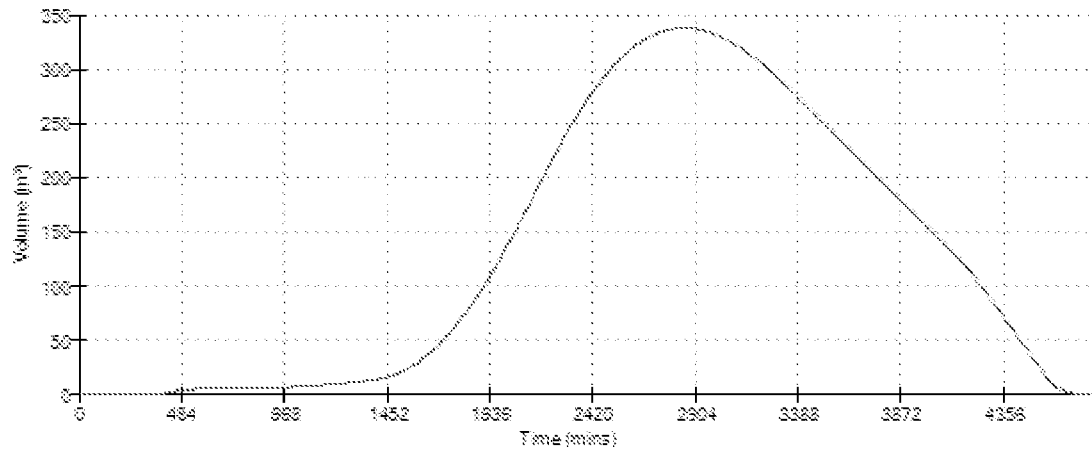
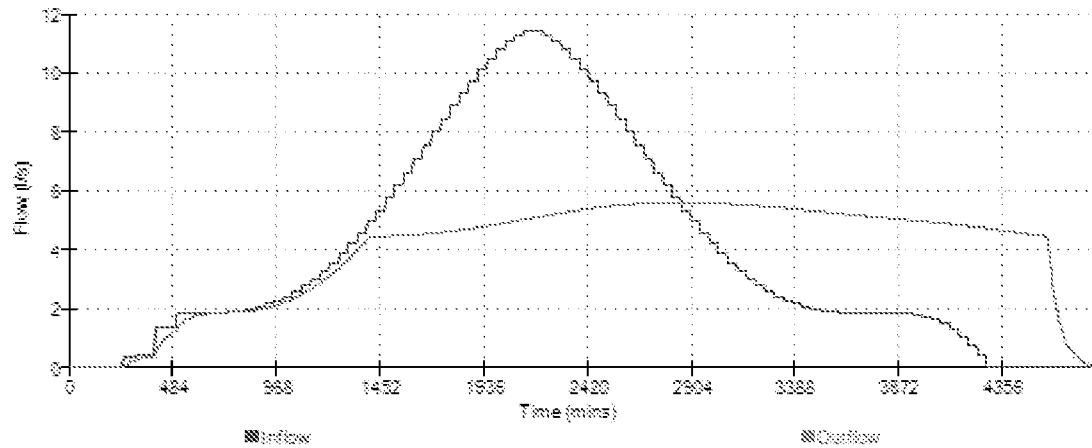
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Causeway		Source Control 2017.1.2

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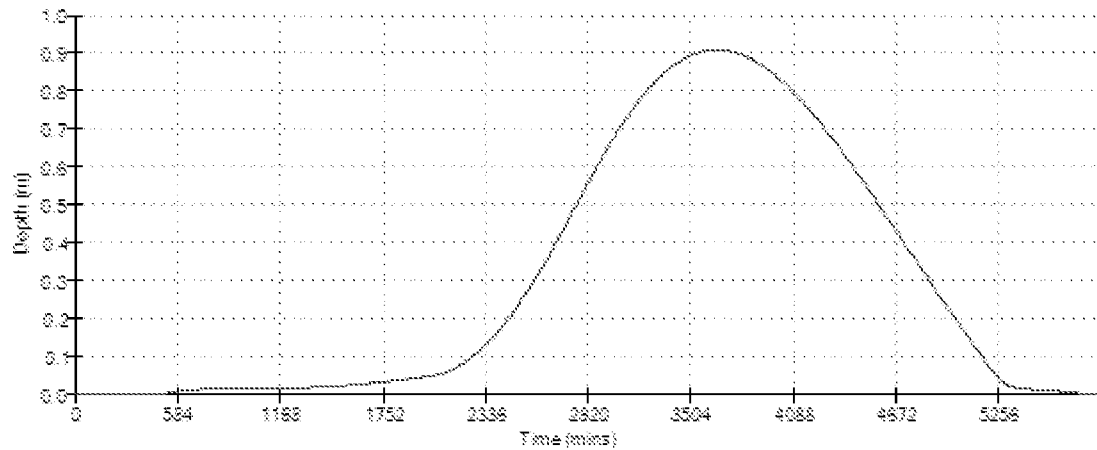
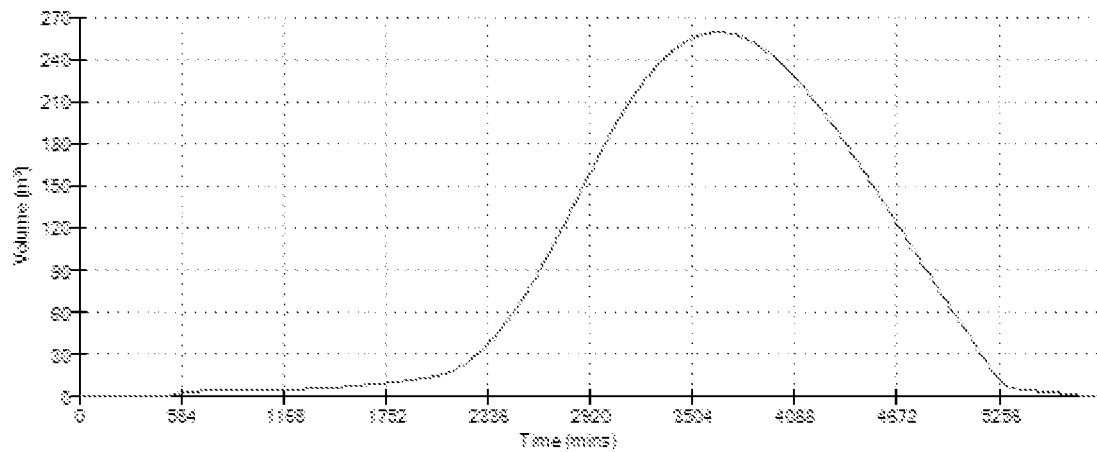
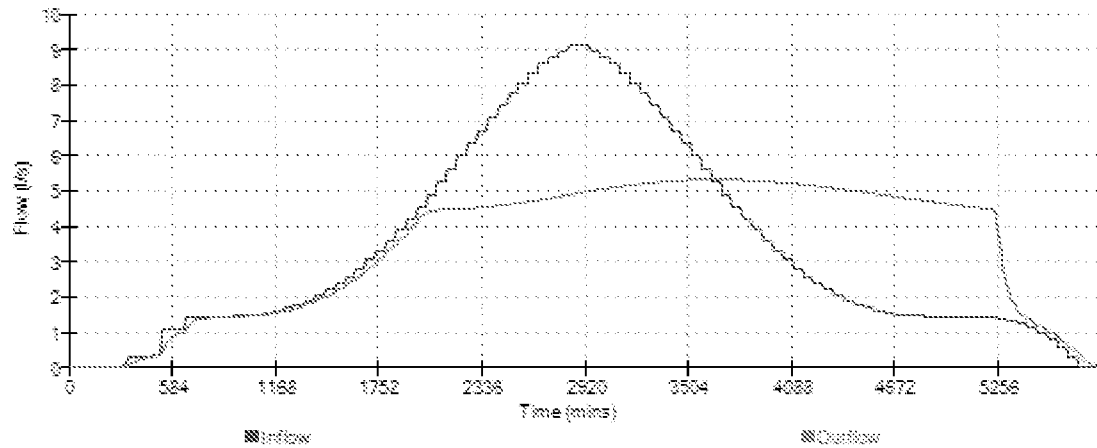
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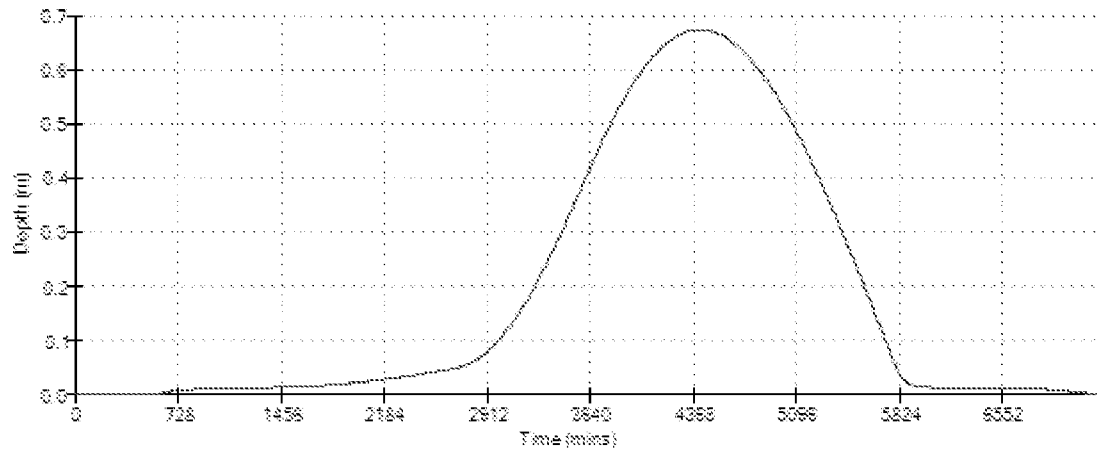
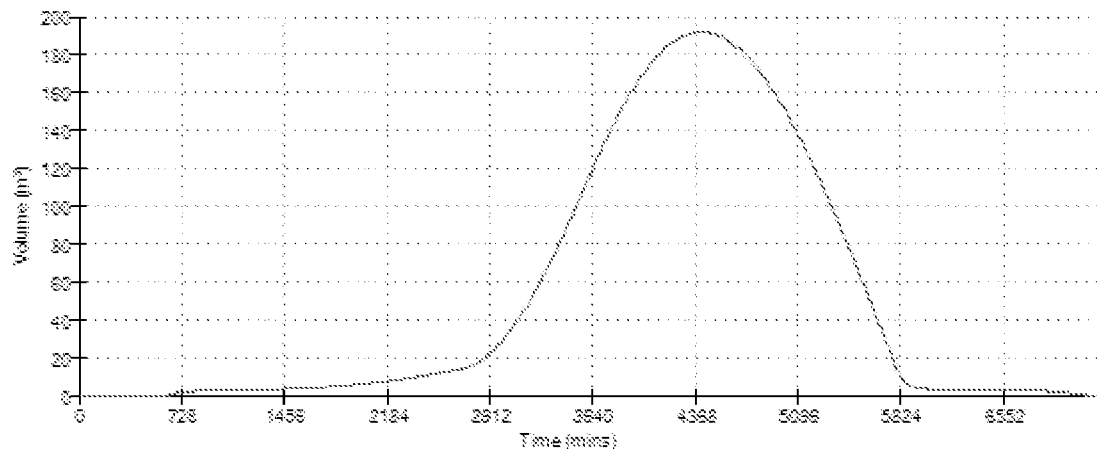
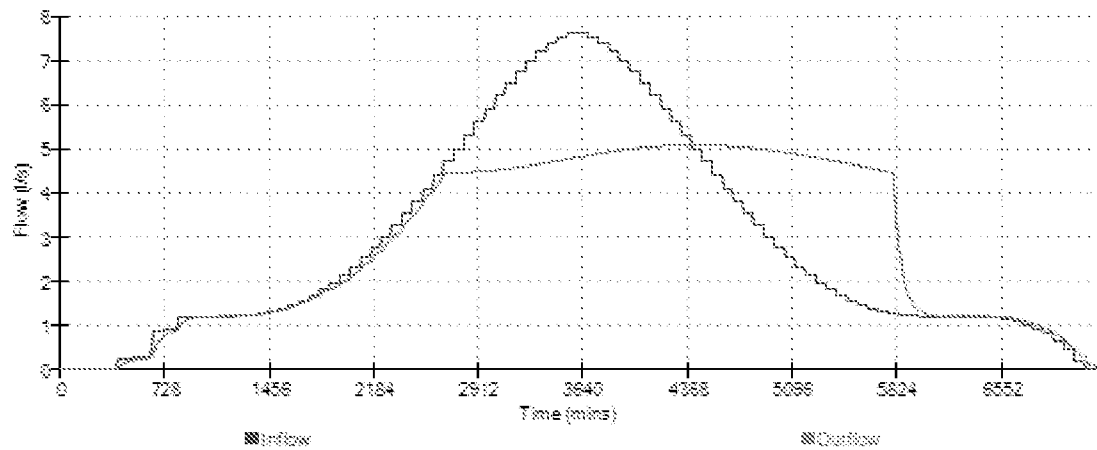
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Cascade Event: 5760 min Winter for 15104 Soakaway cascade Rev C.SRCX



