Civil Engineers & Transport Planners

Flood Risk Assessment

Brunningham Farm

December 2025

251953/FRA/IN/KL/01

Rev B

Civil Engineers & Transport Planners

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1 INTRODUCTION

1.1 Scope

1.1.1 Lanmor Consulting Ltd has been appointed to prepare a Flood Risk Assessment & Drainage Strategy report for the proposed development at Brunninghams Farm, Heath Ride, Wokingham, RG40 3QJ. Figure 1.1 below shows the location of the proposed development.

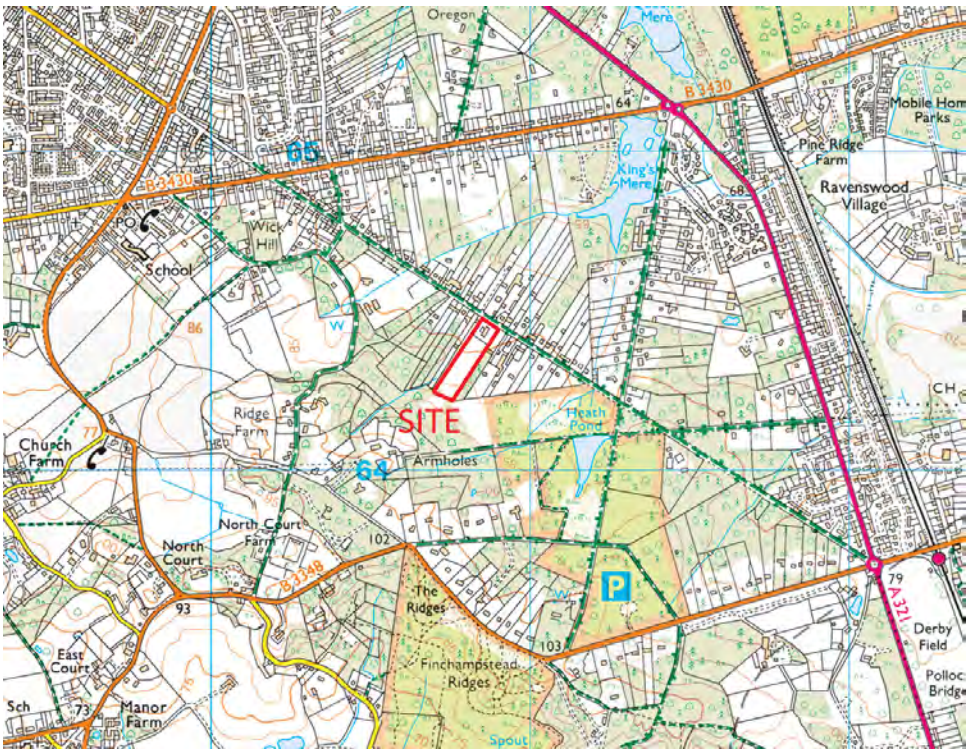


Figure 1.1 – Site Location

1.1.2 The report describes the sites existing condition, development proposals and implications of flooding on the site as described in the governments guidance document; National Planning Policy Framework (NPPF) and its planning practice guidance (PPG)

1.1.3 This report will focus on the following:

- Development proposals;
- Sources of flooding
- Flooding extents, depth and climate change prediction
- Impact of flooding on the development
- Dangers presented by flooding

1.1.4 This FRA report has been prepared in accordance with the requirements of the NPPF and will demonstrate that the proposed development will be safe and will not increase the risk of flooding in the surrounding areas.

1.1.5 The drainage element of the report will consider a strategy for the disposal of runoff from the development and suitable SuDS features to limit flood risk.

2 BASELINE PARAMETERS

2.1 Existing Site

2.1.1 The site is situated off Heath Ride in a rural area of Wokingham and is a significant distant from the nearest main river. The site comprises of an abandoned warehouse which use to be a farm surrounded by soft landscaping. The site topographic survey is included in Appendix A as drawing 2025-2000-001 & 002.

Existing Geology

2.1.2 The British Geological Survey (BGS) shows that the majority of the site sits on a bedrock of Windlesham Formation – Sand, Silt and Clay. Sedimentary bedrock formed between 56 and 33.9 million years ago during Palaeogene period.

2.1.3 The remainder around 15 percent to the south is indicated to have a bedrock formation of Camberley Sand Formation, formed between 47.8 and 41.2 million years ago. Superficial deposits of the Camberley sand are recorded overlaying the Windlesham Formation.

2.1.4 Albury SI were appointed to undertake a site investigation primarily to establish infiltration rates. Two tests in compliance with BRE digest 365 soils were undertaken on site. Their report contains the details of the underlying soil geology, sandy clays and clayey sands to a depth of at least 2.9m. This is confirmed by a nearby BGS borehole log also within the Windlesham formation, which suggests these sandy / clayey strata continue to a depth of at least 10m. The water level in the test pits failed to drain and the testing was abandoned with the conclusion the geology is not suitable for infiltration, the full report is included in Appendix B.

2.2 Proposed Developments

2.2.1 The proposed application seeks to demolish the existing buildings and develop the site to provide for 7 dwellings, garages for each dwelling, visitor and disabled parking, and an access road with a pedestrian path to all dwellings. The proposed site plan is included in Appendix C as drawing 25050/PL/01.

3 PLANING POLICY

3.1 National Planning Policy

National Planning Policy Framework (2024)

3.1.1 The national polices for meeting the challenge of climate change, flooding and coastal change are set out in the National Planning Policy Framework (NPPF). The requirements and goals of the NPPF are:

- Direct development away from areas at highest risk of flooding;
- All plans should apply a sequential, risk-based approach to the location of development;
- Determine any planning applications to ensure that flood risk is not increased elsewhere.

3.1.2 Local planning authorities under the NPPF should apply the risk-based approach to their decisions on suitability of development.

Planning practice Guidance (2024)

3.1.3 Flood risk is set out as a combination of the probability and the potential consequences of flooding. Areas at risk of flooding are those at risk of flooding from any source, now or in the future. Sources include rivers and the sea, direct rainfall on the ground surface, rising groundwater, overwhelmed sewers and drainage systems, reservoirs, canals and lakes and other artificial sources.

3.1.4 The guidance sets out the flood risk probability for fluvial flooding into 3 zones.

- Zone 1: ‘Low Probability’: This comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year.

- Zone 2: 'Medium Probability' – This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

- Zone 3a: 'High Probability' – This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (≥1%) or a 1 in 200 or greater annual probability of sea flooding (≥0.5%) in any year.

- Zone 3b: 'The Functional Floodplain' – This zone comprises of land where water must flow or be stored in times of flood. The SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA) including water conveyance routes.

3.2 Local Policy

Wokingham Borough Council

3.2.1 Wokingham borough Adopted their Local Plan in January 2010, which sets out the vision for future development in the borough for the plan period and includes policies that would avoid developments in areas that are affected by flooding, noise and pollution.

Policy CP1 – Sustainable Development

3.2.2 The council of Wokingham has released a list of requirements for a planning permission to be granted:

1) Maintain or enhance the high quality of the environment;

2) Minimise the emission of pollutants into the wider environment;

3) Limit any adverse effects on water quality (including ground water);

4) Ensure the provision of adequate drainage;

5) Minimise the consumption and use of resources and provide for recycling;

6) Incorporate facilities for recycling of water and waste to help reduce per capita water consumption;

7) Avoid areas of best and most versatile agricultural land;

8) Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers;

9) Avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater);

10) Provide attractive, functional, accessible, safe, secure and adaptable schemes;

11) Demonstrate how they support opportunities for reducing the need to travel, particularly by private car in line with CP6; and

12) Contribute towards the goal of reaching zero-carbon developments41 as soon as possible by:

    a. Including appropriate on-site renewable energy features; and

    b. Minimising energy and water consumption by measures including the use of appropriate layout and orientation, building form, design and construction, and design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.

4 SOURCES OF FLOODING

4.1 Fluvial Flooding

4.1.1 Flood mapping has been obtained from the Flood Mapping for Planning website published by the Environment Agency (EA) for the site and surrounding area. The mapping indicates that the site is within Flood Zone 1.

4.1.2 As stated by NPPF and PPG, land within Zone 1 has a low probability of river or sea flooding, less than 1 in 1000 annual probability (<0.1%). Figure 4.1 below shows the site's position in relation to the fluvial flood zones.

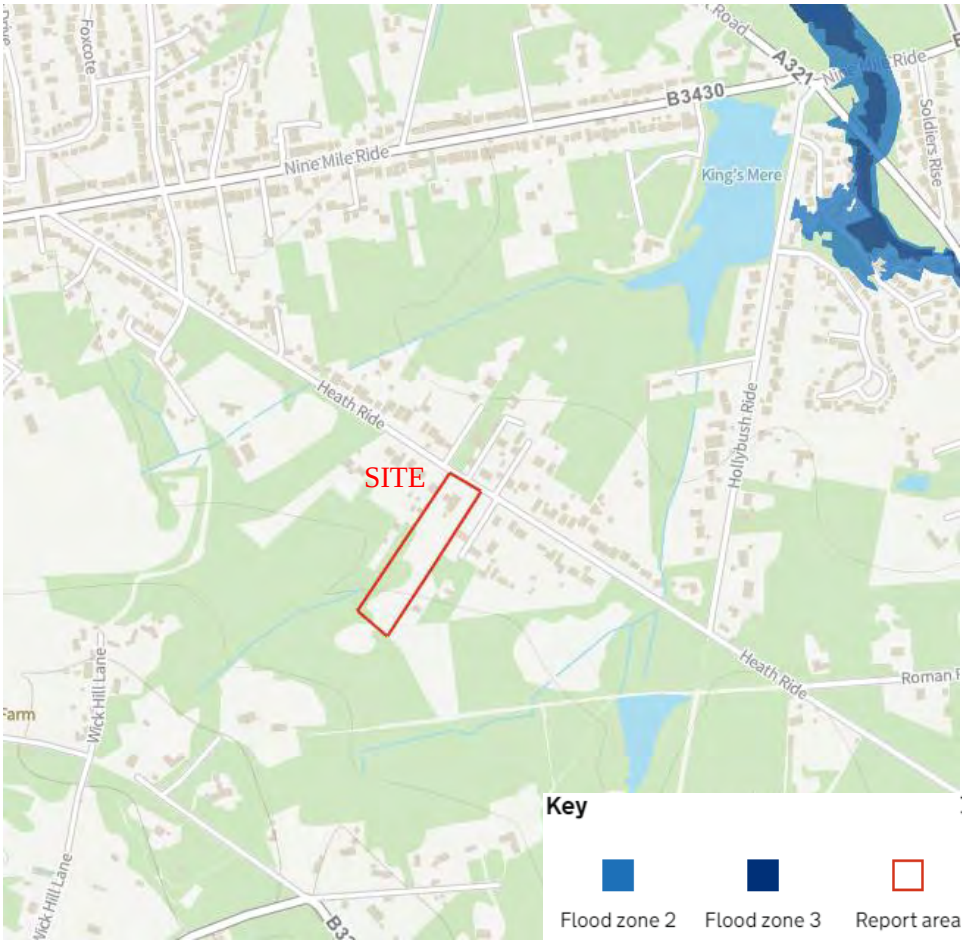


Figure 4.1 – EA Flood Zones Map

4.1.3 The blue shaded areas on the map above show the flood zones, the unshaded area on the map shows land in Flood Zone 1, with less than 0.1% probability of flooding. It is clearly shown that the site is within Flood Zone 1.

4.2 Surface Water Flood Risk

4.2.1 The surface water flood mapping provided by the EA is considered to be the best available source of national information on surface water flooding; it is a starting point for understanding patterns and probability of surface water flooding.

4.2.2 The EA accept that the mapping has limitations and state that "these maps cannot definitely show that an area of land or property is, or is not, at risk of flooding, and the maps are not suitable for use at an individual property level".

4.2.3 The EA describe the surface water flood extents as follows:

- Low Risk: 'Low Probability' This zone comprises land assessed as having between 0.1 and 1% chance of surface water flooding per annum.
- Medium Risk: 'Medium Probability' This zone comprises land assessed as having between 1% and 3.3% chance of surface water flooding per annum.
- High Risk: 'High Probability' This zone comprises of land assessed as having greater than 3.3% chance of surface water flooding per annum.

4.2.4 Figure 4.2 below shows the location of the map with the respective chances of flood risk per annum.

Figure 4.2 – Surface Water Flooding Map

4.2.5 The mapping above shows that there are some small areas of the site which have medium and high chances of surface water flooding. This means that there is a greater than 3.3% chance of surface water flooding which is in two small areas to the North and West of the site. However, the vast majority of the application site is not at risk of surface water flooding.

4.3 Ground Water Flooding

4.3.1 The borough of Wokingham published data in their SFRA regarding the risk of groundwater flooding to the site. Data on the mapping shows that there is less than 25% risk of groundwater emergence in the local area.

4.4 Reservoir Flooding

4.4.1 The council has provided an interactive map with the SFRA, the interactive map shows the information about flooding across Wokingham. As shown in Figure 4.3 below the site is not at risk of flooding from reservoirs.

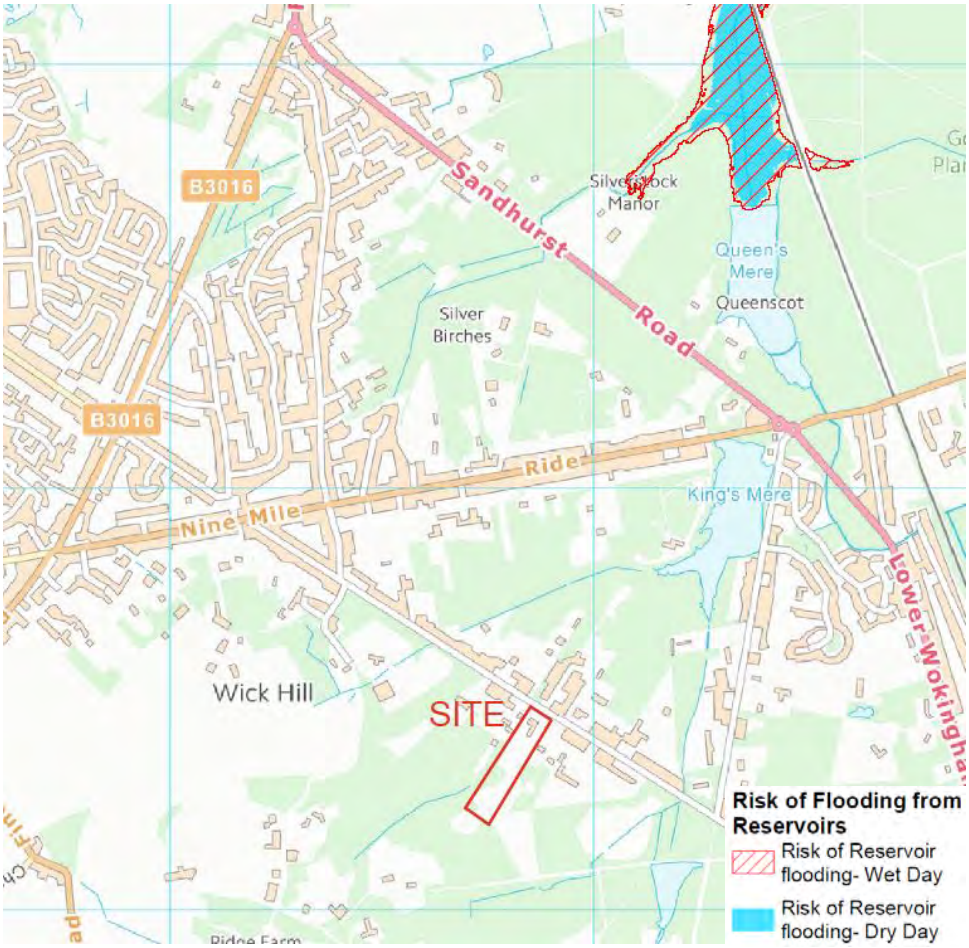


Figure 4.3 – Reservoir Flooding Map

4.5 Sewer Flooding

4.5.1 Within the SFRA Section 5.6, Table 5.3, it indicates the sewer flooding incidents records from January 2000 – May 2022. Within this time frame there were no records of any sewer flooding incidents around the proposed developments area.

5 MODELED FLOOD EVENTS AND CLIMATE CHANGE

5.1 Flood Probability

Fluvial Sources

5.1.1 The site is at very low risk of flooding from fluvial sources therefore considered to have less than 1 in 1000-year probability of fluvial flooding in any year or 0.1% AEP.

Surface Water

5.1.2 The site could be subject to surface water flooding for a 1 in 30 Year Storm event. The site therefore has a high probability of surface water flooding, but this is limited to two very small areas.

5.2 Climate Change Allowances

5.2.1 The Environment Agency have published updated climate change allowances. The climate allowance to be implemented for fluvial flooding is based on the management catchment area, flood zones and site vulnerability. The site is located within the Loddon and Tributaries Management Catchment, as identified on the Department for Environment Food & Rural Affairs (DEFRA) climate change allowance website.

5.2.2 Under Annex 3 of the NPPF, the proposed development would be classed as a building used for residential purposes and therefore would be a “More Vulnerable” use. The site is in flood zone 1 and not at risk of fluvial flooding with a probability of less than 0.1%. The PPG guidance does not require an allowance for climate change to be considered in flood zone 1 areas.

5.2.3 For the surface water flood risk at the front of the site, the ROFSW maps prepared by the EA were updated in January 2025 and shows the extent of the depths of the surface water flooding. Figure 5.1-5.3 suggests that the front of the site could be subjected to surface water flooding from 0.2m-0.6m.

Figure 5.1 – 0.2m of Depth Surface Water

Figure 5.2 – 0.3m of Depth Surface Water

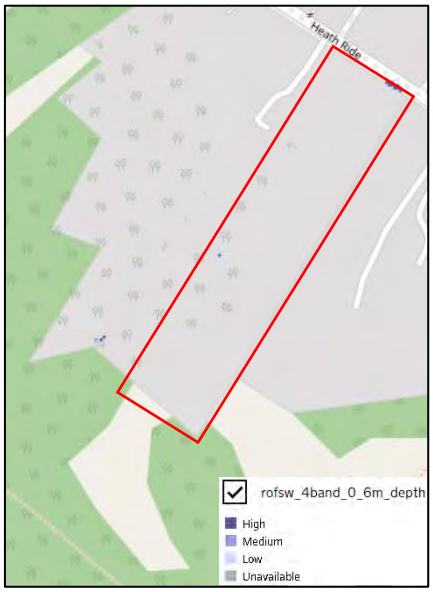


Figure 5.3 – 0.6m of Depth Surface Water

5.2.4 The above figures show that some small areas of the site could be susceptible to surface water flooding. Therefore, to ensure the dwellings will be safe the proposed ground floor levels will be raised 300mm above the surrounding ground. This will ensure that the dwellings will be safe from flooding during an extreme storm event.

6 IMPACT OF FLOODING

6.1 Impact on Flood Waters

6.1.1 As mentioned above, the site is located within Flood Zone 1, thus, the development will not have an impact on the free flow of waters for an event with a probability of 1.0%+CC or greater.

6.2 Impact on Storage Volumes

6.2.1 The proposed development is located above the flood level for an event with a probability of 0.1 % or greater. Given that the site is above the highest estimated flood level, it will not result in the loss of any flood storage volumes associated with an event of 1.0% AEP + CC or greater.

6.3 Impact of Flooding on Developments

6.3.1 This assessment has demonstrated that the buildings will not be affected by a flood with a probability of 1.0% + allowance for climate change. Therefore, a flood with a probability of 1.0% plus allowances for climate change will have no impact on the site. As a precaution the ground floor levels of the properties will be raised 300mm above the ground level to mitigate against any potential surface water flooding.

6.4 Safe Access

6.4.1 The proposed site is within flood zone 1 so a safe access can be provided at all times, however it could be subject to surface water flooding, although this is limited to 2 very small areas of the site. Therefore, the recommended evacuation route would be to exit the site to the northeast, away from surface water flooding to the front of the site.

7 SEQUENTIAL TEST

7.1 METHODOLOGY

7.1.1 The proposed buildings and access will be located on land at low risk of both fluvial and surface water flooding, therefore under the PPG the sequential test doesn't need to be applied. However, for robustness a sequential test has been completed. The methodology employed to undertake the Sequential Test with reference to Government guidance is set out below.

7.1.2 Within the NPPF 2024, paragraph 174, states that "Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding."

7.1.3 The NPPF also sets out the Definition of Deliverable as:

"To be considered deliverable, sites for housing should be available now, offer a suitable location for development now, and be achievable with a realistic prospect that housing will be delivered on the site within five years. In particular:

- Sites which do not involve major development and have planning permission, and all sites with detailed planning permission, should be considered deliverable until permission expires, unless there is clear evidence that homes will not be delivered within five years (for example because they are no longer viable, there is no longer a demand for the type of units or sites have long term phasing plans).

- Where a site has outline planning permission for major development, has been allocated in a development plan, has a grant of permission in principle, or is identified on a brownfield register, it should only be considered deliverable where there is clear evidence that housing completions will begin on site within five years."

7.1.4 Therefore, in order to identify "reasonably available" sites, this report seeks to identify sites which are available for development now and have a reasonable prospect of being developed within the time envisaged for the proposed development. The sites must also be suitable for the type of development being proposed. This means sites that are suitable for dwellings of the density proposed, in an area that is at lower risk of flooding. Therefore, to be 'suitable' the sites should be able to:

a) Accommodate the development of a comparable type, size, and density

b) Be in conformity with the requirements of adopted national and local planning policy

c) Be developable at the same point in time as the development at Brunninghams Farm

7.1.5 It is considered that a site is not reasonably available if:

- The site has implemented the planning consent
- It contains an existing operational or business use (unless planning consent is in place to change the use to residential)
- It has a valid planning permission for development of a similar type and scale, where conditions are being discharged or which is likely to be implemented in the time frame of the application site

7.1.6 In order to identify reasonably available sites, this report seeks to identify sites available for development now, i.e., within 1 – 5 years, within an area of lower flood risk.

Sites are only considered for assessment in this Sequential Test where they have a lower risk of surface water flooding compared to the application site (i.e., 1 in 100-years or lower) and are located within Flood Risk Zone 1. This is because land assessed as having a low and/or medium risk of surface water flooding is sequentially preferable to the application site, which although within Flood Risk Zone 1, is considered to be at high risk of surface water flooding towards the front and west of the site (i.e., 1 in 30-years).

7.2 Site Assessment

7.2.1 The proposed development at Wokingham is considered as being developable within 1- 5 years, and there is a realistic prospect that housing will be delivered within 5 years.

7.2.2 Suitable sites for consideration have been selected based on the WBC Housing and Economic Land Availability Assessment (HELLA) 2024, which contains details of sites across the entire borough area which the council considers are deliverable in 1-5 years or other sites currently for disposal on the market. The search for sites in the HELLA has been limited to sites within the local area and sites that are deliverable within 1-5 years. Some sites have been discounted on the basis that they have been identified for non-residential, mixed, or age-restricted development. Therefore, the sites considered below are ones considered comparable to the Brunninghams Farm site that are known to be available.

7.2.3 The full list of all sites reviewed is included in Appendix D with the reasons why these sites were not taken forward for further consideration. In the HELLA eight sites were identified that were potentially developable, 2 had a similar surface water flood risk and were discounted, leaving 6 for further consideration. Three of the sites in the HELLA are in the process of discharging planning conditions reducing the count to 3. The details of the sites considered are tabulated below with a discussion on the suitability of each site.

Site Ref	Site Name	Flood Zone	Capacity	Deliverable in 5 Years	Constraints
5RU007	Land to the rear of 9-17 Northbury Lane	1	12	1 to 5	Air Quality Management Area Tree Preservation Order (TPO) Loss of Local Green Field
5SH031	Rustlings', 'The Spring' and land to the rear of 'Cushendall', Shinfield Road	1	10	1 to 5	Entire site Within Potentially contaminated land TPO Partially within Outer Consultation Zone Small area risk of surface water flooding 1/1000 & 1/100
5FI024	Hillside, Lower Wokingham Road	1	15	Potentially Developable	Possible Loss of Green Infrastructure TPO
5WK053	Lee Springs, Latimer Road	1	42	1 to 5	Entire Site Within Potentially Contaminated Land TPO Small area risk of surface water flooding, 1 in 1000
5FI028	Westwood Yard, Sheerlands Road	1	10	Potentially Developable	Risk of Surface Water flooding, 1 in 1000 & 1 in 100 TPO
5FI003	31 and 33 Barkham Ride	1	15	Potentially Developable	

Table 7.1 – Sites that have been taken into Consideration

Land rear of 9-17 Northbury Lane

7.2.4 Site HELLA Ref 5RU007 had been selected as it is within Flood Zone 1 and has no risk of surface water flooding. The proposed density of development on the site is considerably greater than that for the application site and therefore the sites are not considered comparable and has been **DISCOUNTED.**

Rustlings the Spring and Land rear of Cushendall Shinfield Road

7.2.5 Site HELLA Ref 5RU008 had been selected for similar reasons to 5RU007, while the number of units proposed is only slightly higher, the proposed density is considerably higher and not comparable to the proposed development of 8 units and has been **DISCOUNTED.**

Hillside, Lower Wokingham Road

7.2.6 HELLA ref 5F1024 this site was taken forward for consideration as it has no risk of surface water flooding and it is within Flood Zone 1. The site received planning permission in the last 2 months for 18 residential properties. The density is greater than the application site and given the recent approval, the site is not considered currently available and has been **DISCOUNTED.**

Lee Springs, Latimer Road

7.2.7 Site HELLA Ref 5RU008 had been selected as it has a lower risk for surface water flooding, and it is within Flood Zone 1. However, the site is currently being pursued by the developers by way of discharge of conditions to planning permission 250788. The application to discharge a condition for the planning permission was received in February 2025 and is still awaiting a decision. Therefore, as the site is actively being pursued it is not considered available for development and has been **DISCOUNTED**

Westwood Yard, Sheerlands Road

7.2.8 Westwood Yard HELLA Ref 5F1028was chosen for consideration as it has a lower probability for surface water flooding than the application site. However, the site is currently being pursued by the developers by way of discharge of conditions to the planning permission. Therefore, as the site is actively being pursued it is not considered available for development and has been **DISCOUNTED.**

31 to 33 Barkham Ride

7.2.9 HELLA Ref 5F1003 has a lower flood risk than the application site, however the site is currently being pursued as a mobile home site, and therefore not comparable in terms of nature or density with the application site and has been **DISCOUNTED**.

7.3 Land for Sale in Wokingham Borough

7.3.1 An assessment of land for sale through local agencies was also undertaken however, none of the land available within Finchampstead was suitable due to the distinction in scale, typology and target demographic.

7.4 Exception Test

7.4.1 To meet the exception test, it should be demonstrated that:

a) development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

7.4.2 With regards to the first part of the test the development can be located in areas not at high flood risk so this part of the test has been satisfied, it also provides wider benefits in that it will increase the 5 years housing provisions for the borough which they are currently short of.

7.4.3 The above assessment has shown that the proposed development will not increase the risk of flooding or be subject to flooding. It has also demonstrated that a safe access can be provided for flood event including climate change allowances ensuring the site will be safe without increasing the flood risk elsewhere, which meets the second part of the test.

7.5 Conclusion

7.5.1 The findings presented above, and the analysis demonstrates that none of the alternative sites assessed meet the definition of reasonably available or developable. Therefore, the conclusion is that there are no sequentially preferable sites at less risk of flooding which are available and could accommodate the proposed development.

7.5.2 The proposals will be safe for their lifetime and will not increase the risk of flooding on site or in the surrounding area.

7.5.3 Therefore, it is considered that the sequential test has been meet. Also, the exception test has been satisfied.

8 DRAINAGE

8.1 Existing Drainage

8.1.1 Investigation into the drainage on site found no evidence of an outfall from the site. The sewer asset records from Thames Water were also reviewed and they confirm there are no adopted sewers in the vicinity of the site.

8.2 Proposed Drainage

Foul Drainage

8.2.1 The foul drainage from the proposed dwellings will be collected via a network of pipes. The effluent will be treated on site via a package treatment plant in each property before discharging to the ditch network running along the front of the site. The discharge will be subject to an environmental permit from the EA to cover the volume of treated effluent to the ditch.

Surface Water Drainage

8.2.2 Sustainable Drainage Systems (SuDS) were considered as part of this assessment for disposal of surface water runoff from the development. The residential dwellings will have pitched roofs and so green / blue roof attenuation systems were not considered to be a viable option.

8.2.3 Harvesting of the runoff for reuse in the properties and surrounding gardens / landscaping is a viable option. Opportunity will be taken to reuse rainwater for the flushing of toilets and irrigation of the gardens, with harvesting systems located at the lower level of the solar roof to each house and the bottom of the downpipes. Raingardens will also be incorporated along the boundary of the access road, running parallel to the site boundary fences to each house. These will be used to absorb any overflow from the harvesting systems, promote biodiversity and generally reduce the burden on the drainage network.

8.2.4 Next on the Sustainable Drainage Hierarchy is the use of ground infiltration techniques such as soakaways and infiltration basins etc. The geology in the area consists of Windlesham Formation. Infiltration testing of the geology was undertaken by Albury SI, two tests were conducted to BRE 365 digest, but both failed to drain to 25%. The SI report concluded that infiltration for discharge of runoff is not possible, therefore the use of soakaways has been discounted. Regardless of this, permeable paving will be employed for areas of hardstanding including the subbase of the access road, but this will be tanked by wrapping the OGCR in an impervious polymer membrane.

8.2.5 Next on the hierarchy is discharge to watercourse. Directly to the north of the site running adjacent to the road is a ditch which is culverted beneath the existing access, this will provide a suitable discharge for the development. There are additional ditches along the eastern and western boundaries of the site.

8.2.6 The proposed drainage strategy for the development will therefore use permeable paving for the access road, and permeable paved driveways to take runoff from the property roof and hardstanding.

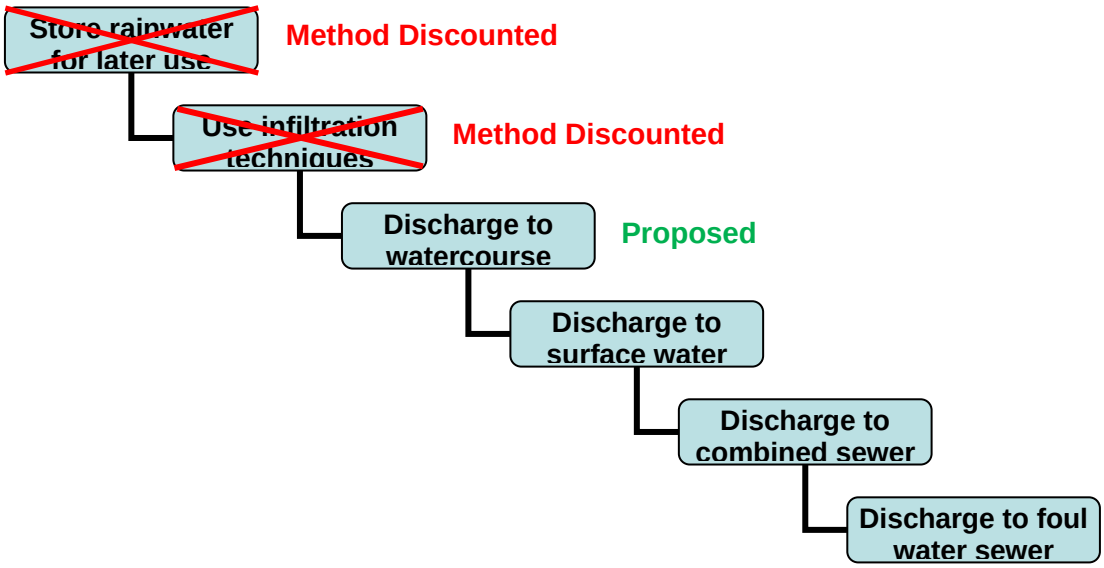


Figure 8.1 – SuDS Hierarchy

8.2.7 Rainfall events will be affected by potential climate changes. The climate change allowances to be factored into the drainage design depends on the development's vulnerability classification, the management catchment area and the life expectancy of the development.

8.2.8 The site is considered a more vulnerable use with life expectancy of 100 years. The PPG guidance recommends the use of the upper end allowance in these cases. The site is located in the Loddon and Tributaries Management Catchment area so a climate change allowance of 40% should be factored in the drainage design.

8.2.9 An assessment of the site green field rate has been undertaken to set the discharge rate form the site. The total area of the site is 1.86ha, the greenfield runoff rate for the application site has been estimated for different return periods and is tabulated below.

Return Period	Greenfield Rate	Proposed Rate	% Change
Q_{bar}	5.1 l/s	-	-
1 in 1	4.3 l/s	3.1 l/s	-28%
1 in 30	11.7 l/s	3.7 l/s	-68%
1 in 100	16.2 l/s	3.9 l/s	-76%
1 in 100 +40% CC	-	4.3 l/s	-

Table 8.1 – Existing & Proposed Discharge Rates

8.2.10 Utilizing MicroDrainage, it was concluded that the **proposed discharge rate** for a **1 in 100+CC, equals** to that of the **Greenfield rate for a 1 in 1-year event**. Furthermore, there would be a 76% reduction on the discharge rate for the 1 in 100-year event. This concludes that the proposal will ensure runoff can be adequately controlled and flood risk in the area managed.

8.2.11 The drainage network for the proposed development has been designed such that rainwater will flow from the roofs of each dwelling and will be directed into the sub-base of the permeable driveway via diffuser units in the sub-base of the paving.

8.2.12 The flow of runoff will be further restricted through 20mm orifice plates at the outlets of the permeable driveways, through which surface water will drain at a restricted rate into the pipe under the road. The driveway paving will have a sub-base formed from **300mm of granular material and 150mm Polypipe permavoid units** to provide for extra storage.

8.2.13 The proposed access road will be constructed from permeable surfaces; however, it will be used as storage given the infiltration rates. The sub-base of the **access roads** will be formed from **450mm of granular fill.** Furthermore, due to the falls across the site, the access road has been split to 14 sections which will be separated with concrete baffles in the sub-base of the access road to prevent longitudinal movement of the water and ponding at low spots. The location of the baffles is indicated on drawing 251953/DS/01 and the figure below shows an example of baffles being used under a slope condition.

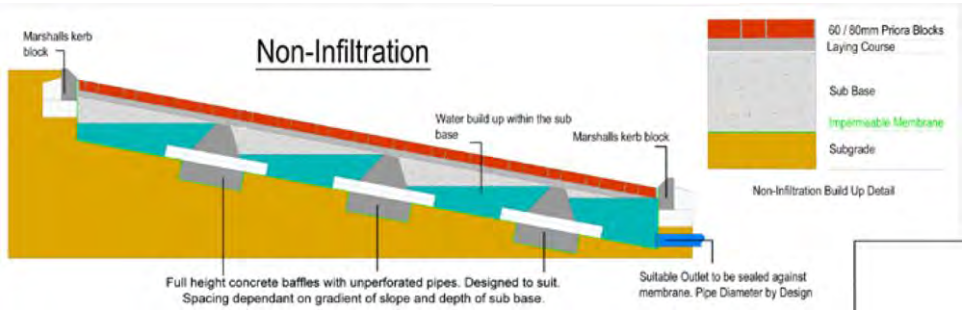


Figure 8.2 – Permeable Paving on Sloping Site.

8.2.14 Given the fall of the site, the access road has been split into 14 sections which will be separated by weirs with an orifice restriction between each to prevent all the runoff from ponding at the lower end. Road 1 and 2 will have an orifice of **25mm** while the rest of the roads will have a **20mm orifice**.

8.2.15 Each of the properties will also incorporate rainwater harvesting systems (such as water butts) with an overflow into the rain gardens / planters, not as part of the attenuation of runoff, but to provide additional rainwater storage for reuse and improve the biodiversity of the development. The ditches around the site will also be cleared and redesigned into landscaped swales to promote improved drainage.

8.2.16 Drawing 251953/DS/01 included in Appendix E, shows an indicative drainage layout for the development, this will be developed at detailed design stage once the rainwater downpipes have been located.

8.2.17 The drainage has been designed and sized to accommodate all high intensity rainfall events up to and including a 1 in 100 year +40%CC event. The full calculations for each element of the SuDS are included in Appendix F.

8.3 Flood Exceedance Route

8.3.1 In the event of a blockage or an event that overwhelms the system the natural fall in the topography will force waters north down the access road away from the proposed properties and into the ditch.

9 MANAGING POLLUTION RISK FROM SURFACE WATER

9.1.1 As part of CIRIA Suds Manual C753, Section 26.7 provides information regarding methods for managing pollution risk from surface water runoff.

9.1.2 Part of the assessment is to determine which land use classification the proposed development falls under Tables26.1 of the CIRIA Report C753 sets the approaches to water quality risk management. For this site the simple Index Approach will be used as shown below.

TABLE 26.1 Approaches to water quality risk management

Design method	Hazard characterisation	Risk reduction	
		For surface water	For groundwater
Simple index approach	Simple pollution hazard indices based on land use (eg Table 26.2 or equivalent)	Simple SuDS hazard mitigation indices (eg Table 26.3 or equivalent)	Simple SuDS hazard mitigation indices (eg Table 26.4 or equivalent)
Risk screening[1]	Factors characterising traffic density and extent of infiltration likely to occur (eg Table 26.5 or equivalent)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (eg Table 26.5 or equivalent)
Detailed risk assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in event mean discharge concentrations and total annual load reductions delivered by the system	

Table 9.1 – Approaches to Water Quality Risk Management

9.1.3 Table.26.2 C753 reproduces as Table 9.2 shows the potential hazard associated with different land uses the hazards indices. The development will consist of residential houses, it is concluded that the site should be classed within the sections shown in Table 9.2 below.

9.1.4 The residential buildings roofs are considered to have a “very low” pollution hazard, generating 0.2 total suspended solids, 0.2 metals and 0.05 hydrocarbons. The access and parking area are considered to have a “low” pollution hazard, generating 0.5 total suspended solids,0 .4 metals and 0.4 hydrocarbons.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Table 9.2 – CIRIA SuDS Manual C753 (Land Use Classifications)

9.1.5 The proposed development will incorporate permeable paving for storage and disposal of runoff from the site. Suitable treatment measures offered by SuDS features are set out CIRA report.

9.1.6 Table 26.3 of C753 reproduced below as Table 9.3 sets out the mitigation indices provided by SuDS features for discharge to surface waters.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Table 9.3 – CIRIA SuDS ManualC753 (Mitigation Indices to surface water)

9.1.7 The permeable paving will provide mitigation of 0.7 for total suspended solids, 0.6 for metals and 0.7 for hydrocarbons. These are all greater than the pollution hazard indices identified in Table 9.2 above.

9.1.8 The above assessment has demonstrated that the proposed SuDS features will provide a suitable level of treatment appropriate to the type of development proposed.

10 SUFACE WATER SUDS MAINTENANCE

10.1.1 Regular inspection of the surface water drainage network for blockages and clearing unwanted debris/silt from the system should improve the performance of the surface water network and decrease the need for future repairs. In the event of blockages, high pressure water jets can be used to clear the gullies and pipes to ensure they are functioning correctly, this should be undertaken by certified trained professionals.

10.1.2 The level and frequency of maintenance required on site is dependent on the type of facility. The type of maintenance will fall into one of three categories "regular maintenance", "occasional maintenance", and "remedial maintenance".

10.1.3 Regular Maintenance of the drainage and SuDS features will include, inspections, removal of litter/debris and sweeping of the surfaces. Occasional maintenance will include removal of sediment etc. and remedial maintenance may include structural repairs and infiltration reconditioning if required.

10.1.4 The drainage and SuDS elements after an initial inspection following construction should be inspected on a monthly basis for the first 12 months and after large storms, thereafter the following maintenance regime should be applied and adjusted if the 12-month monitoring process has identified any issues.

10.1.5 Following completion of the development, each property will be responsible for the maintenance on their permeable paved drives in their property. The access road will be maintained along with all the communal areas by the management company that will be set by the developer upon completion of the development.

10.1.6 The following maintenance regime is recommended for the SuDS features in the development and should be adjusted suit site requirements flowing the initial inspections if required.

