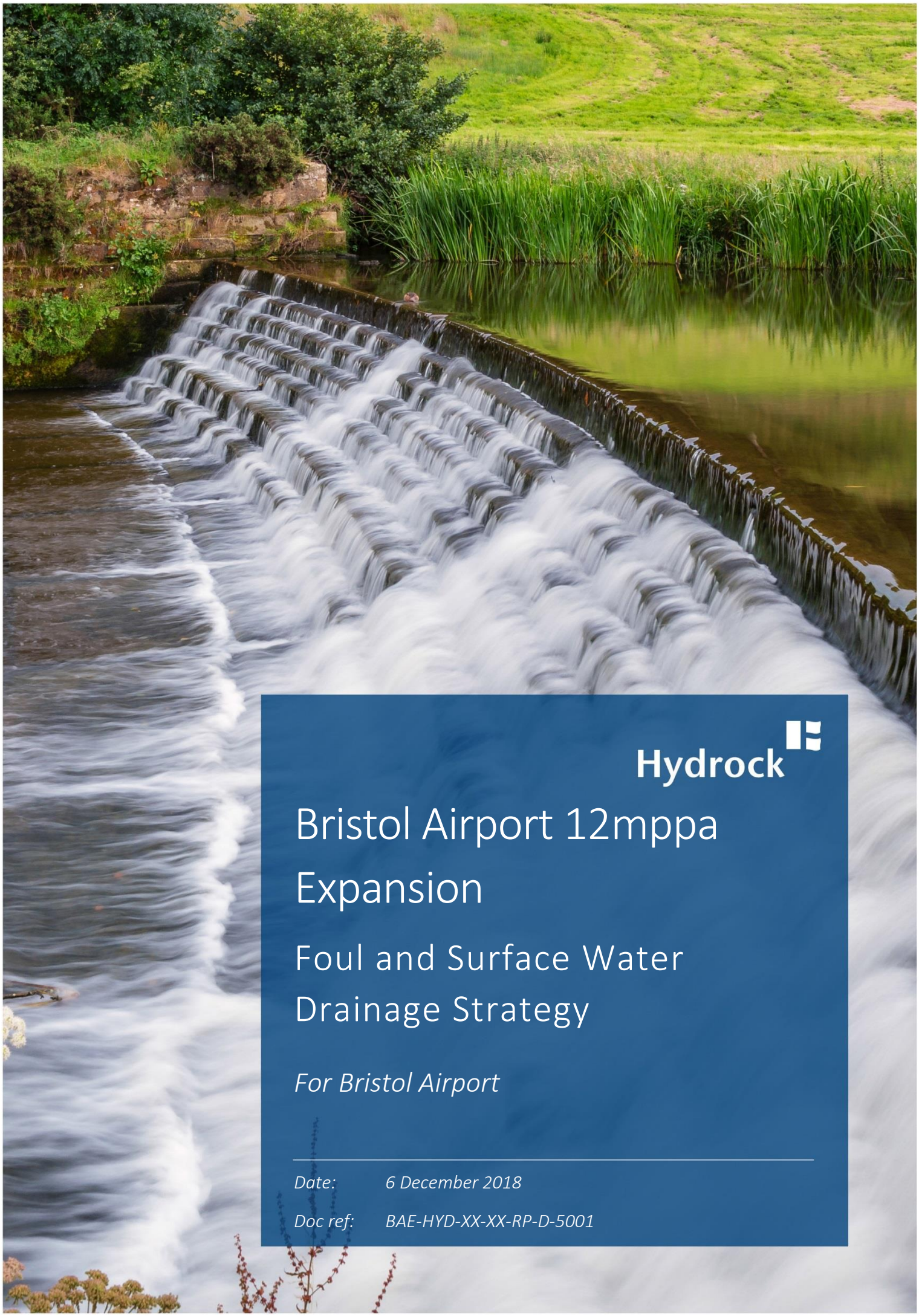

Hydrock

# Bristol Airport 12mppa Expansion

## Foul and Surface Water Drainage Strategy

*For Bristol Airport*

*Date:* *6 December 2018*

*Doc ref:* *BAE-HYD-XX-XX-RP-D-5001*

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## Appendices

# 1. INTRODUCTION

This report has been prepared by Hydrock on behalf of Bristol Airport in support of a Planning Application to be submitted to North Somerset Council for the proposed interim 12 mppa (million passengers per annum) expansion scheme of Bristol Airport.