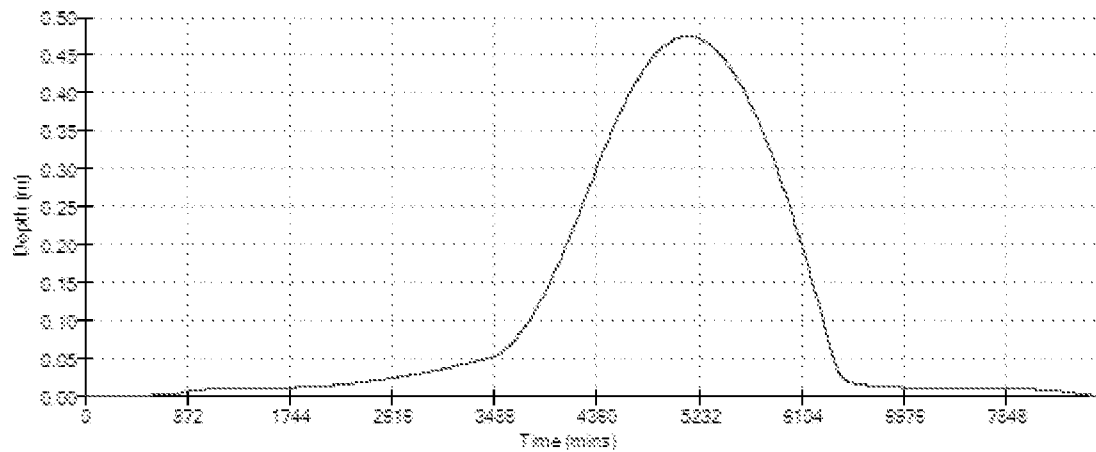
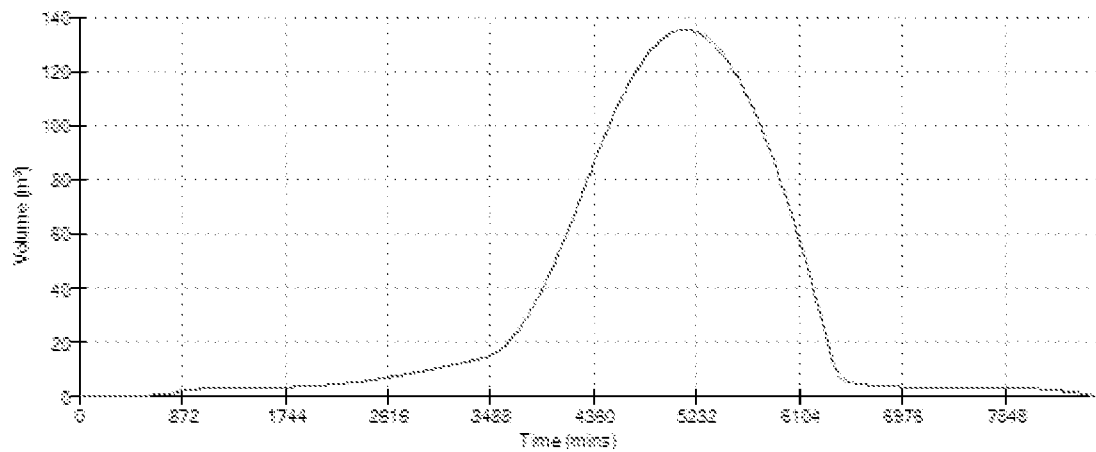
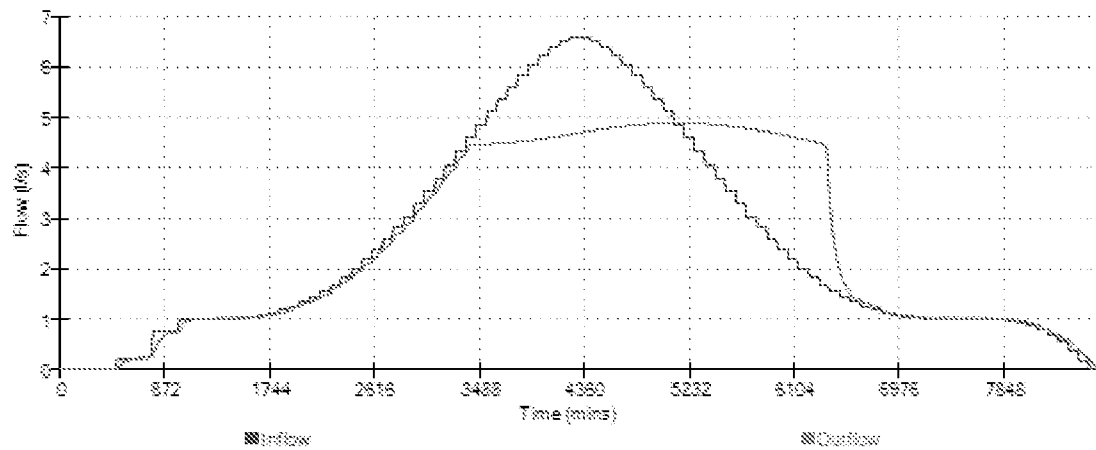
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Causeway	Source Control 2017.1.2	

Cascade Event: 7200 min Winter for 15104 Soakaway cascade Rev C.SRCX



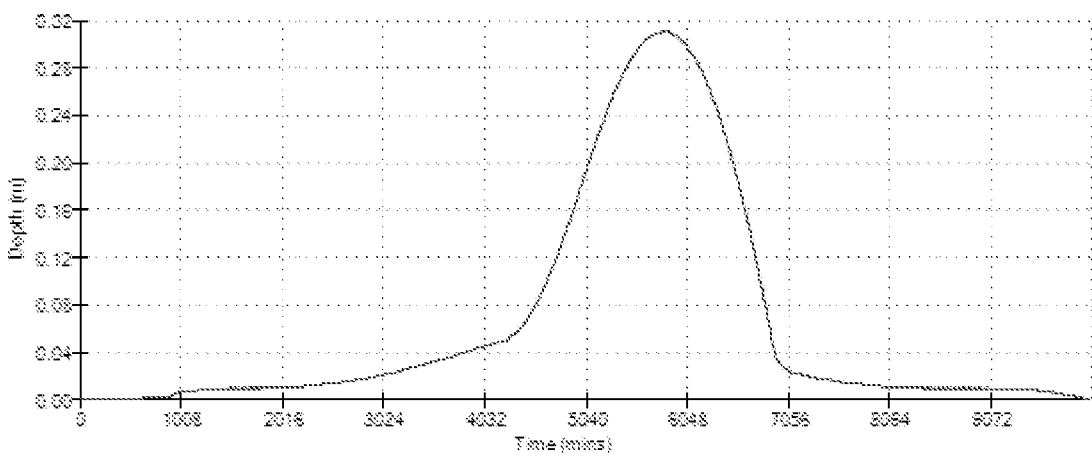
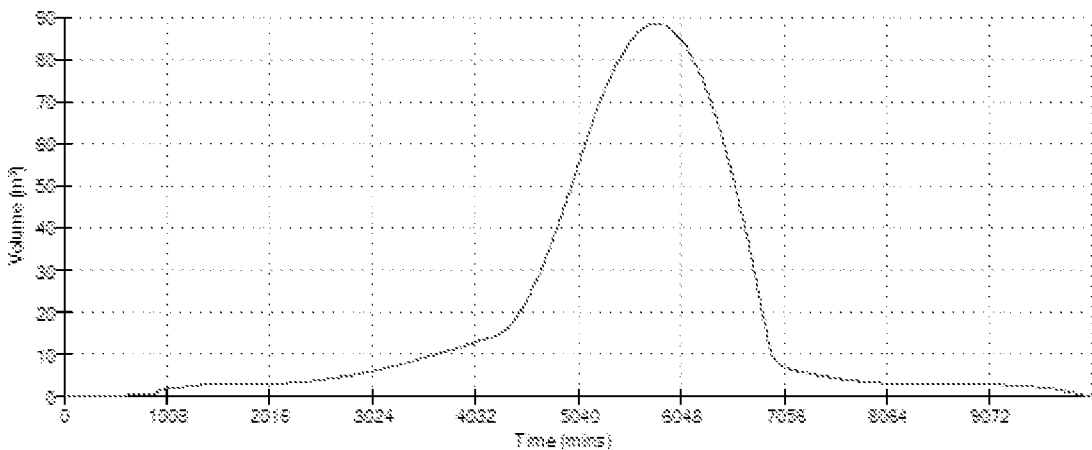
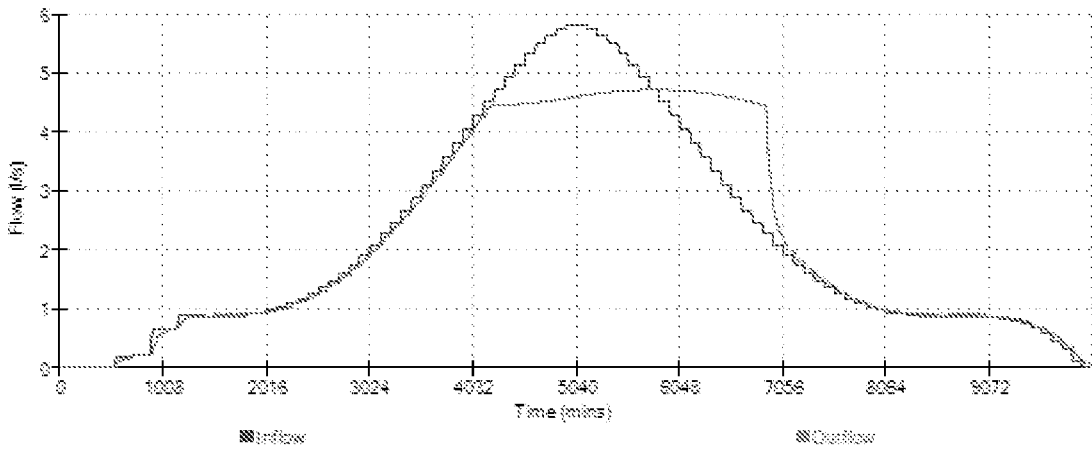
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Causeway	Source Control 2017.1.2	

Cascade Event: 8640 min Winter for 15104 Soakaway cascade Rev C.SRCX



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Causeway	Source Control 2017.1.2	

Cascade Event: 10080 min Winter for 15104 Soakaway cascade Rev C.SRCX





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GTR Fontwell

SUDs Maintenance Schedule

15104
April 2021



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15104 GTR Fontwell SUDs Maintenance Schedule

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APPENDICES

1. Maintenance Schedules

REFERENCES

Ref.	Title
A	Non Statutory Technical Standards for Sustainable Drainage Systems, LASOO
B	The SUDS Manual (C753), CIRIA publication
C	Sustainable Drainage System (C609), CIRIA publication
	HR Wallingford, UK Sustainable Drainage Guidance & Tools [Online] Available at: www.uksuds.com

STRATEGY

The site contains a single drainage catchment. This takes roof water, carparking and access roads from this site, which is attenuated in a basin and then discharges to a crate soakaway. All drives are constructed using permeable paving with a piped outfall from the permeable sub-base. The water is cleansed within the attenuation basin as the discharge will flow through the vegetation between the inlet and outlet headwalls which will trap pollutants.

The drainage system has been designed to accommodate the 100yr + 40% climate change storm.

The site is occupied by one tenant who will be responsible for the operation and maintenance of the SUDs drainage system.

DESIGN CRITERIA

1. The approved design has been based upon the following publications and computer software.
 - a) Non Statutory Technical Standards for Sustainable Drainage Systems (Ref A)
 - b) The SUDS Manual C753 by CIRIA (Ref B)
 - c) Sustainable Drainage Systems C609 by CIRIA (Ref C)
 - d) MicroDrainage WinDes software

MAINTENANCE

2. Maintenance needs will be dependent on the frequency of inspections. Regular inspections will identify problems at an early stage and enable minor defects to be rectified before any major deterioration occurs. Maintenance can fall into two categories:

Routine Maintenance

Periodic Maintenance

Catchpits/Soakaway Chambers

3. The cleaning out/removal of silt and debris from the catchpit and/or soakaway chambers on a monthly basis during the construction phase, and annually, after large storms or as required thereafter.
4. Inspection and monitoring of inlets, outlets and overflows for blockages on a monthly basis during the construction phase, and annually, after large storms or as required thereafter.

Soakaway Crates

5. The cleaning out/removal of silt and debris from the catchpit and/or silt chambers on a monthly basis during the construction phase, and annually, after large storms or as required thereafter.
6. Inspection and monitoring of inlets, outlets and overflows for blockages on a monthly basis during the construction phase, and annually, after large storms or as required thereafter.

Swales, French Drains & Attenuation Basin

7. The cleaning out/removal of litter & debris on a monthly basis or as required. Wild flower/grass cutting is required annually where required and the removal of cuttings is essential as if the soil becomes too rich all that will grow is grass.
8. Re-seeding & planting of areas of poor vegetation growth on an annual basis. Remedial action to be taken of erosion or build-up of sediment as required.
9. Where shingle/gravel surfacing is present, raking and/or topping up is required quarterly.
10. Inspection/monitoring of inlets, outlets, overflows for blockages on a monthly basis.

Maintenance Schedule

11. A suggested Maintenance Schedule has been prepared for the future Stakeholders and it will be their responsibility to implement a suitable maintenance regime. A copy of this Maintenance Schedule is provided at Appendix 1.

CONCLUSION

8. The array of on-site storage facilities have been designed to accommodate the run-off from the proposed development for all storms up to and including the 1 in 100 year + 40% climate change event.

By using a combination of the 'Best Management Practices' for this development it is believed that the design approach meets the objective of the SUDS concept and the requirements of the EA. The benefits can be listed as:-

- Reduction in the quantity of run-off to, and the protection of groundwater.
- Protection of existing and proposed properties from flooding.
- Improved ecological environment.

GTR FONTWELL

APPENDIX 1

MAINTENANCE SCHEDULE

GTR FONTWELL**SUSTAINABLE URBAN DRAINAGE SYSTEMS MAINTENANCE SCHEDULE****AIM**

1. The aim of the Maintenance Schedule is to set out the minimum requirements to maintain the Sustainable Urban Drainage System (SUDS) provided on this development for the treatment / retention of surface water run-off.

OBJECTIVE

2. The objective is to ensure that through planned maintenance and regular inspections the SUDS management train will continue to function for the purpose it was intended.

INSPECTIONS

3. Maintenance needs will be dependent on the frequency of inspections. Regular inspections will identify problems at an early stage and enable minor defects to be rectified before any major deterioration occurs.

MAINTENANCE

4. Initial Maintenance Schedules have been prepared and should be developed during the design phase and adjustments made thereafter to suit specific site requirements.
 - Table 1 – Catchpits/Soakaway Chambers
 - Table 2 - Soakaway Crates
 - Table 3 - Swales, French Drains & Attenuation Basin

Table 1 – Catchpits/Soakaway Chambers Maintenance Schedule

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Silt, litter and debris removal from catchpits and soakaway chambers.	Three monthly initially and then as required.
	Silt and debris removal from gullies.	Three monthly initially and then as required.
	Oils removed from catchpits and gullies.	Immediately following spillages or as required.
Monitoring	Open and inspect catchpits and soakaway chambers.	Monthly/after large storms.

Table 2 – Soakaway Crate Maintenance Schedule

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Three monthly initially, then as required.
	Debris removal from catchment surface (where this may cause risk to performance).	Monthly.
	Remove sediment from pre-treatment structures (catchpit/silt traps)	Quarterly or as required.
Remedial Action	Repair of inlets, outlet, overflows and vents.	As required.
Monitoring	Inspect and check all inlets, outlet, overflows and vents to ensure they are in good condition and operating as designed.	Annually.
	Survey inside of tank for sediment build-up, and remove if necessary.	Annually, after large storms or as required.

Table 3 – Swales, French Drains & Attenuation Basin Management Schedule

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Litter and debris removal. Free movement of flap valves.	Monthly (or as required)
	Meadow grass mixture in basins and swales	Twice a year
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required)
Occasional maintenance	Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter, and cut back adjacent vegetation where possible.	Annually
	Re-seed areas of poor vegetation growth.	Annually
Remedial Actions	Repair erosion or other damage by re-turfing / reseeding, or raking and/or topping up of shingle/gravel surfacing if present.	As required
	Re-level uneven surfaces and reinstate design levels.	As required
	Remove build-up of silt/sediment.	As required
	Remove and dispose of oils or petrol residues using safe standard practices.	As required
Monitoring	Inspect inlets, outlets, control chambers and overflows for blockages, and clear if required.	Monthly
	Inspect surfaces for ponding, silt accumulation. Record areas where water is ponding for >48 hrs.	Monthly, or when required, Half yearly
	Establish appropriate silt removal frequencies	



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Our Ref: 15104X/HW/CPS

30 March 2020

Global Technologies Racing Limited
Denmans Lane
Fontwell
West Sussex
BN18 0SU

By email only

Dealt with by: Colin Shackelford

Direct Dial No: 01622 621978

For the attention of Mr J Biddlecombe

Dear John

GTR, Land at Arundel Road, Fontwell – Soakage Testing

Evans & Langford LLP carried out further work at the above location between 09-11 March 2020. The works comprised the drilling of four boreholes to a depth of between 2.50m and 5.10m, and the installation of a water monitoring well in each. This work follows on from our Report on Ground Investigation reference 15104X dated December 2019, which covers the whole site.