Permeable Paving

10.1.7 For permeable paving areas, the following maintenance is recommended.

Permeable Paving Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular maintenance	Remove debris and leaves etc.	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds	As required- once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting etc	As required
	Rehabilitation of surface and upper substructure	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action.	Three-monthly, 48 hours after large storms in the first six months
	Inspect silt accumulation rates and establish appropriate frequencies for rehabilitation	Annually
	Monitor inspection chambers	Annually

Table 10.1 – Permeable Paving Maintenance Schedule

10.1.8 The above information is only intended as guidance to standard maintenance practise for surface water drainage and SuDS features. The above measures should be reviewed regularly and modified to suit the site conditions.

11 SUMMARY AND CONCLUSION

11.1.1 The proposed application site is located at Brunninghams Farms, within the Borough of Wokingham. The proposed application will involve the demolition of the existing buildings and construction of 7 dwellings.

11.1.2 The application site is shown to be within Flood Zone 1 so has a fluvial risk of flooding of less than 0.1% or (1 in 1000) year event. The application site is indicated to be a reasonable distance from the flood zones so future Climate Change allowance will have no impact on the site. There are a few small areas of the site shown to be at medium to high risk of surface water flooding. These are limited and will not impact the development.

11.1.3 A drainage strategy has been prepared to manage the risk of flooding and runoff from the development for an event with a probability of (1in100+40%). The proposals will not increase the risk of flooding on site or in the surrounding area, the dwellings will be safe from flooding and a dry access can be provided to and from the site during extreme flood events.

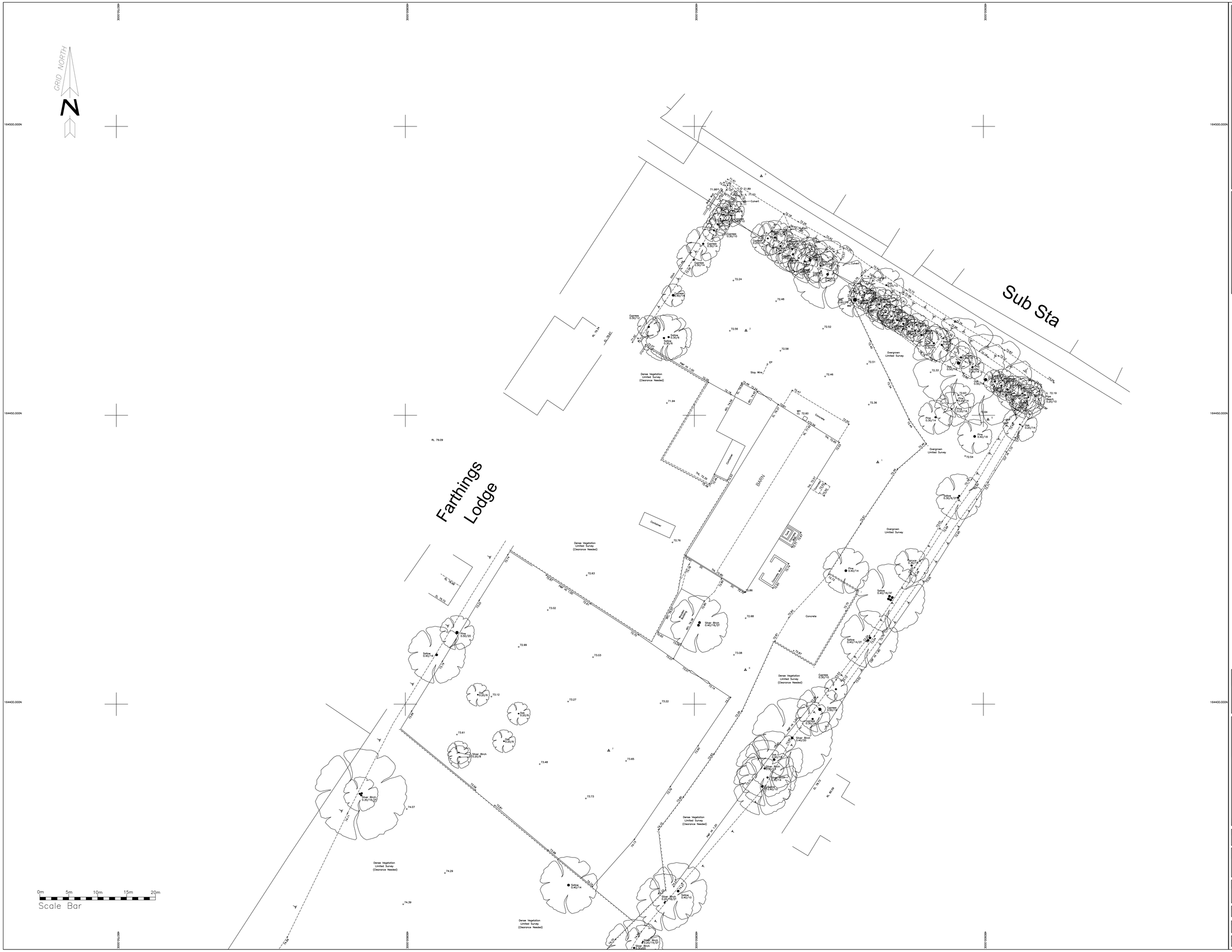
11.1.4 Notably, the proposed discharge rate for the critical 1 in 100-year plus 40% climate change event has been attenuated to the same rate as the 1 in 1-year Greenfield runoff, demonstrating a robust level of flood risk mitigation.

11.1.5 As part of the assessment, SuDS were considered for the discharge of surface water runoff from the proposed buildings and parking areas. The geology is not suitable for infiltration so permeable paving will be employed to store the runoff from the roofs and hardstanding. Rainwater harvesting and raingardens will also be incorporated but not for the attenuation of runoff and mainly for irrigation and biodiversity.

11.1.6 This statement clearly demonstrates that the proposed development will not increase the risk of flooding, and it can be served for the discharge of foul and surface water runoff from the site without increasing the risk of flooding in the area. Given the above, we consider the site is suitable for development in terms of flood risk and drainage provisions.

APPENDIX A

Drawing 2025-2000-001 – Topographical Survey Sht 1 of 2



LEGEND

Street Furniture

ACU	Air Conditioning Unit
BB	Belisha Beacon
BO	Bollard
BS	Bus Stop
CB	Control Box
EP	Electrical Pole
FP	Flag Pole
LB	Litter Bin
LP	Lamp Post
MK	Marker
PB	Post Box
PM	Parking Meter
P	Pool
RS	Road Sign
RWP	Rain Water Pipe
TCB	Telephone Call Box
THL	Threshold Level
TL	Traffic Light
TP	Telegraph Pole
VP	Vent Pipe

Covers/Drainage

AV	Air Valve
CL	Cover Level
CO	Clean Out
CP	Catch Pit
CTV	Cable TV
DC	Drainage Channel
EC	Electric Cover
FH	Fire Hydrant
G	Gully
GV	Gas Valve
IC	Inspection Cover
IL	Invert Level
KO	Kerb Outlet
MH	Manhole
RE	Rodding Eye
SC	Stop Cock
SV	Sluice Valve
TC	Telecoms Cover
UC	Unknown Cover
WC	Water Cover
WM	Water Meter
WO	Wash Out

Walls

BW	Brick Wall
CW	Concrete Wall
GW	Gabion Wall
RTW	Retaining Wall
SW	Stone Wall
TW	Timber Wall

Fences

CBF	Close Board Fence
CLF	Chain Link Fence
CPF	Chestnut Paling Fence
CSF	Concrete Slat Fence
IRF	Iron Railing Fence
PVF	Post and Rail Fence
OBF	Open Board Fence
PRF	Post and Rail Fence
PSB	Pedestrian Safety Barrier
PWF	Post and Wire Fence

Levels

DPC	Damp Proof Course
EL	Eave
FL	Finished Floor
PAR	Parapet
RL	Ridge
RFL	Flat Roof
THL	Threshold
WGL	Window Cill
WGL	Window Head
WHL	Window Head
STN	Survey Station
+ 20.00	Spot Level
	Gate
	Contours
	Hedge

Trees

All trees canopy spreads and heights are approximate.
Species have been identified to the best of the Surveyors knowledge.

Notation : Diameter of Trunk / Height, Spreads drawn to scale

Trees that have multiple boles will have the number shown.

NOTES

Survey Grid & Datum Levels

Survey Grid

The survey grid is Related to Ordnance Survey grid by GPS Observations.

Survey Datum

The survey datum is related to Ordnance Survey datum by GPS observations.

Drainage

Where drainage invert levels/pipe sizes are shown, data has been recorded from the surface by visual inspection only . Drainage connections to other manholes/gully's are assumed, Where drainage information is critical a full drainage tracing survey should be undertaken.

Base Map Data

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Station Control Values

1	480881.718	164441.874	72.412
2	480858.931	164464.653	72.474
3	480861.588	164491.399	72.054
4	480895.133	164466.192	72.803
5	480900.796	164449.266	72.634
6	480858.833	164405.915	73.028
7	480835.183	164391.961	73.477
8	480811.644	164341.856	75.873
9	480800.758	164311.703	77.279
10	480783.056	164271.677	79.107
11	480730.199	164266.770	79.858

Rev	Date	Detail

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Status: Survey Drawings

Site Address: Brunninghams Farm, Heath Ride, Finchampstead, Wokingham, RG40 3QJ

Drawing Title: Existing Topographical Survey

Scale	Date	Drawn
1:200 @ A0	07/04/25	TJJ/TDH

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2025-2000-001-Survey Plan	000000

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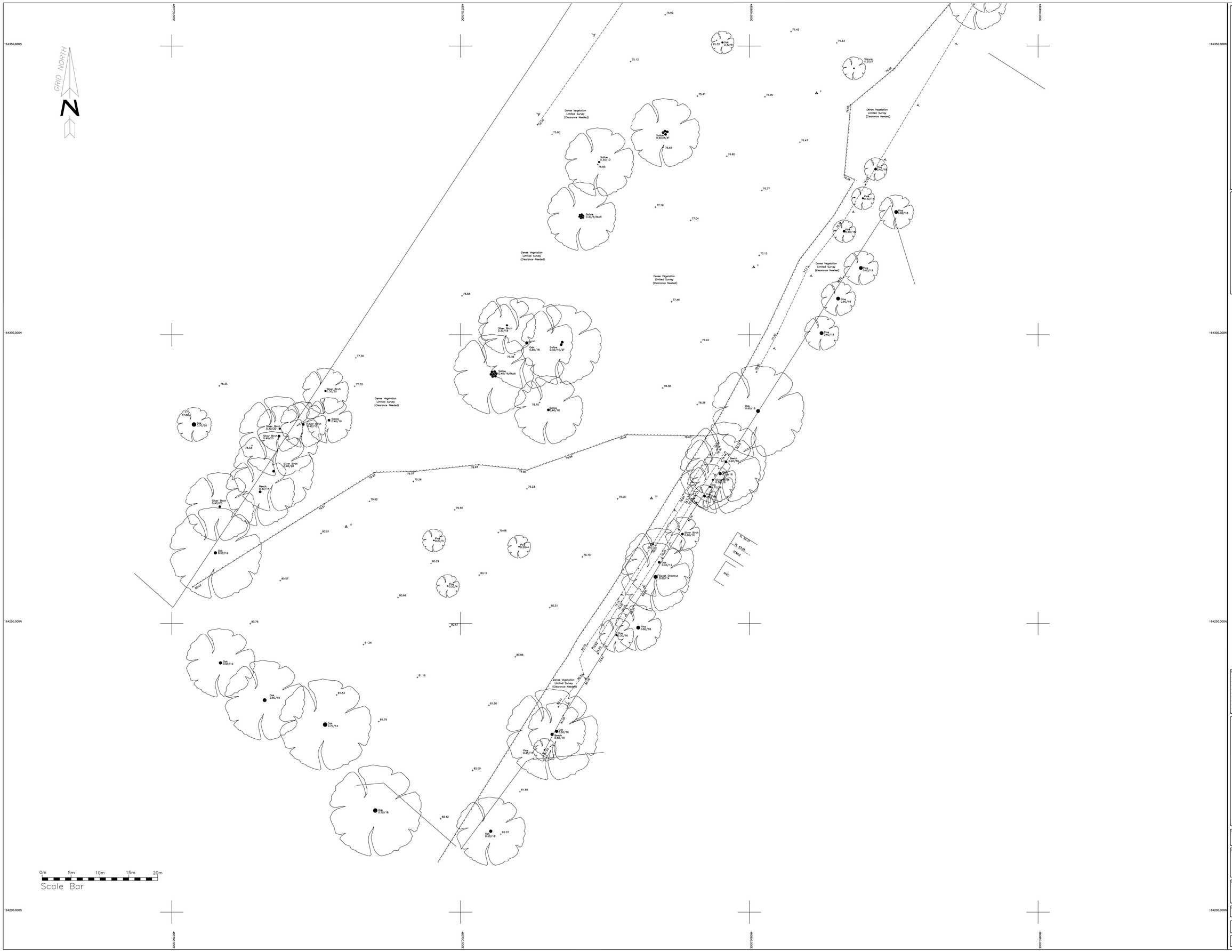
Drawing 2025-2000-002 – Topographical Survey Sht 2 of 2



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CO	Clean Out
CP	Catch Pit
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DC	Drainage Channel
EC	Electric Cover
FH	Fire Hydrant
G	Gully
GV	Gas Valve
IC	Inspection Cover
IL	Invert Level
KO	Kerb Outlet
MH	Manhole
RE	Rodding Eye
SC	Stop Cock
SV	Sluice Valve
TC	Telecoms Cover
TO	Telecoms Outlet
WC	Water Cover
WM	Water Meter
WO	Wash Out

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APPENDIX B

Soil Investigation Report

FACTUAL REPORT ON A SITE INVESTIGATION

Site

BRUNNINGHAMS FARM,
HEATH RIDE, FINCHAMPSTEAD,
BERKSHIRE RG40 3QJ

Client

BF01 LIMITED

Report Ref
25/13158/KJC

Issued
MAY 2025

ALBURY S.I. LTD
Geotechnical & Environmental Specialists

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DOCUMENT CONTROL				
Report Title	Factual Report on a Site Investigation			
Contract	Heath Ride, Finchampstead			
Client	**BF01 Limited**			
Report Reference	25/13158/KJC			
Prepared by	**K J Clark** BSc Hons Director	[redacted]		
DOCUMENT HISTORY				
Revision	Status	Date	Issued by	Revision Detail
0	Final			

Albury S.I. Limited has prepared this Report with reasonable skill and care for the sole use of the Client in accordance with the terms and conditions of the contract under which our services were provided. No duty of care and no contractual obligation (whether expressed or implied) is owed to any third party. Should any third party rely on this Report then they do so at their own risk and Albury S.I. Limited shall have no liability whether in contract or in tort, in negligence, for breach of statutory duty or otherwise to any such party. No warranty, expressed or implied, is made as to the professional advice included in this Report or any services provided by Albury S.I. Limited.

The following foreword should be read in conjunction with this report. Any variations on the general procedures outlined below are indicated in the text.

FOREWORD

The recommendations made and opinions expressed in this Report are based on the strata conditions revealed by the fieldworks as indicated on the exploratory records, together with an assessment of the data from in situ and laboratory tests. No liability can be accepted for conditions which have not been revealed by the fieldworks, for example, between exploratory positions. While this Report may offer opinions on the possible configuration of strata, both between the excavations and below the maximum depth achieved by the investigation, these comments are for guidance only and no liability can be accepted for their accuracy. The data obtained relate to the conditions which are relevant at the time of the investigation.

The groundwater observations entered on exploratory records are those noted at the time of the investigation. The normal rate of progress does not usually permit the recording of any equilibrium water level for any one water strike. It should be noted that groundwater levels are prone to seasonal variation and to changes in local drainage conditions. The word 'none' indicates that groundwater was sealed off by the borehole casing or that no water was observed in the exploratory hole upon completion.

It should be appreciated that this report does not constitute a Geotechnical Design Report (GDR) as defined in Eurocode 7 and no aspect of this report constitutes a design. Specific sections of this report are generally in line with the guidance set out in Eurocode 7 for a Ground Investigation Report (GIR), as defined within BS EN 1997:-2 (2024). This provides guidance on the number and spacing of investigation positions, methods of investigation and sample quality class to be achieved which may not have been met by this investigation.

This Report is prepared for the specific purpose stated and in relation to the development proposals or usage indicated to Albury S.I. Limited at the time of preparation. The recommendations should not be used for adjacent schemes and may not be appropriate for alternative proposals.

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REPORT REF: 25/13158/KJC
CONTRACT: HEATH RIDE, FINCHAMPSTEAD

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2 FIELDWORKS 1

3 GROUND CONDITIONS 2

REFERENCES
LIST OF ABBREVIATIONS

FIGURES

1 Site Layout Plan

APPENDICES

1 Exploratory Records

1 INTRODUCTION

1.1 Scope

The Client proposes to construct a number of houses following the demolition of the existing structures at Brunninghams Farm, Heath Ride, Finchampstead ("the site"). Albury SI Ltd have been commissioned to undertake soakaway tests to assess the drainage characteristics of the underlying soils.

The programme of this investigation comprised the construction of two mechanically excavated trial pits and a single borehole using hand-held window sampling techniques. BRE365 soakaway tests were attempted in the trial pits and a standpipe was installed in the borehole. During this work samples were recovered for further examination and laboratory testing. This report describes the work undertaken and presents the information obtained.

1.2 The Site

The site is located at Ordnance Survey National Grid Reference 480836, 164401.

Photographs which give a general impression of the site at the time of the fieldworks are included below.

2 FIELDWORKS

2.1 Siteworks

The borehole and trial pits were constructed on 28th May 2025 at locations as shown on the site plan, drawing no. 25/13158/1, which is presented as Figure 1. The exploratory positions were located in order to provide adequate site coverage and as agreed on site with the Client's representative.

The depths and descriptions of the strata encountered in the borehole and trial pits are given on the records which comprise Appendix 1 to this report. These records note the depths at which samples were taken, the results of in situ tests and the groundwater observations noted at the time of the fieldworks.

2.2 Installations

Upon completion of the borehole a standpipe or monitoring well was installed in order that long-term groundwater monitoring can be completed. The instrument comprised 1.00m plain pipe extended to a depth of 2.90m. A bentonite and concrete seal was provided from ground level to 0.50m with a lockable cover at ground surface.

3 GROUND CONDITIONS

3.1 Stratigraphy

Consideration of the exploratory records indicates that made ground was noted at the investigatory locations and was shown to extend to 0.30m, 0.50m and 0.70m.

Soils varying from blue-grey/dark grey clayey sand/very sandy clay to orange-brown/grey silty clay were noted beneath the made ground. Trial pits SA1 and SA2 were concluded within these soils at 2.30m and 2.20m. Borehole BH1 was terminated at 2.90m due to an obstruction.

Photographs of the trial pits are included below.

Trial pit SA1

Trial pit SA2

3.2 Groundwater

During the construction of the exploratory positions no groundwater strikes were recorded and all the exploratory excavation were noted to remain dry prior to commencement of the soakaway tests and installation of the standpipe.

3.3 In Situ Testing

Soakaway tests to BRE 365 were attempted in the trial pits. The results are included with the exploratory records. After time periods of 210minutes and 240minutes limited dissipation of the water added had been recorded and the tests were abandoned. The results suggest that the soils underlying the site are unsuitable as a drainage medium.

REFERENCES

- British Standards (2016). Methods of test for soils for civil engineering purposes, BS 1377-1:2016. *British Standard Institution, London.*

- British Standards (2011). Investigation of potentially contaminated sites. Code of Practice. BS 10175+A2:2017. *British Standard Institution, London.*

- British Standards (2013). Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs). BS 8576. *British Standard Institution, London.*

- British Standards (2015). Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. BS 8485+A1:2019. *British Standard Institution, London.*

- British Standards (2015). Code of practice for ground investigations, BS 5930:2015. *British Standard Institution, London.*

- Building Research Establishment [BRE] (2004). *Cover systems for land regeneration: Thickness of cover systems for contaminated land (BR 465)*. BRE Watford, UK.

- Building Research Establishment [BRE] (2005). *Concrete in aggressive ground: Special Digest 1* (3rd Ed.). BRE Watford, UK.

- Building Research Establishment [BRE] (2015). *Guidance on protective measures for new buildings. (BR 212)*. BRE Watford, UK.

- Contaminated land: Applications in Real Environments. (2013). *SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Final Project Report.*

- Chartered Institute of Environmental Health and Contaminated Land: Applications in Real Environments (2008). *The Guidance on Comparing Soil Contamination Data with Critical Concentration.* London, UK.

- Environment Agency (2004). *Model Procedures for the Management of Contaminated Land.* Contaminated Land Report (CLR) 11, SC02000028, Environment Agency, Bristol, UK.

- Environment Agency (2015). Interpretation of the definition and classification of hazardous waste. 1st edition. Technical Guidance WM3. *Environment Agency, UK.*

- Nathanail, C.P., McCaffrey, C., Gillett, A.G., Ogden, R.C. and Nathanail, J.F. (2015). *The LQM/CIEH S4ULs for Human Health Risk Assessment.* Land Quality Press, Nottingham. Publication Number S4UL3073.

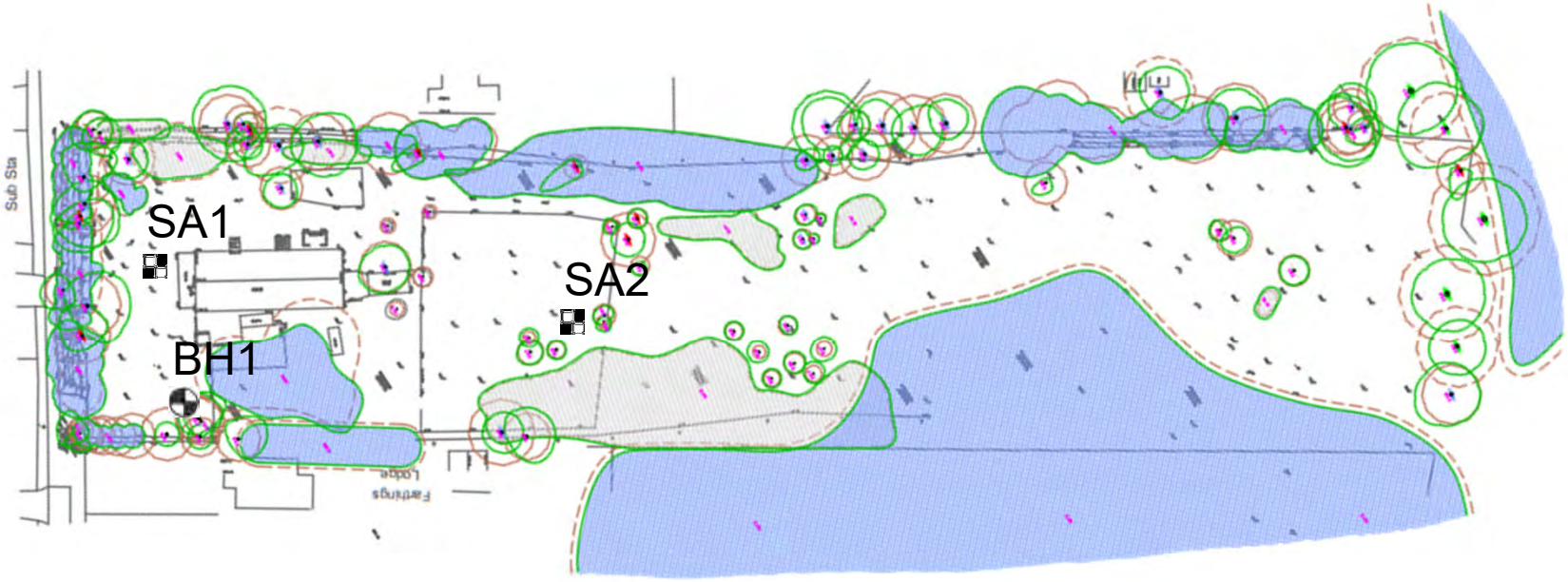
- Stroud, M. A. (1974). The standard penetration test in insensitive clays and soft rocks. *Proceedings of the European Symposium on Penetration Testing, Stockholm*, *2*, 367-375.

LIST OF ABBREVIATIONS

AOD	-	Above Ordnance Datum
ACM	-	Asbestos-containing Material
AST	-	Above-ground Storage Tank
BGS	-	British Geological Survey
BH	-	Borehole
BRE	-	Building Research Establishment
BSI	-	British Standards Institution
BS	-	British Standard
C4SL	-	Category Four Screening Level
CIRIA	-	Construction Industry Research and Information Association
CP	-	Cable Percussive
DPH	-	Dynamic Probing Heavy
DPSH	-	Dynamic Probing Super Heavy
EA	-	Environment Agency
GAC	-	Generic Assessment Criteria
LL	-	Liquid Limit
mAOD	-	Metres Above Ordnance Datum
mBGL	-	Metres Below Ground Level
mOD	-	Metres Ordnance Datum
OS	-	Ordnance Survey
PAH	-	Polycyclic Aromatic Hydrocarbons
PCB	-	Polychlorinated Biphenyl
PID	-	Photo Ionisation Detector
PL	-	Plastic Limit
PSD	-	Particle Size Distribution
SGV	-	Soil Guideline Value
SOM	-	Soil Organic Matter
SPT	-	Standard Penetration Test
SPZ	-	Source Protection Zone
SVOC	-	Semi-volatile Organic Compounds
TPH	-	Total Petroleum Hydrocarbon
UST	-	Underground Storage Tank
UXB	-	Unexploded Bombs
UXO	-	Unexploded Ordnance
VOC	-	Volatile Organic Compound

FIGURE 1

SITE LAYOUT PLAN



Legend:

Borehole Location

Trial Pit Location

Title:	Site Layout Plan
Dwg No:	25/13158/1
Drawn by:	KJC
Client:	BF01 Limited
Contract:	Heath Ride, Finchampstead
Job Ref:	25/13158/KJC
Scale:	NTS
Revision:	0
Issue Date:	29/05/2025

ALBURY S.I. LTD

Miltons Yard, Petworth Road,
Witley, Surrey GU8 5LH
www.alburysi.co.uk

APPENDIX 1

EXPLORATORY RECORDS

ALBURY S.I. LTD Miltons Yard, Petworth Road, Witley, Surrey GU8 5LH		**BOREHOLE**	**BH1**
Contract	Heath Ride, Finchampstead	**Report Ref**	25/13158/KJC
Client	BF01 Limited	**Date**	28/05/2025
Site Address	Brunninghams Farm, Heath Ride, Finchampstead, Berkshire RG40 3QJ	**Ground Level**	

Type of excavator	3 tonne excavator	**Water level after completion, m**	none

Water strikes, m		**Dimensions, m**		**Ease of excavation, m**			
1	none	Diameter	0.08	Very easy		Difficult	GL - 0.90
2				Moderate	0.90 - 2.90	Very hard	2.90

Remarks
Standpipe installed in borehole.

Samples or tests		**Shear Strength kPa**	**Depth**	**Legend**	**Strata Description**
Type	**Depth, m**				
D	0.10				MADE GROUND (grey sand with flint gravel, plastic fragments and roots)
D	0.30		0.40		
D	0.50		0.50		MADE GROUND (grey/brown silty SAND with rare flint gravel)
			0.70		MADE GROUND (brown/grey sandy CLAY with rare flint gravel)
					Orange-brown/grey sandy CLAY
D	1.00				
D	1.50				
			1.90		
D	2.00				Blue-grey/brown silty CLAY
			2.20		
					Blue-grey/dark grey clayey SAND/very sandy CLAY - slight organic odour?
D	2.50		2.50		
					Blue-grey/brown very sandy CLAY
			2.90		END OF BOREHOLE - Obstruction

Sample Code: B - Large Disturbed D - Small Disturbed W - Water Sample R - Root Sample

ALBURY S.I. LTD Miltons Yard, Petworth Road, Witley, Surrey GU8 5LH		**TRIAL PIT**	**SA1**
Contract	Heath Ride, Finchampstead	**Report Ref**	25/13158/KJC
Client	BF01 Limited	**Date**	28/05/2025
Site Address	Brunninghams Farm, Heath Ride, Finchampstead, Berkshire RG40 3QJ	**Ground Level**	
Type of excavator	3 tonne excavator	**Water level after completion, m**	none

Water strikes, m		**Pit Dimensions, m**		**Ease of excavation, m**		
1	none	Length	1.30	Very easy	Difficult	GL - 2.30
2		Breadth	0.50	Moderate	Very hard	

Remarks

Samples or tests		**Shear Strength kPa**	**Depth**	**Legend**	**Strata Description**
Type	**Depth, m**				
D	0.10				MADE GROUND (grey sand with flint gravel, brick fragments and roots)
D	0.30		0.30		Orange-brown/grey silty CLAY with rare flint gravel
D	0.50				
D	1.00				
D	1.50				
			1.80		Orange-brown/light grey very silty CLAY
D	2.00				
			2.30		END OF EXCAVATION

Sample Code: B - Large Disturbed D - Small Disturbed W - Water Sample R - Root Sample

ALBURY S.I. LTD Miltons Yard, Petworth Road, Witley, Surrey GU8 5LH		**TRIAL PIT**	**SA2**
Contract	Heath Ride, Finchampstead	**Report Ref**	25/13158/KJC
Client	BF01 Limited	**Date**	28/05/2025
Site Address	Brunninghams Farm, Heath Ride, Finchampstead, Berkshire RG40 3QJ	**Ground Level**	

Type of excavator	3 tonne excavator	**Water level after completion, m**	none

Water strikes, m		**Pit Dimensions, m**		**Ease of excavation, m**		
1	none	Length	1.20	Very easy	Difficult	GL - 2.20
2		Breadth	0.50	Moderate	Very hard	

Remarks

Samples or tests		**Shear Strength kPa**	**Depth**	**Legend**	**Strata Description**
Type	**Depth, m**				
D	0.10				MADE GROUND (dark grey sand with flint gravel and roots)
D	0.30				
D	0.50		0.50		Orange-brown/grey very sandy CLAY with rare flint gravel and root remains
			0.90		
D	1.00				Brown clayey SAND and flint GRAVEL
			1.10		Green-grey/brown clayey SAND
			1.30		Orange-brown/grey silty CLAY
D	1.50				
D	2.00				
			2.20		END OF EXCAVATION

Sample Code: B - Large Disturbed D - Small Disturbed W - Water Sample R - Root Sample

SOAKAWAY INFILTRATION TEST RESULTS

ALBURY S.I. LTD
Geotechnical & Environmental

Contract	Heath Ride, Finchampstead
Report Ref	25/13158/KJC
Test Location	SA1 - Cycle 1

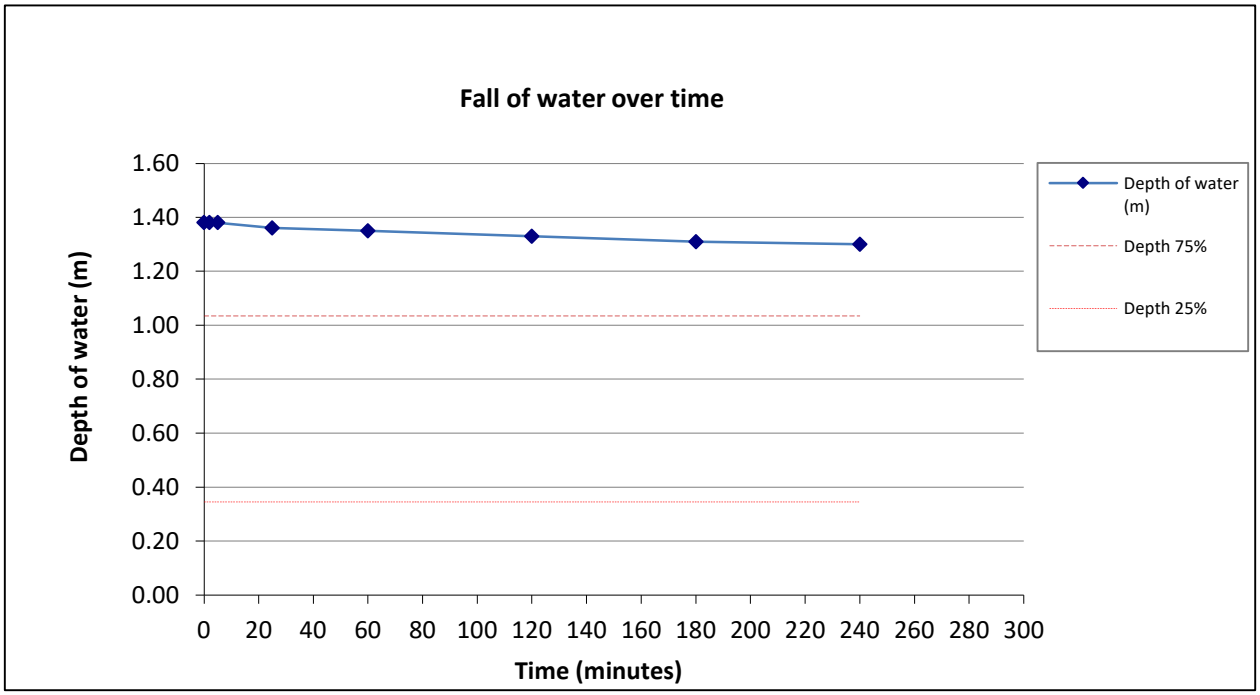
Time (mins)	Depth of Water (m)
0	1.38
2	1.38
5	1.38
25	1.36
60	1.35
120	1.33
180	1.31
240	1.30

Pit Dimensions (m)

Length	1.30
Width	0.50
Depth	2.20

Remarks:

1. Test undertaken in general accordance with BRE Digest 365
2. Trial pit was filled with aggregate for test



V_{p75-25}	Effective depth storage volume of water in trial pit between 75% and 25% effective depth	
α_{p50}	Internal surface area of trial pit up to 50% effective depth and including base	
t_{p75-25}	Time for water level to fall from 75% to 25% effective depth	

Soil Infiltration Rate (m/sec) *f*	FAIL

SOAKAWAY INFILTRATION TEST RESULTS

ALBURY S.I. LTD
Geotechnical & Environmental

Contract	Heath Ride, Finchampstead
Report Ref	25/13158/KJC
Test Location	SA2 - Cycle 1

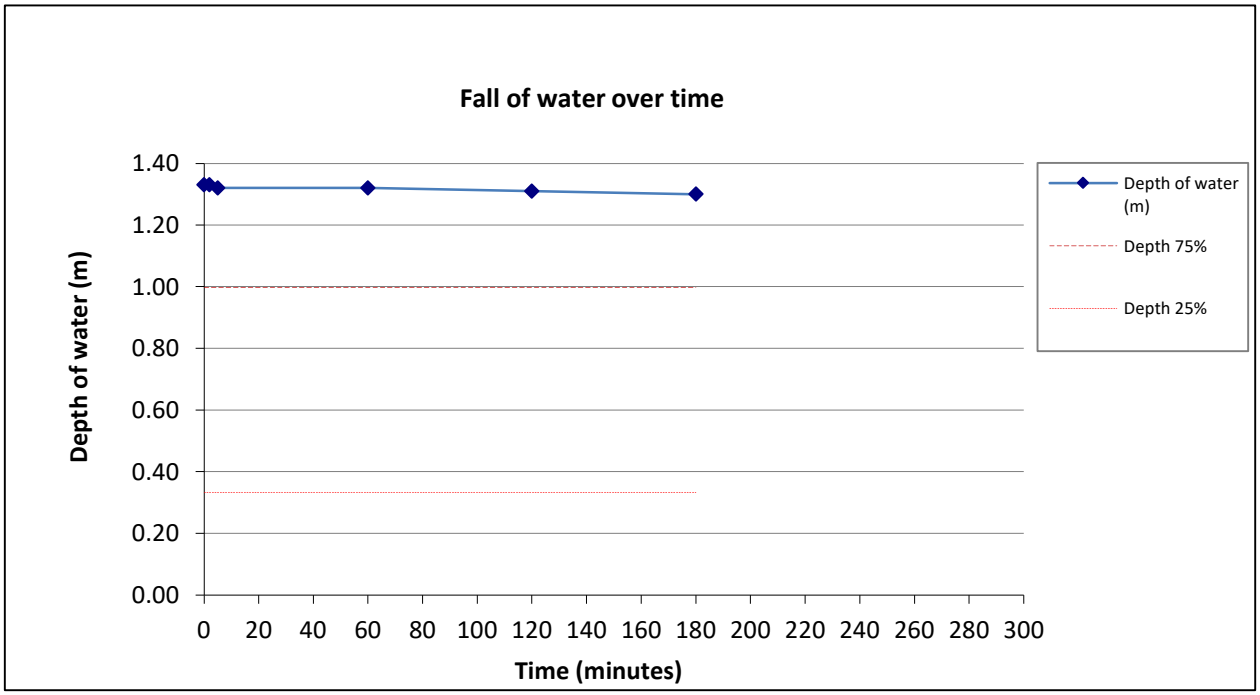
Time (mins)	Depth of Water (m)
0	1.33
2	1.33
5	1.32
60	1.32
120	1.31
180	1.30

Pit Dimensions (m)

Length	1.20
Width	0.50
Depth	2.20

Remarks:

1. Test undertaken in general accordance with BRE Digest 365
2. Trial pit was filled with aggregate for test



V_{p75-25}	Effective depth storage volume of water in trial pit between 75% and 25% effective depth	
α_{p50}	Internal surface area of trial pit up to 50% effective depth and including base	
t_{p75-25}	Time for water level to fall from 75% to 25% effective depth	

Soil Infiltration Rate (m/sec) *f*	FAIL

APPENDIX C

Drawing 25050/PL/01 – Proposed Site Layout

PHILIP WADGE
ARCHITECTURE

Philip Wadge Architecture
Kingfisher Court
Newbury
RG145SJ

info@philipwadge.com
01635 736440
philipwadge.com

Scale
1:500 @ A1

Project Address
Brunninghams Farm
Heath Ride
Wokingham
RG40 3QJ

Revision
01

Date
11/15/25

Client

hello@brunninghamsfarm.co.uk

Scale

0 1 2 5m

project address:

Brunninghams Farm
Heath Ride
Finchampstead
Wokingham
RG40 3QJ

Easting:
Northing:
Latitude: 51.48658087328242
Longitude: -3.1824517250061035

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project:

25050/PL/01

PROPOSED SITE PLAN

APPENDIX D

HELLA 2024 Site Allocations

KEY

Developable outside 1-5 year period
High risk of Flooding
To be taken forward for consideration
Not Available
Undevelopable due to Green Belt