This report sets out the foul and surface water drainage strategies that will draw upon historic and current information with a view to utilising existing systems where possible whilst ensuring that the final proposals meet current day standards.

# 2. SITE INFORMATION

## 2.1 Location and Setting

Bristol Airport is located approximately 4 miles to the south-west of Bristol, adjacent to the A38.

The airport is situated on the top of a plateau of high ground called Broadfield Down and is surrounded by predominantly open, rural, undulating countryside with extensive woodland areas to the west and open farmland. There are a number of small residential settlements immediately to the north and east of the site.

The site is bounded by Downside Road to the north, with agricultural / pasture use fields beyond; small woodland areas to the northeast and northwest; and, residential properties to all other boundaries.

A site location plan is included in Appendix A.

## 2.2 Topography

The site has a high point of 190m AOD towards the western end of the main runway and falls generally to the north-west and south-east.

## 2.3 Existing Site Features

The airport site is characterised by areas that ae described as either being 'landside' or airside'.

'Landside' features generally comprise the main terminal building, car parks, with both permeable and impermeable surfacing, access roads, a multi-storey car park, various outbuildings, a hotel, an administration block and landscaping.

'Airside' features include impermeable surfaces in the form of runways, taxiways, aircraft aprons, access roads, the main terminal buildings, a fuel farm, control tower and associated infrastructure buildings.

## 2.4 Proposed Development

The proposal is for an Interim Planning Application for works to enable expansion of the capacity of the airport in order to be able to cater for up to 12 million passengers per annum, (12 mppa).

The proposed works will include, inter alia, the following elements;

- West Terminal Extension (Phases 2 and 2A)
- New Service Yard
- Transport Interchange and Multi-Storey Car Park (MSCP2)
- Multi-Storey Car Park (MSCP3)
- New Gyratory Road
- Northern Surface Parking

- Surface Parking to Cogloop 2 Land
- South Terminal Extension / New Arrivals VCC (Bussing)
- Taxiway Extensions
- Walkway to East Pier

It should be noted that the Transport Interchange/MSCP2 and Northern Surface Parking works are not part of the 12 mppa application but have previously been approved under the earlier 10 mppa application. However, they have been included in this report as the works will have been completed prior to the current proposals coming forward and therefore will be a change to existing baseline conditions.

A proposed layout plan is included in Appendix B.

# 3. DRAINAGE STRATEGY – SURFACE WATER

## 3.1 Surface Water

### *3.1.1 Site Wide Pre-Development*

The site is served by an entirely private drainage systems which is owned and maintained by Bristol Airport.

Currently, surface water runoff from both 'landside' and 'airside' features is collected via a series of gulleys, drainage channels and roof drainage systems into a positive piped network. Ultimately, all runoff discharges to soakaway features located throughout the site and are variously of either perforated ring construction, tanks or filter trenches. Where appropriate, water is passed through petrol/oil interceptors before discharging to the soakaways.

The drainage system has been added to, amended, or abandoned over time as various parts of the site have been redeveloped. Not all of these works have been recorded and therefore there is no definitive, overall record plan of the current drainage network. It should also be borne in mind that there is a more or less continuous phase of improvement works being carried out which affect and alter the drainage network. It is intended to produce a definitive record of the drainage systems as part of these works.