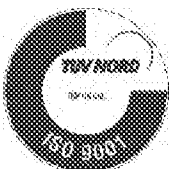
The works were located in the area of our previous BH6, which was drilled to a depth of 10.00m at the location of the proposed soakaway. BH6 found Made Ground, comprising predominantly clay layers with some chalk silt to 2.20m, over the Raised Storm Beach Deposits, which were GRAVEL of flint to 5.50m and gravelly (flint and chalk) CLAY to 7.00m. Below this was silty CLAY of the Lambeth Group, which was proved to the base of the borehole. The ground investigation layout is included as Figure 20.

BH8 was drilled very close to BH6 and was taken to a depth of 5.10m, with a monitoring well installed to 5.00m. Below topsoil BH8 found Made Ground to 1.90m, comprising gravelly clay over clayey gravel over chalk silt. In all cases gravel was of flint. Below this were the Raised Storm Beach Deposits, which comprised layers of GRAVEL of flint which were locally sandy or clayey. At the base of the borehole at 5.10m, chalk silt with a little gravel (flint) and clay were encountered; this is thought to be Raised Storm Beach Deposits similar to that found below the gravel in the nearby BH6, albeit containing more chalk in this location. Water was struck at 4.70m below ground level (bgl) and rose to 3.80m after 20 minutes. At the end of drilling that day (09/03/20), water was at 2.85m bgl and it was at 2.91m bgl at the start of the next day. The borehole log for BH8, with details of the water strike and the monitoring well installation, is included as Figure 21.

Once the water level had been confirmed in BH8, on the morning after being drilled, it was decided that further boreholes in the anticipated location of the crate soakaway would be drilled to 2.50m, just above the water level, installed with a water monitoring pipe, slotted below 1.50m to allow a series of soakage tests to be carried out.

All positions were located in areas of grass over topsoil. Below this, BH9 found layers of Made Ground to 1.90m comprising gravelly to slightly gravelly clay, where gravel was of flint. Raised Storm Beach Deposits, comprising slightly sandy flint GRAVEL, were encountered from 1.90m to the base of the borehole at 2.50m.

Continued /



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BH10 found gravelly (flint) clay to 0.50m over slightly sandy to sandy clay with rare gravel (flint) to its full depth. Given the findings of the boreholes nearby this was identified as Made Ground. The ground conditions found in BH10 were not particularly conducive for soakage so a fourth borehole, BH11, was drilled close to both BH8 and 9. This found Made Ground to 2.10m, comprising gravelly (flint and chalk) clay to 1.20m, over off-white and pale grey chalk silt with clay and gravel (flint) to 1.70m over gravelly (flint) clay with a little sand. Raised Storm Beach Deposits were encountered to the base of the borehole as sandy GRAVEL of flint with rare lenses of clay. The detailed borehole logs for BH9-11 are included as Figures 22-24.

The full results of the soakage tests carried out on 10 and 11 March in BH9, 10 and 11 are included as Figures 26-33, with a summary being presented below. The final column shows the average of the tests carried out in each of the boreholes.

Borehole Soakage Test Results			
Borehole & Test	Date	Result (m/s)	Average for borehole (m/s)
BH9, Test 1	10/03/20	4.5×10^{-6}	7.5×10^{-6}
BH9, Test 2	11/03/20	1.1×10^{-5}	
BH9, Test 3	11/03/20	6.5×10^{-6}	
BH10, Test 1	10/03/20	4.8×10^{-6}	6.3×10^{-6}
BH10, Test 2	11/03/20	6.5×10^{-6}	
BH10, Test 3	11/03/20	7.5×10^{-6}	
BH11, Test 1	11/03/20	4.8×10^{-5}	4.4×10^{-5}
BH11, Test 1	11/03/20	3.9×10^{-5}	

Note: time limitations prevented third test in BH11

Only in the tests carried out in borehole 9, was the driller able to fill the monitoring well to ground level. In all tests in BH9, and test 1 in BH10, 100 litres of water was pumped into the borehole for each test; for the other tests, 150 litres of water was used. Test results have been calculated to the BRE365 method, that is, the volume of water between 25% and 75% of effective depth is assumed to soak through an area up to 50% of the effective depth, where the effective depth is the depth of borehole minus the starting water level. It should be noted that the results for BH9 may be slightly conservative, due to the water level being within the sealed, unperforated part of the pipe during the first part of the test.

The lowest soakage rate calculated in any test was 4.5×10^{-6} m/s and the highest was 4.8×10^{-5} m/s with the average over all eight tests carried out being 1.6×10^{-5} m/s. The average of the tests where gravel was encountered (BH9 and 11) was 2.2×10^{-5} m/s. The rates achieved on this site are a little lower than can generally be expected for gravels and sands, but they are within a reasonable range for these materials.

The results of all groundwater monitoring, in all boreholes drilled by Evans & Langford on this site, are presented as Figure 25. The boreholes drilled as part of the main investigation were measured in using a tape measure and the ground level at each borehole was estimated from the topographical survey. Groundwater levels were then calculated using this information and have previously been issued to Arun District Council, so have been included on the graph for completeness, as dotted lines. During the more recent investigation, surveying equipment was available to accurately record the position and level at each of the boreholes. The data on the graph has therefore been updated and is shown as solid lines. The graphed data obviously only represents the situation during the monitoring visits and levels may have varied outside the limits shown.

It is noted that the water levels in BH8, measured recently, follow those measured in BH7 very closely. It can therefore be inferred that the December peak water level in the area of BH8 (and previous BH6, which did not have a monitoring well) is likely to have been around 22.91mOD, which is approximately 2.70mbgl at the location of BH8 i.e. the area of the proposed soakaway.

The borehole findings and measured soakage rates can now be used to refine the surface water drainage design strategy for the site. We trust that the above is clear, but please do not hesitate to contact us if you have any queries.

Yours sincerely
For and on behalf of Evans & Langford LLP

Enc.

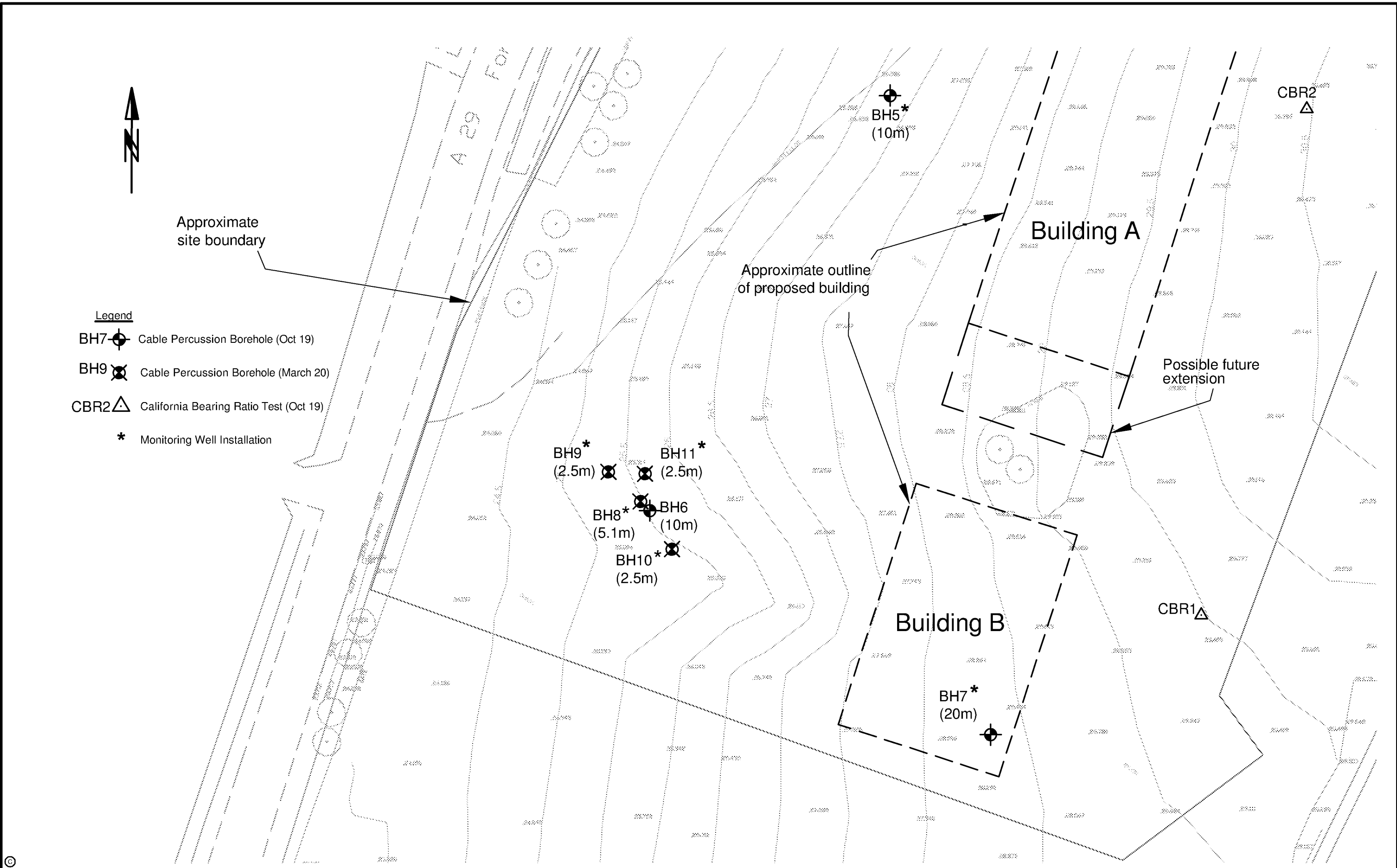
Figure 20 Borehole Location Plan

Figure 21-24 Cable Percussion Borehole Logs (BH8-11)

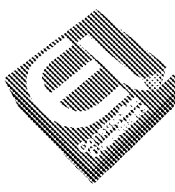
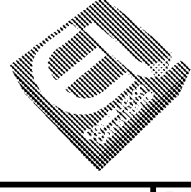
Figures 25 Water Monitoring Results

Figures 26-33 Soakage Test Results

Appendix A Relevant Extract from Original SI Report (Plan and borehole logs)



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 Evans & Langford LLP ♦ Structural & Civil Engineers ♦ Project Managers ♦ Land & Building Surveyors ♦ CDM Consultants ♦ Geo-Environmental Engineers ♦ Contract Administrators Evans & Langford LLP, 91 King Street, Maidstone, Kent ME14 1BG www.evanslangford.co.uk Tel +44 (0) 1622 690120 mail@evanslangford.co.uk	Revisions		Checked	Date	Land at Arundel Road Fontwell Additional Site Investigation Layout Plan for Soakage Testing	Scale 1:500 A3	Drawn HW		
							Date March 20		
							Checked CPS		
							Date March 20		
							Approved CPS		
							Date March 20		
						Drg No.	15104X/Figure 20		Rev. -



Evans & Langford LLP

Borehole Log

BH No:8

Sheet 1 of 2

Location: GTR Fontwell, Arundel

Job No.: 15104X

Final Depth: 5.1m

Diameter

Casing

GL (mOD)

Start

Finish

150mm

GL to 5.10m

25.62

09/03/2010

09/03/2020

Samples & insitu tests

STRATA DETAILS

Depth	Type	Test Result	Water	Reduced Level	Legend	Depth/ Thickness	Description	Installation/ Backfill
0.20	●			25.42		(0.20) 0.20	Grass over brown clayey topsoil. (Made Ground)	
0.50	●			25.12		(0.30) 0.50	Brown slightly gravelly clay. Gravel is of sub angular flint. (Made Ground)	
1.00	●			24.22		(0.90) 1.40	Brown clayey gravel with rare cobbles. Clay is soft. Gravel and cobbles are of sub angular to angular flint. (Made Ground)	
1.50	●			23.72		(0.50) 1.90	Off-white and pale yellow chalk silt with a little soft brown clay. Rare coarse gravel of rounded flint. (Made Ground)	
2.00	●			23.32		(0.40) 2.30	Slightly clayey GRAVEL. Gravel is fine to medium of sub rounded to sub angular flint. (Raised Storm Beach Deposits)	
2.50-3.00 2.50	● ↑↓			22.12		(1.20) 3.50	Slightly sandy GRAVEL. Gravel is fine to medium of rounded to sub angular flint. Sand is grey and fine to medium. (Raised Storm Beach Deposits)	
3.00	●							
3.50	●							
4.00	●					(1.60)	Fine to medium GRAVEL of rounded to sub rounded flint. At 4.00m, a medium gravel size lens of soft to firm brown clay. At 4.50m, becomes slightly sandy and sandy at 5.00m. (Raised Storm Beach Deposits)	
4.50-5.00 4.50	● ↑↓							

Remarks

Hand dug trial pit to 1.20m to check for buried services.
Water level at end of drilling on 09/03/20 at 2.85m bgl, and at 2.91m bgl at start of 10/03/20.

Chiselling Details

From To Time

Water added From To

Scale: 1:25

Figure No.:

21

Method: Cable Percussion Boring

Logged

HW

Checked

CPS

Approved

CPS



Evans & Langford LLP

Borehole Log

BH No:8

Sheet 2 of 2

Location: GTR Fontwell, Arundel

Job No.: 15104X

Final Depth: 5.1m

Diameter	Casing	GL (mOD)	Start	Finish
150mm	GL to 5.10m	25.62	09/03/2010	09/03/2020

Samples & insitu tests			STRATA DETAILS					Installation/ Backfill
Depth	Type	Test Result	Water	Reduced Level	Legend	Depth/ Thickness	Description	
5.10	●			20.52 20.47	o o o x x x	5.10 5.15	Clay and chalk (Driller's description). Sample at 5.10m comprised only white gravelly chalk silt; possible broken cobble of chalk. (Raised Storm Beach Deposits)	

Remarks

Hand dug trial pit to 1.20m to check for buried services.
Water level at end of drilling on 09/03/20 at 2.85m bgl, and at 2.91m bgl at start of 10/03/20.

Chiselling Details

From To Time

Water added From To

Scale: 1:25

Figure No.:

21

Method: Cable Percussion Boring

Logged

HW Checked CPS Approved CPS



Evans & Langford LLP

Borehole Log

BH No:9

Sheet 1 of 1

Location: GTR Fontwell, Arundel

Job No.: 15104X

Final Depth: 2.5m

Diameter	Casing	GL (mOD)	Start	Finish
150mm	GL to 2.50m	25.47	10/03/2020	10/03/2020

Samples & insitu tests			STRATA DETAILS					Installation/ Backfill
Depth	Type	Test Result	Water	Reduced Level	Legend	Depth/ Thickness	Description	
0.10	●			25.37		0.10	Grass over brown clayey topsoil.	
				25.17		(0.20) 0.30	(Made Ground) Brown gravelly clay. Gravel is of sub rounded to sub angular flint.	
0.50	●					(0.50)	(Made Ground) Brown slightly gravelly clay. Gravel is fine to medium of sub rounded to sub angular flint.	
				24.67		0.80	(Made Ground) Soft orange brown slightly gravelly clay with rare cobbles. Gravel is medium of sub angular flint. Cobble is of nodular flint.	
1.00	●					(1.10)	(Made Ground)	
1.50	●							
2.00-2.50 2.00	● ↑↓			23.57		1.90	Slightly sandy GRAVEL. Gravel is medium to coarse of sub rounded to sub angular flint. Sand is grey and fine.	
						(0.60)	At top of layer rare coarse gravel.	
2.50	●			22.97		2.50	(Raised Storm Beach Deposits)	

Remarks

Hand dug trial pit to 1.20m to check for buried services.
Borehole remained dry whilst open.