HELAA REF	Site Address	Parish	Site Area (ha)	NET Units	Proposed Density	Existing Land Use Class	Flood Zone	Available	Delivery Timscale (Years)	Deliverable	Comments	Notes
5RU007	Land to the rear of 9-17 Northbury Lane	Ruscombe	0.51	12	24	Commerial	1	Available	1 to 5	Yes	Will be taken into Consideration, TPO, Entirely within a Radon affected area.	Loss of Local Green Field,Within Green Field, Proposed density too high, No Risk of surface water flooding
5SH031	Rustlings', 'The Spring' and land to the rear of 'Cushendall', Shinfield Road	Shinfield	0.34	10	29	Residential	1	Available	1 to 5	Yes	Will be taken into Consideration. Entirely within potentially contaminated land consultation zone, TPO	partially within Outer Consultation Zone, of AWE Brughfield, Advised not to develop, Proposed density too high, smal area of site risk of surface water flooding 1/1000 & 1/100
5FI024	Hillside, Lower Wokingham Road	Finchampstead	1.04	15	14	Residential	1	Available	Potentially Available	Potentially Developable	Will be taken into Consideration, No surface water floding, TPO.	Proposed Density too High, Posible Loss of Green Infrasrtucure , Site has just been approved, TPO
5WK053	Lee Springs, Latimer Road	Wokingham	0.40	42	105	Industrial	1	Not Available	1 to 5	Yes	Entirely within a potentially contaminated land consultation zone. TPO Adjacent to a railway line.	Discounted as an ongoing application have submitted discharge of conditions (250788), very modest area of site susceptible to surface water flooding, 1 in 1000
5FI028	Westwood Yard, Sheerlands Road	Finchampstead	2.54	10	4	Residential/ Commercial	1	Not Available	Potentially Available	Potentially Developable	Surface water flood risk, 1 in 1000 and small area (1 in 100), TBH SPA +TPO	Discounted as an ongoing application have submitted discharge of conditions
5FI003	31 and 33 Barkham Ride	Finchampstead	5.42	80	15	Residential	1	Not Available	Potentially Available	Potentially Developable	Drainage design submitted for approval in March 2025	Siite is being progressed not available
5FI004	Greenacres Farm, Nine Mile Ride	Finchampstead	9.03	100	11	Industrial	1	Available	Potentially Available	Potentially Developable	TPO, TBHSPA, Small area of contaminated land	Small areas of site are at risk of surface water flooding (1 in 30, 1 in100, 1 in 1000), Proposed Density too High
5RU008	Land between 39-53 New Road	Ruscombe	0.86	20	23	Commercial	1	Available	1 to 5	Yes	Within Green Field Proposed density too High, Surface water flooding risk, 1 in 1000, 1in 30, 1 in 100	Discounted as flood risk is simillar to proposed site and is high rik of surface water flooding. Will remove natural SuDS for Urban Area as existing site is a Greenfield
5SO001	Land at Sonning Farm	Sonning	1.37	25	18	Agricultural	1	Available	6 to 10, 11 to 15	No	Loss best and most verstile agricultural land	Small areas of site are at risk of surface water flooding, Proposed Density too High
5WI008	Winnersh Plant Hire	Winnersh	1.59	60	38	Storage/ Idustrial/ Residential	1(27%), 2(73%), 3a (21%)	Available	6 to 10, 11 to 15	No	High Risk of Fluvial and Surface Flooding	Higer flood risk than proposed site
5WI011	Wheatsheaf Close	Wokingham	0.73	24	33	Public open space	1	Available	6 to 10, 11 to 15	No	High risk of surfave water flooding.	Risk of surface water flooding, 1in 1,000 year
5WK029	Station Industrial Estate, Oxford Road	Wokingham	0.65	40	62	Industrial/ Commercial	1	Available	6 to 10, 11 to 15	No	Low& Medium Risk of Flooding, Susceptible to ground water flooding 25-50%, TPO	
5WK045	Land at Bridge Retail Park	Wokingham	0.57	59	103	Retail/ Commercial	1(75%), 2(25%)	Available	6 to 10, 11 to 15	No	High Risk of Surface Water Flooding	
5WK046	Land at Wellington Road	Wokingham	0.16	20	125	Scrubland and hardstanding	1	Available	6 to 10, 11 to 15	No	Low Risk of Flooding, 25-50% chance of Grounfwater Floding, Entire Land within contaminated land consultation zone	
5WK054	WBC council offices, Shute End	Wokingham	1.40	100	71	Offices	1	Available	6 to 10, 11 to 15	No	High Risk of Surface Water Flooding	

5AR011; 5AR014; 5AR015; 5AR025; 5AR029; 5AR030; 5AR032; 5WI001; 5WI002; 5WI015; 5WI018	Land at Hall Farm	Arborfield & Winnersh	324.03	3,930	12	Agricultural	1(65%), 2(35%), 3a(32%), 3b(29%)	Available	Potentially Available	Potentially Developable	High Risk of Surface Water Flooding	Incomparable, too large of a site
5BA010	Barkham Square	Barkham	58.4	600	10	Agricultural	1 (94%), 2 (6%), 3a (2%), 3b (2%)	Available	Potentially Available	Potentially Developable	High Risk of Surface Water Flooding	Greenfield
5BA032	24 Barkham Ride	Barkham	2.13	30	14	Residential/ Commercial/ Industrial	1	Available	Potentially Available	Potentially Developable	Contaminated land, TPO	Incomparable, too large of a site
5CV001	Land east and west of Park View Drive North	Charvil	13.32	78	6	Agricultural	1(72%), 2(28%), 3a(18%), 3b(13%)	Available	Potentially Available	Potentially Developable	High Risk of Surface Water Flooding	
5CV002	Land west of Park Lane	Charvil	8.82	61	7	Equestrian	1	Available	Potentially Available	Potentially Developable	Highly susceptible to, ground water flooding, TPO, Fully within radon affected area	
5HU006	Land on the north side of Orchard Road	Hurst	1.12	23	21	Equestrian	1	Available	Potentially Available	Potentially Developable	Low Risk of suface water flooding, High risk of ground water flooding >75%	
5HU009; 5HU010; 5HU011; 5HU012; 5HU013; 5HU014; 5HU015; 5HU017; 5HU020; 5HU021; 5HU022; 5HU023; 5HU041; 5HU047; 5HU056	Land at Ashridge	Hurst	249.51	3,000	12	Agricultural	1(98%), 2(1%), 3a(<1%), 3b(<1%)	Available	Potentially Available	Potentially Developable	High Risk of Surface Water Flooding, Loss of best and most versatile agricultural Land, Ancient Woodland Presnt, TPO	
5RU001; 5RU002; 5RU003; 5RU004; 5RU005; 5RU006	Land at Twyford/Ruscombe	Ruscombe	232.42	2,500	11	Agricultural	1(93%), 2(7%), 3a(<6%), 3b(<6%)		Potentially Available	Potentially Developable	Wihtin Green Belt	Wihtin Green Belt
5SH023; 5SH026; 5SH027	Land east and west of Hyde End Road	Shinfield	13.01	175	13	Agricultural	1(98%), 2(1%), 3a(<1%), 3b(<1%)	Available	Potentially Available	Potentially Developable	High Risk of Surface Water Flooding, Risk of Reservoir Flooding, High Risk of Groundwater Flooding	
5SH025	Land north of Arborfield Road	Shinfield	16.43	191	12	Agricultural	1(89%), 2(11%), 3a(<1%), 3b(<1%)	Available	Potentially Available	Potentially Developable	High Risk of Surface Water Flooding	
5SW005	Land east of Trowes Lane	Swallowfield	5.68	85	15	Agricultural	1(84%), 2(16%), 3a(9%), 3b(9%)	Available	Potentially Available	Potentially Developable	High Risk of Surface Water Flooding	
5SW019	Land west of Trowes Lane	Swallowfield	4.22	70	17	Agricultural	1	Available	Potentially Available	Potentially Developable	50-75 % probability to ground water flooding, small areas of site medium and high risk of surface water flooding.	
5TW007; 5TW011	Land north of the A4	Twyford & Wargrave	47.93	230	5	Agricultural	1	Available	Potentially Available	Potentially Developable	Low Risk of Surface water Flooding, Small area risk of reservoir flooding, 76% probability of ground water flooding	
5WI009; 5WI019	Land on the north west side of Old Forest Road	Winnersh	47.94	50	1	Agricultural	1(98%), 2(1%), 3a<1%), 3b(<1%)	Available	Potentially Available	Potentially Developable	Small area is at risk of reservoir flooding, small area high & Medium rsk of surface water flooding,	Whole site within Newt Impact Risk Zone (RED)
5WI012; 5WI021	Land to the rear of Bulldog Garage and BP garage	Winnersh	2.80	34	12	SuDs and informal amenity space & Petrol filling station	1	Available	Potentially Available	Potentially Developable	25-50% probability of Groundwater flooding, low risk of surface water flooding with small areas High &Medium. Contaminated land	
5WI014	69 King Street Lane	Winnersh	1.25	28	22	Residential/ Industrial	1	Available	Potentially Available	Potentially Developable	37% of site low risk of surface water flooding, small area high & medium risk, 25-50% Probability of Ground water flooding, Pottentially contaminated land + TPO	
5WK011	Land south of London Road (Western field)	Wokingham	0.79	12	15	Agricultural	1	Available	Potentially Available	Potentially Developable	Low Risk of Surface water Flooding, Site within land fill gas consultation zone na dpotentially contaminated land.	

5WK023	Rosery Cottage and 171 Evendons Lane	Wokingham	0.73	35	48	Residential/ Commercial	1	Available	Potentially Available	Potentially Developable	Low Risk of Surface water Flooding	
5WK028; 5WK032; 5WW030; 5WW031	Land at Blagrove Lane	Wokingham & Wokingham Without	75.16	387	5	Agricultural	1	Available	Potentially Available	Potentially Developable	Hgih, Medium and Low Risk of Surface water flooding, certain area of site within potentially contaminated land, Ancient woodland + TPO	

APPENDIX E

Drawing 251953/DS/01 – Drainage Strategy

DWG No. 251953-DS-01

NOTES

1. All dimensions are in meters unless expressed otherwise and all levels are shown in meters above Ordnance Datum.
2. This drawing shall be read in conjunction with the drainage schedules and standard details.
3. All existing sewer routes are to be proved on site by the contractor and any discrepancies notified to engineer.
4. All sewers shall be constructed in accordance with Part H of the Building Regulations and Sewers for Adoption 7th Edition.
5. It is the contractors responsibility to ensure compliance with current building regulations and codes of practice.
6. Reference should be made to the structural engineers details for all aspects of foundation design and construction.
7. The contractor should check all dimensions on site. Any discrepancies shall be reported to the engineer immediately.
8. Connections to the adopted drainage authority sewers shall be made under the supervision of the authority. The contractor shall be responsible for obtaining the necessary consents required from the drainage authority.
9. Bed type B,F and N shall be used for rigid pipes. Bed type Z shall be used for all gully connections and pipes under proposed carriageways with less than 700mm cover. The concrete bed and surround is to extend to the side of the trench or be of minimum width and voids filled with well compacted selected backfill.
10. All precast concrete manhole units are to conform to B.S. 5911. Precast concrete cover slabs are to be heavy duty.
11. Downstream exit pipes of 600mm dia. and over should be fitted with heavy duty safety chains across their mouths.
12. Where large differential settlement is probable, several short lengths of pipe with flexible joints should be laid on either side of the chamber.
13. Where drains pass through foundations, a flexible joint should be provided within 150mm of the face of the structure.
14. Fast setting resin mortars may be used in lieu of cement mortar for bedding manhole frames where agreed with the Engineer to enable early cover loading.
15. The concrete base slab shall be 225mm minimum thickness for chambers up to 4500mm deep. Manholes over 4500mm deep require a slab 450mm thick.
16. All manholes over 2000mm deep are to be fitted with a "DANGER TEST FOR OXYGEN" sign
17. Appropriate measures (to be agreed with the district council's building control section) are to be taken to discourage rodent entry into the properties.
18. The contractor is to keep a record of any variations made on site, including the relocation of sewers or drains, so that an as built drawing can be prepared upon completion of the project.
19. Location of RWP's and SVP's to be confirmed by the architect, Sub Stacks shall not be used unless connected to a ventilated section of the sewer in accordance with Building Regulations.

Rev	Amendment	Drawn	Checked	Approved	Date
P2	POND & PLOT 7 REMOVED	IN	RS	RS	16/12/25
P1	PRELIMINARRY ISSUE	IN	RS	KBL	26/11/25

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Mr Caspar Algar

Brunninghams Farm, Heath Ride, Finchampstead, Wokingham, RG40 3QJ

Drainage Strategy

Sheet 1 of 1

DRAWN	IN	CHECKED	RS	APPROVED	KBL
DATE	Nov-2025	DATE	Nov-2025	DATE	Nov-2025
SCALE	1:500	PRJ No.	251953	SIZE	REV
DWG No.	251953-DS-01			A1	P2

APPENDIX F

Drainage Calculations

Cascade Summary of Results for PP1.srcx

Upstream Structures	Outflow To	Overflow To
(None)	(None)	(None)

Half Drain Time : 439 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	71.843	0.193	0.0	0.4	0.4	9.4	O K
30 min Summer	71.866	0.216	0.0	0.4	0.4	12.7	O K
60 min Summer	71.888	0.238	0.0	0.4	0.4	15.9	O K
120 min Summer	71.908	0.258	0.0	0.4	0.4	18.7	O K
180 min Summer	71.917	0.267	0.0	0.4	0.4	19.9	O K
240 min Summer	71.920	0.270	0.0	0.4	0.4	20.4	O K
360 min Summer	71.920	0.270	0.0	0.4	0.4	20.4	O K
480 min Summer	71.919	0.269	0.0	0.4	0.4	20.1	O K
600 min Summer	71.916	0.266	0.0	0.4	0.4	19.8	O K
720 min Summer	71.913	0.263	0.0	0.4	0.4	19.4	O K
960 min Summer	71.908	0.258	0.0	0.4	0.4	18.6	O K
1440 min Summer	71.896	0.246	0.0	0.4	0.4	16.9	O K
2160 min Summer	71.879	0.229	0.0	0.4	0.4	14.6	O K
2880 min Summer	71.865	0.215	0.0	0.4	0.4	12.5	O K
4320 min Summer	71.841	0.191	0.0	0.4	0.4	9.0	O K
5760 min Summer	71.823	0.173	0.0	0.3	0.3	6.3	O K
7200 min Summer	71.809	0.159	0.0	0.3	0.3	4.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	9.6	19
30 min Summer	86.802	0.0	13.1	33
60 min Summer	54.368	0.0	16.9	64
120 min Summer	32.929	0.0	20.8	122
180 min Summer	24.243	0.0	23.1	182
240 min Summer	19.399	0.0	24.7	242
360 min Summer	14.081	0.0	27.0	358
480 min Summer	11.225	0.0	28.7	408
600 min Summer	9.408	0.0	30.1	470
720 min Summer	8.140	0.0	31.2	532
960 min Summer	6.474	0.0	33.1	664
1440 min Summer	4.680	0.0	35.7	938
2160 min Summer	3.378	0.0	38.4	1344
2880 min Summer	2.678	0.0	40.3	1732
4320 min Summer	1.927	0.0	42.8	2508
5760 min Summer	1.525	0.0	44.4	3232
7200 min Summer	1.271	0.0	45.4	3896

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Cascade Summary of Results for PP1.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	71.799	0.149	0.0	0.3	0.3	2.8	O K
10080 min Summer	71.793	0.143	0.0	0.3	0.3	1.8	O K
15 min Winter	71.843	0.193	0.0	0.4	0.4	9.3	O K
30 min Winter	71.866	0.216	0.0	0.4	0.4	12.7	O K
60 min Winter	71.888	0.238	0.0	0.4	0.4	15.9	O K
120 min Winter	71.908	0.258	0.0	0.4	0.4	18.7	O K
180 min Winter	71.917	0.267	0.0	0.4	0.4	19.9	O K
240 min Winter	71.921	0.271	0.0	0.4	0.4	20.5	O K
360 min Winter	71.922	0.272	0.0	0.4	0.4	20.6	O K
480 min Winter	71.919	0.269	0.0	0.4	0.4	20.2	O K
600 min Winter	71.916	0.266	0.0	0.4	0.4	19.8	O K
720 min Winter	71.913	0.263	0.0	0.4	0.4	19.3	O K
960 min Winter	71.905	0.255	0.0	0.4	0.4	18.3	O K
1440 min Winter	71.889	0.239	0.0	0.4	0.4	15.9	O K
2160 min Winter	71.866	0.216	0.0	0.4	0.4	12.7	O K
2880 min Winter	71.847	0.197	0.0	0.4	0.4	9.8	O K
4320 min Winter	71.817	0.167	0.0	0.3	0.3	5.4	O K
5760 min Winter	71.797	0.147	0.0	0.3	0.3	2.4	O K
7200 min Winter	71.776	0.126	0.0	0.3	0.3	1.1	O K
8640 min Winter	71.748	0.098	0.0	0.2	0.2	0.7	O K
10080 min Winter	71.729	0.079	0.0	0.2	0.2	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.095	0.0	46.2	4584
10080 min Summer	0.965	0.0	46.7	5248
15 min Winter	132.106	0.0	9.6	19
30 min Winter	86.802	0.0	13.1	33
60 min Winter	54.368	0.0	16.9	62
120 min Winter	32.929	0.0	20.8	120
180 min Winter	24.243	0.0	23.1	178
240 min Winter	19.399	0.0	24.7	234
360 min Winter	14.081	0.0	27.0	346
480 min Winter	11.225	0.0	28.7	448
600 min Winter	9.408	0.0	30.1	480
720 min Winter	8.140	0.0	31.2	556
960 min Winter	6.474	0.0	33.1	710
1440 min Winter	4.680	0.0	35.7	1010
2160 min Winter	3.378	0.0	38.4	1432
2880 min Winter	2.678	0.0	40.3	1844
4320 min Winter	1.927	0.0	42.8	2592
5760 min Winter	1.525	0.0	44.4	3224
7200 min Winter	1.271	0.0	45.5	3752
8640 min Winter	1.095	0.0	46.3	4416
10080 min Winter	0.965	0.0	46.8	5144

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Cascade Rainfall Details for PP1.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.036

Time (mins) From:	To:	Area (ha)
0	4	0.036

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Cascade Model Details for PP1.srcx

Storage is Online Cover Level (m) 72.300

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.9
Membrane Percolation (mm/hr)	1000	Length (m)	5.5
Max Percolation (l/s)	6.0	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	71.650	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.3
Membrane Percolation (mm/hr)	1000	Length (m)	8.0
Max Percolation (l/s)	40.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	71.790	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.9
Membrane Percolation (mm/hr)	1000	Length (m)	5.5
Max Percolation (l/s)	6.0	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	71.800	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.3
Membrane Percolation (mm/hr)	1000	Length (m)	8.0
Max Percolation (l/s)	40.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	71.940	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 71.650

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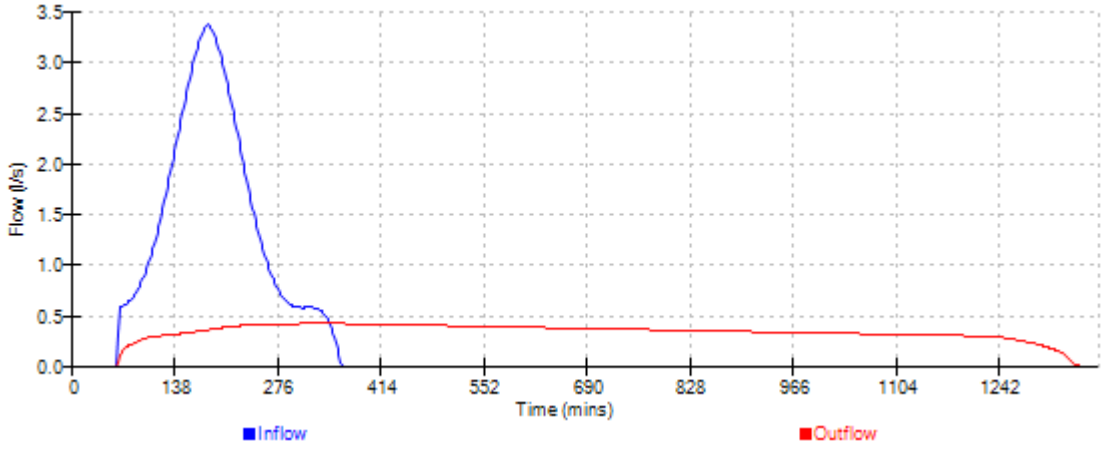
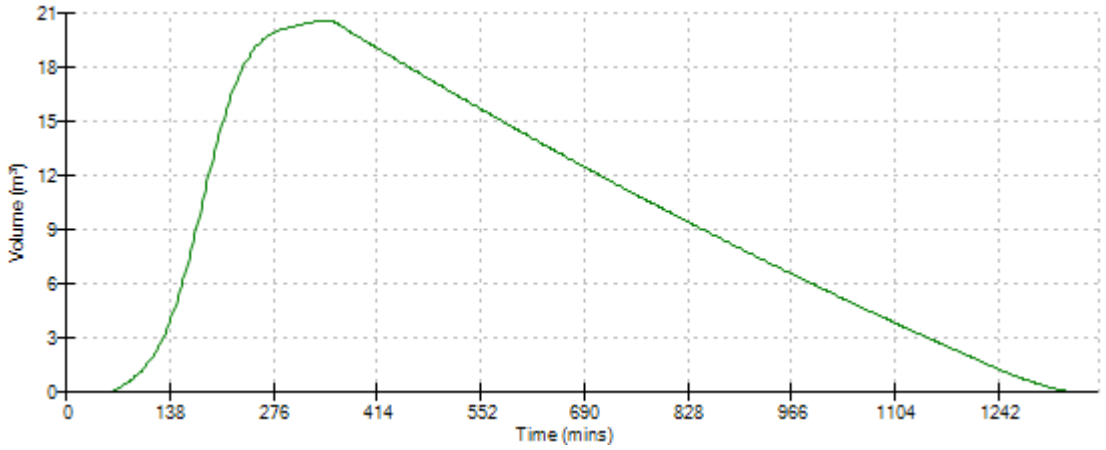
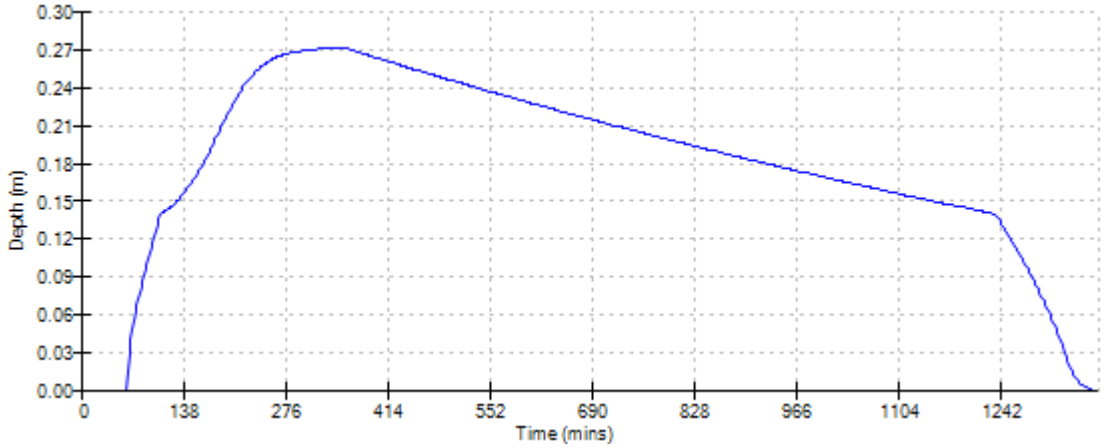
Cascade Event: 360 min Winter for PP1.srcx







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Cascade Summary of Results for PP2.srcx

Upstream Structures	Outflow To	Overflow To
(None)	(None)	(None)

Half Drain Time : 435 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	72.118	0.248	0.0	0.4	0.4	10.4	O K
30 min Summer	72.142	0.272	0.0	0.4	0.4	14.1	O K
60 min Summer	72.165	0.295	0.0	0.4	0.4	17.6	O K
120 min Summer	72.186	0.316	0.0	0.5	0.5	20.8	O K
180 min Summer	72.195	0.325	0.0	0.5	0.5	22.1	O K
240 min Summer	72.199	0.329	0.0	0.5	0.5	22.6	O K
360 min Summer	72.199	0.329	0.0	0.5	0.5	22.7	O K
480 min Summer	72.197	0.327	0.0	0.5	0.5	22.4	O K
600 min Summer	72.195	0.325	0.0	0.5	0.5	22.0	O K
720 min Summer	72.192	0.322	0.0	0.5	0.5	21.6	O K
960 min Summer	72.186	0.316	0.0	0.5	0.5	20.7	O K
1440 min Summer	72.173	0.303	0.0	0.5	0.5	18.8	O K
2160 min Summer	72.155	0.285	0.0	0.4	0.4	16.1	O K
2880 min Summer	72.140	0.270	0.0	0.4	0.4	13.7	O K
4320 min Summer	72.114	0.244	0.0	0.4	0.4	9.8	O K
5760 min Summer	72.095	0.225	0.0	0.4	0.4	6.8	O K
7200 min Summer	72.082	0.212	0.0	0.4	0.4	4.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	10.7	19
30 min Summer	86.802	0.0	14.6	33
60 min Summer	54.368	0.0	18.8	64
120 min Summer	32.929	0.0	23.1	122
180 min Summer	24.243	0.0	25.7	182
240 min Summer	19.399	0.0	27.5	242
360 min Summer	14.081	0.0	30.0	358
480 min Summer	11.225	0.0	31.9	408
600 min Summer	9.408	0.0	33.5	470
720 min Summer	8.140	0.0	34.7	532
960 min Summer	6.474	0.0	36.8	664
1440 min Summer	4.680	0.0	39.7	938
2160 min Summer	3.378	0.0	42.7	1344
2880 min Summer	2.678	0.0	44.8	1732
4320 min Summer	1.927	0.0	47.6	2504
5760 min Summer	1.525	0.0	49.4	3224
7200 min Summer	1.271	0.0	50.6	3888

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Cascade Summary of Results for PP2.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	72.072	0.202	0.0	0.4	0.4	3.1	O K
10080 min Summer	72.049	0.179	0.0	0.3	0.3	2.3	O K
15 min Winter	72.118	0.248	0.0	0.4	0.4	10.4	O K
30 min Winter	72.142	0.272	0.0	0.4	0.4	14.1	O K
60 min Winter	72.165	0.295	0.0	0.4	0.4	17.7	O K
120 min Winter	72.186	0.316	0.0	0.5	0.5	20.8	O K
180 min Winter	72.195	0.325	0.0	0.5	0.5	22.2	O K
240 min Winter	72.199	0.329	0.0	0.5	0.5	22.7	O K
360 min Winter	72.200	0.330	0.0	0.5	0.5	22.9	O K
480 min Winter	72.198	0.328	0.0	0.5	0.5	22.5	O K
600 min Winter	72.194	0.324	0.0	0.5	0.5	22.0	O K
720 min Winter	72.191	0.321	0.0	0.5	0.5	21.5	O K
960 min Winter	72.183	0.313	0.0	0.5	0.5	20.3	O K
1440 min Winter	72.165	0.295	0.0	0.4	0.4	17.6	O K
2160 min Winter	72.141	0.271	0.0	0.4	0.4	13.9	O K
2880 min Winter	72.120	0.250	0.0	0.4	0.4	10.6	O K
4320 min Winter	72.088	0.218	0.0	0.4	0.4	5.7	O K
5760 min Winter	72.069	0.199	0.0	0.4	0.4	2.7	O K
7200 min Winter	72.020	0.150	0.0	0.3	0.3	1.6	O K
8640 min Winter	71.987	0.117	0.0	0.3	0.3	1.0	O K
10080 min Winter	71.964	0.094	0.0	0.2	0.2	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.095	0.0	51.4	4576
10080 min Summer	0.965	0.0	52.0	5240
15 min Winter	132.106	0.0	10.7	19
30 min Winter	86.802	0.0	14.6	33
60 min Winter	54.368	0.0	18.8	62
120 min Winter	32.929	0.0	23.1	120
180 min Winter	24.243	0.0	25.7	178
240 min Winter	19.399	0.0	27.5	234
360 min Winter	14.081	0.0	30.0	346
480 min Winter	11.225	0.0	31.9	448
600 min Winter	9.408	0.0	33.5	480
720 min Winter	8.140	0.0	34.7	556
960 min Winter	6.474	0.0	36.8	710
1440 min Winter	4.680	0.0	39.7	1010
2160 min Winter	3.378	0.0	42.7	1428
2880 min Winter	2.678	0.0	44.8	1820
4320 min Winter	1.927	0.0	47.6	2552
5760 min Winter	1.525	0.0	49.4	3120
7200 min Winter	1.271	0.0	50.7	3816
8640 min Winter	1.095	0.0	51.5	4496
10080 min Winter	0.965	0.0	52.1	5144

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Cascade Rainfall Details for PP2.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.040

Time (mins) From:	To:	Area (ha)
0	4	0.040

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Cascade Model Details for PP2.srcx

Storage is Online Cover Level (m) 72.520

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	7.5
Max Percolation (l/s)	8.3	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	71.870	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	7.5
Max Percolation (l/s)	8.3	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.020	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	14.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.0
Max Percolation (l/s)	42.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	72.070	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	14.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.0
Max Percolation (l/s)	42.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.220	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 71.870

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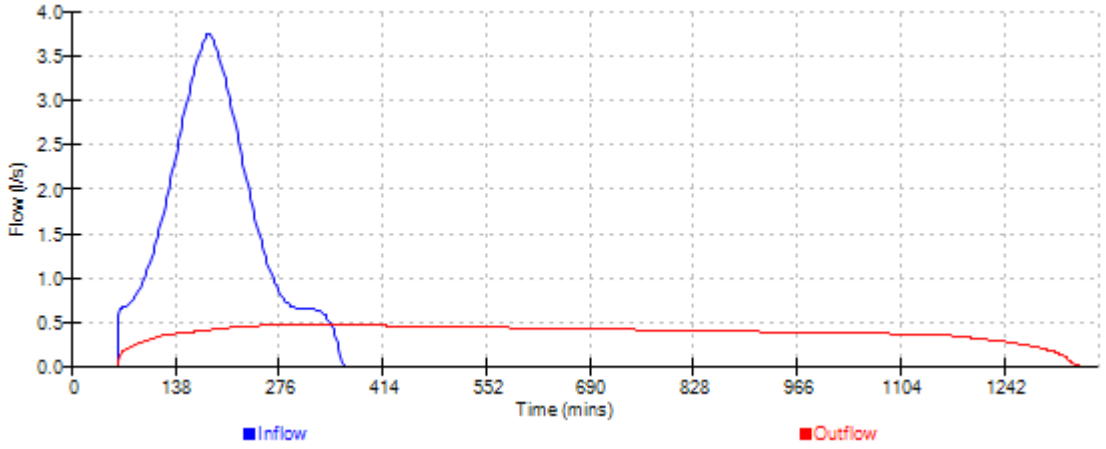
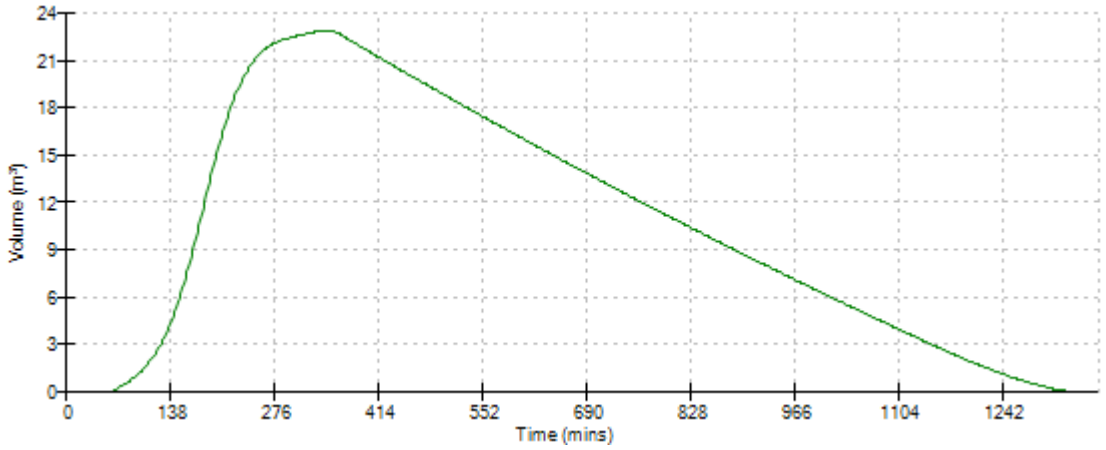
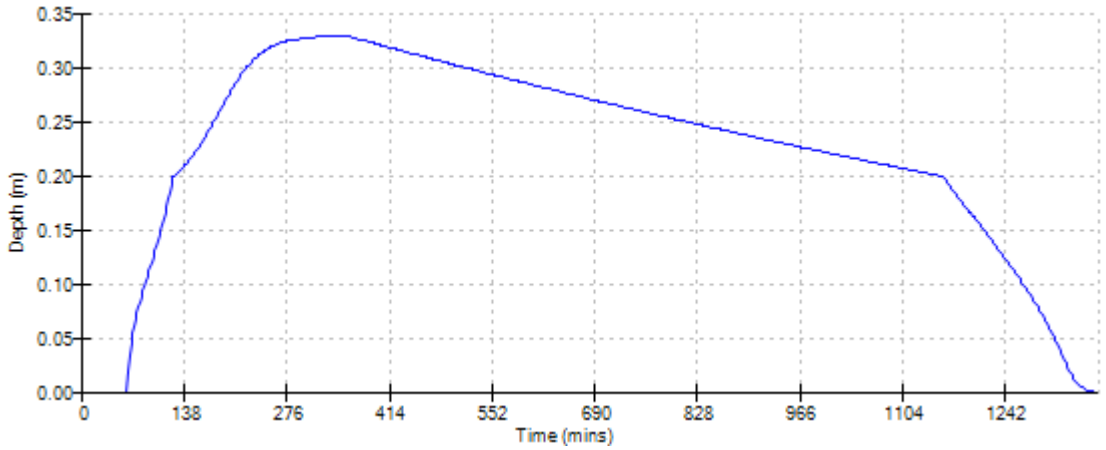
Cascade Event: 360 min Winter for PP2.srcx







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Cascade Summary of Results for PP3.srcx

Upstream Structures	Outflow To	Overflow To
(None)	(None)	(None)

Half Drain Time : 407 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	72.681	0.191	0.0	0.4	0.4	8.9	O K
30 min Summer	72.705	0.215	0.0	0.4	0.4	12.0	O K
60 min Summer	72.728	0.238	0.0	0.4	0.4	15.0	O K
120 min Summer	72.748	0.258	0.0	0.4	0.4	17.6	O K
180 min Summer	72.757	0.267	0.0	0.4	0.4	18.7	O K
240 min Summer	72.760	0.270	0.0	0.4	0.4	19.1	O K
360 min Summer	72.760	0.270	0.0	0.4	0.4	19.0	O K
480 min Summer	72.758	0.268	0.0	0.4	0.4	18.7	O K
600 min Summer	72.755	0.265	0.0	0.4	0.4	18.4	O K
720 min Summer	72.752	0.262	0.0	0.4	0.4	18.0	O K
960 min Summer	72.745	0.255	0.0	0.4	0.4	17.2	O K
1440 min Summer	72.732	0.242	0.0	0.4	0.4	15.5	O K
2160 min Summer	72.715	0.225	0.0	0.4	0.4	13.3	O K
2880 min Summer	72.700	0.210	0.0	0.4	0.4	11.3	O K
4320 min Summer	72.675	0.185	0.0	0.3	0.3	8.0	O K
5760 min Summer	72.656	0.166	0.0	0.3	0.3	5.5	O K
7200 min Summer	72.642	0.152	0.0	0.3	0.3	3.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	9.1	19
30 min Summer	86.802	0.0	12.5	33
60 min Summer	54.368	0.0	16.0	62
120 min Summer	32.929	0.0	19.7	122
180 min Summer	24.243	0.0	21.9	182
240 min Summer	19.399	0.0	23.4	240
360 min Summer	14.081	0.0	25.5	344
480 min Summer	11.225	0.0	27.2	398
600 min Summer	9.408	0.0	28.5	460
720 min Summer	8.140	0.0	29.6	522
960 min Summer	6.474	0.0	31.3	656
1440 min Summer	4.680	0.0	33.9	936
2160 min Summer	3.378	0.0	36.4	1340
2880 min Summer	2.678	0.0	38.2	1732
4320 min Summer	1.927	0.0	40.6	2504
5760 min Summer	1.525	0.0	42.1	3224
7200 min Summer	1.271	0.0	43.2	3896

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Cascade Summary of Results for PP3.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	72.632	0.142	0.0	0.3	0.3	2.3	O K
10080 min Summer	72.626	0.136	0.0	0.3	0.3	1.5	O K
15 min Winter	72.681	0.191	0.0	0.4	0.4	8.9	O K
30 min Winter	72.705	0.215	0.0	0.4	0.4	12.0	O K
60 min Winter	72.728	0.238	0.0	0.4	0.4	15.0	O K
120 min Winter	72.749	0.259	0.0	0.4	0.4	17.6	O K
180 min Winter	72.757	0.267	0.0	0.4	0.4	18.7	O K
240 min Winter	72.761	0.271	0.0	0.4	0.4	19.2	O K
360 min Winter	72.761	0.271	0.0	0.4	0.4	19.2	O K
480 min Winter	72.758	0.268	0.0	0.4	0.4	18.8	O K
600 min Winter	72.755	0.265	0.0	0.4	0.4	18.4	O K
720 min Winter	72.751	0.261	0.0	0.4	0.4	17.9	O K
960 min Winter	72.742	0.252	0.0	0.4	0.4	16.8	O K
1440 min Winter	72.724	0.234	0.0	0.4	0.4	14.5	O K
2160 min Winter	72.700	0.210	0.0	0.4	0.4	11.4	O K
2880 min Winter	72.680	0.190	0.0	0.4	0.4	8.7	O K
4320 min Winter	72.649	0.159	0.0	0.3	0.3	4.6	O K
5760 min Winter	72.630	0.140	0.0	0.3	0.3	1.9	O K
7200 min Winter	72.605	0.115	0.0	0.3	0.3	1.0	O K
8640 min Winter	72.579	0.089	0.0	0.2	0.2	0.6	O K
10080 min Winter	72.562	0.072	0.0	0.2	0.2	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.095	0.0	43.9	4576
10080 min Summer	0.965	0.0	44.5	5240
15 min Winter	132.106	0.0	9.1	18
30 min Winter	86.802	0.0	12.5	33
60 min Winter	54.368	0.0	16.0	62
120 min Winter	32.929	0.0	19.7	120
180 min Winter	24.243	0.0	21.9	178
240 min Winter	19.399	0.0	23.4	234
360 min Winter	14.081	0.0	25.5	344
480 min Winter	11.225	0.0	27.2	440
600 min Winter	9.408	0.0	28.5	472
720 min Winter	8.140	0.0	29.6	550
960 min Winter	6.474	0.0	31.3	702
1440 min Winter	4.680	0.0	33.9	998
2160 min Winter	3.378	0.0	36.4	1424
2880 min Winter	2.678	0.0	38.2	1816
4320 min Winter	1.927	0.0	40.6	2552
5760 min Winter	1.525	0.0	42.2	3176
7200 min Winter	1.271	0.0	43.3	3752
8640 min Winter	1.095	0.0	44.0	4416
10080 min Winter	0.965	0.0	44.6	5144

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Cascade Rainfall Details for PP3.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.034

Time (mins) From:	To:	Area (ha)
0	4	0.034

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Cascade Model Details for PP3.srcx

Storage is Online Cover Level (m) 73.140

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.4
Max Percolation (l/s)	6.0	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	72.490	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.5
Membrane Percolation (mm/hr)	1000	Length (m)	11.3
Max Percolation (l/s)	36.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	72.625	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.4
Max Percolation (l/s)	6.0	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.640	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.5
Membrane Percolation (mm/hr)	1000	Length (m)	11.3
Max Percolation (l/s)	36.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.775	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 72.490