Various historical record plans have been collated and amalgamated into a single drawing. A copy of the plan showing the combined existing drainage information, drawing no. BAE-HYD-XX-XX-DR-D-2001, is included in Appendix C.

A more detailed description and assessment of the existing drainage for each of the specific application areas is set out in the relevant sections below.

### *3.1.2 Site Wide Post-Development*

In accordance with the Sustainable Drainage Systems (SUDS) management train[1], rainfall run-off should be reused, infiltrated to ground, discharged to local watercourses or discharged to a local sewer network (in that order of priority). This approach is supported by Building Regulations Part H and Paragraph 080 of NPPG.

From previous work on the airport site, the strategy will be to infiltrate all surface water runoff from the proposed application works to ground following the principles that have been established to date.

Due to the nature of the site, the provision of open water features such as ponds or swales is not encouraged in order to reduce the potential risk from bird strikes. For this reason these types of SuDS features ae not included in the proposals and water quality will be addressed through the provision of filtration devices and oil interceptors, as appropriate.

Infiltration testing has previously been undertaken across the site as part of previous planning applications and detailed designs. Across the northern section of the airport site an average infiltration value of $4.2 \times 10^{-5}$ m/s was found for the area in the vicinity of the Set Down/Pick Up Car Park and Hotel area and an average value of $5.13 \times 10^{-5}$ m/s was established across the surface car parks. Previous infiltration testing has been undertaken for the 'Cogloop 1' parking area to the south of the runway

[1] CIRIA (2015) CIRIA C753 The SuDS Manual

established an average infiltration rate of 3.35 x $10^{-5}$ m/s. This value has been used for the initial assessment of the proposed Cogloop 2 parking extension.

Additional site testing will be carried out at the specific soakaway locations prior to construction and the design details amended as necessary.

All soakaways will be designed to cater, as a minimum, for the 1 in 30 year storm event and will be tested for the 1 in 100 year event plus an allowance of +30% for climate change in order to assess the performance of the structure. The figure of +30% has been selected in accordance with the advice set out in the DEFRA guidance note, "Flood risk assessments: climate change allowances". Table 2 of this document provides a range of allowances dictated by the design life of the scheme and an assessment of the application of either the Central or Upper End banding as appropriate. In the case of the scheme being considered, it is unlikely that it will remain unchanged beyond a period of 50 years. This would place the development lifetime on the cusp between the 2040 to 2069 and 2070 to 2115 periods for which rainfall increases are specified. For the 2070 to 2115 period, a value of +40% is required if the 'Upper end' allowance is used, or +20% if the 'Central' allowance is used. CIRIA SUSDRAIN guidance* indicates that the +20% allowance can be used if runoff in excess of this drainage system design standard up to the +40% standard can be managed safely within suitable areas of the site. However, for this assessment in order to ensure that there is sufficient contingency within the design, a figure of +30% has been used for sizing soakaways/piped drainage. Final climate change allowances (whether +20%, +30% or +40%) would be selected based on subsequent detailed drainage design and available surface storage in each development area.

All soakaway structures shall be located a minimum of 5m from any building.

A detailed assessment of each application element is set out below.

## 3.2 West Terminal Extension (Phases 2 & 2A), Terminal Canopy and Service Yard

### *3.2.1 Description*

The proposal is for an extension to the western end of the existing terminal building, a new canopy to the northern side of the terminal and the provision of a new Service Yard immediately to the west of the building.

The area of the proposed works is currently occupied by an existing service yard, car parking, buildings (Gate Gourmet), pedestrian areas and an access road.

### *3.2.2 Existing Site Area and Drainage*

As noted above, the area of the proposed terminal building extension, canopy and service yard is currently given over to impermeable areas for car parking, service yards, buildings and roadways.

The existing surface water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2003.

**https://www.susdrain.org/files/resources/fact_sheets/applying_climate_change_allowances_to_suds_design_draft.pdf*

The site is currently 100% impermeable and is already drained to existing on-site surface water drainage systems. The western end of the Terminal Building currently drains north to point 'A' on the above drawing, ultimately discharging to a soakaway located to the north of MSCP1.