Chiselling Details

From To Time

Water added From To

Scale: 1:25

Figure No.:

22

Method: Cable Percussion Boring

Logged

HW Checked CPS Approved CPS



Evans & Langford LLP

Borehole Log

BH No:10

Sheet 1 of 1

Location: GTR Fontwell, Arundel

Job No.: 15104X

Final Depth: 2.5m

Diameter	Casing	GL (mOD)	Start	Finish
150mm	GL to 2.50m	25.40	09/03/2020	10/03/2020

Samples & insitu tests			STRATA DETAILS					Installation/ Backfill
Depth	Type	Test Result	Water	Reduced Level	Legend	Depth/ Thickness	Description	
0.10	●			25.30		0.10	Grass over brown clayey topsoil.	
						(0.40)	(<i>Made Ground</i>) Brown slightly gravelly clay. Gravel is fine to medium of sub rounded to sub angular flint.	
0.50	●			24.90		0.50	(<i>Made Ground</i>) Orange brown becoming brown, slightly sandy to sandy clay with rare gravel. Gravel is fine to medium of sub rounded to sub angular flint.	
						(2.00)	Gravel content increases at base of borehole.	
1.00	●						(<i>Made Ground</i>)	
1.50	●							
2.00	●							
2.50	●			22.90		2.50		

Remarks

Hand dug trial pit to 1.20m to check for buried services.
Borehole remained dry whilst open.

Chiselling Details

From	To	Time
Water added	From	To

Scale: 1:25

Figure No.:

23

Method: Cable Percussion Boring

Logged

HW Checked CPS Approved CPS



Evans & Langford LLP

Borehole Log

BH No:11

Sheet 1 of 1

Location: GTR Fontwell, Arundel

Job No.: 15104X

Final Depth: 2.5m

Diameter	Casing	GL (mOD)	Start	Finish
150mm	GL to 2.50m	25.65	11/03/2020	11/03/2020

Samples & insitu tests			STRATA DETAILS					Installation/ Backfill
Depth	Type	Test Result	Water	Reduced Level	Legend	Depth/ Thickness	Description	
				25.55		0.10	Grass over brown clayey topsoil.	
0.50						(1.10)	(Made Ground) Orange brown slightly gravelly, becoming gravelly clay. Gravel is fine to medium of sub rounded to angular flint with rare fine chalk.	
1.00							(Made Ground)	
				24.45		1.20	Off-white and pale grey chalk silt.	
1.50						(0.50)	Seam/band (15mm thick) of grey brown gravelly clay in sample at 1.50m. Gravel is fine to medium of sub rounded to sub angular flint.	
				23.95		1.70	(Made Ground)	
2.00						(0.40)	Brown and pale orange brown gravelly clay with a little sand. Gravel is fine to medium of sub rounded to sub angular flint. Sand is grey brown and pale grey and fine to medium.	
2.10-2.50				23.55		2.10	(Made Ground)	
						(0.40)	Pale grey sandy GRAVEL with rare fine to medium gravel size lenses of soft sandy clay. Gravel is fine to medium of sub rounded to sub angular flint. Sand is fine to medium.	
2.50				23.15		2.50	(Raised Storm Beach Deposits)	

Remarks

Hand dug trial pit to 1.20m to check for buried services.
Borehole remained dry whilst open.
Ground level is approximate.

Chiselling Details

From	To	Time
------	----	------

Water added	From	To
-------------	------	----

Scale: 1:25

Figure No.:

24

Method: Cable Percussion Boring

Logged

HW	Checked	CPS	Approved	CPS
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Water Levels in Borehole Installations at GTR Fontwell, Arundel

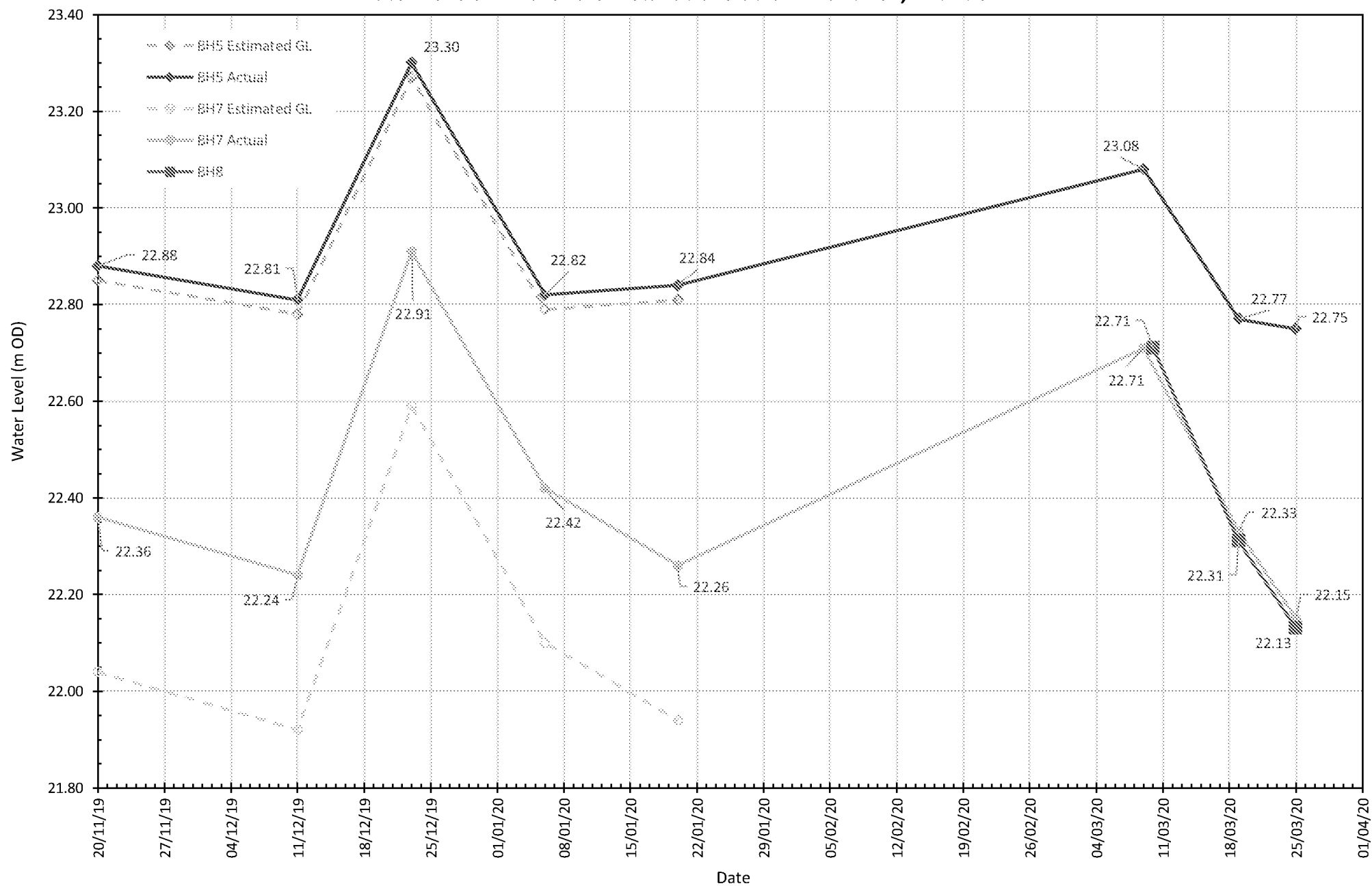


Figure 25

Borehole Soakage Test Results - BH9, Test 1 (10/03/20)

Time (minutes)	Depth below ground level (metres)
0.0	0.00
0.5	0.47
1.0	0.60
1.5	0.78
2.0	0.98
2.5	1.16
3.0	1.28
3.5	1.36
4.0	1.42
4.5	1.43
5.0	1.46
6.0	1.50
7.0	1.53
8.0	1.56
9.0	1.60
10.0	1.62
15.0	1.72
20.0	1.80
30.0	1.85
45.0	1.90
60.0	2.00
120.0	2.16
180.0	2.27

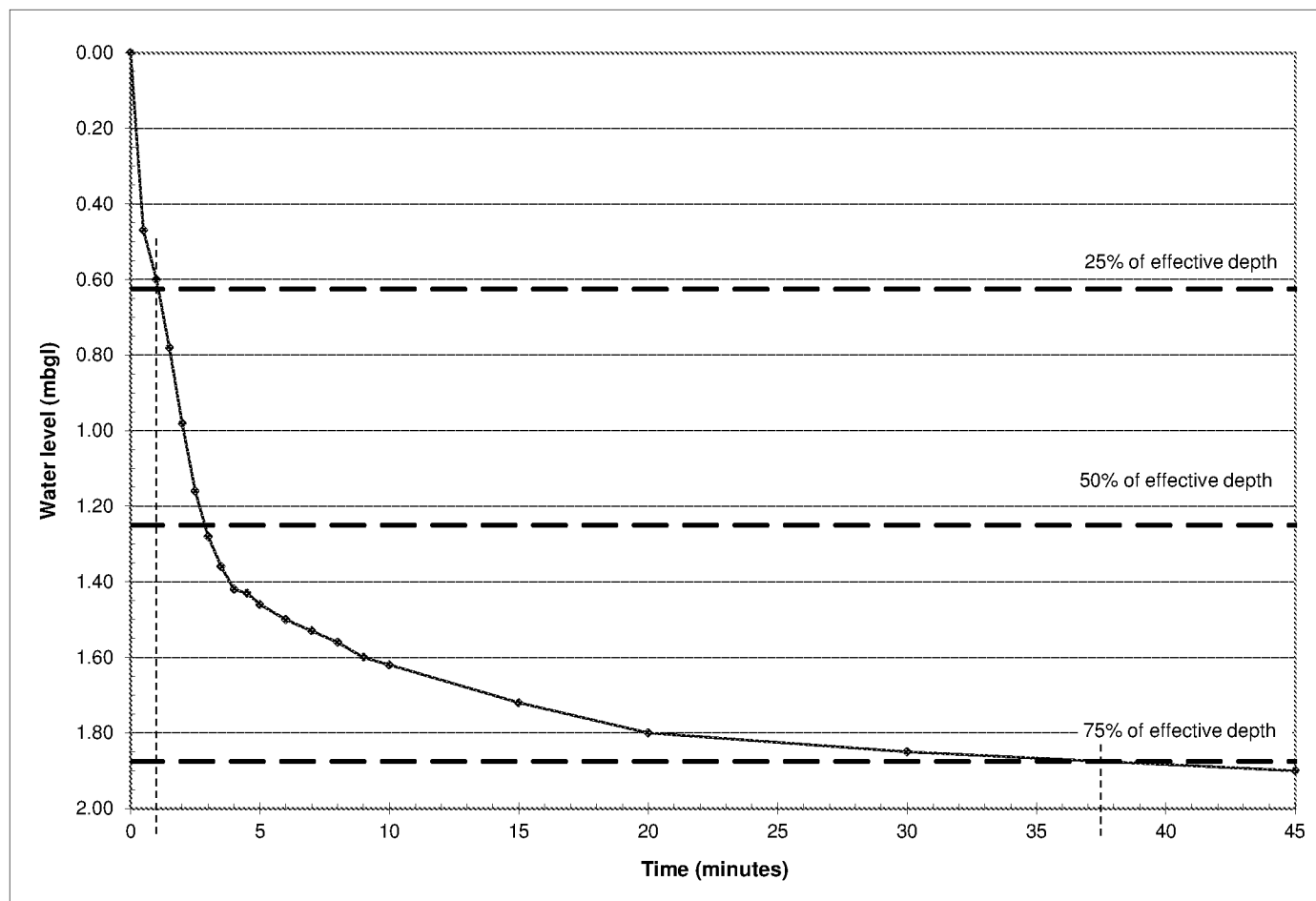


Figure 26a

Borehole Soakage Test Results - BH9, Test 1 (10/03/20)

Calculation of Soakage Rate to BRE Digest 365

Depth of borehole (A)	2.50	m
Water level at start of test (B)	0.00	m
Water level at end of test	2.27	m
Effective Depth (A-B)	2.50	m

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

75% of effective depth =	1.875	m
plus original water level=	1.875	m

50% of effective depth=	1.250	m
plus original water level=	1.250	m

25% of effective depth=	0.625	m
plus original water level=	0.625	m

where V_{p75-25} = effective storage volume between 75% and 25% of effective depth
 a_{p50} = internal surface area of the trial pit up to 50% effective depth
 t_{p75-25} = time for water level to fall from 75% to 25% effective depth.

Soil infiltration rate is calculated based upon the time for water level to fall from 25% to 75% of the effective depth

t_{p75-25} =	37.5-1.0	or	36.5	minutes
			2190	seconds

a_{p50} =	0.489	m^2
-------------	-------	-------

V_{p75-25} =	0.00481	m^3
----------------	---------	-------

} calculated separately

Soil infiltration rate =

$$\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = 4.5E-06 \text{ m/s}$$

Note: 100 litres of water were used in this test.