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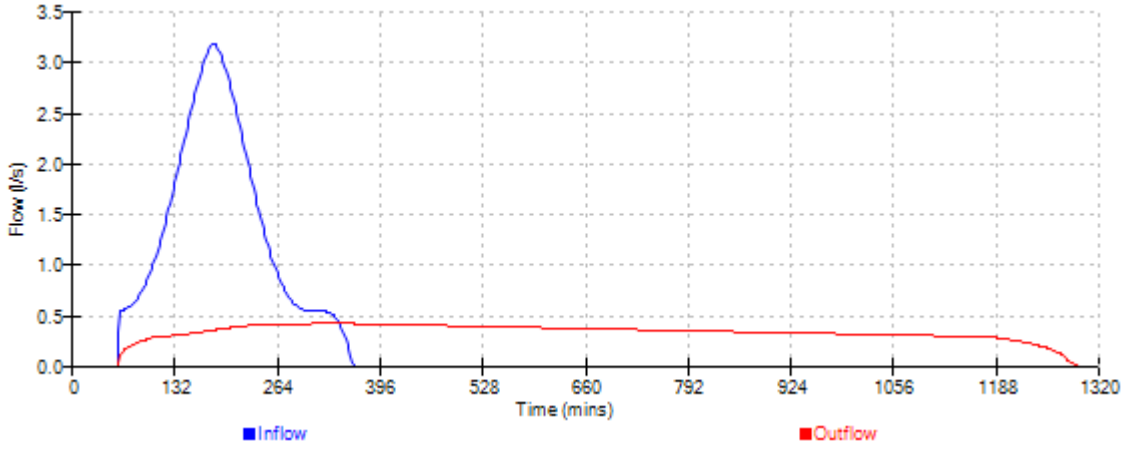
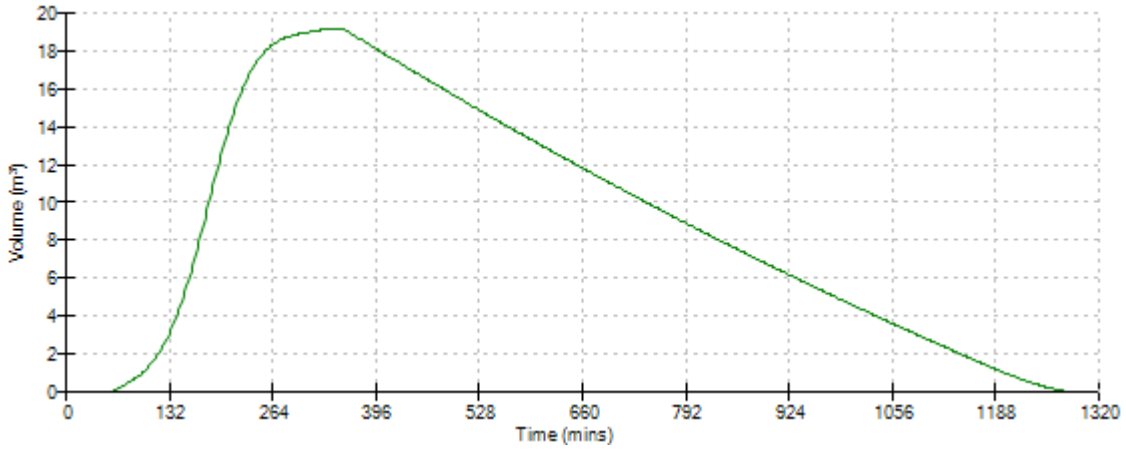
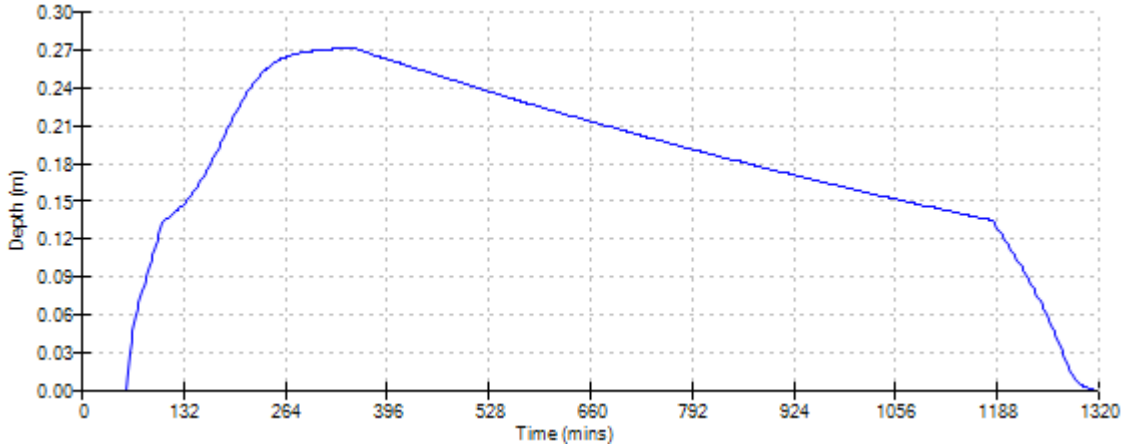
Cascade Event: 360 min Winter for PP3.srcx







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Cascade Summary of Results for PP4.srcx

Upstream Structures	Outflow To	Overflow To
(None)	(None)	(None)

Half Drain Time : 397 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	72.627	0.277	0.0	0.4	0.4	9.9	O K
30 min Summer	72.649	0.299	0.0	0.4	0.4	13.5	O K
60 min Summer	72.670	0.320	0.0	0.5	0.5	16.9	O K
120 min Summer	72.688	0.338	0.0	0.5	0.5	19.9	O K
180 min Summer	72.696	0.346	0.0	0.5	0.5	21.2	O K
240 min Summer	72.699	0.349	0.0	0.5	0.5	21.7	O K
360 min Summer	72.699	0.349	0.0	0.5	0.5	21.6	O K
480 min Summer	72.697	0.347	0.0	0.5	0.5	21.3	O K
600 min Summer	72.695	0.345	0.0	0.5	0.5	21.0	O K
720 min Summer	72.692	0.342	0.0	0.5	0.5	20.5	O K
960 min Summer	72.686	0.336	0.0	0.5	0.5	19.6	O K
1440 min Summer	72.674	0.324	0.0	0.5	0.5	17.6	O K
2160 min Summer	72.657	0.307	0.0	0.5	0.5	14.8	O K
2880 min Summer	72.642	0.292	0.0	0.4	0.4	12.4	O K
4320 min Summer	72.618	0.268	0.0	0.4	0.4	8.5	O K
5760 min Summer	72.602	0.252	0.0	0.4	0.4	5.7	O K
7200 min Summer	72.591	0.241	0.0	0.4	0.4	3.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	10.2	19
30 min Summer	86.802	0.0	14.1	33
60 min Summer	54.368	0.0	18.1	62
120 min Summer	32.929	0.0	22.3	122
180 min Summer	24.243	0.0	24.8	182
240 min Summer	19.399	0.0	26.6	240
360 min Summer	14.081	0.0	29.0	344
480 min Summer	11.225	0.0	30.9	398
600 min Summer	9.408	0.0	32.4	458
720 min Summer	8.140	0.0	33.6	520
960 min Summer	6.474	0.0	35.6	656
1440 min Summer	4.680	0.0	38.4	926
2160 min Summer	3.378	0.0	41.3	1336
2880 min Summer	2.678	0.0	43.3	1728
4320 min Summer	1.927	0.0	45.9	2464
5760 min Summer	1.525	0.0	47.5	3168
7200 min Summer	1.271	0.0	48.6	3816

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Cascade Summary of Results for PP4.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	72.553	0.203	0.0	0.4	0.4	2.8	O K
10080 min Summer	72.522	0.172	0.0	0.3	0.3	2.1	O K
15 min Winter	72.627	0.277	0.0	0.4	0.4	9.9	O K
30 min Winter	72.649	0.299	0.0	0.4	0.4	13.5	O K
60 min Winter	72.670	0.320	0.0	0.5	0.5	17.0	O K
120 min Winter	72.689	0.339	0.0	0.5	0.5	20.0	O K
180 min Winter	72.696	0.346	0.0	0.5	0.5	21.2	O K
240 min Winter	72.700	0.350	0.0	0.5	0.5	21.7	O K
360 min Winter	72.700	0.350	0.0	0.5	0.5	21.8	O K
480 min Winter	72.697	0.347	0.0	0.5	0.5	21.3	O K
600 min Winter	72.694	0.344	0.0	0.5	0.5	20.8	O K
720 min Winter	72.690	0.340	0.0	0.5	0.5	20.3	O K
960 min Winter	72.682	0.332	0.0	0.5	0.5	19.0	O K
1440 min Winter	72.665	0.315	0.0	0.5	0.5	16.2	O K
2160 min Winter	72.642	0.292	0.0	0.4	0.4	12.4	O K
2880 min Winter	72.622	0.272	0.0	0.4	0.4	9.1	O K
4320 min Winter	72.594	0.244	0.0	0.4	0.4	4.5	O K
5760 min Winter	72.540	0.190	0.0	0.4	0.4	2.5	O K
7200 min Winter	72.493	0.143	0.0	0.3	0.3	1.5	O K
8640 min Winter	72.462	0.112	0.0	0.3	0.3	0.9	O K
10080 min Winter	72.439	0.089	0.0	0.2	0.2	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.095	0.0	49.3	4496
10080 min Summer	0.965	0.0	49.7	5240
15 min Winter	132.106	0.0	10.2	18
30 min Winter	86.802	0.0	14.1	33
60 min Winter	54.368	0.0	18.1	62
120 min Winter	32.929	0.0	22.3	120
180 min Winter	24.243	0.0	24.8	178
240 min Winter	19.399	0.0	26.6	234
360 min Winter	14.081	0.0	29.0	344
480 min Winter	11.225	0.0	30.9	440
600 min Winter	9.408	0.0	32.4	472
720 min Winter	8.140	0.0	33.6	548
960 min Winter	6.474	0.0	35.6	702
1440 min Winter	4.680	0.0	38.4	996
2160 min Winter	3.378	0.0	41.3	1408
2880 min Winter	2.678	0.0	43.3	1788
4320 min Winter	1.927	0.0	45.9	2464
5760 min Winter	1.525	0.0	47.6	3120
7200 min Winter	1.271	0.0	48.6	3816
8640 min Winter	1.095	0.0	49.4	4488
10080 min Winter	0.965	0.0	49.9	5144

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Cascade Rainfall Details for PP4.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.039

Time (mins) From:	To:	Area (ha)
0	4	0.039

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Cascade Model Details for PP4.srcx

Storage is Online Cover Level (m) 73.000

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	9.6
Max Percolation (l/s)	10.7	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	72.350	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	9.6
Max Percolation (l/s)	10.7	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.500	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.2
Membrane Percolation (mm/hr)	1000	Length (m)	17.3
Max Percolation (l/s)	44.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	72.590	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.3
Membrane Percolation (mm/hr)	1000	Length (m)	17.3
Max Percolation (l/s)	44.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.740	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 72.350

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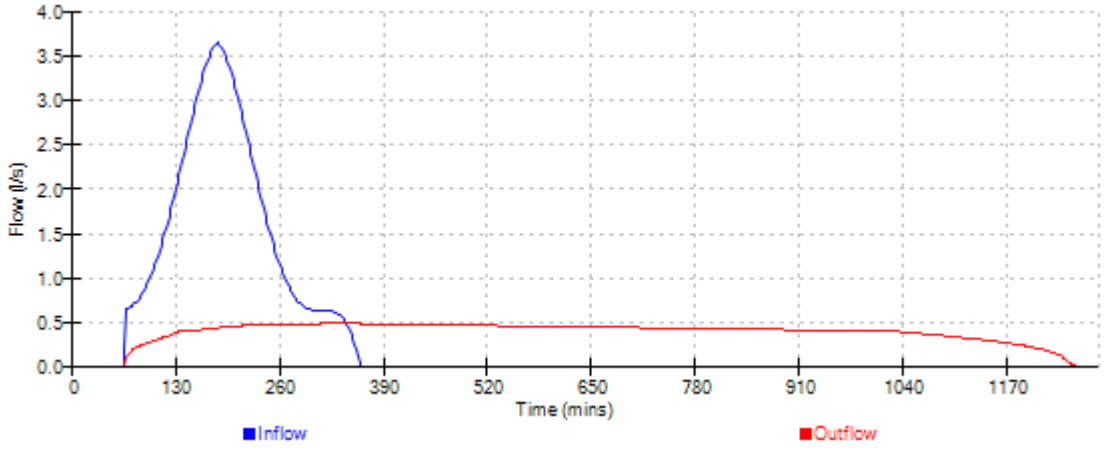
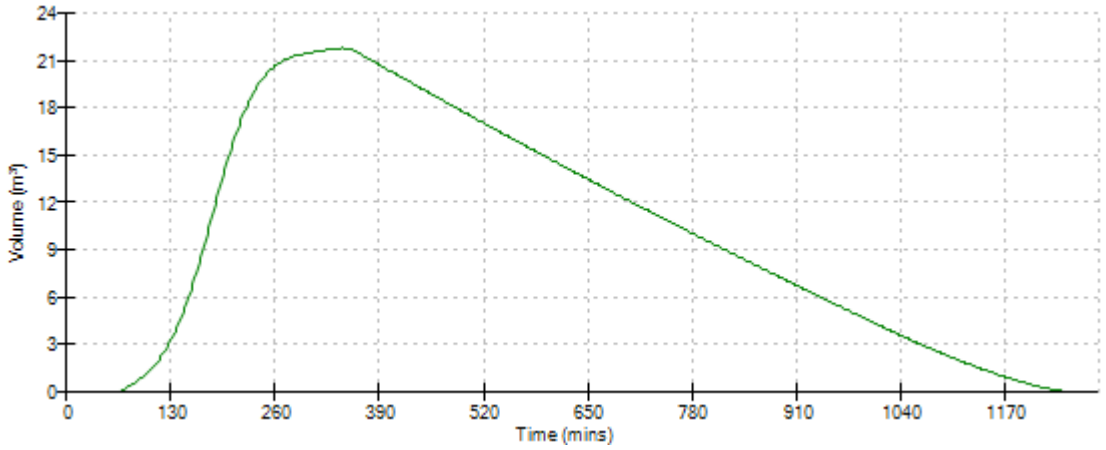
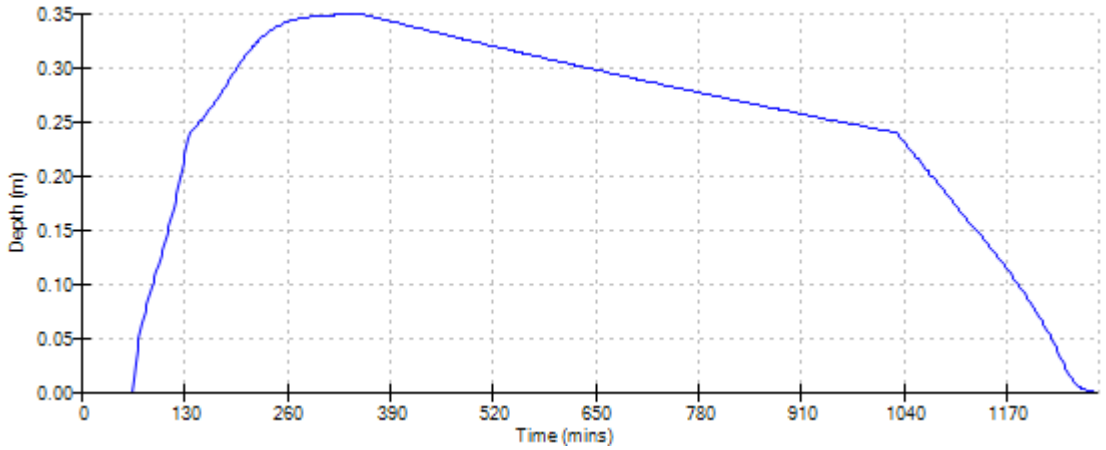
Cascade Event: 360 min Winter for PP4.srcx







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Cascade Summary of Results for PP5.srcx

Upstream Structures	Outflow To	Overflow To
(None)	(None)	(None)

Half Drain Time : 330 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	73.935	0.385	0.0	0.5	0.5	9.7	Flood Risk
30 min Summer	73.959	0.409	0.0	0.5	0.5	13.1	Flood Risk
60 min Summer	73.982	0.432	0.0	0.5	0.5	16.4	Flood Risk
120 min Summer	74.001	0.451	0.0	0.6	0.6	19.1	Flood Risk
180 min Summer	74.009	0.459	0.0	0.6	0.6	20.1	Flood Risk
240 min Summer	74.011	0.461	0.0	0.6	0.6	20.4	Flood Risk
360 min Summer	74.009	0.459	0.0	0.6	0.6	20.2	Flood Risk
480 min Summer	74.007	0.457	0.0	0.6	0.6	19.9	Flood Risk
600 min Summer	74.004	0.454	0.0	0.6	0.6	19.5	Flood Risk
720 min Summer	74.000	0.450	0.0	0.6	0.6	19.0	Flood Risk
960 min Summer	73.992	0.442	0.0	0.5	0.5	17.9	Flood Risk
1440 min Summer	73.977	0.427	0.0	0.5	0.5	15.7	Flood Risk
2160 min Summer	73.957	0.407	0.0	0.5	0.5	12.9	Flood Risk
2880 min Summer	73.940	0.390	0.0	0.5	0.5	10.5	Flood Risk
4320 min Summer	73.905	0.355	0.0	0.5	0.5	7.0	Flood Risk
5760 min Summer	73.836	0.286	0.0	0.4	0.4	5.0	O K
7200 min Summer	73.785	0.235	0.0	0.4	0.4	3.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	10.0	19
30 min Summer	86.802	0.0	13.8	33
60 min Summer	54.368	0.0	17.7	62
120 min Summer	32.929	0.0	21.8	122
180 min Summer	24.243	0.0	24.3	182
240 min Summer	19.399	0.0	26.0	240
360 min Summer	14.081	0.0	28.4	308
480 min Summer	11.225	0.0	30.2	370
600 min Summer	9.408	0.0	31.6	432
720 min Summer	8.140	0.0	32.8	500
960 min Summer	6.474	0.0	34.8	636
1440 min Summer	4.680	0.0	37.6	908
2160 min Summer	3.378	0.0	40.4	1300
2880 min Summer	2.678	0.0	42.3	1672
4320 min Summer	1.927	0.0	44.9	2380
5760 min Summer	1.525	0.0	46.5	3112
7200 min Summer	1.271	0.0	47.6	3816

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Cascade Summary of Results for PP5.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	73.746	0.196	0.0	0.4	0.4	2.7	O K
10080 min Summer	73.715	0.165	0.0	0.3	0.3	2.0	O K
15 min Winter	73.935	0.385	0.0	0.5	0.5	9.7	Flood Risk
30 min Winter	73.959	0.409	0.0	0.5	0.5	13.1	Flood Risk
60 min Winter	73.982	0.432	0.0	0.5	0.5	16.4	Flood Risk
120 min Winter	74.001	0.451	0.0	0.6	0.6	19.1	Flood Risk
180 min Winter	74.009	0.459	0.0	0.6	0.6	20.2	Flood Risk
240 min Winter	74.011	0.461	0.0	0.6	0.6	20.5	Flood Risk
360 min Winter	74.009	0.459	0.0	0.6	0.6	20.2	Flood Risk
480 min Winter	74.006	0.456	0.0	0.6	0.6	19.7	Flood Risk
600 min Winter	74.001	0.451	0.0	0.6	0.6	19.2	Flood Risk
720 min Winter	73.997	0.447	0.0	0.6	0.6	18.5	Flood Risk
960 min Winter	73.986	0.436	0.0	0.5	0.5	17.0	Flood Risk
1440 min Winter	73.965	0.415	0.0	0.5	0.5	14.0	Flood Risk
2160 min Winter	73.938	0.388	0.0	0.5	0.5	10.1	Flood Risk
2880 min Winter	73.912	0.362	0.0	0.5	0.5	7.3	Flood Risk
4320 min Winter	73.802	0.252	0.0	0.4	0.4	4.1	O K
5760 min Winter	73.732	0.182	0.0	0.3	0.3	2.3	O K
7200 min Winter	73.687	0.137	0.0	0.3	0.3	1.4	O K
8640 min Winter	73.657	0.107	0.0	0.3	0.3	0.8	O K
10080 min Winter	73.636	0.086	0.0	0.2	0.2	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.095	0.0	48.3	4496
10080 min Summer	0.965	0.0	48.8	5240
15 min Winter	132.106	0.0	10.0	18
30 min Winter	86.802	0.0	13.8	33
60 min Winter	54.368	0.0	17.7	62
120 min Winter	32.929	0.0	21.8	120
180 min Winter	24.243	0.0	24.3	176
240 min Winter	19.399	0.0	26.0	232
360 min Winter	14.081	0.0	28.4	336
480 min Winter	11.225	0.0	30.2	380
600 min Winter	9.408	0.0	31.6	456
720 min Winter	8.140	0.0	32.8	532
960 min Winter	6.474	0.0	34.8	682
1440 min Winter	4.680	0.0	37.6	966
2160 min Winter	3.378	0.0	40.4	1360
2880 min Winter	2.678	0.0	42.3	1704
4320 min Winter	1.927	0.0	44.9	2420
5760 min Winter	1.525	0.0	46.6	3112
7200 min Winter	1.271	0.0	47.7	3816
8640 min Winter	1.095	0.0	48.4	4488
10080 min Winter	0.965	0.0	48.9	5144

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Cascade Rainfall Details for PP5.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.038

Time (mins) From:	To:	Area (ha)
0	4	0.038

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Cascade Model Details for PP5.srcx

Storage is Online Cover Level (m) 74.200

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	14.7
Max Percolation (l/s)	16.3	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	73.550	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	14.7
Max Percolation (l/s)	16.3	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	73.700	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.9
Membrane Percolation (mm/hr)	1000	Length (m)	11.7
Max Percolation (l/s)	35.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	73.920	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.9
Membrane Percolation (mm/hr)	1000	Length (m)	11.7
Max Percolation (l/s)	35.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	74.070	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 73.550

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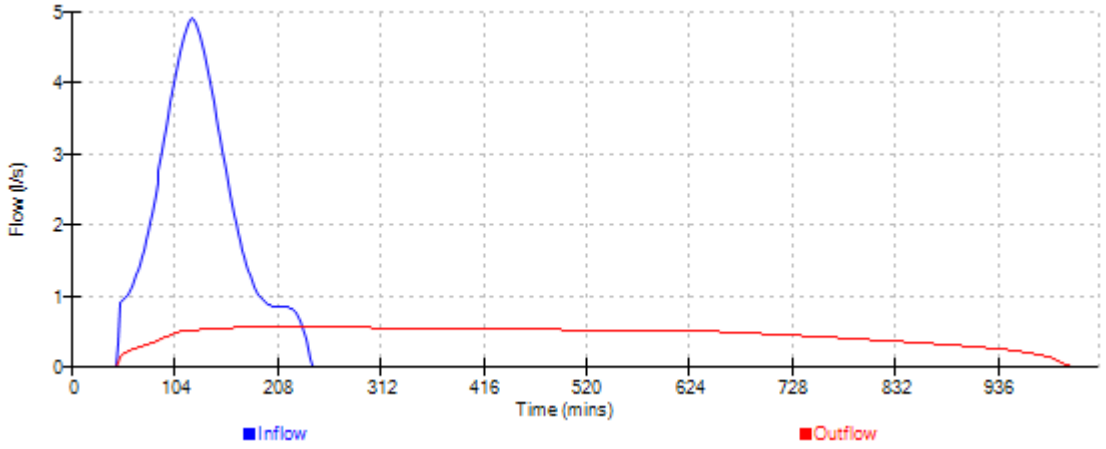
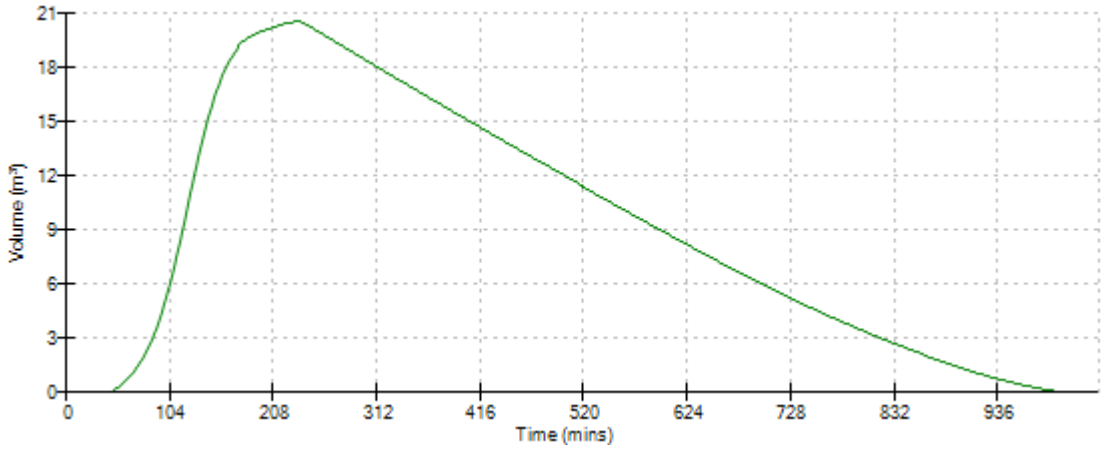
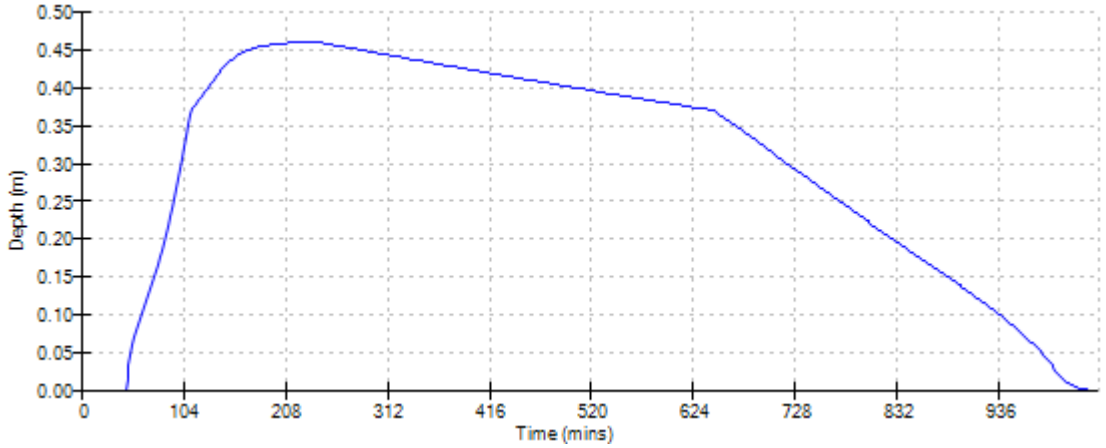
Cascade Event: 240 min Winter for PP5.srcx







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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 327 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	73.773	0.323	0.0	0.5	0.5	9.1	O K
30 min Summer	73.799	0.349	0.0	0.5	0.5	12.3	O K
60 min Summer	73.825	0.375	0.0	0.5	0.5	15.3	Flood Risk
120 min Summer	73.846	0.396	0.0	0.5	0.5	17.7	Flood Risk
180 min Summer	73.854	0.404	0.0	0.5	0.5	18.6	Flood Risk
240 min Summer	73.856	0.406	0.0	0.5	0.5	18.8	Flood Risk
360 min Summer	73.854	0.404	0.0	0.5	0.5	18.6	Flood Risk
480 min Summer	73.851	0.401	0.0	0.5	0.5	18.2	Flood Risk
600 min Summer	73.847	0.397	0.0	0.5	0.5	17.8	Flood Risk
720 min Summer	73.843	0.393	0.0	0.5	0.5	17.3	Flood Risk
960 min Summer	73.834	0.384	0.0	0.5	0.5	16.3	Flood Risk
1440 min Summer	73.817	0.367	0.0	0.5	0.5	14.3	Flood Risk
2160 min Summer	73.794	0.344	0.0	0.5	0.5	11.7	O K
2880 min Summer	73.776	0.326	0.0	0.5	0.5	9.5	O K
4320 min Summer	73.748	0.298	0.0	0.4	0.4	6.1	O K
5760 min Summer	73.707	0.257	0.0	0.4	0.4	4.2	O K
7200 min Summer	73.659	0.209	0.0	0.4	0.4	3.0	O K
8640 min Summer	73.624	0.174	0.0	0.3	0.3	2.2	O K
10080 min Summer	73.597	0.147	0.0	0.3	0.3	1.6	O K
15 min Winter	73.773	0.323	0.0	0.5	0.5	9.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	9.4	19
30 min Summer	86.802	0.0	12.9	33
60 min Summer	54.368	0.0	16.5	62
120 min Summer	32.929	0.0	20.3	122
180 min Summer	24.243	0.0	22.5	182
240 min Summer	19.399	0.0	24.1	240
360 min Summer	14.081	0.0	26.3	306
480 min Summer	11.225	0.0	28.0	368
600 min Summer	9.408	0.0	29.4	430
720 min Summer	8.140	0.0	30.5	498
960 min Summer	6.474	0.0	32.3	636
1440 min Summer	4.680	0.0	34.9	908
2160 min Summer	3.378	0.0	37.5	1300
2880 min Summer	2.678	0.0	39.4	1676
4320 min Summer	1.927	0.0	41.9	2380
5760 min Summer	1.525	0.0	43.5	3064
7200 min Summer	1.271	0.0	44.6	3816
8640 min Summer	1.095	0.0	45.4	4496
10080 min Summer	0.965	0.0	46.0	5152
15 min Winter	132.106	0.0	9.4	18

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	73.799	0.349	0.0	0.5	0.5	12.3	O K
60 min Winter	73.825	0.375	0.0	0.5	0.5	15.3	Flood Risk
120 min Winter	73.847	0.397	0.0	0.5	0.5	17.8	Flood Risk
180 min Winter	73.855	0.405	0.0	0.5	0.5	18.7	Flood Risk
240 min Winter	73.857	0.407	0.0	0.5	0.5	18.9	Flood Risk
360 min Winter	73.854	0.404	0.0	0.5	0.5	18.6	Flood Risk
480 min Winter	73.850	0.400	0.0	0.5	0.5	18.1	Flood Risk
600 min Winter	73.845	0.395	0.0	0.5	0.5	17.6	Flood Risk
720 min Winter	73.839	0.389	0.0	0.5	0.5	16.9	Flood Risk
960 min Winter	73.827	0.377	0.0	0.5	0.5	15.5	Flood Risk
1440 min Winter	73.803	0.353	0.0	0.5	0.5	12.7	Flood Risk
2160 min Winter	73.773	0.323	0.0	0.5	0.5	9.1	O K
2880 min Winter	73.750	0.300	0.0	0.4	0.4	6.3	O K
4320 min Winter	73.674	0.224	0.0	0.4	0.4	3.4	O K
5760 min Winter	73.611	0.161	0.0	0.3	0.3	1.9	O K
7200 min Winter	73.571	0.121	0.0	0.3	0.3	1.1	O K
8640 min Winter	73.544	0.094	0.0	0.2	0.2	0.6	O K
10080 min Winter	73.526	0.076	0.0	0.2	0.2	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	86.802	0.0	12.9	33
60 min Winter	54.368	0.0	16.5	62
120 min Winter	32.929	0.0	20.3	120
180 min Winter	24.243	0.0	22.5	176
240 min Winter	19.399	0.0	24.1	232
360 min Winter	14.081	0.0	26.3	336
480 min Winter	11.225	0.0	28.0	378
600 min Winter	9.408	0.0	29.4	454
720 min Winter	8.140	0.0	30.5	530
960 min Winter	6.474	0.0	32.3	682
1440 min Winter	4.680	0.0	34.9	966
2160 min Winter	3.378	0.0	37.5	1364
2880 min Winter	2.678	0.0	39.4	1728
4320 min Winter	1.927	0.0	41.9	2420
5760 min Winter	1.525	0.0	43.5	3112
7200 min Winter	1.271	0.0	44.7	3752
8640 min Winter	1.095	0.0	45.5	4416
10080 min Winter	0.965	0.0	46.0	5144

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.035

Time (mins) From:	To:	Area (ha)
0	4	0.035

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Model Details

Storage is Online Cover Level (m) 74.100

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.5
Max Percolation (l/s)	12.8	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	73.450	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.5
Max Percolation (l/s)	12.8	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	73.600	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.1
Membrane Percolation (mm/hr)	1000	Length (m)	11.7
Max Percolation (l/s)	29.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	73.740	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.1
Membrane Percolation (mm/hr)	1000	Length (m)	11.7
Max Percolation (l/s)	29.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	73.890	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 73.450

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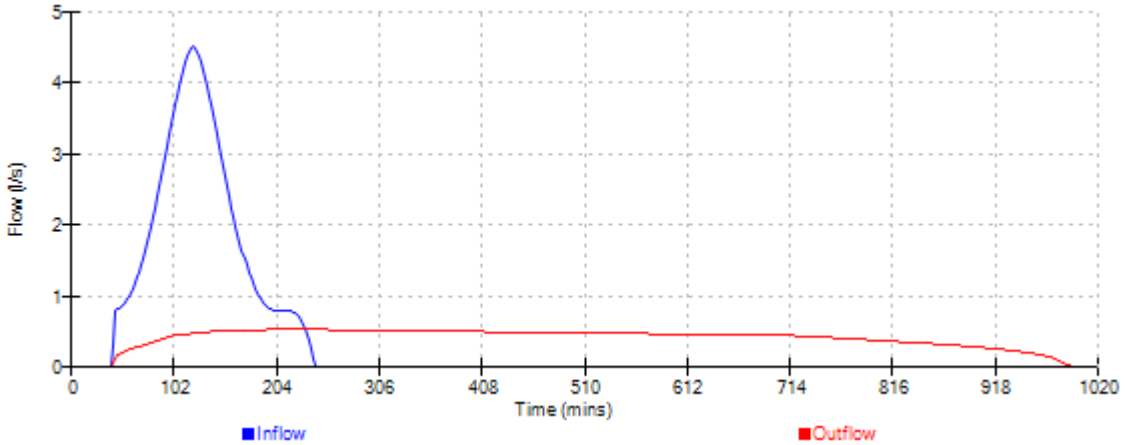
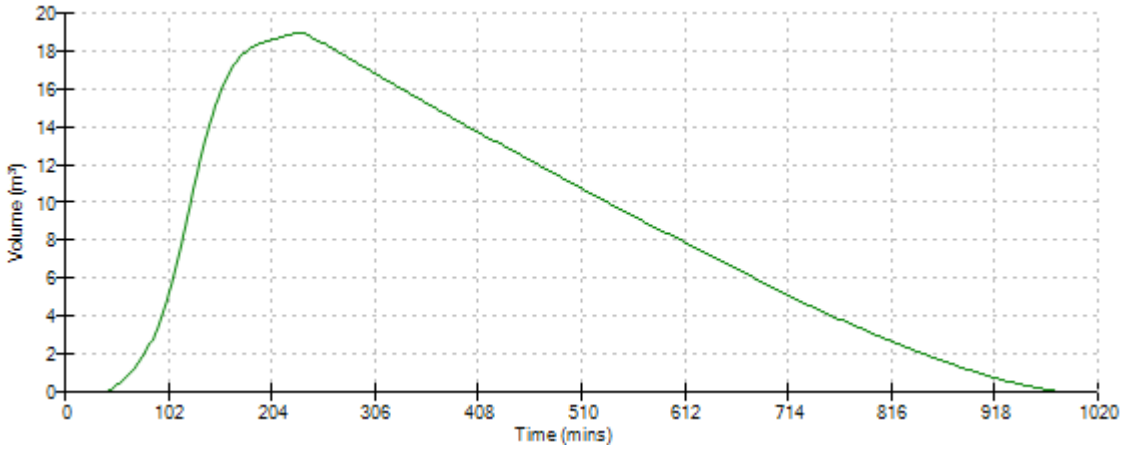
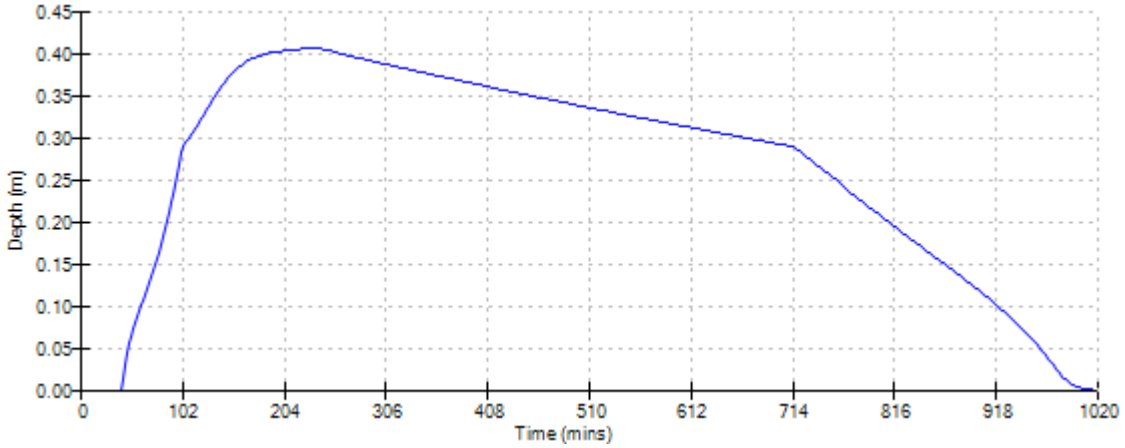
Event: 240 min Winter







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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 395 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	75.743	0.193	0.0	0.4	0.4	9.5	O K
30 min Summer	75.775	0.225	0.0	0.4	0.4	12.7	O K
60 min Summer	75.807	0.257	0.0	0.4	0.4	15.8	O K
120 min Summer	75.875	0.325	0.0	0.5	0.5	18.4	O K
180 min Summer	75.903	0.353	0.0	0.5	0.5	19.4	Flood Risk
240 min Summer	75.912	0.362	0.0	0.5	0.5	19.7	Flood Risk
360 min Summer	75.908	0.358	0.0	0.5	0.5	19.6	Flood Risk
480 min Summer	75.902	0.352	0.0	0.5	0.5	19.4	Flood Risk
600 min Summer	75.893	0.343	0.0	0.5	0.5	19.1	O K
720 min Summer	75.883	0.333	0.0	0.5	0.5	18.7	O K
960 min Summer	75.861	0.311	0.0	0.5	0.5	17.9	O K
1440 min Summer	75.817	0.267	0.0	0.4	0.4	16.4	O K
2160 min Summer	75.790	0.240	0.0	0.4	0.4	14.2	O K
2880 min Summer	75.770	0.220	0.0	0.4	0.4	12.3	O K
4320 min Summer	75.738	0.188	0.0	0.4	0.4	9.1	O K
5760 min Summer	75.714	0.164	0.0	0.3	0.3	6.6	O K
7200 min Summer	75.696	0.146	0.0	0.3	0.3	4.7	O K
8640 min Summer	75.683	0.133	0.0	0.3	0.3	3.2	O K
10080 min Summer	75.672	0.122	0.0	0.3	0.3	2.2	O K
15 min Winter	75.743	0.193	0.0	0.4	0.4	9.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	9.8	19
30 min Summer	86.802	0.0	13.2	33
60 min Summer	54.368	0.0	16.9	62
120 min Summer	32.929	0.0	20.7	122
180 min Summer	24.243	0.0	22.9	182
240 min Summer	19.399	0.0	24.5	240
360 min Summer	14.081	0.0	26.7	316
480 min Summer	11.225	0.0	28.4	378
600 min Summer	9.408	0.0	29.8	442
720 min Summer	8.140	0.0	31.0	508
960 min Summer	6.474	0.0	32.8	652
1440 min Summer	4.680	0.0	35.5	926
2160 min Summer	3.378	0.0	38.2	1340
2880 min Summer	2.678	0.0	40.2	1732
4320 min Summer	1.927	0.0	42.9	2504
5760 min Summer	1.525	0.0	44.7	3232
7200 min Summer	1.271	0.0	46.0	3960
8640 min Summer	1.095	0.0	47.0	4664
10080 min Summer	0.965	0.0	47.8	5344
15 min Winter	132.106	0.0	9.8	19

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	75.775	0.225	0.0	0.4	0.4	12.7	O K
60 min Winter	75.807	0.257	0.0	0.4	0.4	15.8	O K
120 min Winter	75.876	0.326	0.0	0.5	0.5	18.5	O K
180 min Winter	75.905	0.355	0.0	0.5	0.5	19.5	Flood Risk
240 min Winter	75.916	0.366	0.0	0.5	0.5	19.9	Flood Risk
360 min Winter	75.914	0.364	0.0	0.5	0.5	19.8	Flood Risk
480 min Winter	75.903	0.353	0.0	0.5	0.5	19.4	Flood Risk
600 min Winter	75.893	0.343	0.0	0.5	0.5	19.1	O K
720 min Winter	75.880	0.330	0.0	0.5	0.5	18.6	O K
960 min Winter	75.852	0.302	0.0	0.5	0.5	17.6	O K
1440 min Winter	75.803	0.253	0.0	0.4	0.4	15.4	O K
2160 min Winter	75.772	0.222	0.0	0.4	0.4	12.4	O K
2880 min Winter	75.746	0.196	0.0	0.4	0.4	9.8	O K
4320 min Winter	75.707	0.157	0.0	0.3	0.3	5.9	O K
5760 min Winter	75.681	0.131	0.0	0.3	0.3	3.1	O K
7200 min Winter	75.664	0.114	0.0	0.3	0.3	1.3	O K
8640 min Winter	75.646	0.096	0.0	0.2	0.2	0.7	O K
10080 min Winter	75.627	0.077	0.0	0.2	0.2	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	86.802	0.0	13.2	33
60 min Winter	54.368	0.0	16.9	62
120 min Winter	32.929	0.0	20.7	120
180 min Winter	24.243	0.0	22.9	176
240 min Winter	19.399	0.0	24.5	232
360 min Winter	14.081	0.0	26.7	340
480 min Winter	11.225	0.0	28.4	386
600 min Winter	9.408	0.0	29.8	462
720 min Winter	8.140	0.0	31.0	540
960 min Winter	6.474	0.0	32.8	694
1440 min Winter	4.680	0.0	35.5	996
2160 min Winter	3.378	0.0	38.2	1428
2880 min Winter	2.678	0.0	40.2	1820
4320 min Winter	1.927	0.0	42.9	2592
5760 min Winter	1.525	0.0	44.7	3288
7200 min Winter	1.271	0.0	46.0	3888
8640 min Winter	1.095	0.0	47.1	4416
10080 min Winter	0.965	0.0	47.8	5144