The runoff from the West Apron, Control Tower, Western Walkway, MT Building and associated access roads drain to an oil interceptor located at point 'B' on the plan and then subsequently discharge to a soakaway located under the future MSCP3.

The existing Service Yard and Pick Up/Set Down Car Park and Terminal building frontage are drained by a separate drainage system to point 'C' on the plan. This then discharges to the existing soakaways located in the vicinity of the MSCP1 site.

### *3.2.3 Development Proposals*

The proposal is to extend the western part of the existing terminal building and provide a new canopy to the northern side of the building, thus increasing the amount of roof area. A new Service Yard is also to be provided immediately to the west of the terminal building.

The gross area of the terminal extension is approximately 4,585m$^2$ (0.459 ha), the canopy 3,330m$^2$ (0.333 ha) and for the Service Yard is 3,561m$^2$ (0.356 ha) resulting in total area of 11,476m$^2$ (1.148 ha).

The provision of the new Service Yard will also result in alterations to the existing Set Down/Pick Up Car Park area.

All areas will require positive drainage systems to be provided.

### *3.2.4 Drainage Proposals*

As described above, the current development area is already 100% impermeable and is drained by an existing surface water system. The opportunity will be taken to remove the need to drain runoff from the Terminal Building, West Apron, Control Tower and surrounding areas north to soakaways that are currently located in the northern car park areas, which will be affected by the proposed Multi-Storey Car Park proposals. New soakaway units will be installed immediately to the north and west of the Terminal Building.

The proposed surface water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2004.

Previous site investigations within this area of the Airport site have shown an average infiltration value of 4.2 x $10^{-5}$ m/s and this value has been used in the calculations for the soakaways described below.

The eastern part of the West Apron will be intercepted by the new drainage systems to serve the Terminal Building extension and Service Yard thus removing some of the impermeable area currently draining to point 'B'. In view of this reduction, it is proposed to retain the existing oil interceptor in this location. Point 'B' will therefore drain to a new cellular soakaway tank, (Soakaway 1), to the south-west of the hotel complex.

The soakaway has been designed to accommodate the 1 in 30 year storm event and tested against the 1 in 100 year plus 30% climate change scenario. In the latter event, the storage capacity will be exceeded and the additional volume will be accommodated with the combination of an overflow pipe and allowing for a maximum flooded volume of 52m$^3$ at the soakaway location, which equates to a depth of 100mm. The overflow pipe will discharge to two new linked soakaways constructed along the western boundary of the airport site, (Soakaways 1A and 1B).

The proposed Service Yard and West Terminal Extension will be drained via a new surface water system. This will flow northwards and discharge to a new cellular soakaway tank, (Soakaway 2), located to the east of the Hotel complex as shown on the above mentioned plan. Any existing rainwater pipes and internal surface water drainage points that are being retained will be connected to the new system at appropriate points.

The soakaway has been designed to accommodate the 1 in 30 year storm event and tested against the 1 in 100 year plus 30% climate change scenario. In the latter event, the storage capacity will be exceeded and the additional volume will be accommodated by allowing for a maximum flooded volume of 176m$^3$ at the soakaway location, which equates to a depth of 300mm.

In all of the above cases, the flooded volumes will not affect any critical assets.

The existing Set Down/Pick Up Car Park which is being retained and a section of North Side Road immediately to the south of the Hotel complex will continue to drain towards point 'C' on the plan. It is proposed that these areas drain to a new soakaway located in the verge immediately south of MSCP3, (Soakaway 3). This soakaway will also cater for the existing highway drainage to the west and north-west of the Hotel complex. It will be necessary to reconfigure the existing highway drainage connections to accommodate changes in sewer alignment and level.

The soakaway has been designed to accommodate the 1 in 30 year storm event and tested against the 1 in 100 year plus 30% climate change scenario.