Figure 26b

Borehole Soakage Test Results - BH9, Test 2 (11/03/20)

Time (minutes)	Depth below ground level (metres)
0.0	0.00
0.5	0.85
1.0	1.06
1.5	1.33
2.0	1.45
2.5	1.50
3.0	1.53
3.5	1.55
4.0	1.58
4.5	1.60
5.0	1.63
6.0	1.67
7.0	1.70
8.0	1.74
9.0	1.76
10.0	1.79
15.0	1.88
20.0	1.90
30.0	2.00
45.0	2.12
60.0	2.19
75.0	2.25

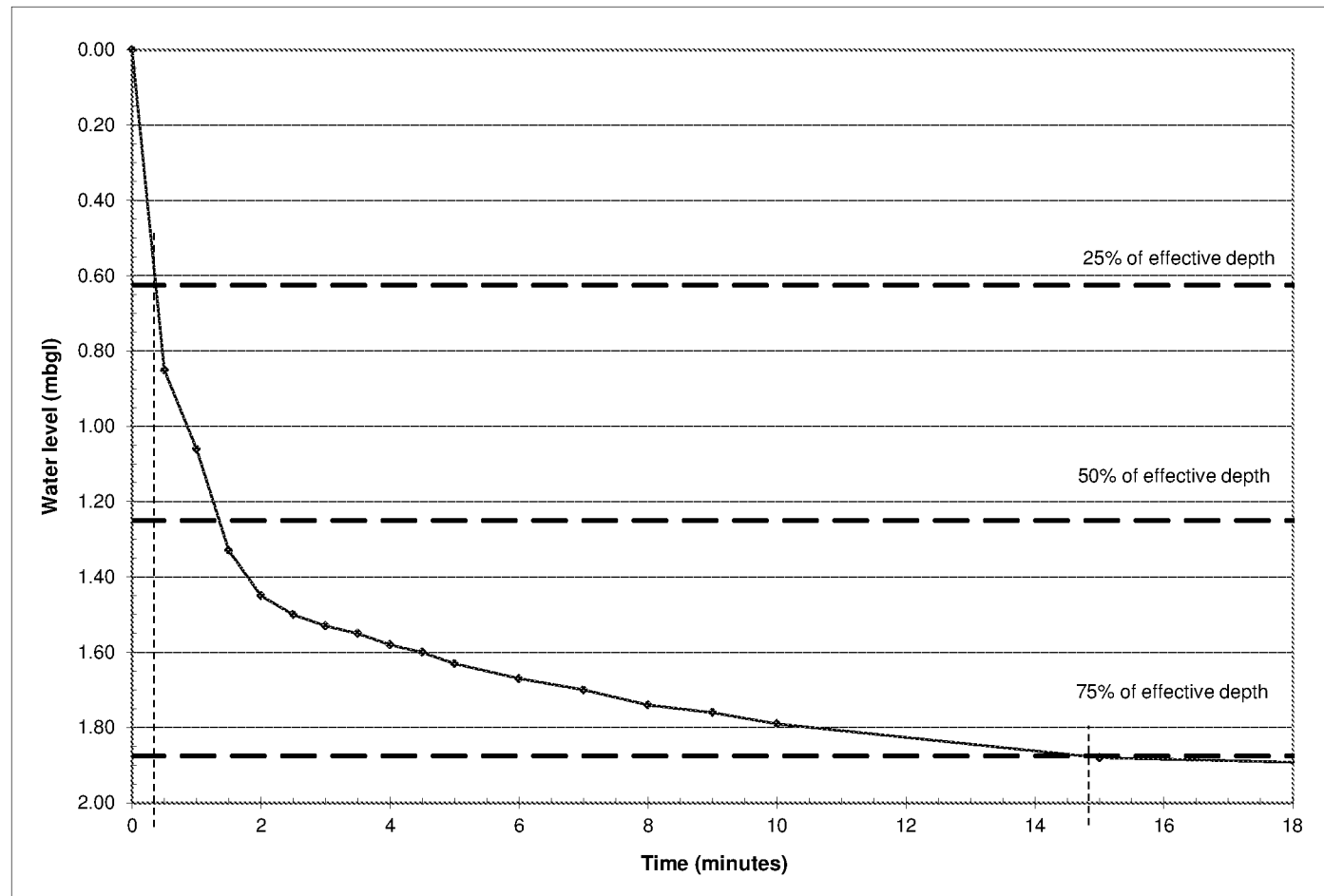


Figure 27a

Borehole Soakage Test Results - BH9, Test 2 (11/03/20)

Calculation of Soakage Rate to BRE Digest 365

Depth of borehole (A)	2.50	m
Water level at start of test (B)	0.00	m
Water level at end of test	2.25	m
Effective Depth (A-B)	2.50	m

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

75% of effective depth =	1.875	m
plus original water level=	1.875	m

50% of effective depth=	1.250	m
plus original water level=	1.250	m

25% of effective depth=	0.625	m
plus original water level=	0.625	m

where V_{p75-25} = effective storage volume between 75% and 25% of effective depth
 a_{p50} = internal surface area of the trial pit up to 50% effective depth
 t_{p75-25} = time for water level to fall from 75% to 25% effective depth.

Soil infiltration rate is calculated based upon the time for water level to fall from 25% to 75% of the effective depth

t_{p75-25} =	14.75-0.40	or	14.35	minutes
			861	seconds

a_{p50} =	0.489	m^2	} calculated separately
V_{p75-25} =	0.00481	m^3	

Soil infiltration rate =

$$\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = 1.1E-05 \text{ m/s}$$

Note: 100 litres of water were used in this test.

Figure 27b

Borehole Soakage Test Results - BH9, Test 3 (11/03/20)

Time (minutes)	Depth below ground level (metres)
0.0	0.00
0.5	0.87
1.0	0.97
1.5	1.23
2.0	1.40
2.5	1.47
3.0	1.50
3.5	1.52
4.0	1.54
4.5	1.56
5.0	1.58
6.0	1.61
7.0	1.62
8.0	1.66
9.0	1.69
10.0	1.71
15.0	1.78
20.0	1.84
30.0	1.90
45.0	2.00
60.0	2.10
75.0	2.16

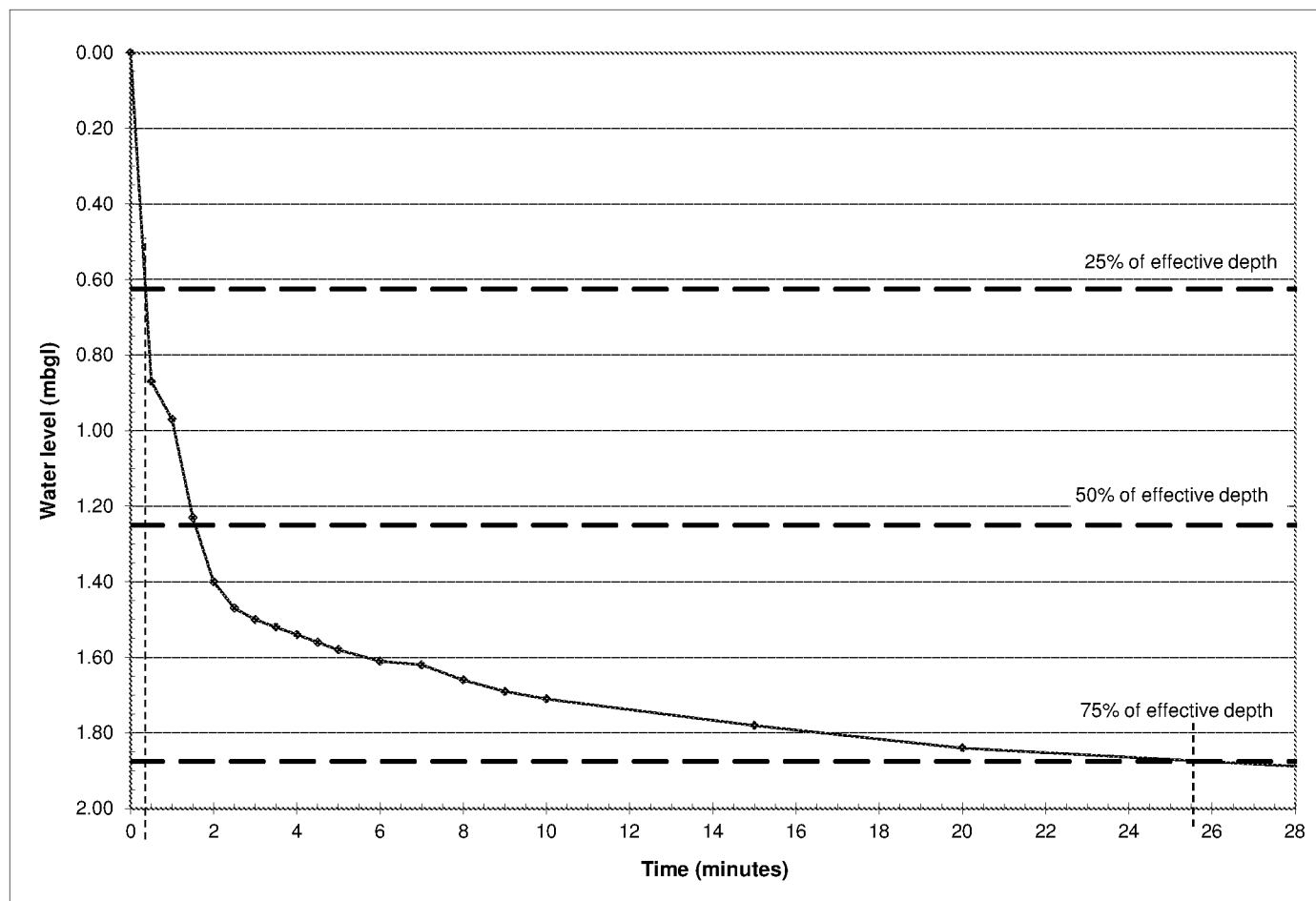


Figure 28a

Borehole Soakage Test Results - BH9, Test 3 (11/03/20)

Calculation of Soakage Rate to BRE Digest 365

Depth of borehole (A)	2.50	m
Water level at start of test (B)	0.00	m
Water level at end of test	2.16	m
Effective Depth (A-B)	2.50	m

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

75% of effective depth =	1.875	m
plus original water level=	1.875	m

50% of effective depth=	1.250	m
plus original water level=	1.250	m

25% of effective depth=	0.625	m
plus original water level=	0.625	m

where V_{p75-25} = effective storage volume between 75% and 25% of effective depth
 a_{p50} = internal surface area of the trial pit up to 50% effective depth
 t_{p75-25} = time for water level to fall from 75% to 25% effective depth.

Soil infiltration rate is calculated based upon the time for water level to fall from 25% to 75% of the effective depth

t_{p75-25} =	25.5-0.40	25.1	minutes
	or	1506	seconds

a_{p50} =	0.489	m^2
-------------	-------	-------

V_{p75-25} =	0.00481	m^3
----------------	---------	-------

} calculated separately

Soil infiltration rate =

$$\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \mathbf{6.5E-06 \text{ m/s}}$$

Note: 100 litres of water were used in this test.

Figure 28b

Borehole Soakage Test Results - BH10, Test 1 (10/03/20)

Time (minutes)	Depth below ground level (metres)
0.0	2.100
0.5	2.140
1.0	2.150
1.5	2.160
2.0	2.170
2.5	2.170
3.0	2.170
3.5	2.175
4.0	2.175
4.5	2.175
5.0	2.180
6.0	2.185
7.0	2.190
8.0	2.195
9.0	2.200
10.0	2.205
15.0	2.220
20.0	2.230
30.0	2.270
45.0	2.320
60.0	2.400

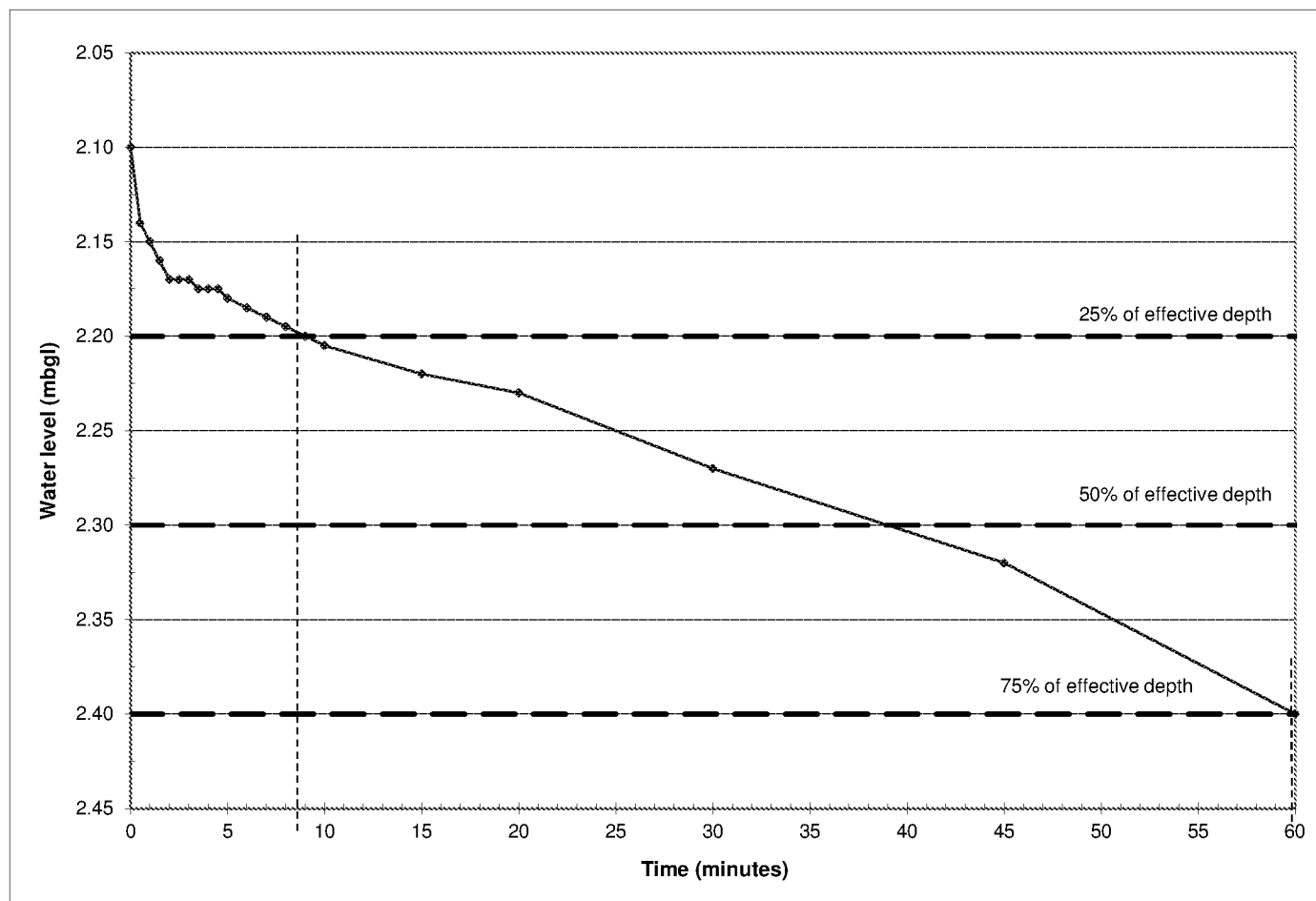


Figure 29a

Borehole Soakage Test Results - BH10, Test 1 (10/03/20)

Calculation of Soakage Rate to BRE Digest 365

Depth of borehole (A)	2.50	m
Water level at start of test (B)	2.10	m
Water level at end of test	2.40	m
Effective Depth (A-B)	0.40	m

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

75% of effective depth =	0.300	m
plus original water level=	2.400	m

50% of effective depth=	0.200	m
plus original water level=	2.300	m

25% of effective depth=	0.100	m
plus original water level=	2.200	m

where V_{p75-25} = effective storage volume between 75% and 25% of effective depth
 a_{p50} = internal surface area of the trial pit up to 50% effective depth
 t_{p75-25} = time for water level to fall from 75% to 25% effective depth.

Soil infiltration rate is calculated based upon the time for water level to fall from 25% to 75% of the effective depth

t_{p75-25} =	60-8.5	or	51.5	minutes
			3090	seconds
a_{p50} =	0.112		m^2	} calculated separately
V_{p75-25} =	0.00165		m^3	

Soil infiltration rate =

$$\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \mathbf{4.8E-06 \text{ m/s}}$$

Note: 100 litres of water were used in this test. It was not possible to raise the water level to ground level.