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.035

Time (mins) From:	To:	Area (ha)
0	4	0.035

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Model Details

Storage is Online Cover Level (m) 76.200

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	4.5
Max Percolation (l/s)	5.0	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	75.550	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.2
Membrane Percolation (mm/hr)	1000	Length (m)	10.8
Max Percolation (l/s)	27.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.90	Evaporation (mm/day)	3
Invert Level (m)	75.660	Cap Volume Depth (m)	0.150

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	4.5
Max Percolation (l/s)	5.0	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	75.700	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.2
Membrane Percolation (mm/hr)	1000	Length (m)	10.8
Max Percolation (l/s)	27.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	75.810	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 75.550

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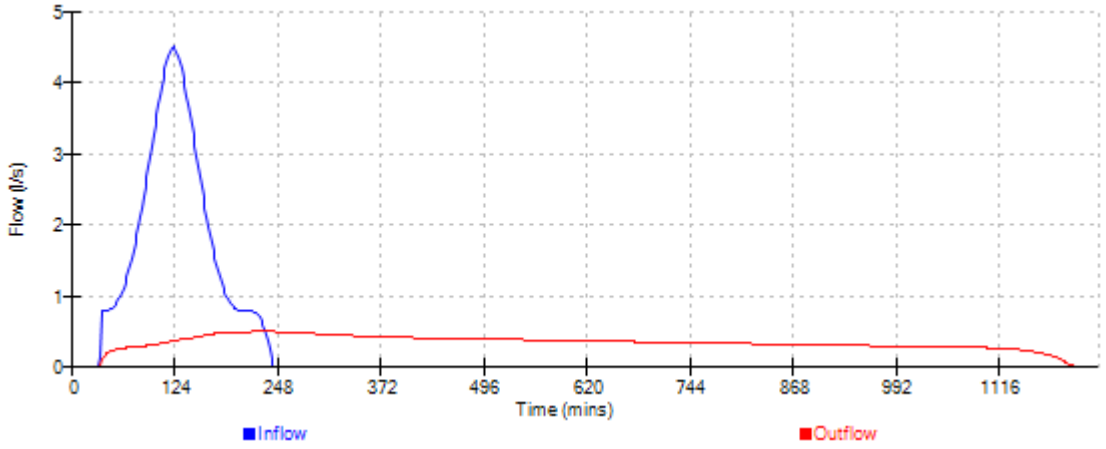
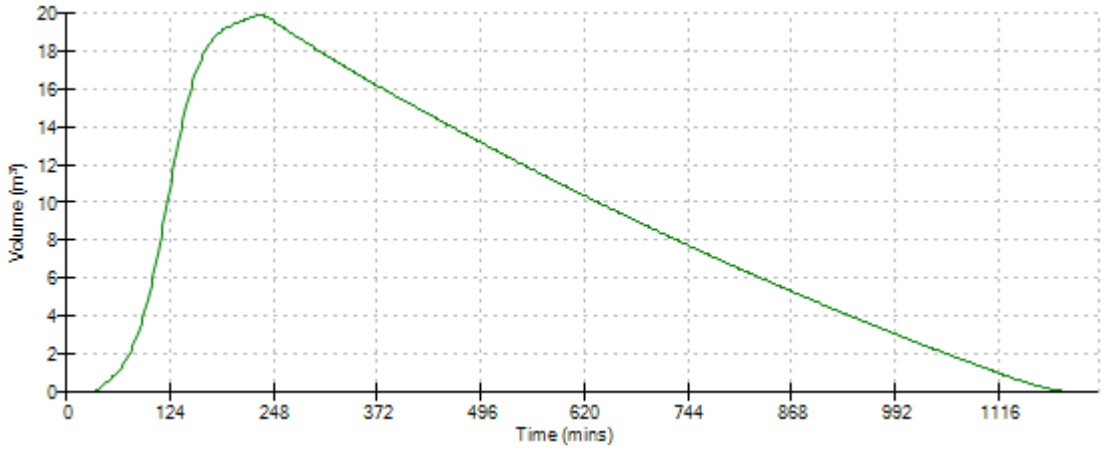
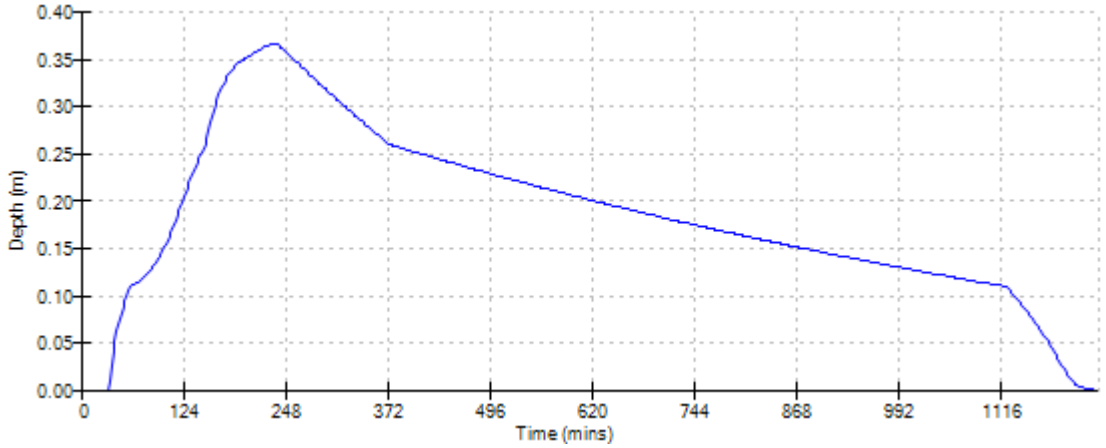
Event: 240 min Winter







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Cascade Summary of Results for Road1.srcx

Upstream Structures	Outflow To	Overflow To
Road2.srcx	(None)	(None)
Road3.srcx		
Road4.srcx		
Road5.srcx		
Road6.srcx		
Road7.srcx		
Road8.srcx		
Road9.srcx		
Road10.srcx		
Road11.srcx		
Road12.srcx		
Road13.srcx		
Road14.srcx		

Half Drain Time : 196 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	71.937	0.287	0.0	0.7	0.7	6.6	O K
30 min Summer	71.986	0.336	0.0	0.7	0.7	9.0	O K
60 min Summer	72.031	0.381	0.0	0.8	0.8	11.6	Flood Risk
120 min Summer	72.072	0.422	0.0	0.8	0.8	14.1	Flood Risk
180 min Summer	72.093	0.443	0.0	0.9	0.9	15.6	Flood Risk
240 min Summer	72.106	0.456	0.0	0.9	0.9	16.6	Flood Risk
360 min Summer	72.123	0.473	0.0	0.9	0.9	17.7	Flood Risk
480 min Summer	72.133	0.483	0.0	0.9	0.9	18.5	Flood Risk
600 min Summer	72.139	0.489	0.0	0.9	0.9	18.9	Flood Risk
720 min Summer	72.143	0.493	0.0	0.9	0.9	19.2	Flood Risk
960 min Summer	72.144	0.494	0.0	0.9	0.9	19.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	33.9	19
30 min Summer	86.802	0.0	46.5	34
60 min Summer	54.368	0.0	59.7	64
120 min Summer	32.929	0.0	73.6	124
180 min Summer	24.243	0.0	81.8	184
240 min Summer	19.399	0.0	87.5	244
360 min Summer	14.081	0.0	95.6	362
480 min Summer	11.225	0.0	101.7	482
600 min Summer	9.408	0.0	106.6	602
720 min Summer	8.140	0.0	110.7	722
960 min Summer	6.474	0.0	117.3	960

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Cascade Summary of Results for Road1.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
1440 min Summer	72.138	0.488	0.0	0.9	0.9	18.8	Flood Risk
2160 min Summer	72.126	0.476	0.0	0.9	0.9	18.0	Flood Risk
2880 min Summer	72.112	0.462	0.0	0.9	0.9	17.0	Flood Risk
4320 min Summer	72.086	0.436	0.0	0.8	0.8	15.1	Flood Risk
5760 min Summer	72.061	0.411	0.0	0.8	0.8	13.4	Flood Risk
7200 min Summer	72.037	0.387	0.0	0.8	0.8	11.9	Flood Risk
8640 min Summer	72.015	0.365	0.0	0.8	0.8	10.6	Flood Risk
10080 min Summer	71.993	0.343	0.0	0.8	0.8	9.4	O K
15 min Winter	71.937	0.287	0.0	0.7	0.7	6.6	O K
30 min Winter	71.986	0.336	0.0	0.7	0.7	9.0	O K
60 min Winter	72.031	0.381	0.0	0.8	0.8	11.5	Flood Risk
120 min Winter	72.072	0.422	0.0	0.8	0.8	14.1	Flood Risk
180 min Winter	72.093	0.443	0.0	0.9	0.9	15.6	Flood Risk
240 min Winter	72.106	0.456	0.0	0.9	0.9	16.6	Flood Risk
360 min Winter	72.123	0.473	0.0	0.9	0.9	17.8	Flood Risk
480 min Winter	72.133	0.483	0.0	0.9	0.9	18.5	Flood Risk
600 min Winter	72.140	0.490	0.0	0.9	0.9	19.0	Flood Risk
720 min Winter	72.143	0.493	0.0	0.9	0.9	19.2	Flood Risk
960 min Winter	72.145	0.495	0.0	0.9	0.9	19.3	Flood Risk
1440 min Winter	72.137	0.487	0.0	0.9	0.9	18.8	Flood Risk
2160 min Winter	72.123	0.473	0.0	0.9	0.9	17.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
1440 min Summer	4.680	0.0	121.7	1212
2160 min Summer	3.378	0.0	136.1	1576
2880 min Summer	2.678	0.0	142.7	1960
4320 min Summer	1.927	0.0	151.4	2768
5760 min Summer	1.525	0.0	157.0	3568
7200 min Summer	1.271	0.0	160.7	4328
8640 min Summer	1.095	0.0	163.2	5104
10080 min Summer	0.965	0.0	164.9	5848
15 min Winter	132.106	0.0	33.9	19
30 min Winter	86.802	0.0	46.5	34
60 min Winter	54.368	0.0	59.7	64
120 min Winter	32.929	0.0	73.6	122
180 min Winter	24.243	0.0	81.8	182
240 min Winter	19.399	0.0	87.5	240
360 min Winter	14.081	0.0	95.6	358
480 min Winter	11.225	0.0	101.7	474
600 min Winter	9.408	0.0	106.6	590
720 min Winter	8.140	0.0	110.7	704
960 min Winter	6.474	0.0	117.3	924
1440 min Winter	4.680	0.0	122.0	1310
2160 min Winter	3.378	0.0	136.1	1644

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Cascade Summary of Results for Road1.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
2880 min Winter	72.105	0.455	0.0	0.9	0.9	16.4	Flood Risk
4320 min Winter	72.068	0.418	0.0	0.8	0.8	13.9	Flood Risk
5760 min Winter	72.032	0.382	0.0	0.8	0.8	11.6	Flood Risk
7200 min Winter	71.997	0.347	0.0	0.8	0.8	9.6	O K
8640 min Winter	71.962	0.312	0.0	0.7	0.7	7.8	O K
10080 min Winter	71.928	0.278	0.0	0.7	0.7	6.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
2880 min Winter	2.678	0.0	142.7	2080
4320 min Winter	1.927	0.0	151.5	2944
5760 min Winter	1.525	0.0	157.1	3792
7200 min Winter	1.271	0.0	160.9	4544
8640 min Winter	1.095	0.0	163.5	5280
10080 min Winter	0.965	0.0	165.3	5952

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Cascade Rainfall Details for Road1.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.025

Time (mins) From:	To:	Area (ha)
0	4	0.025

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Cascade Model Details for Road1.srcx

Storage is Online Cover Level (m) 72.300

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.3
Membrane Percolation (mm/hr)	1000	Length (m)	47.5
Max Percolation (l/s)	69.9	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	71.650	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 71.650

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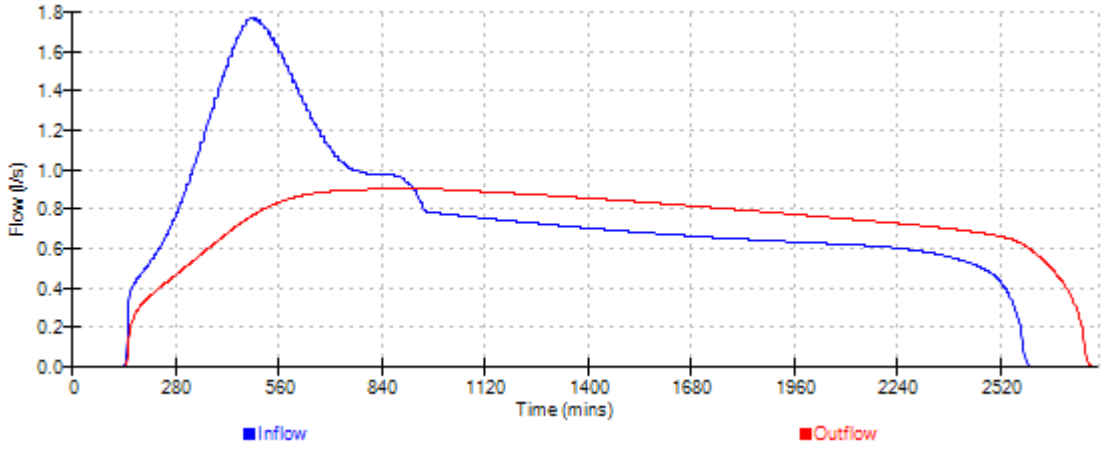
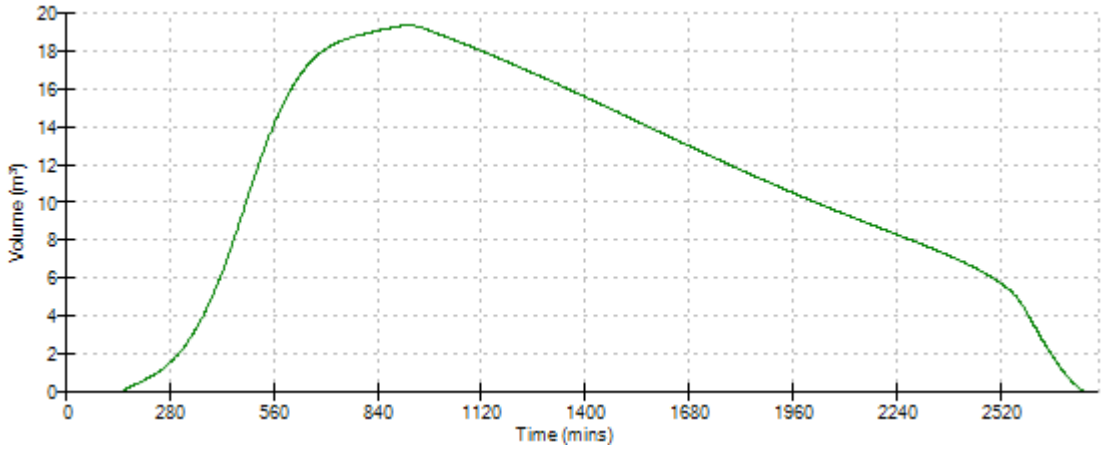
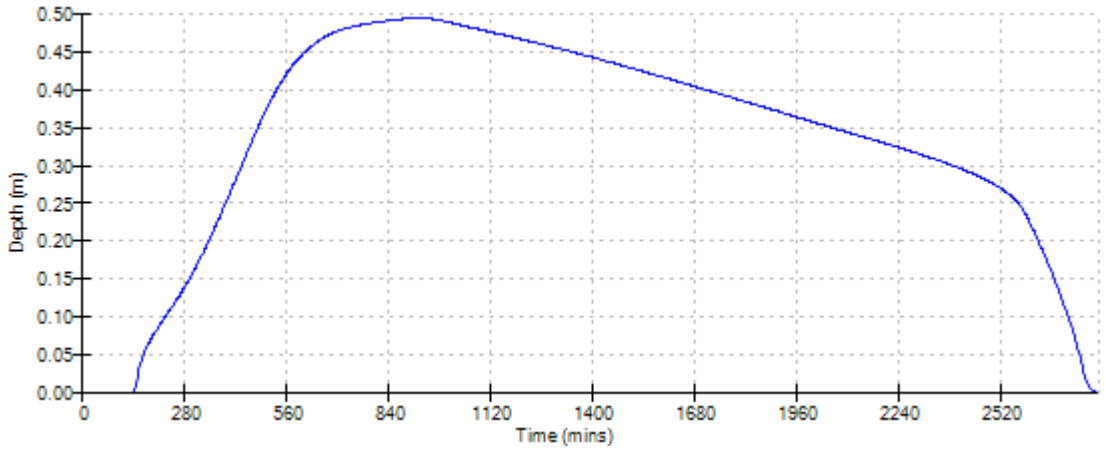
Cascade Event: 960 min Winter for Road1.srcx







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Cascade Summary of Results for Road2.srcx

Upstream Structures	Outflow To	Overflow To
Road3.srcx	Road1.srcx	(None)
Road4.srcx		
Road5.srcx		
Road6.srcx		
Road7.srcx		
Road8.srcx		
Road9.srcx		
Road10.srcx		
Road11.srcx		
Road12.srcx		
Road13.srcx		
Road14.srcx		

Half Drain Time : 146 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	72.367	0.267	0.0	0.7	0.7	5.7	O K
30 min Summer	72.411	0.311	0.0	0.7	0.7	7.7	O K
60 min Summer	72.448	0.348	0.0	0.8	0.8	9.6	O K
120 min Summer	72.478	0.378	0.0	0.8	0.8	11.4	Flood Risk
180 min Summer	72.490	0.390	0.0	0.8	0.8	12.1	Flood Risk
240 min Summer	72.496	0.396	0.0	0.8	0.8	12.4	Flood Risk
360 min Summer	72.498	0.398	0.0	0.8	0.8	12.6	Flood Risk
480 min Summer	72.498	0.398	0.0	0.8	0.8	12.6	Flood Risk
600 min Summer	72.497	0.397	0.0	0.8	0.8	12.5	Flood Risk
720 min Summer	72.496	0.396	0.0	0.8	0.8	12.5	Flood Risk
960 min Summer	72.493	0.393	0.0	0.8	0.8	12.3	Flood Risk
1440 min Summer	72.485	0.385	0.0	0.8	0.8	11.8	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	27.3	19
30 min Summer	86.802	0.0	37.4	33
60 min Summer	54.368	0.0	48.1	62
120 min Summer	32.929	0.0	59.2	122
180 min Summer	24.243	0.0	65.8	182
240 min Summer	19.399	0.0	70.5	240
360 min Summer	14.081	0.0	77.0	360
480 min Summer	11.225	0.0	81.9	414
600 min Summer	9.408	0.0	85.9	476
720 min Summer	8.140	0.0	89.1	542
960 min Summer	6.474	0.0	94.4	674
1440 min Summer	4.680	0.0	102.0	954

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Cascade Summary of Results for Road2.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
2160 min Summer	72.469	0.369	0.0	0.8	0.8	10.8	Flood Risk
2880 min Summer	72.452	0.352	0.0	0.8	0.8	9.9	Flood Risk
4320 min Summer	72.425	0.325	0.0	0.7	0.7	8.4	O K
5760 min Summer	72.402	0.302	0.0	0.7	0.7	7.3	O K
7200 min Summer	72.383	0.283	0.0	0.7	0.7	6.4	O K
8640 min Summer	72.365	0.265	0.0	0.7	0.7	5.6	O K
10080 min Summer	72.349	0.249	0.0	0.6	0.6	4.9	O K
15 min Winter	72.367	0.267	0.0	0.7	0.7	5.7	O K
30 min Winter	72.411	0.311	0.0	0.7	0.7	7.7	O K
60 min Winter	72.448	0.348	0.0	0.8	0.8	9.6	O K
120 min Winter	72.478	0.378	0.0	0.8	0.8	11.4	Flood Risk
180 min Winter	72.491	0.391	0.0	0.8	0.8	12.1	Flood Risk
240 min Winter	72.496	0.396	0.0	0.8	0.8	12.5	Flood Risk
360 min Winter	72.499	0.399	0.0	0.8	0.8	12.7	Flood Risk
480 min Winter	72.499	0.399	0.0	0.8	0.8	12.6	Flood Risk
600 min Winter	72.496	0.396	0.0	0.8	0.8	12.5	Flood Risk
720 min Winter	72.495	0.395	0.0	0.8	0.8	12.4	Flood Risk
960 min Winter	72.490	0.390	0.0	0.8	0.8	12.1	Flood Risk
1440 min Winter	72.479	0.379	0.0	0.8	0.8	11.4	Flood Risk
2160 min Winter	72.459	0.359	0.0	0.8	0.8	10.2	Flood Risk
2880 min Winter	72.439	0.339	0.0	0.7	0.7	9.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
2160 min Summer	3.378	0.0	109.6	1380
2880 min Summer	2.678	0.0	114.9	1788
4320 min Summer	1.927	0.0	122.0	2596
5760 min Summer	1.525	0.0	126.5	3408
7200 min Summer	1.271	0.0	129.5	4184
8640 min Summer	1.095	0.0	131.5	5008
10080 min Summer	0.965	0.0	132.9	5752
15 min Winter	132.106	0.0	27.3	18
30 min Winter	86.802	0.0	37.4	33
60 min Winter	54.368	0.0	48.1	62
120 min Winter	32.929	0.0	59.2	120
180 min Winter	24.243	0.0	65.8	178
240 min Winter	19.399	0.0	70.5	234
360 min Winter	14.081	0.0	77.0	346
480 min Winter	11.225	0.0	81.9	452
600 min Winter	9.408	0.0	85.9	488
720 min Winter	8.140	0.0	89.1	564
960 min Winter	6.474	0.0	94.4	722
1440 min Winter	4.680	0.0	102.0	1038
2160 min Winter	3.378	0.0	109.6	1492
2880 min Winter	2.678	0.0	114.9	1956

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Cascade Summary of Results for Road2.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
4320 min Winter	72.407	0.307	0.0	0.7	0.7	7.5	O K
5760 min Winter	72.379	0.279	0.0	0.7	0.7	6.2	O K
7200 min Winter	72.352	0.252	0.0	0.6	0.6	5.0	O K
8640 min Winter	72.324	0.224	0.0	0.6	0.6	4.0	O K
10080 min Winter	72.297	0.197	0.0	0.6	0.6	3.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
4320 min Winter	1.927	0.0	122.1	2812
5760 min Winter	1.525	0.0	126.6	3688
7200 min Winter	1.271	0.0	129.7	4472
8640 min Winter	1.095	0.0	131.8	5192
10080 min Winter	0.965	0.0	133.3	5848

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Cascade Rainfall Details for Road2.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.022

Time (mins) From:	To:	Area (ha)
0	4	0.022

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Cascade Model Details for Road2.srcx

Storage is Online Cover Level (m) 72.750

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.3
Membrane Percolation (mm/hr)	1000	Length (m)	41.0
Max Percolation (l/s)	60.4	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.100	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 72.100

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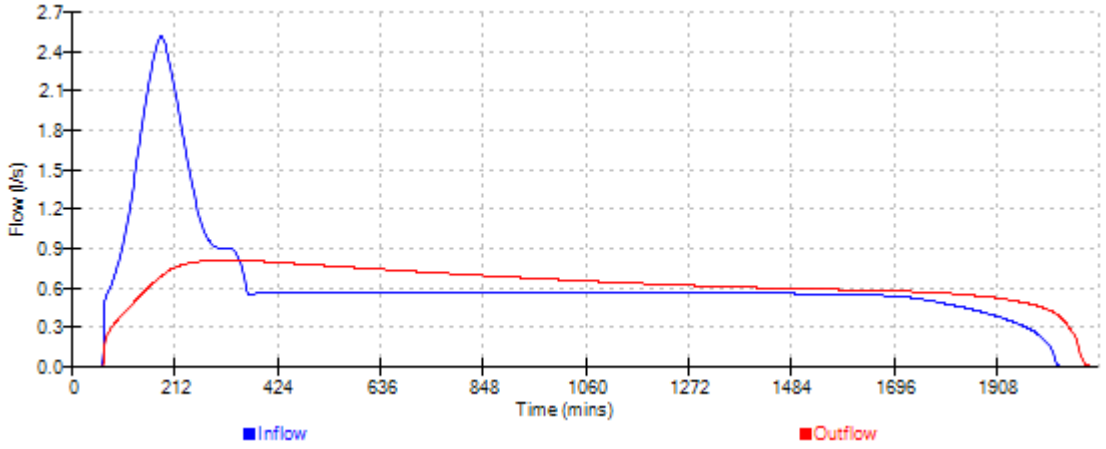
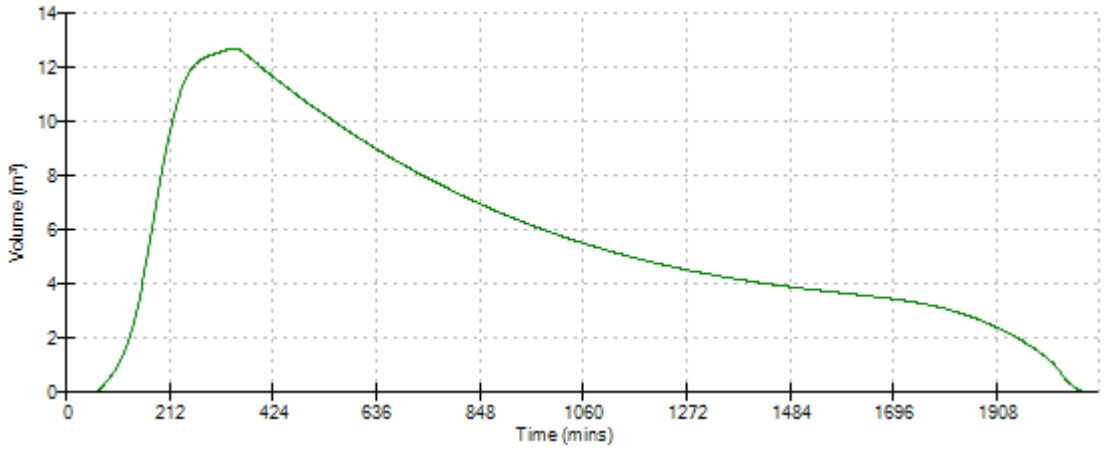
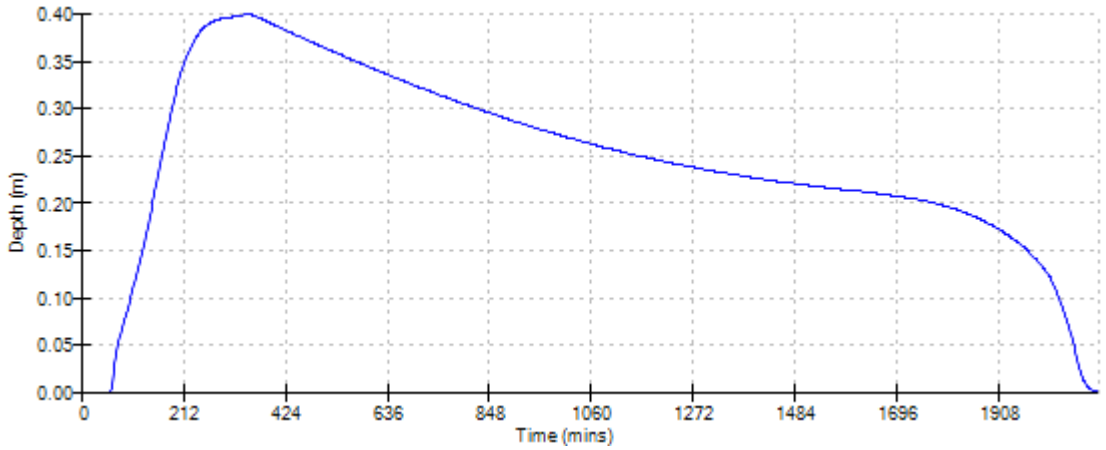
Cascade Event: 360 min Winter for Road2.srcx







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Cascade Summary of Results for Road3.srcx

Upstream Structures	Outflow To	Overflow To
Road4.srcx	Road2.srcx	(None)
Road5.srcx		
Road6.srcx		
Road7.srcx		
Road8.srcx		
Road9.srcx		
Road10.srcx		
Road11.srcx		
Road12.srcx		
Road13.srcx		
Road14.srcx		

Half Drain Time : 169 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	72.820	0.270	0.0	0.4	0.4	3.0	O K
30 min Summer	72.866	0.316	0.0	0.5	0.5	4.1	O K
60 min Summer	72.908	0.358	0.0	0.5	0.5	5.3	Flood Risk
120 min Summer	72.947	0.397	0.0	0.5	0.5	6.5	Flood Risk
180 min Summer	72.970	0.420	0.0	0.5	0.5	7.2	Flood Risk
240 min Summer	72.986	0.436	0.0	0.5	0.5	7.7	Flood Risk
360 min Summer	73.007	0.457	0.0	0.6	0.6	8.4	Flood Risk
480 min Summer	73.024	0.474	0.0	0.6	0.6	9.0	Flood Risk
600 min Summer	73.038	0.488	0.0	0.6	0.6	9.4	Flood Risk
720 min Summer	73.050	0.500	0.0	0.6	0.6	9.7	Flood Risk
960 min Summer	73.070	0.520	0.0	0.6	0.6	10.3	Flood Risk
1440 min Summer	73.094	0.544	0.0	0.6	0.6	10.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	21.5	303
30 min Summer	86.802	0.0	29.5	422
60 min Summer	54.368	0.0	37.9	512
120 min Summer	32.929	0.0	46.6	640
180 min Summer	24.243	0.0	51.8	700
240 min Summer	19.399	0.0	55.5	728
360 min Summer	14.081	0.0	60.6	832
480 min Summer	11.225	0.0	64.5	870
600 min Summer	9.408	0.0	67.6	908
720 min Summer	8.140	0.0	70.1	950
960 min Summer	6.474	0.0	74.3	1024
1440 min Summer	4.680	0.0	80.3	1444

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Cascade Summary of Results for Road3.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
2160 min Summer	73.100	0.550	0.0	0.6	0.6	11.1	Flood Risk
2880 min Summer	73.096	0.546	0.0	0.6	0.6	11.0	Flood Risk
4320 min Summer	73.069	0.519	0.0	0.6	0.6	10.3	Flood Risk
5760 min Summer	73.045	0.495	0.0	0.6	0.6	9.6	Flood Risk
7200 min Summer	73.020	0.470	0.0	0.6	0.6	8.8	Flood Risk
8640 min Summer	72.994	0.444	0.0	0.5	0.5	8.0	Flood Risk
10080 min Summer	72.965	0.415	0.0	0.5	0.5	7.1	Flood Risk
15 min Winter	72.820	0.270	0.0	0.4	0.4	3.0	O K
30 min Winter	72.866	0.316	0.0	0.5	0.5	4.1	O K
60 min Winter	72.908	0.358	0.0	0.5	0.5	5.3	Flood Risk
120 min Winter	72.947	0.397	0.0	0.5	0.5	6.5	Flood Risk
180 min Winter	72.970	0.420	0.0	0.5	0.5	7.2	Flood Risk
240 min Winter	72.986	0.436	0.0	0.5	0.5	7.7	Flood Risk
360 min Winter	73.007	0.457	0.0	0.6	0.6	8.4	Flood Risk
480 min Winter	73.024	0.474	0.0	0.6	0.6	9.0	Flood Risk
600 min Winter	73.038	0.488	0.0	0.6	0.6	9.4	Flood Risk
720 min Winter	73.050	0.500	0.0	0.6	0.6	9.7	Flood Risk
960 min Winter	73.070	0.520	0.0	0.6	0.6	10.3	Flood Risk
1440 min Winter	73.096	0.546	0.0	0.6	0.6	11.0	Flood Risk
2160 min Winter	73.107	0.557	0.0	0.6	0.6	11.2	Flood Risk
2880 min Winter	73.101	0.551	0.0	0.6	0.6	11.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
2160 min Summer	3.378	0.0	86.3	2164
2880 min Summer	2.678	0.0	90.4	2880
4320 min Summer	1.927	0.0	96.0	3516
5760 min Summer	1.525	0.0	99.6	4160
7200 min Summer	1.271	0.0	102.0	4824
8640 min Summer	1.095	0.0	103.6	5480
10080 min Summer	0.965	0.0	104.7	6144
15 min Winter	132.106	0.0	21.5	314
30 min Winter	86.802	0.0	29.5	424
60 min Winter	54.368	0.0	37.9	516
120 min Winter	32.929	0.0	46.6	640
180 min Winter	24.243	0.0	51.8	698
240 min Winter	19.399	0.0	55.5	726
360 min Winter	14.081	0.0	60.6	826
480 min Winter	11.225	0.0	64.5	862
600 min Winter	9.408	0.0	67.6	906
720 min Winter	8.140	0.0	70.1	952
960 min Winter	6.474	0.0	74.3	1042
1440 min Winter	4.680	0.0	80.3	1428
2160 min Winter	3.378	0.0	86.3	2124
2880 min Winter	2.678	0.0	90.5	2792

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Cascade Summary of Results for Road3.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
4320 min Winter	73.061	0.511	0.0	0.6	0.6	10.0	Flood Risk
5760 min Winter	73.016	0.466	0.0	0.6	0.6	8.7	Flood Risk
7200 min Winter	72.963	0.413	0.0	0.5	0.5	7.0	Flood Risk
8640 min Winter	72.908	0.358	0.0	0.5	0.5	5.3	Flood Risk
10080 min Winter	72.856	0.306	0.0	0.5	0.5	3.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
4320 min Winter	1.927	0.0	96.1	3444
5760 min Winter	1.525	0.0	99.7	4096
7200 min Winter	1.271	0.0	102.1	4696
8640 min Winter	1.095	0.0	103.8	5272
10080 min Winter	0.965	0.0	105.0	5848

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Cascade Rainfall Details for Road3.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.011

Time (mins) From:	To:	Area (ha)
0	4	0.011

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Cascade Model Details for Road3.srcx

Storage is Online Cover Level (m) 73.200

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	23.0
Max Percolation (l/s)	29.4	Slope (1:X)	60.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.550	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 72.550

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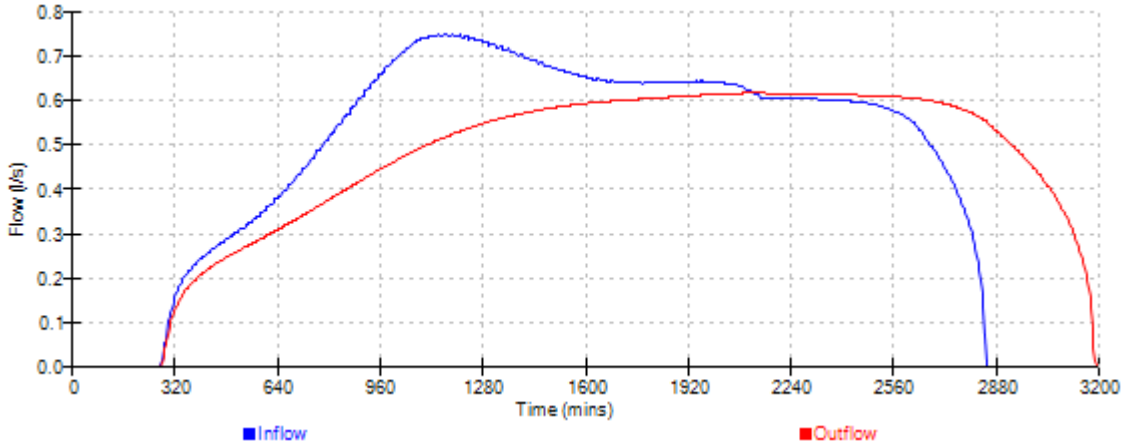
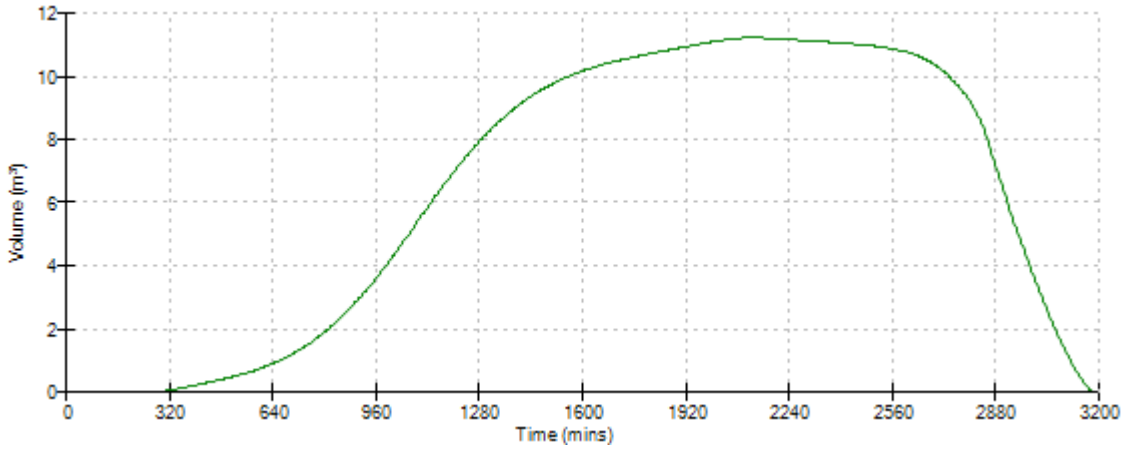
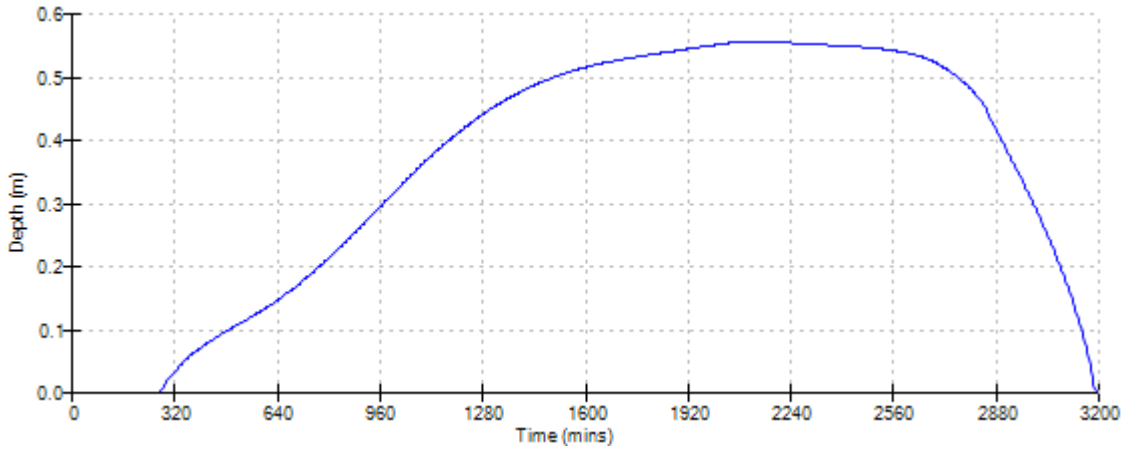
Cascade Event: 2160 min Winter for Road3.srcx