The area under canopy to the northern side of the building is currently pedestrianised and drains to point 'D'. The provision of a new canopy will extend the impermeable area and it is proposed that this is drained to a new soakaway located immediately to the north.

The soakaway has been designed to accommodate the 1 in 30 year storm event and tested against the 1 in 100 year plus 30% climate change scenario.

## 3.3 Transport Interchange and Multi-Storey Car park (MSCP2)

### *3.3.1 Description*

The proposal is for the construction of a new Transport Interchange and Multi-Storey Car Park (MSCP2) located to the north of the main Terminal Building and to the east of MSCP1.

A new access road will also be constructed immediately to the south and will be served by a revised gyratory system to the east.

It should be noted that these elements are not part of the 12 mmpa application but have been approved under the previous 10 mppa approval. The proposals are however included here as they represent changes that will occur to the existing drainage baseline.

### 3.3.2 Existing Site Area and Drainage

The Interchange will be built on the site of an existing surface car park.

The existing surface water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2007.

The site is currently occupied by surface parking comprising Premier Parking, long stay and short stay parking. The former is asphalt paving and is 100% impermeable, the remaining areas are a permeable surfacing.

### 3.3.3 Development Proposals

The proposal is to provide a new Transport Interchange multi-storey car park, with associated access roads, which will form a direct link to the main Terminal Building.

The gross area of the new car park is 16,730m$^2$ (1.673 ha) and the access road to the south is 1,531m$^2$ (0.153 ha).

All areas will require positive drainage systems to be provided.

### 3.3.4 Drainage Proposals

Approximately 85% of the area of the Interchange site is currently Premier Parking which is fully paved and is positively drained to an existing soakaway, (Soakaway 7) located immediately to the north west which also caters for the existing MSCP1. This soakaway also accommodates the existing runoff from the western part of the Terminal Building, the western service yard and the main access road fronting the Terminal Building. As described in separate sections of this report, that part of the Terminal Building and service yard will be drained to a new soakaway (Soakaway 2). The main access road will also be removed and therefore a significant part of the drained area currently contributing to existing Soakaway 7 will be removed in the redevelopment proposals. Consequently, it is proposed that the western half of Interchange is drained to the existing soakaway as there will be a net decrease in contributing area.

The proposed surface water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2008.

Previous site investigations within this area of the Airport site have shown an average infiltration value of 5.13 x $10^{-5}$ m/s and this value has been used in the calculations for the soakaways described below.

The runoff from the eastern part of the multi-storey car park will be collected via a new piped system and directed to a new cellular soakaway unit, (Soakaway 6), located in the surface car park area immediately to the north-east of the building.

The soakaway has been designed to accommodate the 1 in 30 year storm event and tested against the 1 in 100 year plus 30% climate change scenario. No flooding will occur in this latter event.

The proposed access road immediately to the south of the Interchange will be drained via a series of road gulleys to a collector pipe flowing west to east in the verge. This will discharge to a new cellular soakaway unit, (Soakaway 8), located in the proposed verge to the south.

The soakaway has been designed to accommodate the 1 in 30 year storm event and tested against the 1 in 100 year plus 30% climate change scenario. No flooding will occur in this latter event.

## 3.4 Multi-Storey Car Park (MSCP3)

### *3.4.1 Description*

The proposal is for the construction of a new multi-storey car park located in the north-west corner of the airport site. The car park will effectively form an extension of the adjacent MSCP1.

A new access road will also be constructed immediately to the south.

### *3.4.2 Existing Site Area and Drainage*

The MSCP will be built on the site of an existing surface car park.

The existing surface water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2005.

The site is currently a mixture of permeable surfacing and asphalt roadways which drain to various soakaway systems.

The site area also includes a number of soakaways that serve the western terminal building, the West Apron, Control Tower area and Set Down/Pick Up area. In order to allow the construction of the MSCP it will be necessary to remove these existing drainage systems and this work has been described elsewhere under the relevant application elements.