Figure 29b

Borehole Soakage Test Results - BH10, Test 2 (11/03/20)

Time (minutes)	Depth below ground level (metres)
0.0	1.900
0.5	2.100
1.0	2.130
1.5	2.150
2.0	2.160
2.5	2.170
3.0	2.180
3.5	2.190
4.0	2.195
4.5	2.200
5.0	2.200
6.0	2.210
7.0	2.220
8.0	2.225
9.0	2.230
10.0	2.240
15.0	2.240
20.0	2.270
30.0	2.310
45.0	2.370
60.0	Dry

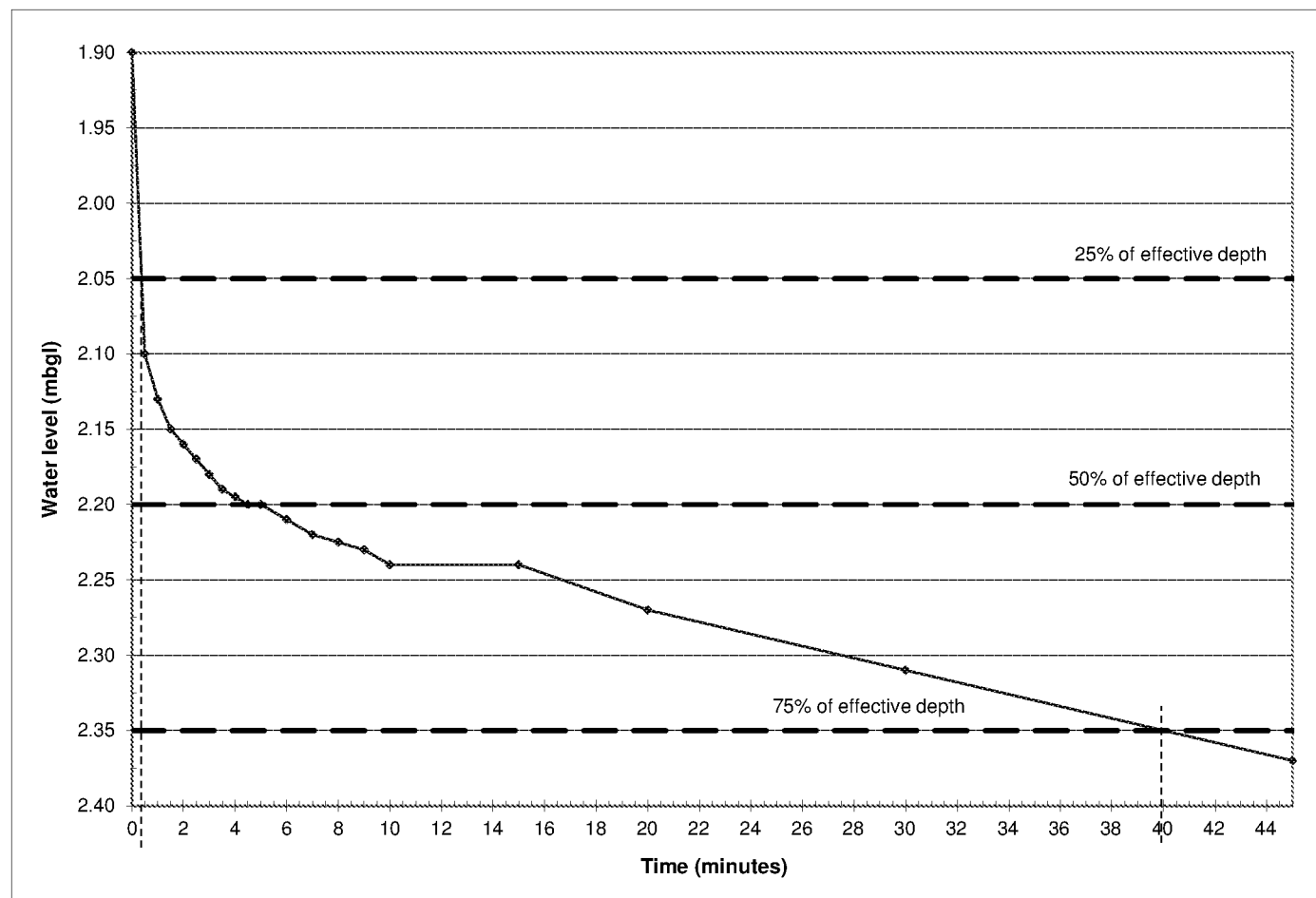


Figure 30a

Borehole Soakage Test Results - BH10, Test 2 (11/03/20)

Calculation of Soakage Rate to BRE Digest 365

Depth of borehole (A)	2.50	m
Water level at start of test (B)	1.90	m
Water level at end of test	2.50	m
Effective Depth (A-B)	0.60	m

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

75% of effective depth =	0.450	m
plus original water level=	2.350	m

50% of effective depth=	0.300	m
plus original water level=	2.200	m

25% of effective depth=	0.150	m
plus original water level=	2.050	m

where V_{p75-25} = effective storage volume between 75% and 25% of effective depth
 a_{p50} = internal surface area of the trial pit up to 50% effective depth
 t_{p75-25} = time for water level to fall from 75% to 25% effective depth.

Soil infiltration rate is calculated based upon the time for water level to fall from 25% to 75% of the effective depth

t_{p75-25} =	40-0.4	or	39.6	minutes
			2376	seconds
a_{p50} =	0.159		m^2	} calculated separately
V_{p75-25} =	0.00247		m^3	

Soil infiltration rate =

$$\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \mathbf{6.5E-06 \text{ m/s}}$$

Note: 150 litres of water were used in this test. It was not possible to raise the water level to ground level.

Figure 30b

Borehole Soakage Test Results - BH10, Test 3 (11/03/20)

Time (minutes)	Depth below ground level (metres)
0.0	1.940
0.5	2.000
1.0	2.140
1.5	2.160
2.0	2.190
2.5	2.210
3.0	2.220
3.5	2.230
4.0	2.230
4.5	2.230
5.0	2.235
6.0	2.245
7.0	2.245
8.0	2.250
9.0	2.260
10.0	2.265
15.0	2.280
20.0	2.300
30.0	2.340
45.0	2.400
60.0	Dry

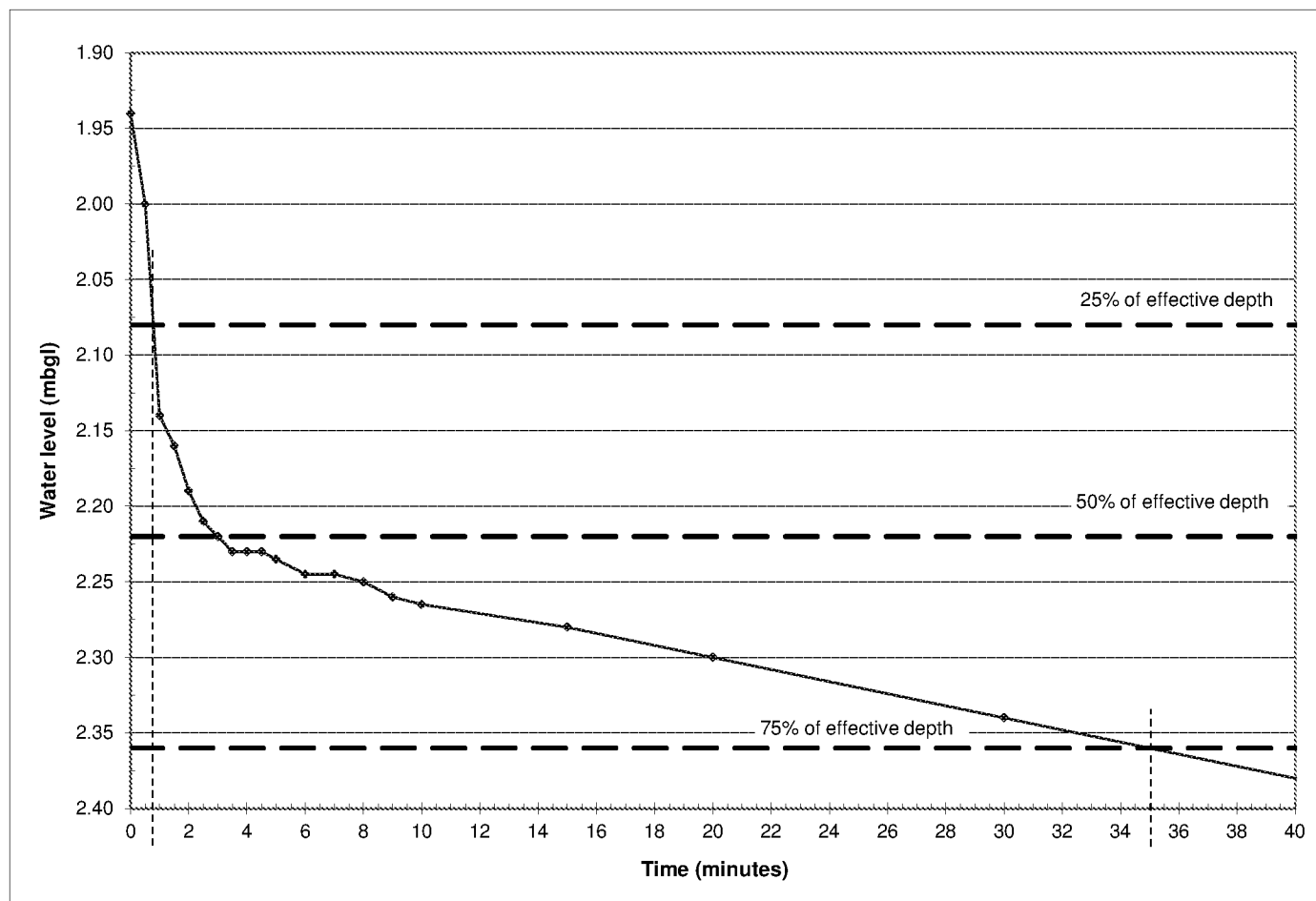


Figure 31a

Borehole Soakage Test Results - BH10, Test 3 (11/03/20)

Calculation of Soakage Rate to BRE Digest 365

Depth of borehole (A)	2.50	m
Water level at start of test (B)	1.94	m
Water level at end of test	2.50	m
Effective Depth (A-B)	0.56	m

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

75% of effective depth =	0.420	m
plus original water level=	2.360	m

50% of effective depth=	0.280	m
plus original water level=	2.220	m

25% of effective depth=	0.140	m
plus original water level=	2.080	m

where V_{p75-25} = effective storage volume between 75% and 25% of effective depth
 a_{p50} = internal surface area of the trial pit up to 50% effective depth
 t_{p75-25} = time for water level to fall from 75% to 25% effective depth.

Soil infiltration rate is calculated based upon the time for water level to fall from 25% to 75% of the effective depth

t_{p75-25} =	35-0.75	or	34.25	minutes
			2055	seconds
a_{p50} =	0.150		m^2	} calculated separately
V_{p75-25} =	0.00231		m^3	

Soil infiltration rate =

$$\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \mathbf{7.5E-06 \text{ m/s}}$$

Note: 150 litres of water were used in this test. It was not possible to raise the water level to ground level.

Figure 31b

Borehole Soakage Test Results - BH11, Test 1 (11/03/20)

Time (minutes)	Depth below ground level (metres)
0.0	1.62
0.5	1.74
1.0	1.83
1.5	1.92
2.0	1.97
2.5	2.00
3.0	2.06
3.5	2.10
4.0	2.12
4.5	2.16
5.0	2.19
6.0	2.25
7.0	2.30
8.0	Dry

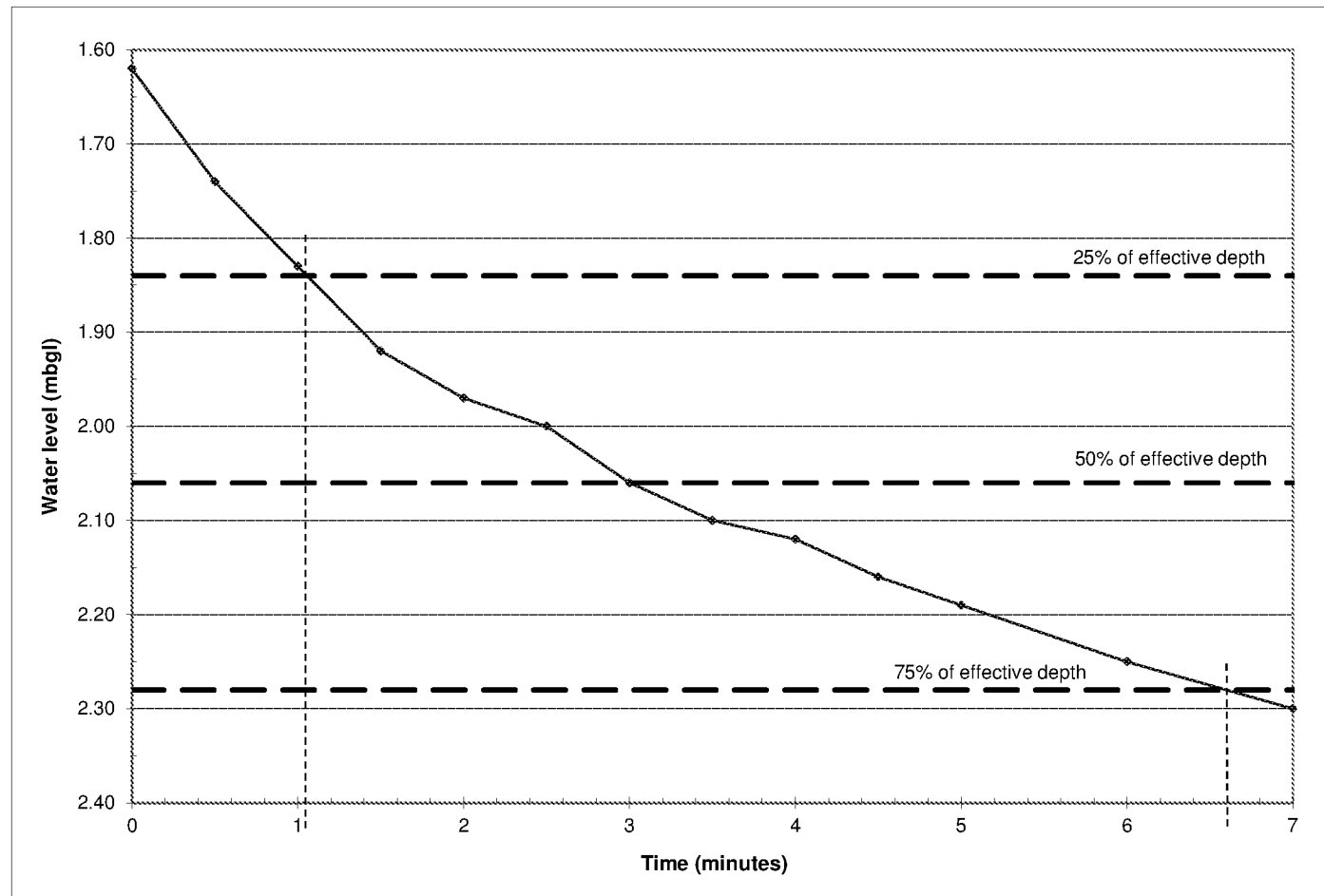


Figure 32a

Borehole Soakage Test Results - BH11, Test 1 (11/03/20)

Calculation of Soakage Rate to BRE Digest 365

Depth of borehole (A)	2.50	m
Water level at start of test (B)	1.62	m
Water level at end of test	2.50	m
Effective Depth (A-B)	0.88	m

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

75% of effective depth =	0.660	m
plus original water level=	2.280	m

50% of effective depth=	0.440	m
plus original water level=	2.060	m

25% of effective depth=	0.220	m
plus original water level=	1.840	m

where V_{p75-25} = effective storage volume between 75% and 25% of effective depth
 a_{p50} = internal surface area of the trial pit up to 50% effective depth
 t_{p75-25} = time for water level to fall from 75% to 25% effective depth.