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Cascade Summary of Results for Road4.srcx

Upstream Structures	Outflow To	Overflow To
Road5.srcx	Road3.srcx	(None)
Road6.srcx		
Road7.srcx		
Road8.srcx		
Road9.srcx		
Road10.srcx		
Road11.srcx		
Road12.srcx		
Road13.srcx		
Road14.srcx		

Half Drain Time : 111 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	73.279	0.279	0.0	0.4	0.4	2.1	O K
30 min Summer	73.326	0.326	0.0	0.5	0.5	2.9	O K
60 min Summer	73.368	0.368	0.0	0.5	0.5	3.7	Flood Risk
120 min Summer	73.408	0.408	0.0	0.5	0.5	4.6	Flood Risk
180 min Summer	73.431	0.431	0.0	0.5	0.5	5.1	Flood Risk
240 min Summer	73.447	0.447	0.0	0.6	0.6	5.4	Flood Risk
360 min Summer	73.468	0.468	0.0	0.6	0.6	5.9	Flood Risk
480 min Summer	73.484	0.484	0.0	0.6	0.6	6.2	Flood Risk
600 min Summer	73.497	0.497	0.0	0.6	0.6	6.5	Flood Risk
720 min Summer	73.508	0.508	0.0	0.6	0.6	6.7	Flood Risk
960 min Summer	73.523	0.523	0.0	0.6	0.6	6.9	Flood Risk
1440 min Summer	73.535	0.535	0.0	0.6	0.6	7.2	Flood Risk
2160 min Summer	73.534	0.534	0.0	0.6	0.6	7.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	18.6	19
30 min Summer	86.802	0.0	25.5	34
60 min Summer	54.368	0.0	32.7	64
120 min Summer	32.929	0.0	40.3	124
180 min Summer	24.243	0.0	44.8	184
240 min Summer	19.399	0.0	47.9	244
360 min Summer	14.081	0.0	52.3	364
480 min Summer	11.225	0.0	55.7	484
600 min Summer	9.408	0.0	58.4	604
720 min Summer	8.140	0.0	60.6	724
960 min Summer	6.474	0.0	64.2	962
1440 min Summer	4.680	0.0	69.4	1442
2160 min Summer	3.378	0.0	74.6	2164

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Cascade Summary of Results for Road4.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
2880 min Summer	73.524	0.524	0.0	0.6	0.6	7.0	Flood Risk
4320 min Summer	73.498	0.498	0.0	0.6	0.6	6.5	Flood Risk
5760 min Summer	73.472	0.472	0.0	0.6	0.6	5.9	Flood Risk
7200 min Summer	73.444	0.444	0.0	0.5	0.5	5.3	Flood Risk
8640 min Summer	73.412	0.412	0.0	0.5	0.5	4.7	Flood Risk
10080 min Summer	73.379	0.379	0.0	0.5	0.5	4.0	Flood Risk
15 min Winter	73.279	0.279	0.0	0.4	0.4	2.1	O K
30 min Winter	73.326	0.326	0.0	0.5	0.5	2.9	O K
60 min Winter	73.368	0.368	0.0	0.5	0.5	3.7	Flood Risk
120 min Winter	73.408	0.408	0.0	0.5	0.5	4.6	Flood Risk
180 min Winter	73.431	0.431	0.0	0.5	0.5	5.1	Flood Risk
240 min Winter	73.447	0.447	0.0	0.6	0.6	5.4	Flood Risk
360 min Winter	73.468	0.468	0.0	0.6	0.6	5.9	Flood Risk
480 min Winter	73.484	0.484	0.0	0.6	0.6	6.2	Flood Risk
600 min Winter	73.497	0.497	0.0	0.6	0.6	6.5	Flood Risk
720 min Winter	73.508	0.508	0.0	0.6	0.6	6.7	Flood Risk
960 min Winter	73.524	0.524	0.0	0.6	0.6	7.0	Flood Risk
1440 min Winter	73.539	0.539	0.0	0.6	0.6	7.2	Flood Risk
2160 min Winter	73.540	0.540	0.0	0.6	0.6	7.3	Flood Risk
2880 min Winter	73.526	0.526	0.0	0.6	0.6	7.0	Flood Risk
4320 min Winter	73.483	0.483	0.0	0.6	0.6	6.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
2880 min Summer	2.678	0.0	78.2	2704
4320 min Summer	1.927	0.0	83.0	3320
5760 min Summer	1.525	0.0	86.1	3968
7200 min Summer	1.271	0.0	88.1	4616
8640 min Summer	1.095	0.0	89.6	5272
10080 min Summer	0.965	0.0	90.5	5920
15 min Winter	132.106	0.0	18.6	19
30 min Winter	86.802	0.0	25.5	34
60 min Winter	54.368	0.0	32.7	64
120 min Winter	32.929	0.0	40.3	124
180 min Winter	24.243	0.0	44.8	182
240 min Winter	19.399	0.0	47.9	242
360 min Winter	14.081	0.0	52.3	360
480 min Winter	11.225	0.0	55.7	478
600 min Winter	9.408	0.0	58.4	596
720 min Winter	8.140	0.0	60.6	714
960 min Winter	6.474	0.0	64.2	952
1440 min Winter	4.680	0.0	69.4	1414
2160 min Winter	3.378	0.0	74.6	2116
2880 min Winter	2.678	0.0	78.2	2672
4320 min Winter	1.927	0.0	83.0	3240

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Cascade Summary of Results for Road4.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
5760 min Winter	73.428	0.428	0.0	0.5	0.5	5.0	Flood Risk
7200 min Winter	73.365	0.365	0.0	0.5	0.5	3.7	Flood Risk
8640 min Winter	73.304	0.304	0.0	0.5	0.5	2.5	O K
10080 min Winter	73.251	0.251	0.0	0.4	0.4	1.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Winter	1.525	0.0	86.2	3864
7200 min Winter	1.271	0.0	88.3	4448
8640 min Winter	1.095	0.0	89.7	5008
10080 min Winter	0.965	0.0	90.7	5584

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Cascade Rainfall Details for Road4.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.008

Time (mins) From:	To:	Area (ha)
0	4	0.008

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Cascade Model Details for Road4.srcx

Storage is Online Cover Level (m) 73.650

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	15.4
Max Percolation (l/s)	19.7	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	73.000	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 73.000

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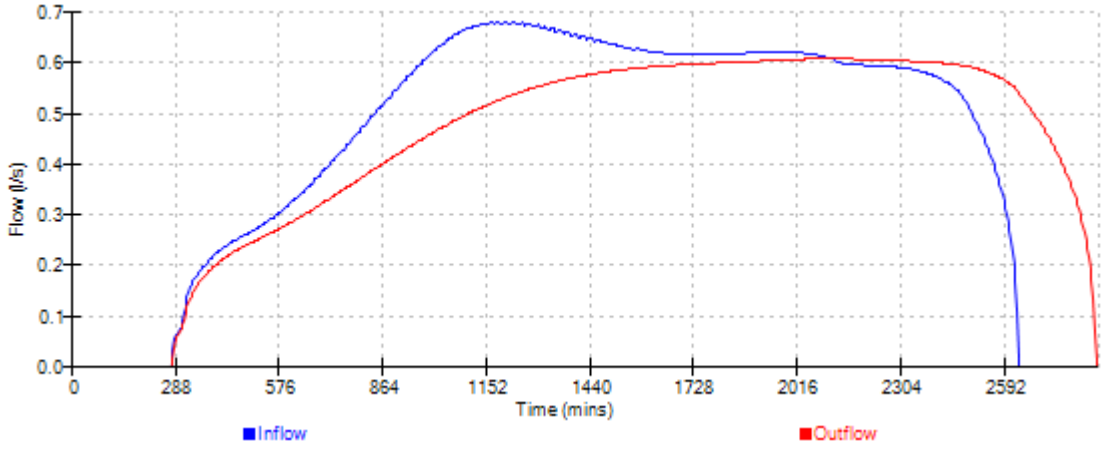
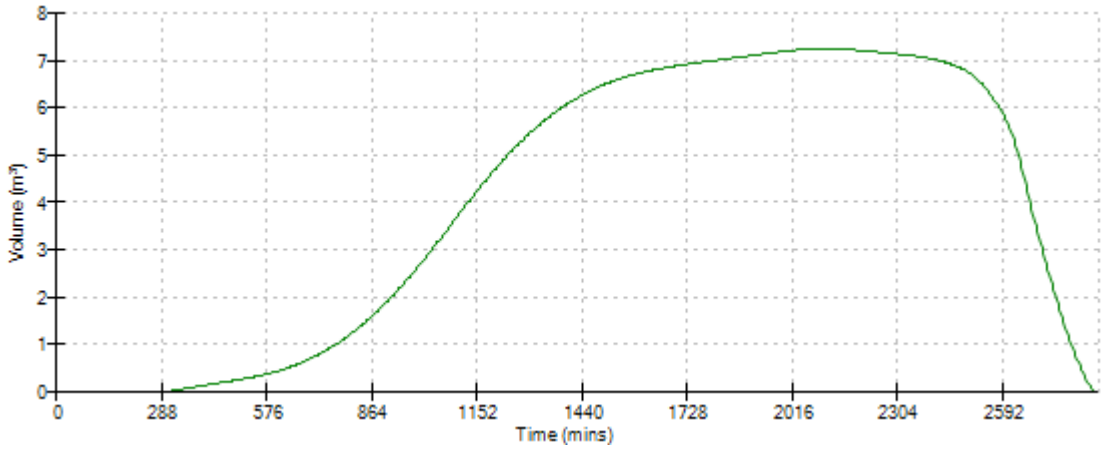
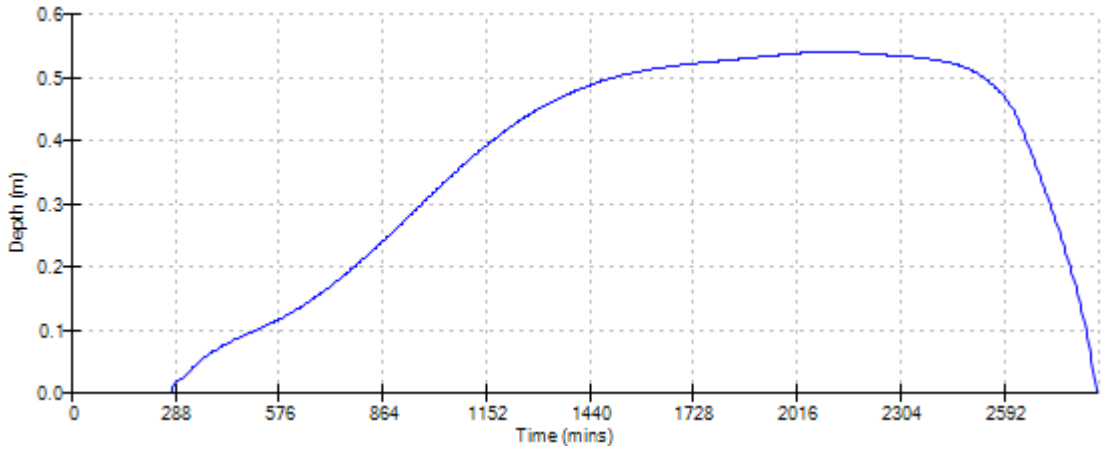
Cascade Event: 2160 min Winter for Road4.srcx







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Cascade Summary of Results for Road5.srcx

Upstream Structures	Outflow To	Overflow To
Road6.srcx	Road4.srcx	(None)
Road7.srcx		
Road8.srcx		
Road9.srcx		
Road10.srcx		
Road11.srcx		
Road12.srcx		
Road13.srcx		
Road14.srcx		

Half Drain Time : 84 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	73.725	0.275	0.0	0.4	0.4	1.6	O K
30 min Summer	73.771	0.321	0.0	0.5	0.5	2.1	O K
60 min Summer	73.813	0.363	0.0	0.5	0.5	2.7	Flood Risk
120 min Summer	73.851	0.401	0.0	0.5	0.5	3.3	Flood Risk
180 min Summer	73.871	0.421	0.0	0.5	0.5	3.7	Flood Risk
240 min Summer	73.884	0.434	0.0	0.5	0.5	3.9	Flood Risk
360 min Summer	73.903	0.453	0.0	0.6	0.6	4.2	Flood Risk
480 min Summer	73.917	0.467	0.0	0.6	0.6	4.5	Flood Risk
600 min Summer	73.928	0.478	0.0	0.6	0.6	4.7	Flood Risk
720 min Summer	73.938	0.488	0.0	0.6	0.6	4.9	Flood Risk
960 min Summer	73.952	0.502	0.0	0.6	0.6	5.1	Flood Risk
1440 min Summer	73.963	0.513	0.0	0.6	0.6	5.3	Flood Risk
2160 min Summer	73.967	0.517	0.0	0.6	0.6	5.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	16.4	19
30 min Summer	86.802	0.0	22.5	34
60 min Summer	54.368	0.0	29.0	64
120 min Summer	32.929	0.0	35.7	124
180 min Summer	24.243	0.0	39.6	184
240 min Summer	19.399	0.0	42.4	244
360 min Summer	14.081	0.0	46.3	364
480 min Summer	11.225	0.0	49.3	484
600 min Summer	9.408	0.0	51.7	604
720 min Summer	8.140	0.0	53.7	724
960 min Summer	6.474	0.0	56.8	964
1440 min Summer	4.680	0.0	61.4	1444
2160 min Summer	3.378	0.0	66.0	2164

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Cascade Summary of Results for Road5.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
2880 min Summer	73.953	0.503	0.0	0.6	0.6	5.2	Flood Risk
4320 min Summer	73.925	0.475	0.0	0.6	0.6	4.7	Flood Risk
5760 min Summer	73.896	0.446	0.0	0.6	0.6	4.1	Flood Risk
7200 min Summer	73.862	0.412	0.0	0.5	0.5	3.5	Flood Risk
8640 min Summer	73.827	0.377	0.0	0.5	0.5	2.9	Flood Risk
10080 min Summer	73.790	0.340	0.0	0.5	0.5	2.4	O K
15 min Winter	73.725	0.275	0.0	0.4	0.4	1.6	O K
30 min Winter	73.771	0.321	0.0	0.5	0.5	2.1	O K
60 min Winter	73.813	0.363	0.0	0.5	0.5	2.7	Flood Risk
120 min Winter	73.851	0.401	0.0	0.5	0.5	3.3	Flood Risk
180 min Winter	73.871	0.421	0.0	0.5	0.5	3.7	Flood Risk
240 min Winter	73.884	0.434	0.0	0.5	0.5	3.9	Flood Risk
360 min Winter	73.903	0.453	0.0	0.6	0.6	4.2	Flood Risk
480 min Winter	73.917	0.467	0.0	0.6	0.6	4.5	Flood Risk
600 min Winter	73.928	0.478	0.0	0.6	0.6	4.7	Flood Risk
720 min Winter	73.938	0.488	0.0	0.6	0.6	4.9	Flood Risk
960 min Winter	73.953	0.503	0.0	0.6	0.6	5.2	Flood Risk
1440 min Winter	73.968	0.518	0.0	0.6	0.6	5.4	Flood Risk
2160 min Winter	73.970	0.520	0.0	0.6	0.6	5.5	Flood Risk
2880 min Winter	73.949	0.499	0.0	0.6	0.6	5.1	Flood Risk
4320 min Winter	73.899	0.449	0.0	0.6	0.6	4.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
2880 min Summer	2.678	0.0	69.2	2568
4320 min Summer	1.927	0.0	73.4	3192
5760 min Summer	1.525	0.0	76.1	3832
7200 min Summer	1.271	0.0	78.0	4472
8640 min Summer	1.095	0.0	79.2	5112
10080 min Summer	0.965	0.0	80.0	5752
15 min Winter	132.106	0.0	16.4	19
30 min Winter	86.802	0.0	22.5	34
60 min Winter	54.368	0.0	29.0	64
120 min Winter	32.929	0.0	35.7	122
180 min Winter	24.243	0.0	39.6	182
240 min Winter	19.399	0.0	42.4	240
360 min Winter	14.081	0.0	46.3	360
480 min Winter	11.225	0.0	49.3	480
600 min Winter	9.408	0.0	51.7	1338
720 min Winter	8.140	0.0	53.7	1398
960 min Winter	6.474	0.0	56.8	954
1440 min Winter	4.680	0.0	61.4	1428
2160 min Winter	3.378	0.0	66.0	2120
2880 min Winter	2.678	0.0	69.2	2532
4320 min Winter	1.927	0.0	73.5	3112

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Cascade Summary of Results for Road5.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
5760 min Winter	73.835	0.385	0.0	0.5	0.5	3.1	Flood Risk
7200 min Winter	73.766	0.316	0.0	0.5	0.5	2.1	O K
8640 min Winter	73.705	0.255	0.0	0.4	0.4	1.3	O K
10080 min Winter	73.656	0.206	0.0	0.4	0.4	0.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Winter	1.525	0.0	76.2	3696
7200 min Winter	1.271	0.0	78.1	4256
8640 min Winter	1.095	0.0	79.4	4840
10080 min Winter	0.965	0.0	80.2	5440

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Cascade Rainfall Details for Road5.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.006

Time (mins) From:	To:	Area (ha)
0	4	0.006

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Cascade Model Details for Road5.srcx

Storage is Online Cover Level (m) 74.100

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	13.4
Max Percolation (l/s)	17.1	Slope (1:X)	30.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	73.450	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 73.450

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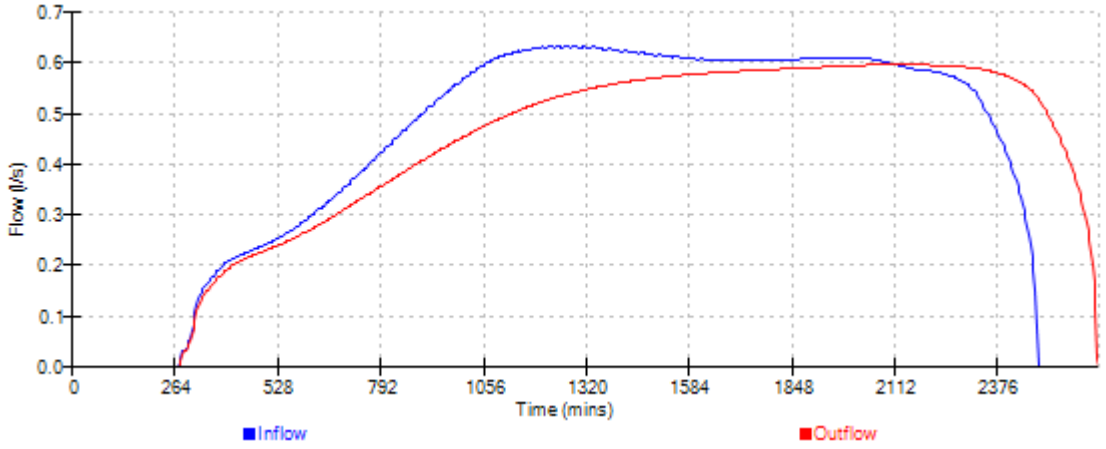
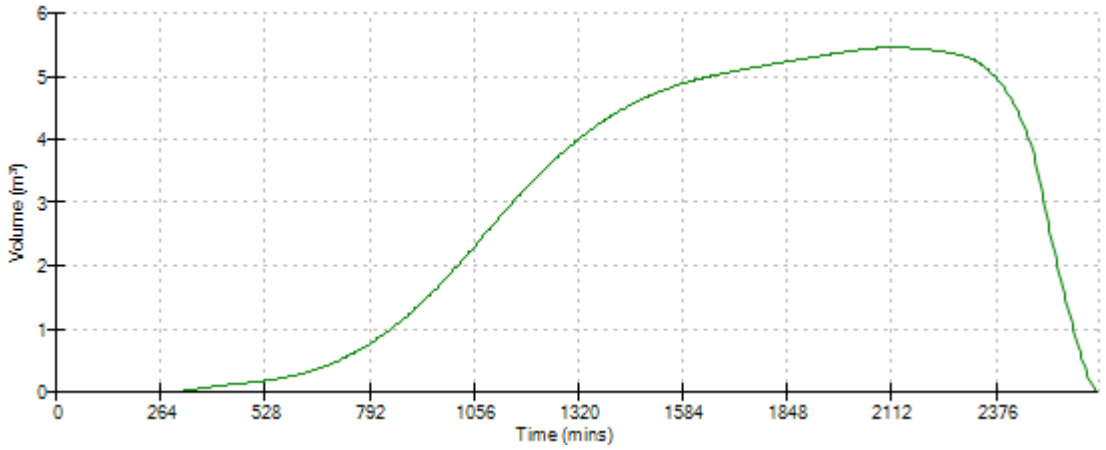
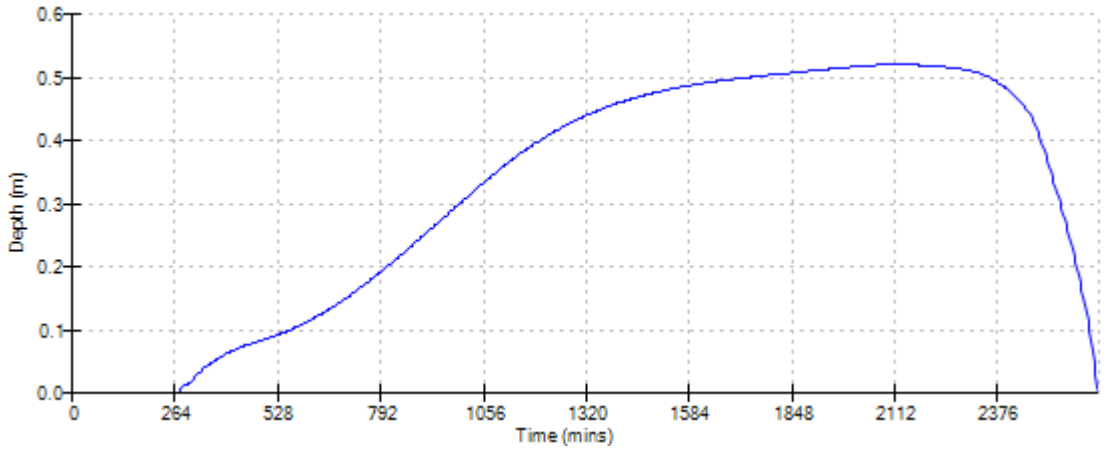
Cascade Event: 2160 min Winter for Road5.srcx







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Cascade Summary of Results for Road6.srcx

Upstream Structures	Outflow To	Overflow To
Road7.srcx	Road5.srcx	(None)
Road8.srcx		
Road9.srcx		
Road10.srcx		
Road11.srcx		
Road12.srcx		
Road13.srcx		
Road14.srcx		

Half Drain Time : 77 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	74.162	0.262	0.0	0.4	0.4	1.4	O K
30 min Summer	74.209	0.309	0.0	0.5	0.5	2.0	O K
60 min Summer	74.253	0.353	0.0	0.5	0.5	2.6	Flood Risk
120 min Summer	74.294	0.394	0.0	0.5	0.5	3.2	Flood Risk
180 min Summer	74.317	0.417	0.0	0.5	0.5	3.5	Flood Risk
240 min Summer	74.333	0.433	0.0	0.5	0.5	3.8	Flood Risk
360 min Summer	74.354	0.454	0.0	0.6	0.6	4.1	Flood Risk
480 min Summer	74.369	0.469	0.0	0.6	0.6	4.3	Flood Risk
600 min Summer	74.380	0.480	0.0	0.6	0.6	4.5	Flood Risk
720 min Summer	74.389	0.489	0.0	0.6	0.6	4.6	Flood Risk
960 min Summer	74.400	0.500	0.0	0.6	0.6	4.8	Flood Risk
1440 min Summer	74.410	0.510	0.0	0.6	0.6	4.9	Flood Risk
2160 min Summer	74.409	0.509	0.0	0.6	0.6	4.9	Flood Risk
2880 min Summer	74.392	0.492	0.0	0.6	0.6	4.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	14.9	477
30 min Summer	86.802	0.0	20.4	604
60 min Summer	54.368	0.0	26.2	732
120 min Summer	32.929	0.0	32.2	866
180 min Summer	24.243	0.0	35.8	948
240 min Summer	19.399	0.0	38.3	1010
360 min Summer	14.081	0.0	41.9	1106
480 min Summer	11.225	0.0	44.6	1182
600 min Summer	9.408	0.0	46.7	1244
720 min Summer	8.140	0.0	48.5	1300
960 min Summer	6.474	0.0	51.4	1390
1440 min Summer	4.680	0.0	55.5	1444
2160 min Summer	3.378	0.0	59.6	2128
2880 min Summer	2.678	0.0	62.5	2428

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Cascade Summary of Results for Road6.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
4320 min Summer	74.360	0.460	0.0	0.6	0.6	4.2	Flood Risk
5760 min Summer	74.325	0.425	0.0	0.5	0.5	3.7	Flood Risk
7200 min Summer	74.285	0.385	0.0	0.5	0.5	3.1	Flood Risk
8640 min Summer	74.245	0.345	0.0	0.5	0.5	2.5	O K
10080 min Summer	74.206	0.306	0.0	0.5	0.5	1.9	O K
15 min Winter	74.162	0.262	0.0	0.4	0.4	1.4	O K
30 min Winter	74.209	0.309	0.0	0.5	0.5	2.0	O K
60 min Winter	74.252	0.352	0.0	0.5	0.5	2.6	Flood Risk
120 min Winter	74.294	0.394	0.0	0.5	0.5	3.2	Flood Risk
180 min Winter	74.317	0.417	0.0	0.5	0.5	3.5	Flood Risk
240 min Winter	74.333	0.433	0.0	0.5	0.5	3.8	Flood Risk
360 min Winter	74.354	0.454	0.0	0.6	0.6	4.1	Flood Risk
480 min Winter	74.369	0.469	0.0	0.6	0.6	4.3	Flood Risk
600 min Winter	74.381	0.481	0.0	0.6	0.6	4.5	Flood Risk
720 min Winter	74.390	0.490	0.0	0.6	0.6	4.6	Flood Risk
960 min Winter	74.402	0.502	0.0	0.6	0.6	4.8	Flood Risk
1440 min Winter	74.414	0.514	0.0	0.6	0.6	5.0	Flood Risk
2160 min Winter	74.410	0.510	0.0	0.6	0.6	4.9	Flood Risk
2880 min Winter	74.383	0.483	0.0	0.6	0.6	4.5	Flood Risk
4320 min Winter	74.322	0.422	0.0	0.5	0.5	3.6	Flood Risk
5760 min Winter	74.245	0.345	0.0	0.5	0.5	2.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
4320 min Summer	1.927	0.0	66.4	3060
5760 min Summer	1.525	0.0	68.8	3704
7200 min Summer	1.271	0.0	70.5	4352
8640 min Summer	1.095	0.0	71.6	4992
10080 min Summer	0.965	0.0	72.4	5616
15 min Winter	132.106	0.0	14.9	477
30 min Winter	86.802	0.0	20.4	603
60 min Winter	54.368	0.0	26.2	732
120 min Winter	32.929	0.0	32.2	866
180 min Winter	24.243	0.0	35.8	950
240 min Winter	19.399	0.0	38.3	1010
360 min Winter	14.081	0.0	41.9	1104
480 min Winter	11.225	0.0	44.6	1180
600 min Winter	9.408	0.0	46.7	1240
720 min Winter	8.140	0.0	48.5	1296
960 min Winter	6.474	0.0	51.4	1380
1440 min Winter	4.680	0.0	55.5	1428
2160 min Winter	3.378	0.0	59.6	2072
2880 min Winter	2.678	0.0	62.5	2368
4320 min Winter	1.927	0.0	66.4	2980
5760 min Winter	1.525	0.0	68.9	3568

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Cascade Summary of Results for Road6.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200 min Winter	74.174	0.274	0.0	0.4	0.4	1.6	O K
8640 min Winter	74.116	0.216	0.0	0.4	0.4	1.0	O K
10080 min Winter	74.073	0.173	0.0	0.3	0.3	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	1.271	0.0	70.6	4112
8640 min Winter	1.095	0.0	71.8	4712
10080 min Winter	0.965	0.0	72.6	5336

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Cascade Rainfall Details for Road6.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.005

Time (mins) From:	To:	Area (ha)
0	4	0.005

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Cascade Model Details for Road6.srcx

Storage is Online Cover Level (m) 74.550

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	10.8
Max Percolation (l/s)	13.8	Slope (1:X)	30.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	73.900	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 73.900

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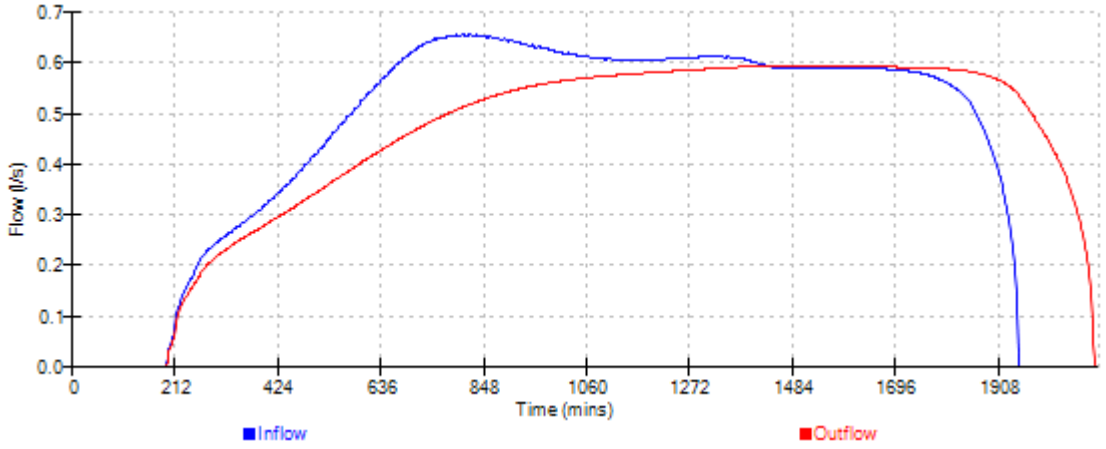
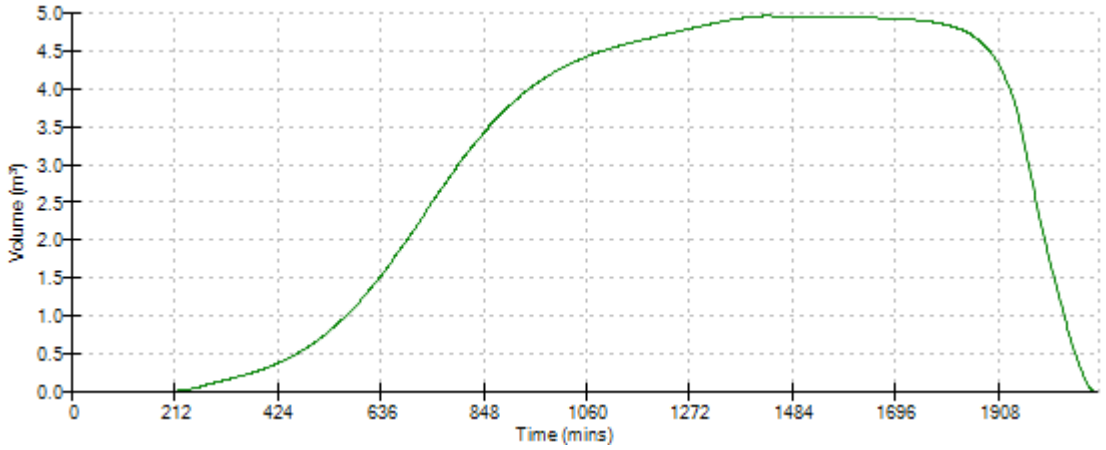
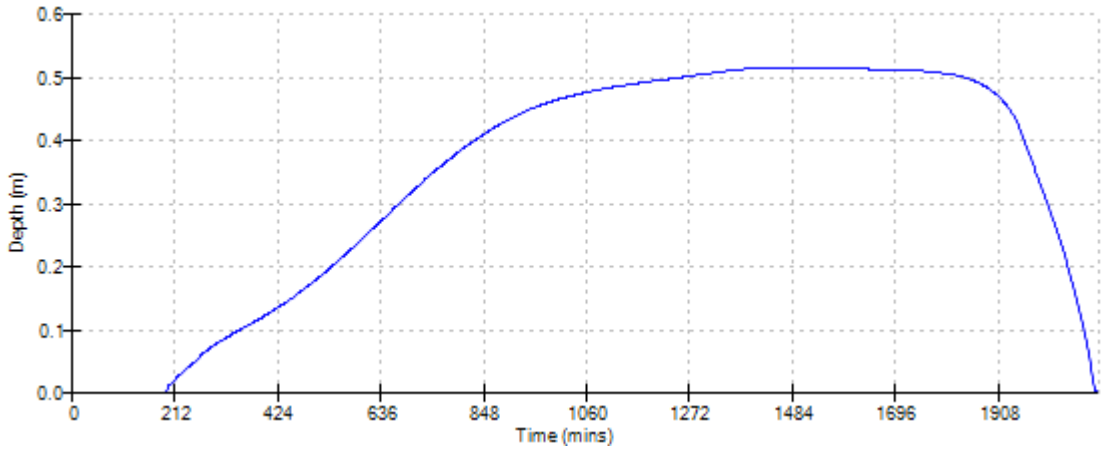
Cascade Event: 1440 min Winter for Road6.srcx







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Cascade Summary of Results for Road7.srcx

Upstream Structures	Outflow To	Overflow To
Road8.srcx	Road6.srcx	(None)
Road9.srcx		
Road10.srcx		
Road11.srcx		
Road12.srcx		
Road13.srcx		
Road14.srcx		

Half Drain Time : 56 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	74.618	0.268	0.0	0.4	0.4	1.0	O K
30 min Summer	74.666	0.316	0.0	0.5	0.5	1.4	O K
60 min Summer	74.710	0.360	0.0	0.5	0.5	1.8	Flood Risk
120 min Summer	74.752	0.402	0.0	0.5	0.5	2.2	Flood Risk
180 min Summer	74.774	0.424	0.0	0.5	0.5	2.5	Flood Risk
240 min Summer	74.790	0.440	0.0	0.5	0.5	2.7	Flood Risk
360 min Summer	74.810	0.460	0.0	0.6	0.6	2.9	Flood Risk
480 min Summer	74.824	0.474	0.0	0.6	0.6	3.1	Flood Risk
600 min Summer	74.835	0.485	0.0	0.6	0.6	3.3	Flood Risk
720 min Summer	74.842	0.492	0.0	0.6	0.6	3.4	Flood Risk
960 min Summer	74.851	0.501	0.0	0.6	0.6	3.5	Flood Risk
1440 min Summer	74.858	0.508	0.0	0.6	0.6	3.6	Flood Risk
2160 min Summer	74.849	0.499	0.0	0.6	0.6	3.4	Flood Risk
2880 min Summer	74.831	0.481	0.0	0.6	0.6	3.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	13.6	435
30 min Summer	86.802	0.0	18.6	547
60 min Summer	54.368	0.0	23.8	664
120 min Summer	32.929	0.0	29.4	786
180 min Summer	24.243	0.0	32.6	862
240 min Summer	19.399	0.0	34.9	918
360 min Summer	14.081	0.0	38.1	1006
480 min Summer	11.225	0.0	40.6	1076
600 min Summer	9.408	0.0	42.5	1132
720 min Summer	8.140	0.0	44.2	1182
960 min Summer	6.474	0.0	46.8	1274
1440 min Summer	4.680	0.0	50.5	1494
2160 min Summer	3.378	0.0	54.3	2000
2880 min Summer	2.678	0.0	57.0	2304

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Cascade Summary of Results for Road7.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
4320 min Summer	74.795	0.445	0.0	0.6	0.6	2.7	Flood Risk
5760 min Summer	74.755	0.405	0.0	0.5	0.5	2.3	Flood Risk
7200 min Summer	74.711	0.361	0.0	0.5	0.5	1.8	Flood Risk
8640 min Summer	74.667	0.317	0.0	0.5	0.5	1.4	O K
10080 min Summer	74.627	0.277	0.0	0.4	0.4	1.1	O K
15 min Winter	74.618	0.268	0.0	0.4	0.4	1.0	O K
30 min Winter	74.666	0.316	0.0	0.5	0.5	1.4	O K
60 min Winter	74.710	0.360	0.0	0.5	0.5	1.8	Flood Risk
120 min Winter	74.752	0.402	0.0	0.5	0.5	2.2	Flood Risk
180 min Winter	74.774	0.424	0.0	0.5	0.5	2.5	Flood Risk
240 min Winter	74.790	0.440	0.0	0.5	0.5	2.7	Flood Risk
360 min Winter	74.810	0.460	0.0	0.6	0.6	2.9	Flood Risk
480 min Winter	74.825	0.475	0.0	0.6	0.6	3.1	Flood Risk
600 min Winter	74.836	0.486	0.0	0.6	0.6	3.3	Flood Risk
720 min Winter	74.844	0.494	0.0	0.6	0.6	3.4	Flood Risk
960 min Winter	74.854	0.504	0.0	0.6	0.6	3.5	Flood Risk
1440 min Winter	74.861	0.511	0.0	0.6	0.6	3.6	Flood Risk
2160 min Winter	74.845	0.495	0.0	0.6	0.6	3.4	Flood Risk
2880 min Winter	74.815	0.465	0.0	0.6	0.6	3.0	Flood Risk
4320 min Winter	74.743	0.393	0.0	0.5	0.5	2.1	Flood Risk
5760 min Winter	74.660	0.310	0.0	0.5	0.5	1.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
4320 min Summer	1.927	0.0	60.5	2928
5760 min Summer	1.525	0.0	62.7	3576
7200 min Summer	1.271	0.0	64.3	4216
8640 min Summer	1.095	0.0	65.3	4848
10080 min Summer	0.965	0.0	66.0	5488
15 min Winter	132.106	0.0	13.6	434
30 min Winter	86.802	0.0	18.6	547
60 min Winter	54.368	0.0	23.8	662
120 min Winter	32.929	0.0	29.4	786
180 min Winter	24.243	0.0	32.6	862
240 min Winter	19.399	0.0	34.9	918
360 min Winter	14.081	0.0	38.1	1004
480 min Winter	11.225	0.0	40.6	1074
600 min Winter	9.408	0.0	42.5	1128
720 min Winter	8.140	0.0	44.2	1176
960 min Winter	6.474	0.0	46.8	1252
1440 min Winter	4.680	0.0	50.6	1430
2160 min Winter	3.378	0.0	54.3	1972
2880 min Winter	2.678	0.0	57.0	2228
4320 min Winter	1.927	0.0	60.5	2844
5760 min Winter	1.525	0.0	62.8	3408

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Cascade Summary of Results for Road7.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200 min Winter	74.589	0.239	0.0	0.4	0.4	0.8	O K
8640 min Winter	74.535	0.185	0.0	0.3	0.3	0.5	O K
10080 min Winter	74.497	0.147	0.0	0.3	0.3	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	1.271	0.0	64.4	3984
8640 min Winter	1.095	0.0	65.4	4600
10080 min Winter	0.965	0.0	66.2	5248

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Cascade Rainfall Details for Road7.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.004

Time (mins) From:	To:	Area (ha)
0	4	0.004

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Cascade Model Details for Road7.srcx

Storage is Online Cover Level (m) 75.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	10.4
Max Percolation (l/s)	13.3	Slope (1:X)	20.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	74.350	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 74.350