### *3.4.3 Development Proposals*

The proposal is to provide a new multi-storey car park with associated access roads which will effectively form an extension to the MSCP1.

The gross area of the new car park is 11,135m$^2$ (1.114 ha) and the access road to the south is 1,475m$^2$ (0.175 ha).

All areas will require positive drainage systems to be provided.

### *3.4.4 Drainage Proposals*

In order to allow construction of the MSCP3, it will be necessary to remove the existing soakaways serving the Terminal Building, West Apron, Control Tower and surrounding areas. New soakaway units

will be installed immediately to the north and west of the Terminal Building and are described in more detail int the relevant sections for these areas.

The proposed surface water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2006.

Previous site investigations within this area of the Airport site have shown an average infiltration value of 5.13 x $10^{-5}$ m/s and this value has been used in the calculations for the soakaways described below.

The runoff from the multi-storey car park will be collected via a new piped system and directed to a new cellular soakaway unit, (Soakaway 4), located on the northern side of the building.

The soakaway has been designed to accommodate the 1 in 30 year storm event and tested against the 1 in 100 year plus 30% climate change scenario. In the latter event, the storage capacity will be exceeded and the maximum flooded volume of 40$m^3$ will be accommodated in the surface car park in and around the soakaway area. The existing bund along the northern boundary of the airport boundary will prevent any flood water escaping from the site. The flooded volumes will not affect any critical assets.

The proposed access road immediately to the south of the MSCP3 will be drained via a series of road gulleys to a collector pipe flowing west to east in the verge. This will discharge to a new cellular soakaway unit, (Soakaway 5), located in the proposed verge to the south of the existing MSCP1.

The soakaway has been designed to accommodate the 1 in 30 year storm event and tested against the 1 in 100 year plus 30% climate change scenario. No flooding will occur in this latter event.

## 3.5 New Gyratory Road System

### *3.5.1 Description*

A new gyratory road system is to be constructed in order to provide access to the proposed Transport Interchange and the reconfigured surface car a parking. This highway network will also include the main revised access into the airport from the A38.

### *3.5.2 Existing Site Area and Drainage*

The area of the proposed gyratory road system is currently occupied by long stay and short stay car parks, nearly all of which are permeable surfaces.

There are no positive drainage systems serving the car parks however, the area does include soakaways and a petrol interceptor which cater for the main access road into the airport, the eastern part of the Terminal Building and the airside aprons.

The works will also include realignment of the main access road which is currently drained by a positive drainage system discharging to soakaways within the existing car park areas.

The existing surface water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2009.

### 3.5.3 *Development Proposals*

The proposed gyratory roads will be constructed with an impermeable asphalt surface and will allow circulatory access to the various surface car parks and the transport Interchange.

### 3.5.4 *Drainage Proposals*

As noted above, there a number of existing soakaways and a petrol interceptor which cater for surface water runoff from the existing Terminal Building and aircraft apron areas. These will be retained but, in the case of the units to the north of the proposed gyratory road system will need to be relocated in order to remove them from lying immediately below the new road surface.

The proposed road surface will be drained via gulleys and a positive piped drainage system ultimately discharging to a series of soakaway units.

The approach roads from the east will drain to multiple perforated concrete ring soakaways. For the purposes of preparing a drainage strategy, it has been assumed that each soakaway will cater for approximately 800m$^2$ drained area each. These soakaways will be redesigned individually at the detailed design stage when road levels and gulley positions have been fixed. The purpose of this strategy is to identify the approximate locations and numbers of soakaways.

The soakaways have been designed to accommodate the 1 in 30 year storm event and tested against the 1 in 100 year plus 30% climate change scenario. No flooding will occur in this latter event.

The proposed surface water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2010.