Soil infiltration rate is calculated based upon the time for water level to fall from 25% to 75% of the effective depth

t_{p75-25} =	6.6-1.05	or	5.55	minutes
			333	seconds

a_{p50} =	0.225	m^2
-------------	-------	-------

V_{p75-25} =	0.00363	m^3
----------------	---------	-------

} calculated separately

Soil infiltration rate =

$$\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \mathbf{4.8E-05 \text{ m/s}}$$

Note: 150 litres of water were used in this test. It was not possible to raise the water level to ground level.

Figure 32b

Borehole Soakage Test Results - BH11, Test 2 (11/03/20)

Time (minutes)	Depth below ground level (metres)
0.0	1.69
0.5	1.79
1.0	1.87
1.5	1.93
2.0	2.00
2.5	2.04
3.0	2.05
3.5	2.06
4.0	2.12
4.5	2.15
5.0	2.18
6.0	2.21
7.0	2.26
8.0	2.30
9.0	2.35
10.0	2.39
15.0	Dry

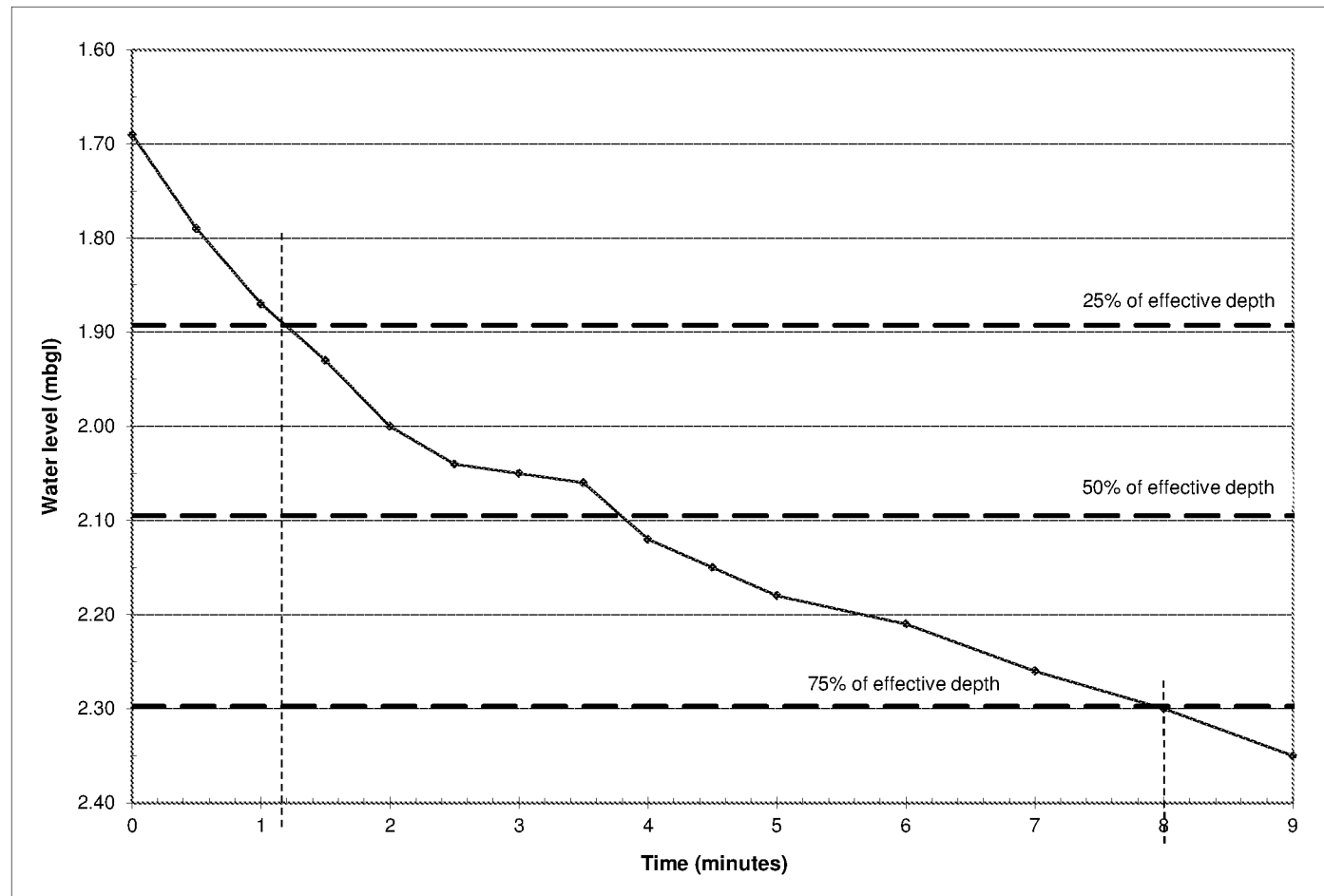


Figure 33a

Borehole Soakage Test Results - BH11, Test 2 (11/03/20)

Calculation of Soakage Rate to BRE Digest 365

Depth of borehole (A)	2.50	m
Water level at start of test (B)	1.69	m
Water level at end of test	2.50	m
Effective Depth (A-B)	0.81	m

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

75% of effective depth =	0.608	m
plus original water level=	2.298	m

50% of effective depth=	0.405	m
plus original water level=	2.095	m

25% of effective depth=	0.203	m
plus original water level=	1.893	m

where V_{p75-25} = effective storage volume between 75% and 25% of effective depth
 a_{p50} = internal surface area of the trial pit up to 50% effective depth
 t_{p75-25} = time for water level to fall from 75% to 25% effective depth.

Soil infiltration rate is calculated based upon the time for water level to fall from 25% to 75% of the effective depth

t_{p75-25} =	8-1.2	or	6.8	minutes
			408	seconds
a_{p50} =	0.209		m^2	} calculated separately
V_{p75-25} =	0.00334		m^3	

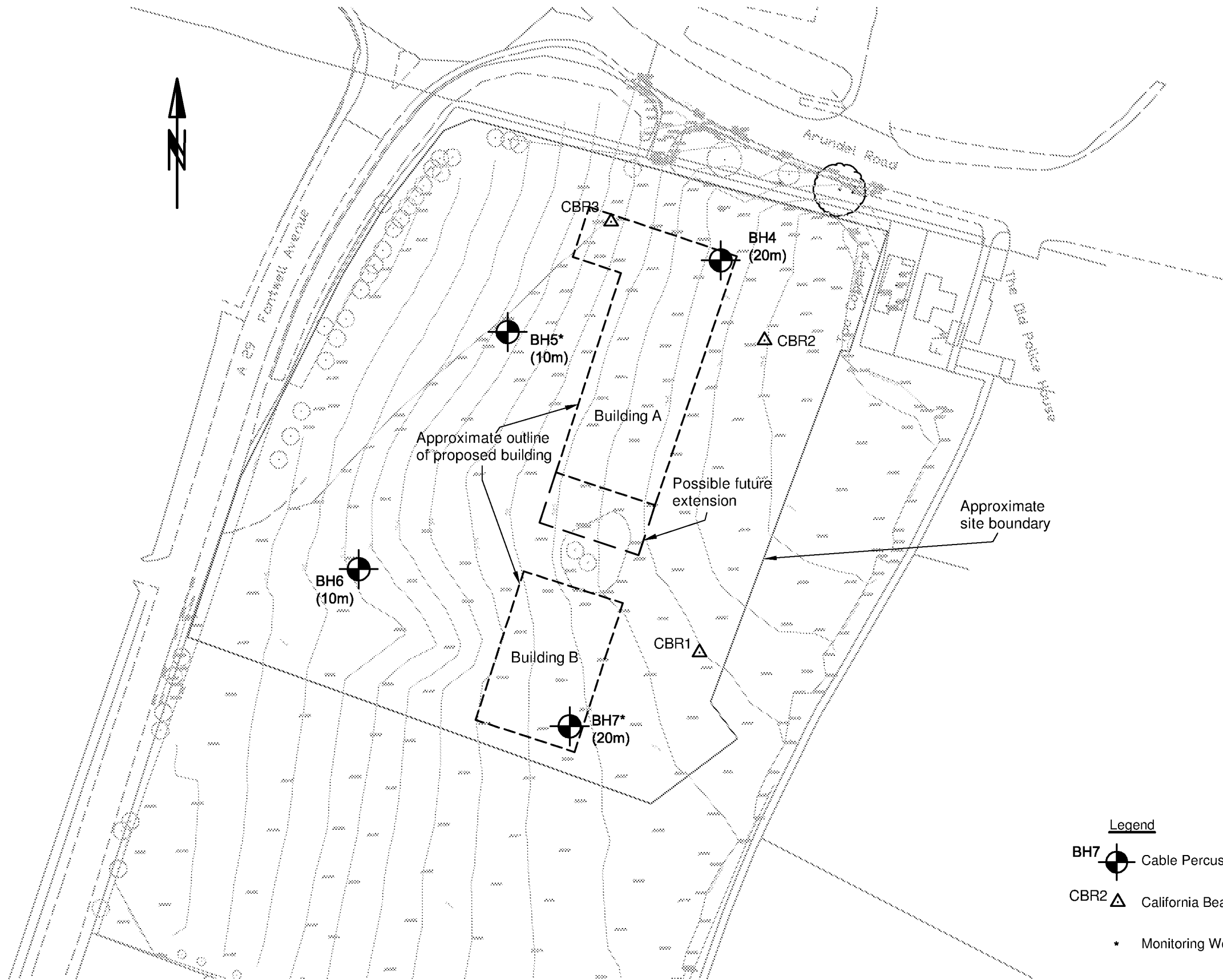
Soil infiltration rate =

$$\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \mathbf{3.9E-05 \text{ m/s}}$$

Note: 150 litres of water were used in this test. It was not possible to raise the water level to ground level.

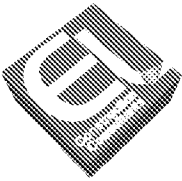
Figure 33b

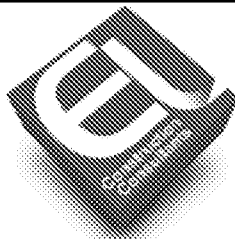
Appendix A
Relevant Extract from Original Site Investigation Report



- Legend**
- BH7 Cable Percussion Borehole
 - CBR2 California Bearing Ratio Test
 - * Monitoring Well Installation

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 Evans & Langford LLP ♦ Structural & Civil Engineers ♦ Project Managers ♦ Land & Building Surveyors ♦ CDM Consultants ♦ Geo-Environmental Engineers ♦ Contract Administrators Evans & Langford LLP, 91 King Street, Maidstone, Kent ME14 1BG www.evanslangford.co.uk Tel +44 (0) 1622 690120 mail@evanslangford.co.uk	Revisions		Checked	Date	Land at Arundel Road Fontwell Site Investigation Layout Plan	Scale 1:1,000 OA3	Drawn HW		
							Date Oct 19		
							Checked CPS		
							Date Dec 19		
						Approved CPS	Date Dec 19		
						Drg No.	15104X/Figure 2		Rev. -



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Borehole Log

BH No.:4

Sheet 1 of 3

Location: GTR Fontwell, Arundel

Job No.: 15104X

Final Depth: 20.45m

Diameter

Casing

GL (mOD)

Start

Finish

200mm

GL to 13.00m

29.65

30/10/2019

31/10/2019

Samples & insitu tests

STRATA DETAILS

Depth	Type	Test Result	Water	Reduced Level	Legend	Depth/ Thickness	Description	Installation/ Backfill
0.10	●			29.55		0.10	Grass over brown slightly gravelly, clayey topsoil with occasional fine roots. Gravel is of flint.	
0.40	●			29.25		0.40		
1.00	●						(Made Ground)	
1.20-1.65	●	N=24					Firm brown very gravelly clay with rare fine roots. Gravel is of sub rounded to sub angular flint.	
1.50	●					(2.00)	(Made Ground)	
2.00	●						Medium dense to loose brown very clayey gravel with rare fine roots. Gravel is of sub rounded to sub angular flint.	
2.00-2.45	●	N=9					(Made Ground)	
2.50	●			27.25		2.40	Off-white and cream, locally buff chalk silt.	
3.00	●					(1.00)	(Made Ground)	
3.00-3.45	●	N=20						
3.50	●			26.25		3.40	Brown slightly sandy, very clayey gravel. Gravel is of sub rounded to sub angular flint.	
4.00	●					(0.60)		
4.00-4.45	●	N=18		25.65		4.00	(Made Ground)	
4.50-5.00	●					(0.50)	Pale yellow, locally buff, locally white chalk silt. A little firm brown gravelly clay. Gravel is fine to medium of flint.	
4.50	●			25.15		4.50	(Made Ground)	
5.00	●	pp=1.5					Firm pale grey becoming orange brown slightly gravelly CLAY with a little orange brown fine to medium sand. Gravel is fine of flint. Locally a little silt.	
5.00-5.45	●	N=7						
5.50	●	pp=1.1					Gravel content increases with depth.	
6.00	●	pp=1.0				(2.30)	At 4.50m, pale green brown, slightly gravelly, slightly silty fine SAND. Gravel is fine to medium of rounded to sub rounded flint.	
6.50	●						(Head)	
6.50-6.95	●	pp=1.2		22.85		6.80		
7.00	●	pp=2.8				(0.70)	Stiff grey locally red, locally orange brown CLAY with a little orange brown sand.	
7.50	●	pp=1.9		22.15		7.50	(Lambeth Group)	
8.00	●						Stiff becoming very stiff, black locally red, gravelly CLAY. Gravel is fine to medium of black lignite.	
8.00-8.45	●	pp=3.1				(1.20)	Below 8.00m, clay is dark grey, with no gravel.	
8.50	●	pp=3.7					(Lambeth Group)	
9.00	●	pp=3.4		20.95		8.70		
9.50	●						Very stiff red CLAY with rare orange brown or grey mottling.	
9.50-9.95	●	pp=4.1					At 10.50m, clay is dark grey, locally red.	
10.00	●	pp=6+					Locally clay is extremely closely fissured.	
		pp=26					(Lambeth Group)	
		pp=5.7						
		pp=6+						

Remarks

Hand dug trial pit to 1.20m to check for buried services.
Casing reduced to 150mm at 12.50m.
Ground level is approximate.