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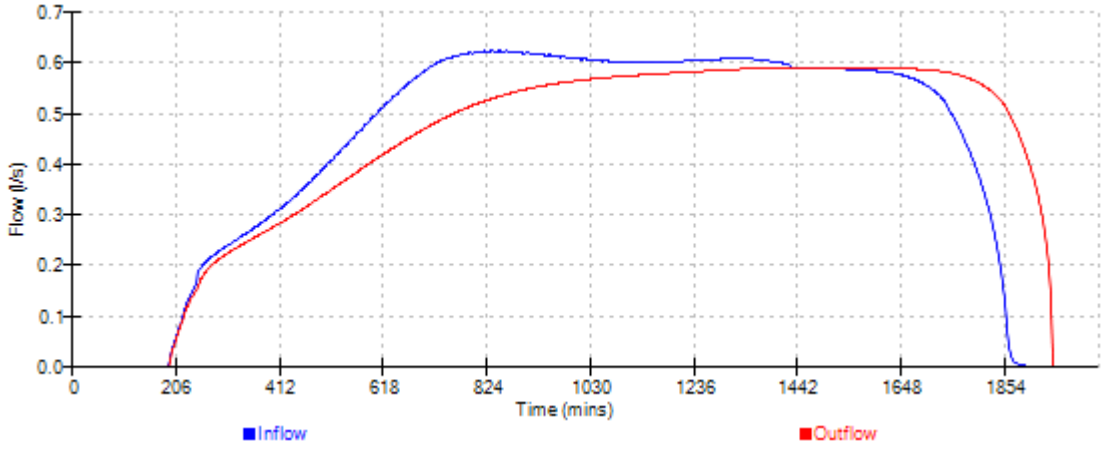
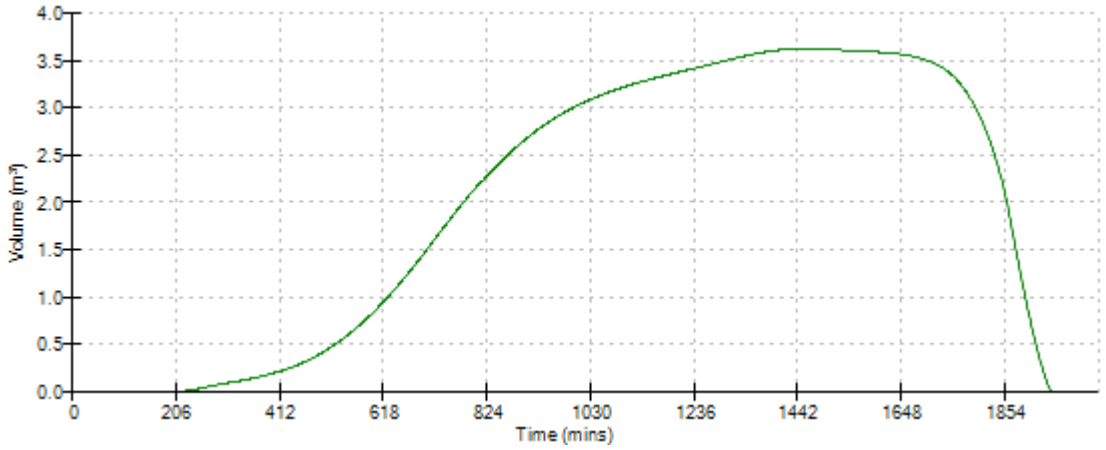
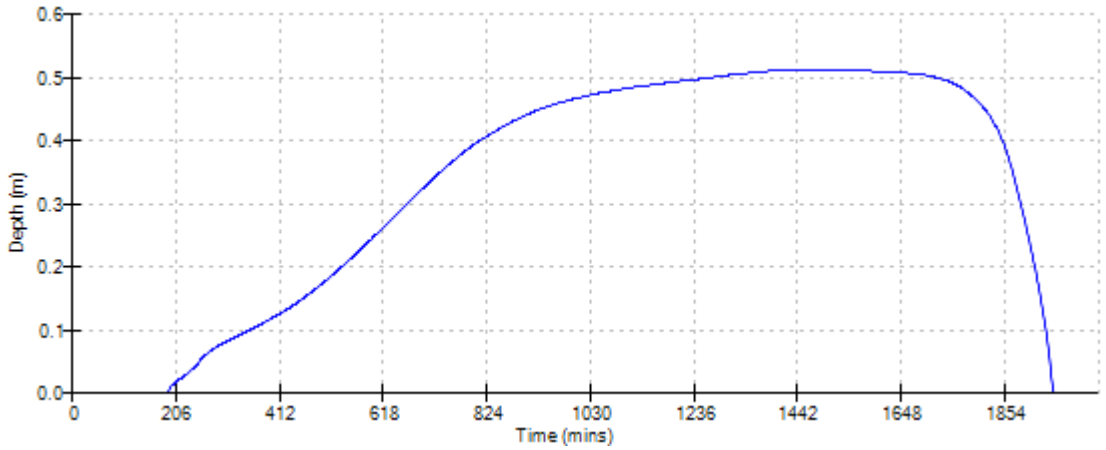
Cascade Event: 1440 min Winter for Road7.srcx







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Cascade Summary of Results for Road8.srcx

Upstream Structures	Outflow To	Overflow To
Road9.srcx	Road7.srcx	(None)
Road10.srcx		
Road11.srcx		
Road12.srcx		
Road13.srcx		
Road14.srcx		

Half Drain Time : 65 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	75.074	0.324	0.0	0.4	0.4	1.4	O K
30 min Summer	75.122	0.372	0.0	0.5	0.5	1.9	Flood Risk
60 min Summer	75.167	0.417	0.0	0.5	0.5	2.4	Flood Risk
120 min Summer	75.208	0.458	0.0	0.5	0.5	2.9	Flood Risk
180 min Summer	75.231	0.481	0.0	0.5	0.5	3.2	Flood Risk
240 min Summer	75.246	0.496	0.0	0.6	0.6	3.4	Flood Risk
360 min Summer	75.266	0.516	0.0	0.6	0.6	3.6	Flood Risk
480 min Summer	75.279	0.529	0.0	0.6	0.6	3.8	Flood Risk
600 min Summer	75.289	0.539	0.0	0.6	0.6	3.9	Flood Risk
720 min Summer	75.296	0.546	0.0	0.6	0.6	4.0	Flood Risk
960 min Summer	75.304	0.554	0.0	0.6	0.6	4.0	Flood Risk
1440 min Summer	75.310	0.560	0.0	0.6	0.6	4.1	Flood Risk
2160 min Summer	75.291	0.541	0.0	0.6	0.6	3.9	Flood Risk
2880 min Summer	75.271	0.521	0.0	0.6	0.6	3.7	Flood Risk
4320 min Summer	75.228	0.478	0.0	0.5	0.5	3.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	12.5	388
30 min Summer	86.802	0.0	17.2	491
60 min Summer	54.368	0.0	22.0	596
120 min Summer	32.929	0.0	27.1	706
180 min Summer	24.243	0.0	30.1	776
240 min Summer	19.399	0.0	32.2	826
360 min Summer	14.081	0.0	35.2	900
480 min Summer	11.225	0.0	37.5	960
600 min Summer	9.408	0.0	39.3	1002
720 min Summer	8.140	0.0	40.8	1030
960 min Summer	6.474	0.0	43.2	1040
1440 min Summer	4.680	0.0	46.7	1442
2160 min Summer	3.378	0.0	50.2	1860
2880 min Summer	2.678	0.0	52.6	2172
4320 min Summer	1.927	0.0	55.9	2812

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Cascade Summary of Results for Road8.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
5760 min Summer	75.181	0.431	0.0	0.5	0.5	2.6	Flood Risk
7200 min Summer	75.133	0.383	0.0	0.5	0.5	2.0	Flood Risk
8640 min Summer	75.088	0.338	0.0	0.4	0.4	1.6	O K
10080 min Summer	75.049	0.299	0.0	0.4	0.4	1.2	O K
15 min Winter	75.074	0.324	0.0	0.4	0.4	1.4	O K
30 min Winter	75.122	0.372	0.0	0.5	0.5	1.9	Flood Risk
60 min Winter	75.167	0.417	0.0	0.5	0.5	2.4	Flood Risk
120 min Winter	75.208	0.458	0.0	0.5	0.5	2.9	Flood Risk
180 min Winter	75.231	0.481	0.0	0.5	0.5	3.2	Flood Risk
240 min Winter	75.246	0.496	0.0	0.6	0.6	3.4	Flood Risk
360 min Winter	75.266	0.516	0.0	0.6	0.6	3.6	Flood Risk
480 min Winter	75.280	0.530	0.0	0.6	0.6	3.8	Flood Risk
600 min Winter	75.290	0.540	0.0	0.6	0.6	3.9	Flood Risk
720 min Winter	75.297	0.547	0.0	0.6	0.6	4.0	Flood Risk
960 min Winter	75.307	0.557	0.0	0.6	0.6	4.1	Flood Risk
1440 min Winter	75.312	0.562	0.0	0.6	0.6	4.1	Flood Risk
2160 min Winter	75.282	0.532	0.0	0.6	0.6	3.8	Flood Risk
2880 min Winter	75.248	0.498	0.0	0.6	0.6	3.4	Flood Risk
4320 min Winter	75.162	0.412	0.0	0.5	0.5	2.3	Flood Risk
5760 min Winter	75.076	0.326	0.0	0.4	0.4	1.5	O K
7200 min Winter	75.009	0.259	0.0	0.4	0.4	0.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Summer	1.525	0.0	58.0	3472
7200 min Summer	1.271	0.0	59.4	4112
8640 min Summer	1.095	0.0	60.4	4752
10080 min Summer	0.965	0.0	61.1	5408
15 min Winter	132.106	0.0	12.5	388
30 min Winter	86.802	0.0	17.2	490
60 min Winter	54.368	0.0	22.0	594
120 min Winter	32.929	0.0	27.1	708
180 min Winter	24.243	0.0	30.1	776
240 min Winter	19.399	0.0	32.2	826
360 min Winter	14.081	0.0	35.2	902
480 min Winter	11.225	0.0	37.5	956
600 min Winter	9.408	0.0	39.3	990
720 min Winter	8.140	0.0	40.8	1008
960 min Winter	6.474	0.0	43.2	998
1440 min Winter	4.680	0.0	46.7	1412
2160 min Winter	3.378	0.0	50.2	1816
2880 min Winter	2.678	0.0	52.6	2120
4320 min Winter	1.927	0.0	55.9	2732
5760 min Winter	1.525	0.0	58.0	3320
7200 min Winter	1.271	0.0	59.5	3912

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Cascade Summary of Results for Road8.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Winter	74.961	0.211	0.0	0.3	0.3	0.6	O K
10080 min Winter	74.927	0.177	0.0	0.3	0.3	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.095	0.0	60.5	4536
10080 min Winter	0.965	0.0	61.2	5216

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Cascade Rainfall Details for Road8.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.004

Time (mins) From:	To:	Area (ha)
0	4	0.004

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Cascade Model Details for Road8.srcx

Storage is Online Cover Level (m) 75.400

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	9.0
Max Percolation (l/s)	11.5	Slope (1:X)	20.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	74.750	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 74.800

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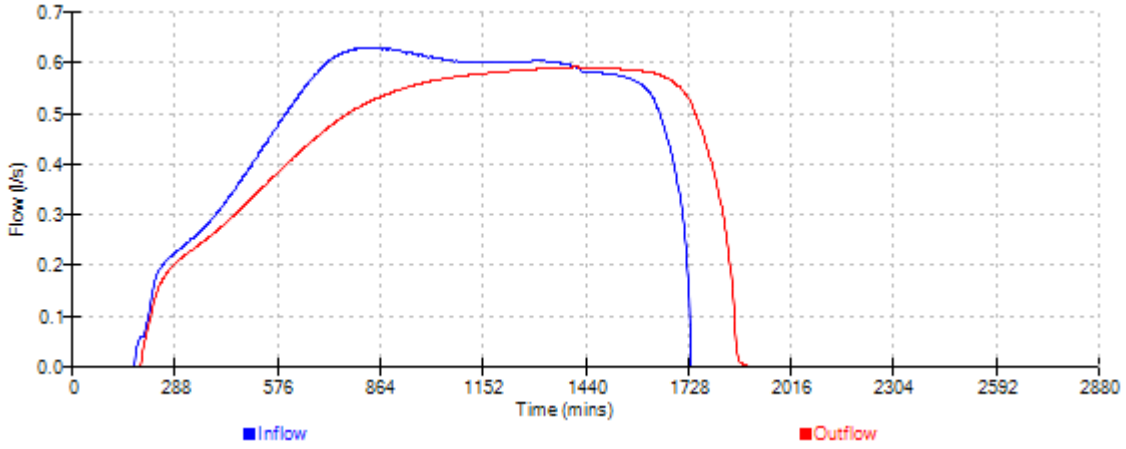
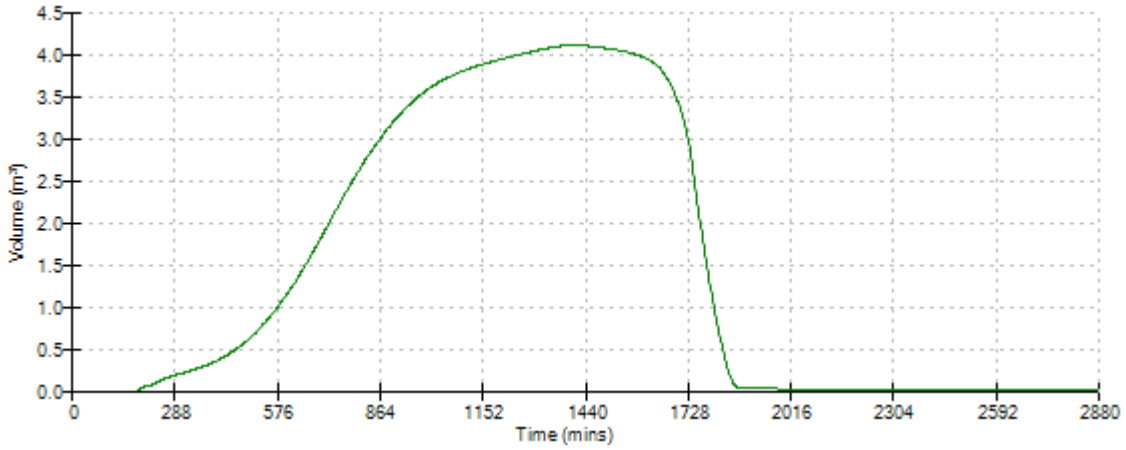
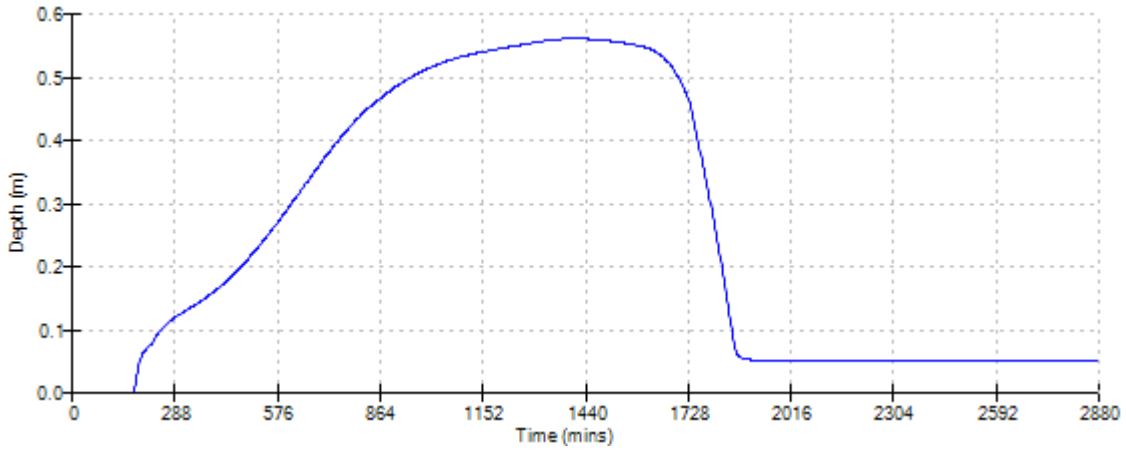
Cascade Event: 1440 min Winter for Road8.srcx







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Cascade Summary of Results for Road9.srcx

Upstream Structures	Outflow To	Overflow To
Road10.srcx	Road8.srcx	(None)
Road11.srcx		
Road12.srcx		
Road13.srcx		
Road14.srcx		

Half Drain Time : 55 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	75.532	0.282	0.0	0.4	0.4	1.1	O K
30 min Summer	75.581	0.331	0.0	0.5	0.5	1.5	O K
60 min Summer	75.626	0.376	0.0	0.5	0.5	2.0	Flood Risk
120 min Summer	75.667	0.417	0.0	0.5	0.5	2.4	Flood Risk
180 min Summer	75.689	0.439	0.0	0.5	0.5	2.7	Flood Risk
240 min Summer	75.704	0.454	0.0	0.6	0.6	2.8	Flood Risk
360 min Summer	75.722	0.472	0.0	0.6	0.6	3.1	Flood Risk
480 min Summer	75.734	0.484	0.0	0.6	0.6	3.2	Flood Risk
600 min Summer	75.742	0.492	0.0	0.6	0.6	3.3	Flood Risk
720 min Summer	75.748	0.498	0.0	0.6	0.6	3.4	Flood Risk
960 min Summer	75.755	0.505	0.0	0.6	0.6	3.5	Flood Risk
1440 min Summer	75.751	0.501	0.0	0.6	0.6	3.5	Flood Risk
2160 min Summer	75.728	0.478	0.0	0.6	0.6	3.2	Flood Risk
2880 min Summer	75.707	0.457	0.0	0.6	0.6	2.9	Flood Risk
4320 min Summer	75.659	0.409	0.0	0.5	0.5	2.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	11.5	306
30 min Summer	86.802	0.0	15.8	389
60 min Summer	54.368	0.0	20.2	478
120 min Summer	32.929	0.0	24.9	570
180 min Summer	24.243	0.0	27.6	630
240 min Summer	19.399	0.0	29.5	670
360 min Summer	14.081	0.0	32.3	730
480 min Summer	11.225	0.0	34.3	780
600 min Summer	9.408	0.0	36.0	816
720 min Summer	8.140	0.0	37.4	848
960 min Summer	6.474	0.0	39.6	964
1440 min Summer	4.680	0.0	42.8	1424
2160 min Summer	3.378	0.0	46.0	1716
2880 min Summer	2.678	0.0	48.2	2024
4320 min Summer	1.927	0.0	51.2	2688

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Cascade Summary of Results for Road9.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
5760 min Summer	75.606	0.356	0.0	0.5	0.5	1.7	Flood Risk
7200 min Summer	75.554	0.304	0.0	0.5	0.5	1.3	O K
8640 min Summer	75.509	0.259	0.0	0.4	0.4	0.9	O K
10080 min Summer	75.471	0.221	0.0	0.4	0.4	0.7	O K
15 min Winter	75.533	0.283	0.0	0.4	0.4	1.1	O K
30 min Winter	75.581	0.331	0.0	0.5	0.5	1.5	O K
60 min Winter	75.626	0.376	0.0	0.5	0.5	1.9	Flood Risk
120 min Winter	75.667	0.417	0.0	0.5	0.5	2.4	Flood Risk
180 min Winter	75.689	0.439	0.0	0.5	0.5	2.7	Flood Risk
240 min Winter	75.704	0.454	0.0	0.6	0.6	2.8	Flood Risk
360 min Winter	75.722	0.472	0.0	0.6	0.6	3.1	Flood Risk
480 min Winter	75.735	0.485	0.0	0.6	0.6	3.3	Flood Risk
600 min Winter	75.744	0.494	0.0	0.6	0.6	3.4	Flood Risk
720 min Winter	75.750	0.500	0.0	0.6	0.6	3.4	Flood Risk
960 min Winter	75.758	0.508	0.0	0.6	0.6	3.5	Flood Risk
1440 min Winter	75.750	0.500	0.0	0.6	0.6	3.4	Flood Risk
2160 min Winter	75.715	0.465	0.0	0.6	0.6	3.0	Flood Risk
2880 min Winter	75.676	0.426	0.0	0.5	0.5	2.5	Flood Risk
4320 min Winter	75.579	0.329	0.0	0.5	0.5	1.5	O K
5760 min Winter	75.492	0.242	0.0	0.4	0.4	0.8	O K
7200 min Winter	75.430	0.180	0.0	0.3	0.3	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Summer	1.525	0.0	53.2	3352
7200 min Summer	1.271	0.0	54.5	4000
8640 min Summer	1.095	0.0	55.4	4664
10080 min Summer	0.965	0.0	56.0	5320
15 min Winter	132.106	0.0	11.5	303
30 min Winter	86.802	0.0	15.8	388
60 min Winter	54.368	0.0	20.2	478
120 min Winter	32.929	0.0	24.9	570
180 min Winter	24.243	0.0	27.6	630
240 min Winter	19.399	0.0	29.5	672
360 min Winter	14.081	0.0	32.3	728
480 min Winter	11.225	0.0	34.3	772
600 min Winter	9.408	0.0	36.0	798
720 min Winter	8.140	0.0	37.4	816
960 min Winter	6.474	0.0	39.6	954
1440 min Winter	4.680	0.0	42.8	1378
2160 min Winter	3.378	0.0	46.0	1668
2880 min Winter	2.678	0.0	48.2	1996
4320 min Winter	1.927	0.0	51.3	2616
5760 min Winter	1.525	0.0	53.2	3216
7200 min Winter	1.271	0.0	54.6	3824

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Cascade Summary of Results for Road9.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Winter	75.388	0.138	0.0	0.3	0.3	0.3	O K
10080 min Winter	75.359	0.109	0.0	0.3	0.3	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.095	0.0	55.5	4456
10080 min Winter	0.965	0.0	56.2	5152

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Cascade Rainfall Details for Road9.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.004

Time (mins) From:	To:	Area (ha)
0	4	0.004

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Cascade Model Details for Road9.srcx

Storage is Online Cover Level (m) 75.900

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	9.2
Max Percolation (l/s)	11.8	Slope (1:X)	20.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	75.250	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 75.250

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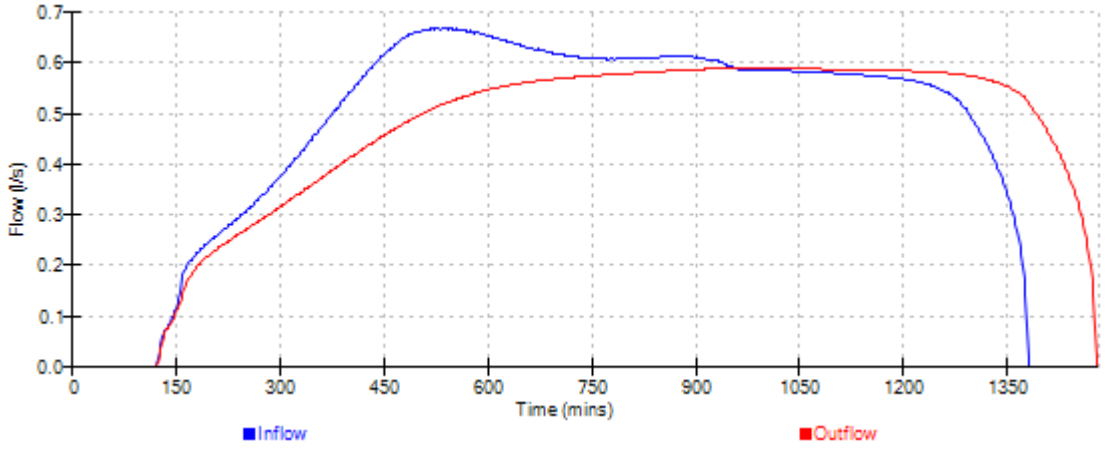
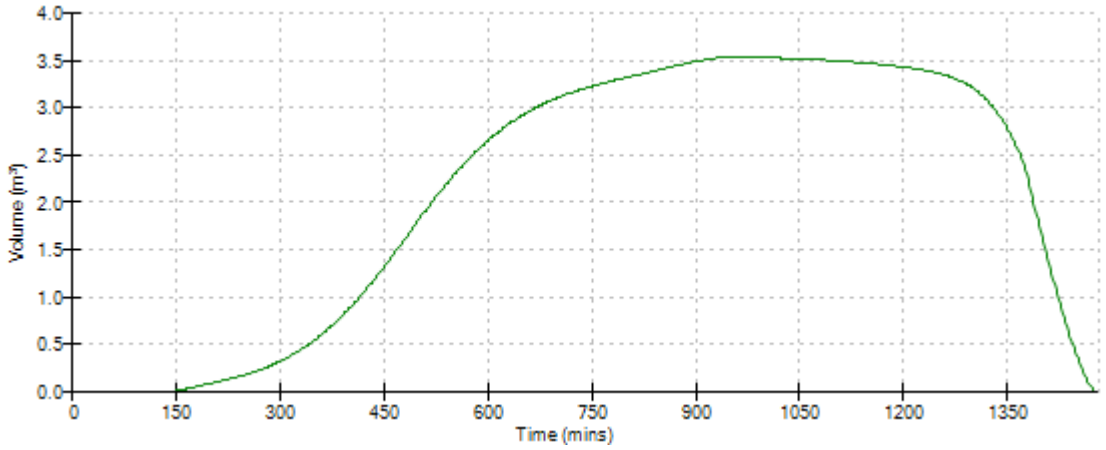
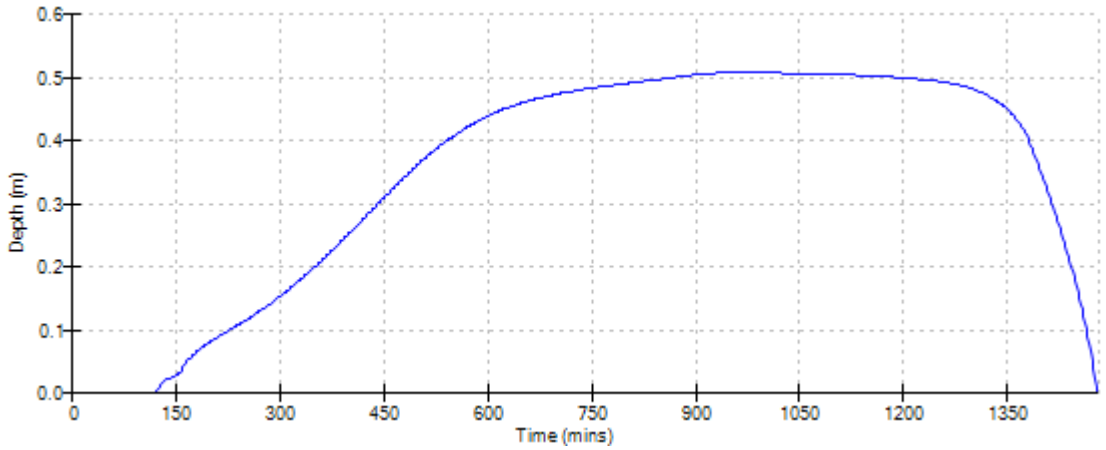
Cascade Event: 960 min Winter for Road9.srcx







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Cascade Summary of Results for Road10.srcx

Upstream Structures	Outflow To	Overflow To
Road11.srcx	Road9.srcx	(None)
Road12.srcx		
Road13.srcx		
Road14.srcx		

Half Drain Time : 54 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	75.987	0.287	0.0	0.4	0.4	1.1	O K
30 min Summer	76.036	0.336	0.0	0.5	0.5	1.6	O K
60 min Summer	76.081	0.381	0.0	0.5	0.5	2.0	Flood Risk
120 min Summer	76.123	0.423	0.0	0.5	0.5	2.5	Flood Risk
180 min Summer	76.145	0.445	0.0	0.6	0.6	2.7	Flood Risk
240 min Summer	76.158	0.458	0.0	0.6	0.6	2.9	Flood Risk
360 min Summer	76.176	0.476	0.0	0.6	0.6	3.1	Flood Risk
480 min Summer	76.188	0.488	0.0	0.6	0.6	3.3	Flood Risk
600 min Summer	76.195	0.495	0.0	0.6	0.6	3.4	Flood Risk
720 min Summer	76.201	0.501	0.0	0.6	0.6	3.4	Flood Risk
960 min Summer	76.204	0.504	0.0	0.6	0.6	3.5	Flood Risk
1440 min Summer	76.187	0.487	0.0	0.6	0.6	3.3	Flood Risk
2160 min Summer	76.162	0.462	0.0	0.6	0.6	3.0	Flood Risk
2880 min Summer	76.137	0.437	0.0	0.5	0.5	2.6	Flood Risk
4320 min Summer	76.080	0.380	0.0	0.5	0.5	2.0	Flood Risk
5760 min Summer	76.021	0.321	0.0	0.5	0.5	1.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	10.5	234
30 min Summer	86.802	0.0	14.3	299
60 min Summer	54.368	0.0	18.4	370
120 min Summer	32.929	0.0	22.6	446
180 min Summer	24.243	0.0	25.1	496
240 min Summer	19.399	0.0	26.8	538
360 min Summer	14.081	0.0	29.3	594
480 min Summer	11.225	0.0	31.2	636
600 min Summer	9.408	0.0	32.7	678
720 min Summer	8.140	0.0	33.9	724
960 min Summer	6.474	0.0	35.9	962
1440 min Summer	4.680	0.0	38.8	1256
2160 min Summer	3.378	0.0	41.8	1576
2880 min Summer	2.678	0.0	43.8	1904
4320 min Summer	1.927	0.0	46.5	2592
5760 min Summer	1.525	0.0	48.3	3256

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Cascade Summary of Results for Road10.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200 min Summer	75.969	0.269	0.0	0.4	0.4	1.0	O K
8640 min Summer	75.926	0.226	0.0	0.4	0.4	0.7	O K
10080 min Summer	75.890	0.190	0.0	0.4	0.4	0.5	O K
15 min Winter	75.987	0.287	0.0	0.4	0.4	1.1	O K
30 min Winter	76.036	0.336	0.0	0.5	0.5	1.6	O K
60 min Winter	76.081	0.381	0.0	0.5	0.5	2.0	Flood Risk
120 min Winter	76.123	0.423	0.0	0.5	0.5	2.5	Flood Risk
180 min Winter	76.145	0.445	0.0	0.6	0.6	2.7	Flood Risk
240 min Winter	76.159	0.459	0.0	0.6	0.6	2.9	Flood Risk
360 min Winter	76.176	0.476	0.0	0.6	0.6	3.1	Flood Risk
480 min Winter	76.189	0.489	0.0	0.6	0.6	3.3	Flood Risk
600 min Winter	76.197	0.497	0.0	0.6	0.6	3.4	Flood Risk
720 min Winter	76.202	0.502	0.0	0.6	0.6	3.4	Flood Risk
960 min Winter	76.204	0.504	0.0	0.6	0.6	3.5	Flood Risk
1440 min Winter	76.182	0.482	0.0	0.6	0.6	3.2	Flood Risk
2160 min Winter	76.142	0.442	0.0	0.5	0.5	2.7	Flood Risk
2880 min Winter	76.092	0.392	0.0	0.5	0.5	2.1	Flood Risk
4320 min Winter	75.988	0.288	0.0	0.4	0.4	1.1	O K
5760 min Winter	75.906	0.206	0.0	0.4	0.4	0.6	O K
7200 min Winter	75.852	0.152	0.0	0.3	0.3	0.3	O K
8640 min Winter	75.816	0.116	0.0	0.3	0.3	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Summer	1.271	0.0	49.5	3904
8640 min Summer	1.095	0.0	50.4	4576
10080 min Summer	0.965	0.0	51.0	5248
15 min Winter	132.106	0.0	10.5	234
30 min Winter	86.802	0.0	14.3	301
60 min Winter	54.368	0.0	18.4	370
120 min Winter	32.929	0.0	22.6	446
180 min Winter	24.243	0.0	25.1	496
240 min Winter	19.399	0.0	26.8	534
360 min Winter	14.081	0.0	29.3	590
480 min Winter	11.225	0.0	31.2	626
600 min Winter	9.408	0.0	32.7	658
720 min Winter	8.140	0.0	33.9	718
960 min Winter	6.474	0.0	35.9	942
1440 min Winter	4.680	0.0	38.8	1252
2160 min Winter	3.378	0.0	41.8	1560
2880 min Winter	2.678	0.0	43.8	1904
4320 min Winter	1.927	0.0	46.6	2524
5760 min Winter	1.525	0.0	48.4	3144
7200 min Winter	1.271	0.0	49.6	3760
8640 min Winter	1.095	0.0	50.5	4424

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Cascade Summary of Results for Road10.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	75.792	0.092	0.0	0.2	0.2	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.965	0.0	51.1	5120

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Cascade Rainfall Details for Road10.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.004

Time (mins) From:	To:	Area (ha)
0	4	0.004

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Cascade Model Details for Road10.srcx

Storage is Online Cover Level (m) 76.350

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	8.8
Max Percolation (l/s)	11.2	Slope (1:X)	20.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	75.700	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 75.700

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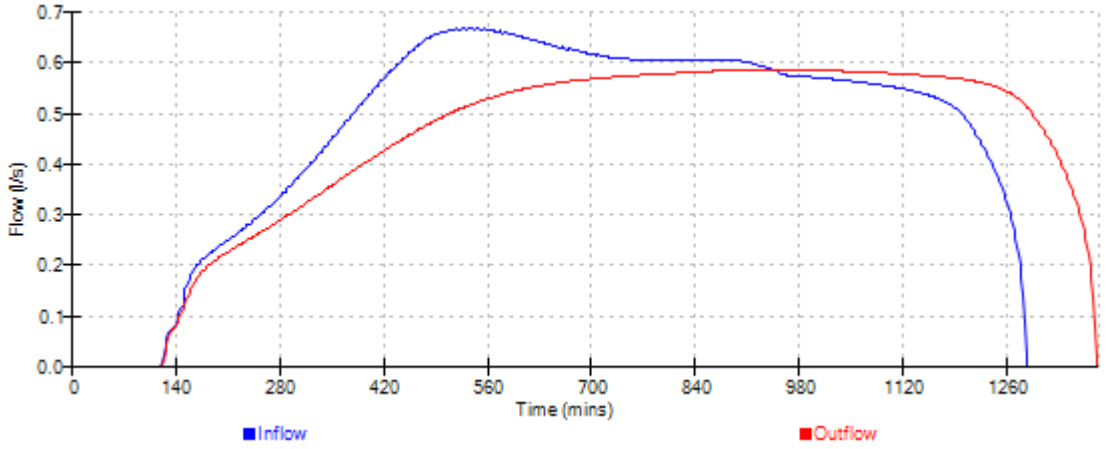
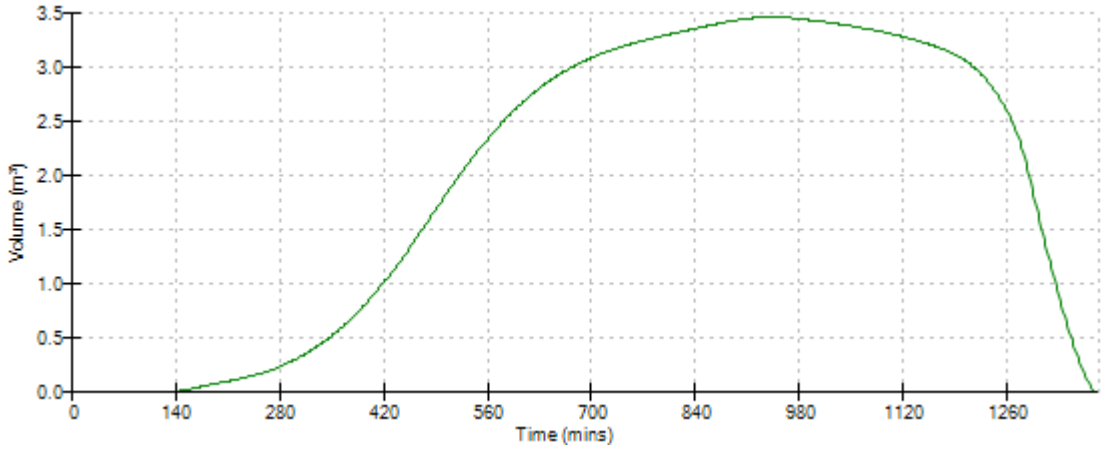
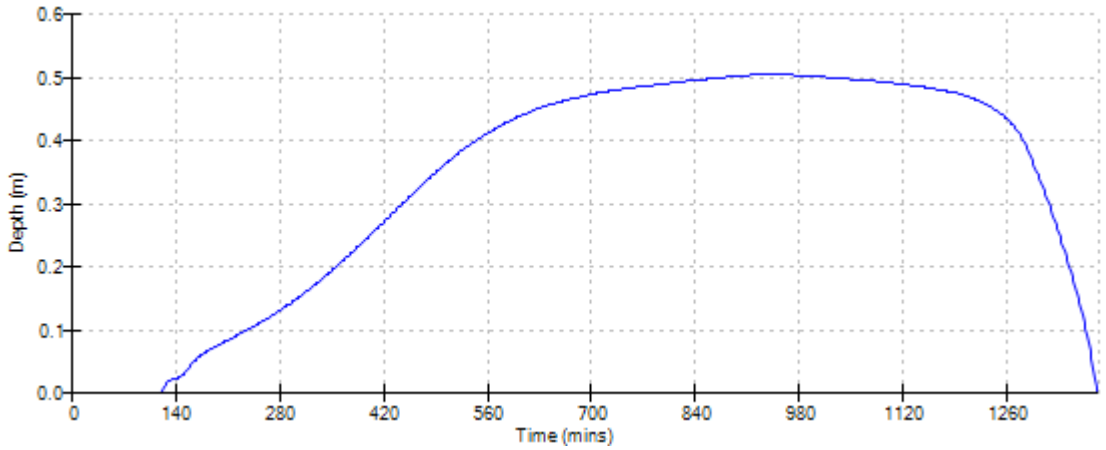
Cascade Event: 960 min Winter for Road10.srcx







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Cascade Summary of Results for Road11.srcx

Upstream Structures	Outflow To	Overflow To
Road12.srcx	Road10.srcx	(None)
Road13.srcx		
Road14.srcx		

Half Drain Time : 54 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	76.444	0.294	0.0	0.4	0.4	1.2	O K
30 min Summer	76.494	0.344	0.0	0.5	0.5	1.6	O K
60 min Summer	76.540	0.390	0.0	0.5	0.5	2.1	Flood Risk
120 min Summer	76.582	0.432	0.0	0.5	0.5	2.6	Flood Risk
180 min Summer	76.604	0.454	0.0	0.6	0.6	2.8	Flood Risk
240 min Summer	76.617	0.467	0.0	0.6	0.6	3.0	Flood Risk
360 min Summer	76.633	0.483	0.0	0.6	0.6	3.2	Flood Risk
480 min Summer	76.644	0.494	0.0	0.6	0.6	3.4	Flood Risk
600 min Summer	76.649	0.499	0.0	0.6	0.6	3.4	Flood Risk
720 min Summer	76.650	0.500	0.0	0.6	0.6	3.4	Flood Risk
960 min Summer	76.641	0.491	0.0	0.6	0.6	3.3	Flood Risk
1440 min Summer	76.621	0.471	0.0	0.6	0.6	3.1	Flood Risk
2160 min Summer	76.592	0.442	0.0	0.5	0.5	2.7	Flood Risk
2880 min Summer	76.560	0.410	0.0	0.5	0.5	2.3	Flood Risk
4320 min Summer	76.493	0.343	0.0	0.5	0.5	1.6	O K
5760 min Summer	76.432	0.282	0.0	0.4	0.4	1.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	9.4	155
30 min Summer	86.802	0.0	12.9	201
60 min Summer	54.368	0.0	16.5	250
120 min Summer	32.929	0.0	20.3	308
180 min Summer	24.243	0.0	22.5	352
240 min Summer	19.399	0.0	24.1	386
360 min Summer	14.081	0.0	26.3	448
480 min Summer	11.225	0.0	28.0	502
600 min Summer	9.408	0.0	29.4	604
720 min Summer	8.140	0.0	30.5	722
960 min Summer	6.474	0.0	32.3	892
1440 min Summer	4.680	0.0	34.9	1104
2160 min Summer	3.378	0.0	37.5	1448
2880 min Summer	2.678	0.0	39.4	1804
4320 min Summer	1.927	0.0	41.8	2500
5760 min Summer	1.525	0.0	43.4	3168