## 3.6 Northern Surface Car Parking

### 3.6.1 *Description*

The existing long and short stay car parks are to be reconfigured, where required, in order to accommodate the proposed works that are planned in the immediate area, i.e. Multi-Storey Car Park, Transport Interchange and Gyratory Road System.

It should be noted that these elements are not part of the 12 mmpa application but have been approved under the previous 10 mppa approval. The proposals are however included here as they represent changes that will occur to the existing drainage baseline.

### 3.6.2 *Existing Site and Drainage*

The existing car parks are constructed with permeable surfaces and asphalt search lanes.

There are no positive drainage systems serving the car parks however, the area does include soakaways and a petrol interceptor which cater for the main access road into the airport, the eastern part of the Terminal Building and the airside aprons.

The existing surface water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2011.

### 3.6.3 *Development Proposals*

The existing parking will be reconfigured to suit the other development proposals in the immediate vicinity.

Search lanes will be formed in an impermeable asphalt construction whilst the parking bays will be formed with a permeable surfacing of reinforced grass/gravel.

### 3.6.4 *Drainage Proposals*

The impermeable search lanes will be crossfalled in order to shed runoff towards the permeable parking bays.

During frequent storm events runoff will drain through the permeable surfacing and infiltrate naturally to ground. In addition, infiltration trenches will be provided running in a west-east direction in order to cater for more intense rainfall events thus providing further storage volume.

An existing landscape bund to the northern perimeter of the site will provide a containment feature preventing exceedance flows from leaving the site.

The drainage system will be designed such that there will be no flooding up to and including the 1 in 30 year event. The system will also be modelled for the 1 in 100 year event with an allowance of +30% for climate change in order to check the performance of the network and to identify the locations and degree of any flooding. For the purposes of this strategy, a 120m long drainage length has been assumed.

Previous geotechnical investigations have shown an infiltration value of $5.13 \times 10^{-5}$ m/s through the site.

Lateral infiltration trenches will be provided in an east-west axis in order to intercept water shedding across the parking areas generally in a south-north direction.

The proposed surface water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2012.

## 3.7 Surface Parking to Cogloop 2 Land

### 3.7.1 *Description*

The proposal is for an extension to the existing Silverzone Cogloop 1 car park area on the southern side of the airport site.

The current car park areas consist of asphalt search lanes with porous gravel parking bays draining direct to ground.

It is intended that the Cogloop 2 proposals will follow those previously employed on Cogloop 1.

### 3.7.2 Existing Site and Drainage

Cogloop 2 is currently a grassed agricultural field. The site geology generally consists of a reddish brown clayey slightly sandy gravel, overlying jointed limestone bedrock.

The gross area is approximately 4.9 hectares and slopes generally from north to south with an average fall of 1 in 20 with a central band where the fall increase to 1 in 10.

As the site is currently undeveloped it is unlikely that there are any existing drainage systems present.

### 3.7.3 Development Proposals

The proposal is to provide some 2,700 car parking spaces with associated search lanes. Access will be formed through the existing landscaping bund on the northern boundary of the site from the Cogloop 1 car park.

Search lanes will be formed in an impermeable asphalt construction whilst the parking bays will be formed with a permeable surfacing of reinforced grass/gravel.

### 3.7.4 Drainage Proposals

The impermeable search lanes will be crossfalled in order to shed runoff towards the permeable parking bays.

During frequent storm events runoff will drain through the permeable surfacing and infiltrate naturally to ground. In addition, infiltration trenches will be provided running in a west-east direction in order to cater for more intense rainfall events thus providing further storage volume.

A 2m high landscape bund will be provided around the perimeter of the site and the section of the southern boundary will therefore provide a containment feature preventing exceedance flows from leaving the site.

The drainage system will be designed such that there will be no flooding up to and including the 1 in 30 year event. The system will also be modelled for the 1 in 100 year event with an allowance of +30% for climate change in order to check the performance of the network and to identify the locations and degree of any flooding. No flooding is predicted to occur in this event.