Chiselling Details

From

To

Time

Water added

From

To

Scale: 1:50

Figure No.:

3

Method: Cable Percussion Boring

Logged

HW

Checked

CPS

Approved

CPS



Evans & Langford LLP

Borehole Log

BH No.:4

Sheet 2 of 3

Location: GTR Fontwell, Arundel

Job No.: 15104X

Final Depth: 20.45m

Diameter	Casing	GL (mOD)	Start	Finish
200mm	GL to 13.00m	29.65	30/10/2019	31/10/2019

Samples & insitu tests			STRATA DETAILS					Installation/ Backfill
Depth	Type	Test Result	Water	Reduced Level	Legend	Depth/ Thickness	Description	
10.50	●	pp=4.4				(2.60)	Very stiff red CLAY with rare orange brown or grey mottling. At 10.50m, clay is dark grey, locally red. Locally clay is extremely closely fissured.	
11.00 11.00-11.45	● 	pp=4.2 N=29 pp=4.8		18.35		11.30	(Lambeth Group)	
11.50	●	pp=5.7					Very stiff dark grey brown, locally dark grey or orange CLAY. Rare fine gravel size pockets of selenite crystals.	
12.00	●					(1.50)	(Lambeth Group)	
12.50 12.50-12.95	● 	pp=5.3 N=32 pp=4.4		16.85		12.80		
13.00	●	pp=5.2					Very stiff becoming stiff, brown slightly gravelly CLAY with a little white or off-white chalk silt. Gravel is fine to medium of sub rounded to sub angular flint, with rare fine gravel of chalk.	
13.50	●					(1.70)	(Lambeth Group)	
14.00 14.00-14.45	● 	N=50 (0mm)		15.15		14.50		
14.50	●			14.85		14.80	Stiff pale brown very gravelly CLAY. Gravel is fine of flint and chalk.	
15.00	●						(Lambeth Group) Chalk recovered as:	
15.50 15.50-15.95	● 	N=50 (75mm)					Structureless off-white and white CHALK composed of silt, locally with rare fine to medium gravel.	
16.00	●						Locally, rare fine to medium flint.	
16.50	●						At 18.00m, becomes white.	
17.00 17.00-17.45	● 	N=43					(White Chalk Subgroup)	
17.50	●							
18.00	●					(5.65)		
18.50 18.50-18.95	● 	N=30						
19.00	●							
19.50	●							
20.00	●							

Remarks

Hand dug trial pit to 1.20m to check for buried services.
Casing reduced to 150mm at 12.50m.
Ground level is approximate.

Chiselling Details

From	To	Time
Water added	From	To
HW	Checked	CPS
Approved	CPS	

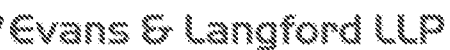
Scale: 1:50

Figure No.:

3

Method: Cable Percussion Boring

Logged



BH No.:4

Sheet 3 of 3

Location:GTR Fontwell, Arundel

Job No.:15104X

Final Depth: 20.45m

Diameter

Casing

GL (mOD)

Start

Finish

200mm

GL to 13.00m

29.65

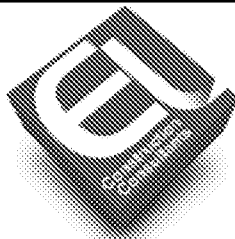
30/10/2019

31/10/2019

Samples & insitu tests

STRATA DETAILS

Remarks Hand dug trial pit to 1.20m to check for buried services. Casing reduced to 150mm at 12.50m. Ground level is approximate.				Chiselling Details					Scale: 1:50 Figure No.: 3		
				From		To		Time			
				Water added		From		To			
Method: Cable Percussion Boring			Logged	HW	Checked	CPS	Approved	CPS			



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Borehole Log

BH No.:5

Sheet 1 of 1

Location: GTR Fontwell, Arundel

Job No.: 15104X

Final Depth: 10m

Diameter	Casing	GL (mOD)	Start	Finish
200mm	GL to 9.00m	26.70	05/11/2019	07/11/2019

Samples & insitu tests			STRATA DETAILS					Installation/ Backfill
Depth	Type	Test Result	Water	Reduced Level	Legend	Depth/ Thickness	Description	
0.10	●			26.60		0.10	Grass over brown slightly gravelly, clayey topsoil with rare fine roots.	
0.30	●			26.40		0.30	Gravel is fine to medium of sub rounded to sub angular flint.	
0.50	●						(Made Ground)	
1.00	●						Firm to stiff brown gravelly clay with rare fine roots. Gravel is fine to medium of sub rounded to sub angular flint.	
1.20-1.65	●	N=13				(1.70)	(Made Ground)	
1.50	●						Firm to stiff brown very clayey gravel with rare fine roots. Gravel is of sub rounded to sub angular flint.	
2.00	●	pp=3.3		24.70		2.00	With depth becomes firm to stiff very gravelly clay.	
2.00-2.45	●	N=14		24.50		2.20	(Made Ground)	
2.50-3.00	●						Very stiff brown, locally dark brown, silty clay with a little fine sand and rare fine roots. Rare fine gravel of flint.	
2.50	●					(1.00)	(Made Ground)	
3.00	●						Orange brown slightly clayey gravelly fine to medium sand. Gravel is fine to medium of rounded to sub angular flint.	
3.00-3.45	●	N=15		23.50		3.20		
3.30	●			23.40		3.30	Becomes slightly sandy gravel with depth.	
3.50	●						(Made Ground)	
4.00	●					(1.00)	Medium dense gravel and cobbles of nodular to sub rounded flint. Some buff chalk silt with rare fine gravel of white chalk.	
4.00-4.45	●	N=13		22.40		4.30	(Made Ground)	
4.50	●	pp=0.6					Off-white gravelly chalk silt. Gravel is of sub rounded to angular flint.	
5.00	●						A little buff sand at top of layer.	
5.00-5.45	●	pp=0.8					(Made Ground)	
5.50	●	N=6					Soft grey brown slightly sandy CLAY. Locally silty. Rare medium gravel of tabular sandstone.	
6.00	●	pp=0.6				(2.90)	Rare medium flint at top and bottom of layer.	
6.50	●						(Head)	
6.50-6.95	●	pp=0.6						
7.00	●	pp=1.2						
7.50	●	pp=0.7		19.50		7.20	Soft, locally very soft, orange brown gravelly CLAY with rare cobbles and some sand. Gravel and cobbles are of flint.	
8.00	●	pp=0.8				(1.00)	At 7.50m, rare fine gravel of chalk.	
8.00-8.45	●	pp=0.3		18.50		8.20	(Raised Storm Beach Deposits)	
8.50	●	N=11					Stiff, locally very stiff red CLAY with rare grey, locally brown mottling.	
9.00	●	pp=1.6					Some samples contain rare medium mudstone nodules.	
9.50	●	pp=2.7					Below 9.50m, clay becomes dark grey.	
9.50-9.95	●	pp=4.2				(1.80)	(Lambeth Group)	
10.00	●	N=23		16.70		10.00		

Remarks

Hand dug trial pit to 1.20m to check for buried services.
Ground level is approximate.

Chiselling Details

From	To	Time
Water added	From 2.5	To 5
HW	Checked	CPS
Approved	CPS	

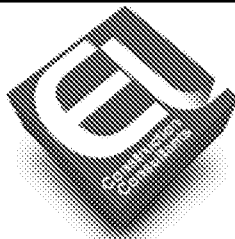
Scale: 1:50

Figure No.:

4

Method: Cable Percussion Boring

Logged



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Borehole Log

BH No.:6

Sheet 1 of 1

Location: GTR Fontwell, Arundel

Job No.: 15104X

Final Depth: 10m

Diameter	Casing	GL (mOD)	Start	Finish
200mm	GL to 7.00m	25.65	04/01/2019	05/11/2019

Samples & insitu tests			STRATA DETAILS					Installation/ Backfill
Depth	Type	Test Result	Water	Reduced Level	Legend	Depth/ Thickness	Description	
0.10	●			25.55		0.10	Grass over brown topsoil with rare fine roots	
0.30	●			25.25		0.40	(<i>Made Ground</i>)	
0.50	●						Firm brown, locally red or pale grey, gravelly clay with rare root hairs. Gravel is fine to medium of sub angular to angular flint.	
1.00	●					(1.00)	(<i>Made Ground</i>)	
1.20-1.65	●	N=24		24.25		1.40	Firm to stiff brown gravelly, to very gravelly clay with rare root hairs. Gravel is of sub rounded to sub angular flint.	
1.50	●			23.85		(0.40) 1.80	(<i>Made Ground</i>)	
2.00	●	pp=2.8 N=38		23.45		(0.40) 2.20	Off-white/pale grey slightly gravelly chalk silt. Gravel is fine to medium of chalk.	
2.50-3.00	●						(<i>Made Ground</i>)	
2.50	●					(1.30)	Stiff grey brown, locally grey gravelly clay. Gravel is fine to medium of rounded, locally sub rounded flint. A little off-white chalk silt.	
3.00	●						(<i>Made Ground</i>)	
3.00-3.45	●	N=18					Dense becoming medium dense, very sandy GRAVEL with rare cobbles. Gravel and cobbles are of sub rounded to sub angular flint, sand is orange brown and fine to medium.	
3.50	●			22.15		3.50	At top of layer, rare gravel size pockets of soft to firm grey clay.	
4.00	●						(<i>Raised Storm Beach Deposits</i>)	
4.00-4.45	●	N=21				(2.00)	Medium dense GRAVEL and cobbles locally with a little sand. Gravel and cobbles are of rounded and sub rounded flint. Sand is orange brown and medium to coarse.	
4.50-5.00	●						(<i>Raised Storm Beach Deposits</i>)	
4.50	●							
5.00	●							
5.00-5.45	●	N=16						
5.50	●	pp=0.5		20.15		5.50	Soft, locally firm, pale orange brown slightly gravelly CLAY, locally with a little fine sand. Gravel is fine to medium of sub rounded to angular flint and fine of chalk.	
6.00	●	pp=1.1				(1.50)	(<i>Raised Storm Beach Deposits</i>)	
6.50	●	pp=0.5 N=7						
6.50-6.95	●							
7.00	●	pp=2.2		18.65		7.00	Stiff becoming very stiff, red, locally silty CLAY with some grey or orange brown mottling.	
7.50	●	pp=3.3					(<i>Lambeth Group</i>)	
8.00	●	pp=2.1 N=16 pp=2.9				(3.00)		
8.00-8.45	●							
8.50	●	pp=3.1						
9.00	●	pp=5.8						
9.50	●	pp=6+ N=27 pp=5.2						
9.50-9.95	●							
10.00	●	pp=4.8		15.65		10.00		

Remarks

Hand dug trial pit to 1.20m to check for buried services.
Ground level is approximate.

Chiselling Details

From	To	Time
Water added	From 3	To 5
HW	Checked	CPS
Approved	CPS	

Scale: 1:50

Figure No.:

5

Method: Cable Percussion Boring

Logged



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Borehole Log

BH No.:7

Sheet 1 of 2

Location: GTR Fontwell, Arundel

Job No.: 15104X

Final Depth: 16.2m

Diameter	Casing	GL (mOD)	Start	Finish
200mm	GL to 14.00m	28.30	31/10/2019	04/11/2019

Samples & insitu tests			STRATA DETAILS					Installation/ Backfill
Depth	Type	Test Result	Water	Reduced Level	Legend	Depth/ Thickness	Description	
0.10	●			28.00		0.30	Grass over brown slightly gravelly topsoil with rare fine roots. Gravel is of sub rounded to sub angular flint.	
0.50	●			27.50		(0.50) 0.80	(Made Ground) Stiff brown slightly gravelly clay with rare roots up to 2mm in diameter. Gravel is fine of chalk and flint.	
1.00	●					(1.60)	(Made Ground) Firm to stiff orange brown gravelly clay. Gravel is fine to medium of sub rounded to angular flint.	
1.20-1.65	●	N=26 pp=4.6					With depth becomes very clayey gravel.	
1.50	●						(Made Ground)	
2.00	●			25.90		2.40	Off-white/pale yellow slightly gravelly chalk silt. Gravel is fine to medium of chalk.	
2.00-2.45	●	N=13					At 3.50m, rare fine to medium gravel of flint.	
2.50	●						(Made Ground)	
3.00	●					(1.90)		
3.00-3.45	●	N=50						
3.50	●							
4.00	●			24.00		4.30	Stiff to very stiff grey brown, locally orange brown or grey CLAY.	
4.00-4.45	●	N=15 pp=2.3				(1.10)	At 4.50m, rare off-white gravel size fragments of shell.	
4.50	●	pp=3.2					(Head)	
5.00	●			22.90		5.40	Stiff, locally soft grey slightly sandy becoming very sandy CLAY.	
5.00-5.45	●	pp=2.8 N=18 pp=3.3				(1.30)	Below 6.00m, rare fine to medium gravel of sub rounded flint.	
5.50-6.00	●	pp=1.8					Towards base of layer, becomes very clayey, fine to medium SAND.	
5.50	●						(Head)	
6.00	●			21.60		6.70	Medium dense slightly sandy GRAVEL. Gravel is of rounded to sub rounded flint. Sand is orange brown and fine to medium.	
6.50	●					(1.60)	(Raised Storm Beach Deposits)	
6.50-6.95	●	N=22						
7.00	●							
7.50-8.00	●							
7.50	●							
8.00	●			20.00		8.30	Slightly sandy GRAVEL. Gravel is of rounded to sub rounded flint. Sand is orange brown and fine to medium.	
8.00-8.45	●	N=16				(0.50) 8.80	Driller noted chalk.	
8.50	●			19.50			(Raised Storm Beach Deposits)	
9.00	●	pp=0.9		19.30		9.00	Brown sandy CLAY, slightly gravelly (driller's description).	
9.50	●					(0.90)	(Raised Storm Beach Deposits)	
9.50-9.95	●	pp=0.8 N=19 pp=0.8					Firm orange brown slightly sandy CLAY. Rare fine gravel of flint.	
10.00	●			18.40		9.90		

Remarks

Hand dug trial pit to 1.20m to check for buried services.
Casing reduced to 150mm at 12.50m.
Tool stuck at 16.20m.
Ground level is approximate.

Chiselling Details

From	To	Time
Water added	From	To

Scale: 1:50

Figure No.:

6

Method: Cable Percussion Boring

Logged

HW Checked CPS Approved CPS



Evans & Langford LLP

Borehole Log

BH No.:7

Sheet 2 of 2

Location: GTR Fontwell, Arundel

Job No.: 15104X

Final Depth: 16.2m

Diameter	Casing	GL (mOD)	Start	Finish
200mm	GL to 14.00m	28.30	31/10/2019	04/11/2019

Samples & insitu tests			STRATA DETAILS					Installation/ Backfill
Depth	Type	Test Result	Water	Reduced Level	Legend	Depth/ Thickness	Description	
10.50	●	pp=0.8		17.80		(0.60) 10.50	(Raised Storm Beach Deposits) Gravelly COBBLES, with some clay. Gravel and cobbles are of rounded flint with rare chalk. Clay is soft to firm, orange brown and grey.	
11.00 11.00-11.45	● 	pp=2.6 N=30 pp=1.6					(Raised Storm Beach Deposits) Stiff becoming very stiff light grey CLAY with some red mottling. At top of layer clay is dark grey, with rare fine to medium mudstone gravel. Between 13.50 and 14.00m, clay is predominantly red. Locally clay is extremely closely fissured.	
11.50	●	pp=1.9						
12.00	●	pp=2.6						
12.50 12.50-12.95	● 	pp=1.9 N=30 pp=2.6						
13.00	●	pp=4.3				(4.70)		
13.50	●	pp=4.3						
14.00 14.00-14.45	● 	pp=3.0 N=30 pp=4.0						
14.50	●							
15.00	●	pp=5.8		13.10		15.20		
15.50 15.50-15.95	● 	pp=4.5 N=50 (50mm)				(0.80)	Very stiff dark grey, slightly gravelly CLAY with some orange brown mottling. Gravel is fine of chalk. (Lambeth Group)	
16.00	●	pp=3.6		12.30 12.10		16.00 16.20	Brown green SAND with chalk (Driller's description) (Lambeth Group)	

Remarks

Hand dug trial pit to 1.20m to check for buried services.
Casing reduced to 150mm at 12.50m.
Tool stuck at 16.20m.
Ground level is approximate.

Chiselling Details

From	To	Time
Water added	From	To
HW	Checked	CPS
Approved	CPS	

Scale: 1:50

Figure No.:

6

Method: Cable Percussion Boring

Logged