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Cascade Summary of Results for Road11.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200 min Summer	76.381	0.231	0.0	0.4	0.4	0.7	O K
8640 min Summer	76.341	0.191	0.0	0.4	0.4	0.5	O K
10080 min Summer	76.310	0.160	0.0	0.3	0.3	0.4	O K
15 min Winter	76.444	0.294	0.0	0.4	0.4	1.2	O K
30 min Winter	76.494	0.344	0.0	0.5	0.5	1.6	O K
60 min Winter	76.540	0.390	0.0	0.5	0.5	2.1	Flood Risk
120 min Winter	76.582	0.432	0.0	0.5	0.5	2.6	Flood Risk
180 min Winter	76.604	0.454	0.0	0.6	0.6	2.8	Flood Risk
240 min Winter	76.617	0.467	0.0	0.6	0.6	3.0	Flood Risk
360 min Winter	76.634	0.484	0.0	0.6	0.6	3.2	Flood Risk
480 min Winter	76.644	0.494	0.0	0.6	0.6	3.4	Flood Risk
600 min Winter	76.650	0.500	0.0	0.6	0.6	3.4	Flood Risk
720 min Winter	76.650	0.500	0.0	0.6	0.6	3.4	Flood Risk
960 min Winter	76.640	0.490	0.0	0.6	0.6	3.3	Flood Risk
1440 min Winter	76.610	0.460	0.0	0.6	0.6	2.9	Flood Risk
2160 min Winter	76.559	0.409	0.0	0.5	0.5	2.3	Flood Risk
2880 min Winter	76.500	0.350	0.0	0.5	0.5	1.7	Flood Risk
4320 min Winter	76.394	0.244	0.0	0.4	0.4	0.8	O K
5760 min Winter	76.321	0.171	0.0	0.3	0.3	0.4	O K
7200 min Winter	76.275	0.125	0.0	0.3	0.3	0.2	O K
8640 min Winter	76.246	0.096	0.0	0.2	0.2	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Summer	1.271	0.0	44.6	3824
8640 min Summer	1.095	0.0	45.3	4504
10080 min Summer	0.965	0.0	45.9	5192
15 min Winter	132.106	0.0	9.4	155
30 min Winter	86.802	0.0	12.9	201
60 min Winter	54.368	0.0	16.5	250
120 min Winter	32.929	0.0	20.3	308
180 min Winter	24.243	0.0	22.5	352
240 min Winter	19.399	0.0	24.1	384
360 min Winter	14.081	0.0	26.3	444
480 min Winter	11.225	0.0	28.0	496
600 min Winter	9.408	0.0	29.4	596
720 min Winter	8.140	0.0	30.5	708
960 min Winter	6.474	0.0	32.3	898
1440 min Winter	4.680	0.0	34.9	1100
2160 min Winter	3.378	0.0	37.5	1468
2880 min Winter	2.678	0.0	39.4	1812
4320 min Winter	1.927	0.0	41.9	2436
5760 min Winter	1.525	0.0	43.5	3064
7200 min Winter	1.271	0.0	44.6	3744
8640 min Winter	1.095	0.0	45.4	4408

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Cascade Summary of Results for Road11.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	76.226	0.076	0.0	0.2	0.2	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.965	0.0	46.0	5096

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Cascade Rainfall Details for Road11.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.004

Time (mins) From:	To:	Area (ha)
0	4	0.004

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Cascade Model Details for Road11.srcx

Storage is Online Cover Level (m) 76.800

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	9.1
Max Percolation (l/s)	11.6	Slope (1:X)	20.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	76.150	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 76.150

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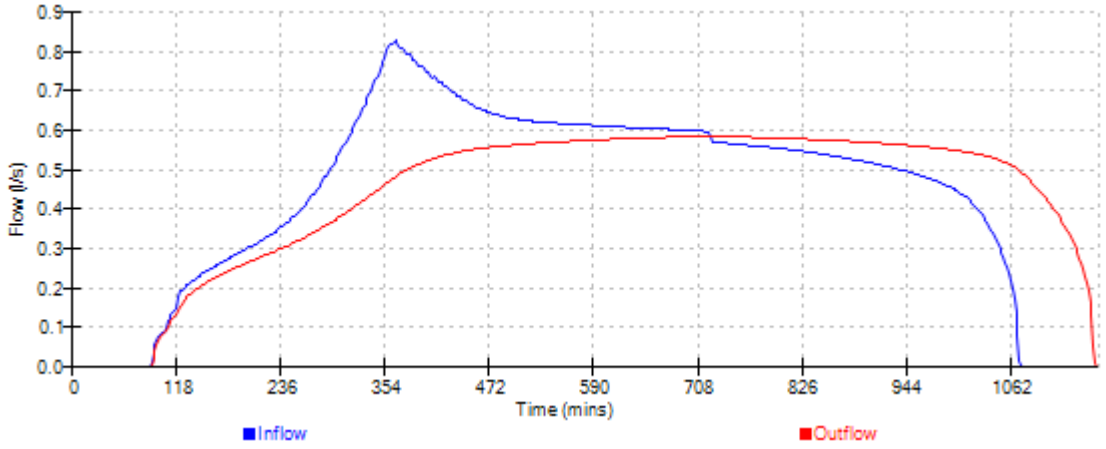
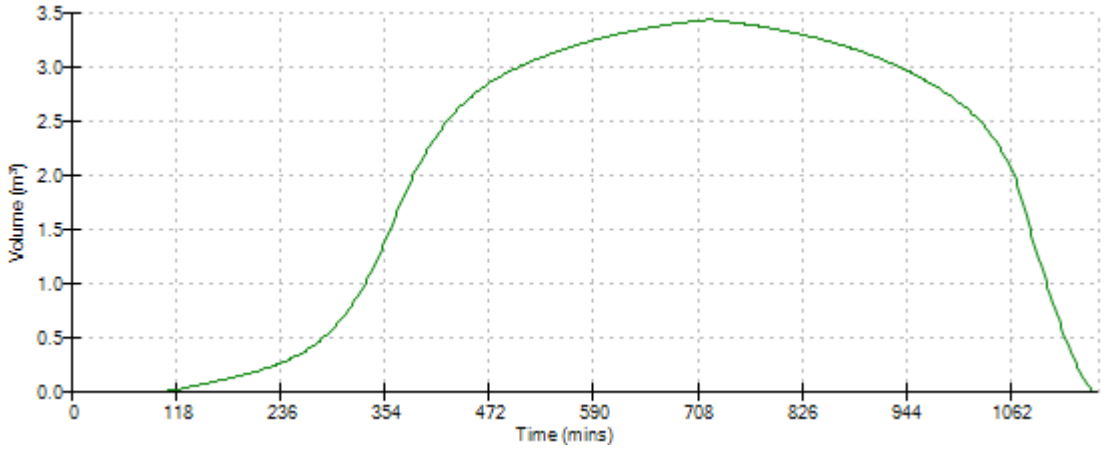
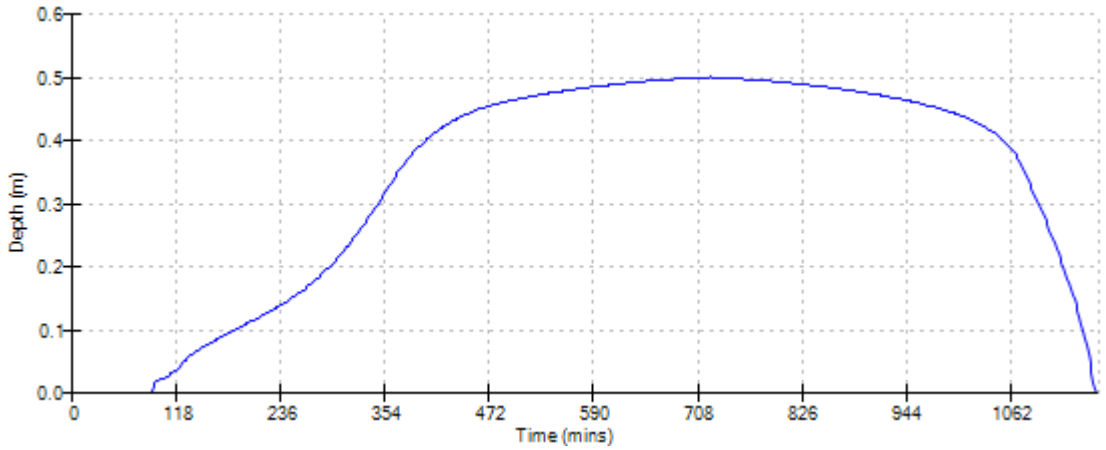
Cascade Event: 720 min Summer for Road11.srcx







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Cascade Summary of Results for Road12.srcx

Upstream Structures	Outflow To	Overflow To
Road13.srcx Road14.srcx	Road11.srcx	(None)

Half Drain Time : 55 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	76.914	0.314	0.0	0.5	0.5	1.4	O K
30 min Summer	76.967	0.367	0.0	0.5	0.5	1.9	Flood Risk
60 min Summer	77.015	0.415	0.0	0.5	0.5	2.4	Flood Risk
120 min Summer	77.057	0.457	0.0	0.6	0.6	2.9	Flood Risk
180 min Summer	77.078	0.478	0.0	0.6	0.6	3.2	Flood Risk
240 min Summer	77.089	0.489	0.0	0.6	0.6	3.3	Flood Risk
360 min Summer	77.098	0.498	0.0	0.6	0.6	3.4	Flood Risk
480 min Summer	77.098	0.498	0.0	0.6	0.6	3.4	Flood Risk
600 min Summer	77.092	0.492	0.0	0.6	0.6	3.4	Flood Risk
720 min Summer	77.086	0.486	0.0	0.6	0.6	3.3	Flood Risk
960 min Summer	77.074	0.474	0.0	0.6	0.6	3.1	Flood Risk
1440 min Summer	77.051	0.451	0.0	0.6	0.6	2.8	Flood Risk
2160 min Summer	77.012	0.412	0.0	0.5	0.5	2.3	Flood Risk
2880 min Summer	76.972	0.372	0.0	0.5	0.5	1.9	Flood Risk
4320 min Summer	76.897	0.297	0.0	0.4	0.4	1.2	O K
5760 min Summer	76.837	0.237	0.0	0.4	0.4	0.8	O K
7200 min Summer	76.791	0.191	0.0	0.4	0.4	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	8.4	39
30 min Summer	86.802	0.0	11.4	52
60 min Summer	54.368	0.0	14.6	68
120 min Summer	32.929	0.0	18.0	124
180 min Summer	24.243	0.0	20.0	184
240 min Summer	19.399	0.0	21.4	244
360 min Summer	14.081	0.0	23.4	362
480 min Summer	11.225	0.0	24.9	480
600 min Summer	9.408	0.0	26.0	546
720 min Summer	8.140	0.0	27.0	600
960 min Summer	6.474	0.0	28.6	712
1440 min Summer	4.680	0.0	31.0	960
2160 min Summer	3.378	0.0	33.3	1340
2880 min Summer	2.678	0.0	34.9	1704
4320 min Summer	1.927	0.0	37.1	2400
5760 min Summer	1.525	0.0	38.6	3080
7200 min Summer	1.271	0.0	39.6	3752

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Cascade Summary of Results for Road12.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	76.756	0.156	0.0	0.3	0.3	0.3	O K
10080 min Summer	76.730	0.130	0.0	0.3	0.3	0.2	O K
15 min Winter	76.914	0.314	0.0	0.5	0.5	1.4	O K
30 min Winter	76.967	0.367	0.0	0.5	0.5	1.9	Flood Risk
60 min Winter	77.015	0.415	0.0	0.5	0.5	2.4	Flood Risk
120 min Winter	77.057	0.457	0.0	0.6	0.6	2.9	Flood Risk
180 min Winter	77.078	0.478	0.0	0.6	0.6	3.2	Flood Risk
240 min Winter	77.089	0.489	0.0	0.6	0.6	3.3	Flood Risk
360 min Winter	77.099	0.499	0.0	0.6	0.6	3.4	Flood Risk
480 min Winter	77.099	0.499	0.0	0.6	0.6	3.4	Flood Risk
600 min Winter	77.093	0.493	0.0	0.6	0.6	3.4	Flood Risk
720 min Winter	77.084	0.484	0.0	0.6	0.6	3.3	Flood Risk
960 min Winter	77.068	0.468	0.0	0.6	0.6	3.0	Flood Risk
1440 min Winter	77.029	0.429	0.0	0.5	0.5	2.5	Flood Risk
2160 min Winter	76.963	0.363	0.0	0.5	0.5	1.8	Flood Risk
2880 min Winter	76.899	0.299	0.0	0.4	0.4	1.2	O K
4320 min Winter	76.800	0.200	0.0	0.4	0.4	0.6	O K
5760 min Winter	76.738	0.138	0.0	0.3	0.3	0.3	O K
7200 min Winter	76.701	0.101	0.0	0.3	0.3	0.1	O K
8640 min Winter	76.677	0.077	0.0	0.2	0.2	0.1	O K
10080 min Winter	76.662	0.062	0.0	0.2	0.2	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.095	0.0	40.3	4464
10080 min Summer	0.965	0.0	40.8	5152
15 min Winter	132.106	0.0	8.4	39
30 min Winter	86.802	0.0	11.4	52
60 min Winter	54.368	0.0	14.6	68
120 min Winter	32.929	0.0	18.0	124
180 min Winter	24.243	0.0	20.0	182
240 min Winter	19.399	0.0	21.4	240
360 min Winter	14.081	0.0	23.4	354
480 min Winter	11.225	0.0	24.9	464
600 min Winter	9.408	0.0	26.0	562
720 min Winter	8.140	0.0	27.0	606
960 min Winter	6.474	0.0	28.6	730
1440 min Winter	4.680	0.0	31.0	998
2160 min Winter	3.378	0.0	33.3	1376
2880 min Winter	2.678	0.0	34.9	1720
4320 min Winter	1.927	0.0	37.2	2376
5760 min Winter	1.525	0.0	38.6	3016
7200 min Winter	1.271	0.0	39.6	3688
8640 min Winter	1.095	0.0	40.4	4408
10080 min Winter	0.965	0.0	40.9	5072

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Cascade Rainfall Details for Road12.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.005

Time (mins) From:	To:	Area (ha)
0	4	0.005

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Cascade Model Details for Road12.srcx

Storage is Online Cover Level (m) 77.250

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	9.9
Max Percolation (l/s)	12.7	Slope (1:X)	20.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	76.600	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 76.600

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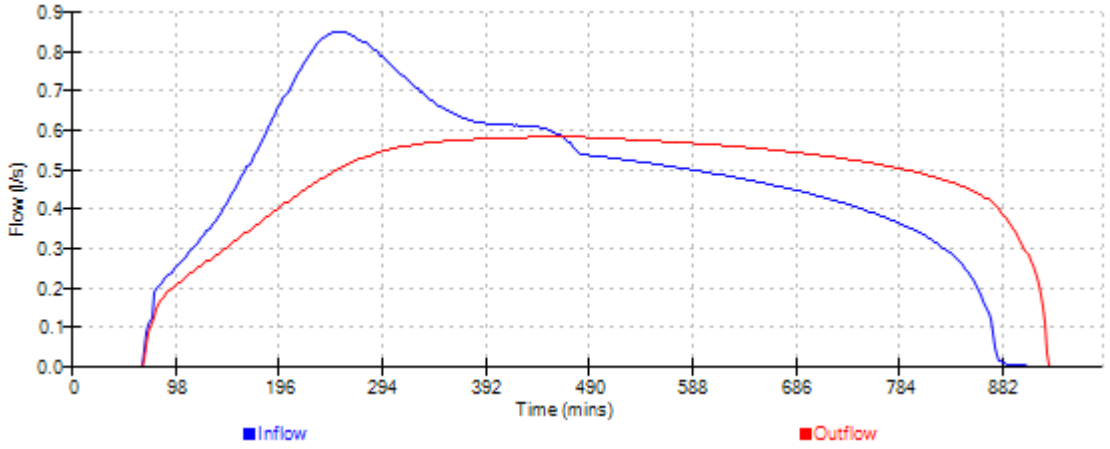
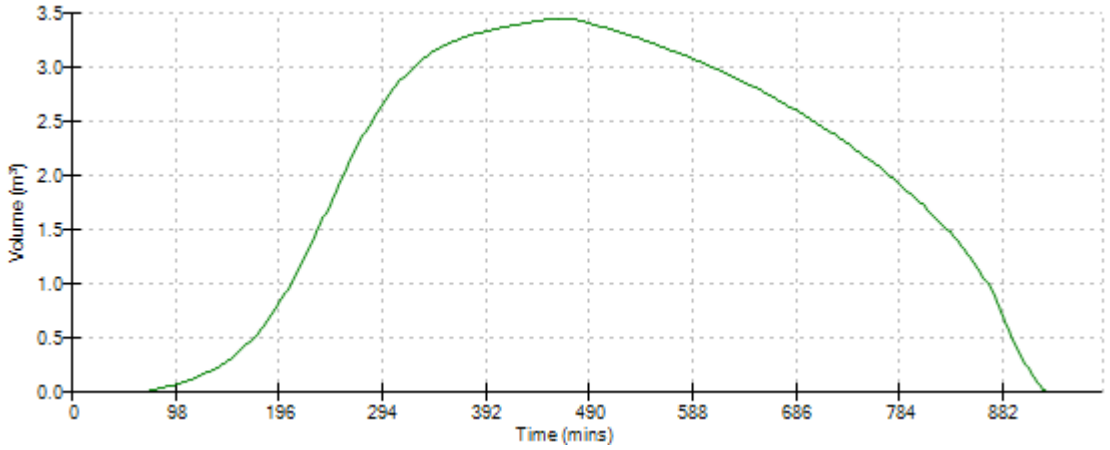
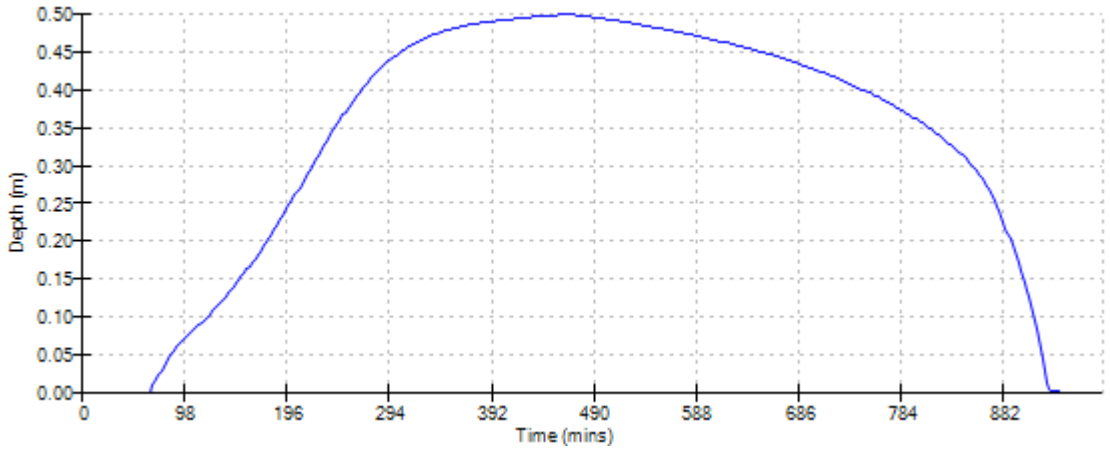
Cascade Event: 480 min Winter for Road12.srcx







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Cascade Summary of Results for Road13.srcx

Upstream Structures	Outflow To	Overflow To
Road14.srcx	Road12.srcx	(None)

Half Drain Time : 99 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	77.375	0.325	0.0	0.5	0.5	2.9	O K
30 min Summer	77.425	0.375	0.0	0.5	0.5	3.9	Flood Risk
60 min Summer	77.467	0.417	0.0	0.5	0.5	4.8	Flood Risk
120 min Summer	77.498	0.448	0.0	0.6	0.6	5.5	Flood Risk
180 min Summer	77.508	0.458	0.0	0.6	0.6	5.8	Flood Risk
240 min Summer	77.509	0.459	0.0	0.6	0.6	5.8	Flood Risk
360 min Summer	77.504	0.454	0.0	0.6	0.6	5.7	Flood Risk
480 min Summer	77.498	0.448	0.0	0.6	0.6	5.5	Flood Risk
600 min Summer	77.491	0.441	0.0	0.5	0.5	5.4	Flood Risk
720 min Summer	77.483	0.433	0.0	0.5	0.5	5.2	Flood Risk
960 min Summer	77.467	0.417	0.0	0.5	0.5	4.8	Flood Risk
1440 min Summer	77.434	0.384	0.0	0.5	0.5	4.1	Flood Risk
2160 min Summer	77.387	0.337	0.0	0.5	0.5	3.1	O K
2880 min Summer	77.345	0.295	0.0	0.4	0.4	2.4	O K
4320 min Summer	77.277	0.227	0.0	0.4	0.4	1.4	O K
5760 min Summer	77.227	0.177	0.0	0.3	0.3	0.9	O K
7200 min Summer	77.191	0.141	0.0	0.3	0.3	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	7.0	19
30 min Summer	86.802	0.0	9.6	33
60 min Summer	54.368	0.0	12.3	62
120 min Summer	32.929	0.0	15.1	122
180 min Summer	24.243	0.0	16.8	180
240 min Summer	19.399	0.0	18.0	240
360 min Summer	14.081	0.0	19.6	296
480 min Summer	11.225	0.0	20.9	358
600 min Summer	9.408	0.0	21.9	422
720 min Summer	8.140	0.0	22.7	490
960 min Summer	6.474	0.0	24.0	624
1440 min Summer	4.680	0.0	26.0	888
2160 min Summer	3.378	0.0	27.9	1272
2880 min Summer	2.678	0.0	29.3	1640
4320 min Summer	1.927	0.0	31.2	2336
5760 min Summer	1.525	0.0	32.4	3040
7200 min Summer	1.271	0.0	33.3	3744

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Cascade Summary of Results for Road13.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	77.165	0.115	0.0	0.3	0.3	0.4	O K
10080 min Summer	77.146	0.096	0.0	0.2	0.2	0.3	O K
15 min Winter	77.375	0.325	0.0	0.5	0.5	2.9	O K
30 min Winter	77.425	0.375	0.0	0.5	0.5	3.9	Flood Risk
60 min Winter	77.467	0.417	0.0	0.5	0.5	4.8	Flood Risk
120 min Winter	77.499	0.449	0.0	0.6	0.6	5.6	Flood Risk
180 min Winter	77.509	0.459	0.0	0.6	0.6	5.8	Flood Risk
240 min Winter	77.510	0.460	0.0	0.6	0.6	5.9	Flood Risk
360 min Winter	77.503	0.453	0.0	0.6	0.6	5.7	Flood Risk
480 min Winter	77.495	0.445	0.0	0.6	0.6	5.5	Flood Risk
600 min Winter	77.485	0.435	0.0	0.5	0.5	5.2	Flood Risk
720 min Winter	77.474	0.424	0.0	0.5	0.5	5.0	Flood Risk
960 min Winter	77.450	0.400	0.0	0.5	0.5	4.4	Flood Risk
1440 min Winter	77.400	0.350	0.0	0.5	0.5	3.4	Flood Risk
2160 min Winter	77.332	0.282	0.0	0.4	0.4	2.2	O K
2880 min Winter	77.275	0.225	0.0	0.4	0.4	1.4	O K
4320 min Winter	77.196	0.146	0.0	0.3	0.3	0.6	O K
5760 min Winter	77.151	0.101	0.0	0.3	0.3	0.3	O K
7200 min Winter	77.124	0.074	0.0	0.2	0.2	0.2	O K
8640 min Winter	77.108	0.058	0.0	0.2	0.2	0.1	O K
10080 min Winter	77.097	0.047	0.0	0.2	0.2	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.095	0.0	33.9	4416
10080 min Summer	0.965	0.0	34.3	5144
15 min Winter	132.106	0.0	7.0	18
30 min Winter	86.802	0.0	9.6	33
60 min Winter	54.368	0.0	12.3	62
120 min Winter	32.929	0.0	15.1	120
180 min Winter	24.243	0.0	16.8	176
240 min Winter	19.399	0.0	18.0	232
360 min Winter	14.081	0.0	19.6	318
480 min Winter	11.225	0.0	20.9	370
600 min Winter	9.408	0.0	21.9	446
720 min Winter	8.140	0.0	22.7	520
960 min Winter	6.474	0.0	24.0	664
1440 min Winter	4.680	0.0	26.0	936
2160 min Winter	3.378	0.0	27.9	1300
2880 min Winter	2.678	0.0	29.3	1648
4320 min Winter	1.927	0.0	31.2	2332
5760 min Winter	1.525	0.0	32.4	3000
7200 min Winter	1.271	0.0	33.3	3672
8640 min Winter	1.095	0.0	33.9	4400
10080 min Winter	0.965	0.0	34.4	5128

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Cascade Rainfall Details for Road13.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.011

Time (mins) From:	To:	Area (ha)
0	4	0.011

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Cascade Model Details for Road13.srcx

Storage is Online Cover Level (m) 77.700

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	18.2
Max Percolation (l/s)	23.3	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	77.050	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 77.050

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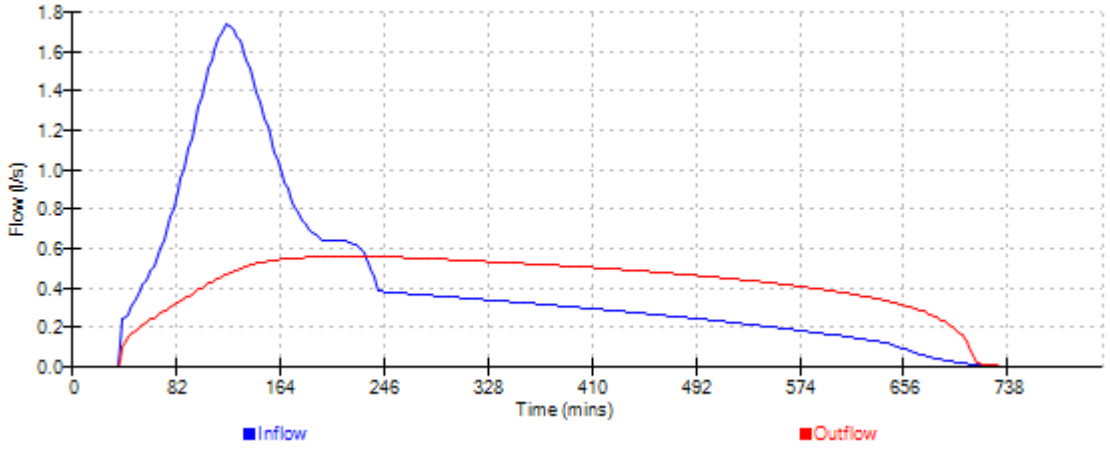
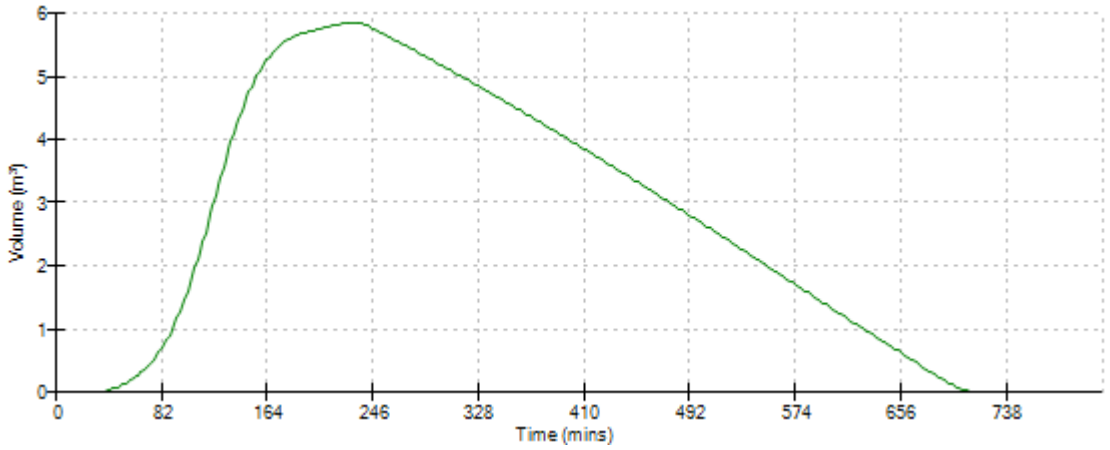
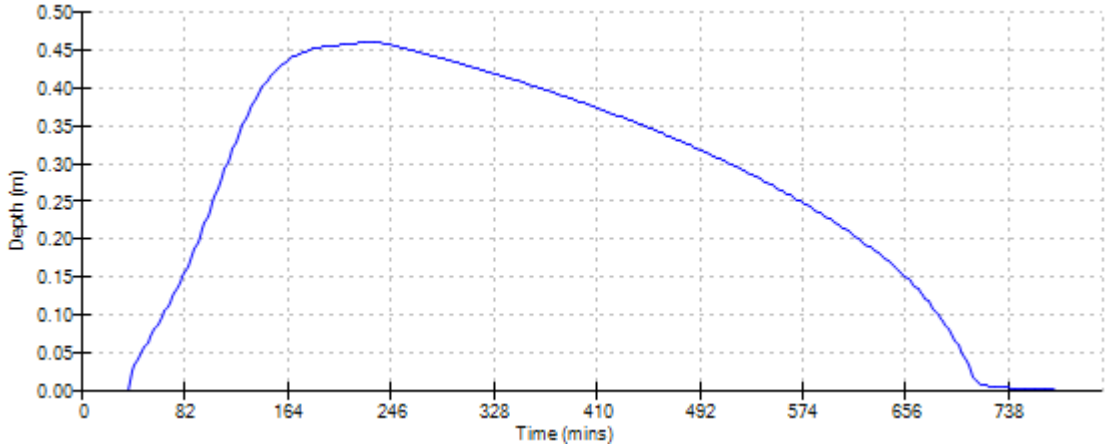
Cascade Event: 240 min Winter for Road13.srcx







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Cascade Summary of Results for Road14.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Road13.srcx	(None)

Half Drain Time : 181 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	77.650	0.150	0.0	0.3	0.3	3.8	O K
30 min Summer	77.681	0.181	0.0	0.3	0.3	5.1	O K
60 min Summer	77.709	0.209	0.0	0.4	0.4	6.2	O K
120 min Summer	77.726	0.226	0.0	0.4	0.4	6.9	O K
180 min Summer	77.729	0.229	0.0	0.4	0.4	7.0	O K
240 min Summer	77.729	0.229	0.0	0.4	0.4	7.0	O K
360 min Summer	77.724	0.224	0.0	0.4	0.4	6.9	O K
480 min Summer	77.718	0.218	0.0	0.4	0.4	6.6	O K
600 min Summer	77.711	0.211	0.0	0.4	0.4	6.3	O K
720 min Summer	77.704	0.204	0.0	0.4	0.4	6.0	O K
960 min Summer	77.691	0.191	0.0	0.4	0.4	5.5	O K
1440 min Summer	77.667	0.167	0.0	0.3	0.3	4.5	O K
2160 min Summer	77.640	0.140	0.0	0.3	0.3	3.4	O K
2880 min Summer	77.618	0.118	0.0	0.3	0.3	2.7	O K
4320 min Summer	77.587	0.087	0.0	0.2	0.2	1.7	O K
5760 min Summer	77.567	0.067	0.0	0.2	0.2	1.1	O K
7200 min Summer	77.554	0.054	0.0	0.2	0.2	0.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	4.0	18
30 min Summer	86.802	0.0	5.5	33
60 min Summer	54.368	0.0	7.0	62
120 min Summer	32.929	0.0	8.7	120
180 min Summer	24.243	0.0	9.6	154
240 min Summer	19.399	0.0	10.3	184
360 min Summer	14.081	0.0	11.3	250
480 min Summer	11.225	0.0	12.0	320
600 min Summer	9.408	0.0	12.6	386
720 min Summer	8.140	0.0	13.0	456
960 min Summer	6.474	0.0	13.8	588
1440 min Summer	4.680	0.0	14.9	852
2160 min Summer	3.378	0.0	16.0	1216
2880 min Summer	2.678	0.0	16.8	1584
4320 min Summer	1.927	0.0	17.9	2292
5760 min Summer	1.525	0.0	18.5	3000
7200 min Summer	1.271	0.0	19.0	3744

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Cascade Summary of Results for Road14.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	77.545	0.045	0.0	0.2	0.2	0.5	O K
10080 min Summer	77.539	0.039	0.0	0.1	0.1	0.4	O K
15 min Winter	77.650	0.150	0.0	0.3	0.3	3.8	O K
30 min Winter	77.682	0.182	0.0	0.3	0.3	5.1	O K
60 min Winter	77.709	0.209	0.0	0.4	0.4	6.2	O K
120 min Winter	77.727	0.227	0.0	0.4	0.4	7.0	O K
180 min Winter	77.729	0.229	0.0	0.4	0.4	7.1	O K
240 min Winter	77.728	0.228	0.0	0.4	0.4	7.0	O K
360 min Winter	77.721	0.221	0.0	0.4	0.4	6.7	O K
480 min Winter	77.712	0.212	0.0	0.4	0.4	6.4	O K
600 min Winter	77.703	0.203	0.0	0.4	0.4	6.0	O K
720 min Winter	77.693	0.193	0.0	0.4	0.4	5.6	O K
960 min Winter	77.675	0.175	0.0	0.3	0.3	4.8	O K
1440 min Winter	77.644	0.144	0.0	0.3	0.3	3.6	O K
2160 min Winter	77.610	0.110	0.0	0.3	0.3	2.4	O K
2880 min Winter	77.585	0.085	0.0	0.2	0.2	1.6	O K
4320 min Winter	77.555	0.055	0.0	0.2	0.2	0.8	O K
5760 min Winter	77.540	0.040	0.0	0.1	0.1	0.4	O K
7200 min Winter	77.531	0.031	0.0	0.1	0.1	0.3	O K
8640 min Winter	77.527	0.027	0.0	0.1	0.1	0.2	O K
10080 min Winter	77.525	0.025	0.0	0.1	0.1	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.095	0.0	19.3	4408
10080 min Summer	0.965	0.0	19.5	5144
15 min Winter	132.106	0.0	4.0	18
30 min Winter	86.802	0.0	5.5	32
60 min Winter	54.368	0.0	7.0	60
120 min Winter	32.929	0.0	8.7	116
180 min Winter	24.243	0.0	9.6	168
240 min Winter	19.399	0.0	10.3	190
360 min Winter	14.081	0.0	11.3	266
480 min Winter	11.225	0.0	12.0	342
600 min Winter	9.408	0.0	12.6	416
720 min Winter	8.140	0.0	13.0	486
960 min Winter	6.474	0.0	13.8	626
1440 min Winter	4.680	0.0	14.9	892
2160 min Winter	3.378	0.0	16.0	1256
2880 min Winter	2.678	0.0	16.8	1616
4320 min Winter	1.927	0.0	17.9	2296
5760 min Winter	1.525	0.0	18.6	2992
7200 min Winter	1.271	0.0	19.0	3672
8640 min Winter	1.095	0.0	19.4	4416
10080 min Winter	0.965	0.0	19.6	5056

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Cascade Rainfall Details for Road14.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.015

Time (mins) From:	To:	Area (ha)
0	4	0.015

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Cascade Model Details for Road14.srcx

Storage is Online Cover Level (m) 78.150

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.6
Membrane Percolation (mm/hr)	1000	Length (m)	16.7
Max Percolation (l/s)	21.3	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	77.500	Cap Volume Depth (m)	0.450

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	13.0
Membrane Percolation (mm/hr)	1000	Length (m)	4.6
Max Percolation (l/s)	16.6	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	77.500	Cap Volume Depth (m)	0.450

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 77.500

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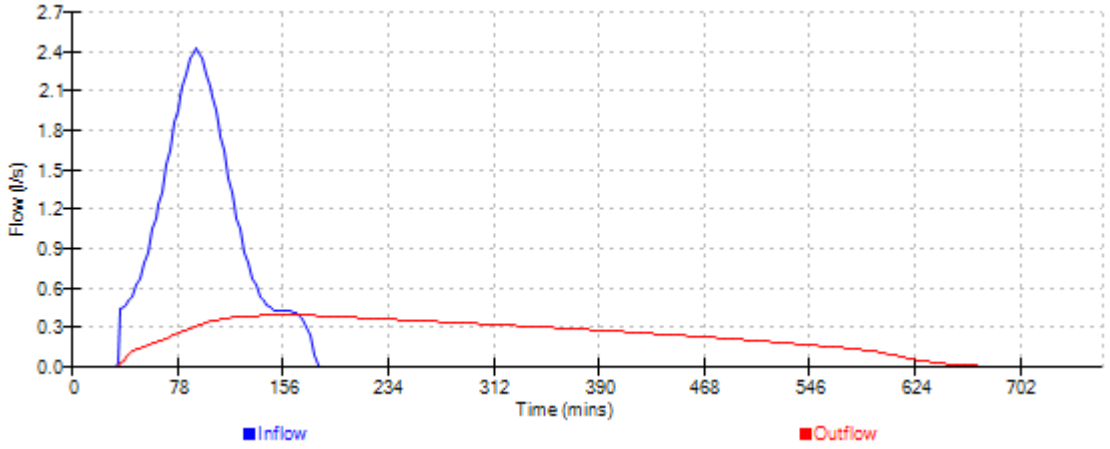
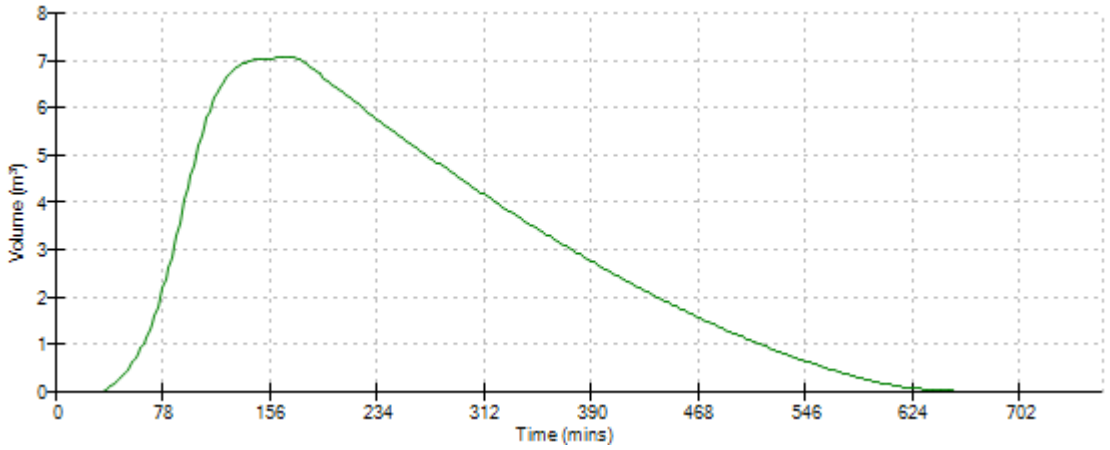
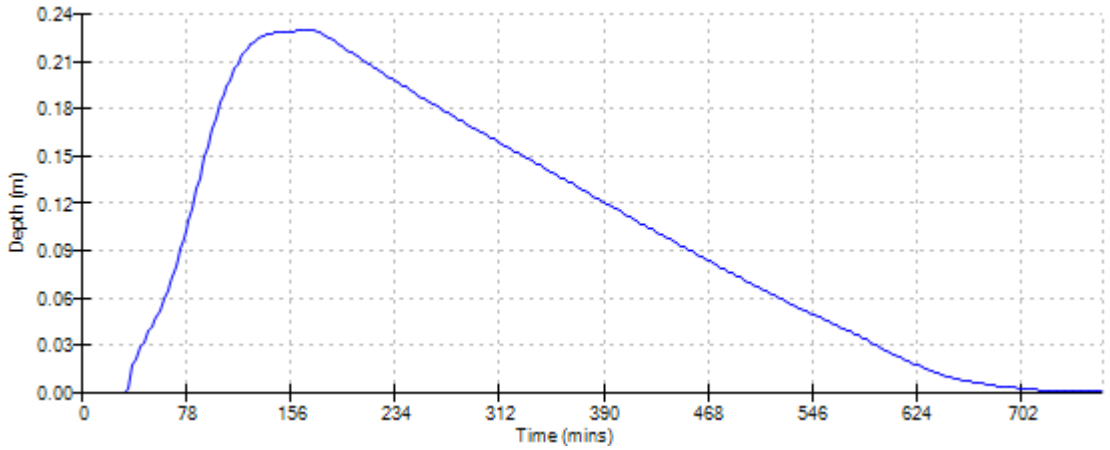
Cascade Event: 180 min Winter for Road14.srcx







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