Previous geotechnical investigations have shown infiltration values ranging between $1.73 \times 10^{-5}$ and $4.19 \times 10^{-5}$ m/s immediately to the north of the site. Further site specific testing will be carried out at the detailed design stage however, for the purposes of this assessment, the average value of the range will be taken, ($3.35 \times 10^{-5}$ m/s).

Lateral infiltration trenches will be provided in an east-west axis in order to intercept water shedding across the parking areas generally in a north-south direction.

The proposed surface water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2002.

## 3.8 South Terminal Extension / New Arrivals VCC (Bussing)

### *3.8.1 Description*

The proposal is to extend the southern terminal building and include for additional 'new arrivals' facilities.

### *3.8.2 Existing Site and Drainage*

The area of the site is currently 100% paved being occupied by access roads and pedestrian areas. Runoff from these areas currently drain to existing positive drainage systems and discharge to the east and north of the Terminal building, ultimately draining to soakaways located in the northern surface car parks.

### *3.8.3 Development Proposals*

The proposals will extend the Terminal building footprint by approximately 2,000m$^2$ (0.200 ha) to the south and include new bussing units.

### *3.8.4 Drainage Proposals*

As noted above, the area of the proposed extension works is already occupied by impermeable, drained areas. There will therefore be no increase in runoff resulting from the proposed works. It is proposed that the outfall drainage is retained and that connections to the system are amended to suit.

## 3.9 Taxiway Extensions

### *3.9.1 Description*

The proposal is to provide extensions to existing taxiway areas on the northern and eastern sections of the current runway/taxiway hardstanding areas.

### *3.9.2 Existing Site and Drainage*

The areas over which the extensions will be built are currently grassed. They are immediately adjacent to existing taxiways which shed surface water runoff to the edges of the hardstanding areas. Surface water is collected via infiltration trenches running parallel with the edge of the hardstandings.

### *3.9.3 Development Proposals*

The proposals comprise extension fillets to the edges of the northern taxiway at five separate locations, references T1 to T5 as shown on drawing no BAE-HYD-XX-XX-DR-D-2016 and a further East Taxiway

extension immediately to the east of taxiway Alpha as shown on drawing no. BAE-HYD-XX-XX-DR-D-2015.

The total area of the extensions is 22,546m$^2$ (2.255 ha), for the northern taxiway and 7,151m$^2$ (0.715 ha) for the east taxiway.

### *3.9.4 Drainage Proposals*

As described above, the existing taxiways currently shed water to the edge of the impermeable areas where the runoff then discharges to existing infiltration trenches.

The development proposals will increase the amount of hardstanding and therefore additional soakaway features will be required in order to cater for the additional run-off. For areas T2, T3 and T4 it is proposed to construct new infiltration trenches which will accommodate both the existing taxiway runoff and that resulting from the extension areas.

The infiltration trenches will be designed such that there will be no flooding up to and including the 1 in 30 year event. The system will also be modelled for the 1 in 100 year event with an allowance of +30% for climate change in order to check the performance of the network and to identify the locations and degree of any flooding.

There are no geotechnical investigations for the runway/taxiway areas due to the proximity of air traffic and therefore the minimum infiltration value of 2.5 x $10^{-5}$ the north of the site has been used. Further site specific testing will be carried out at the detailed design stage to confirm the actual values.

The calculations are included in Appendix J and show that flooding will occur in the Q100 +30% event in infiltration trenches T2, T3, T4 and T5 with a volumes of 20$^3$, 27m$^3$, 37m$^3$ and 30m$^3$ respectively. In all cases the flooded volume will naturally fall towards the grassed infield between the taxiway and the runway. The extent of the available area results in negligible depth of standing water even assuming that no natural infiltration will take place across the infield with no adverse impacts on the airfield infrastructure.

The extreme western taxiway extension (T1) and the East taxiway extension will both be served by multiple precast concrete soakaway rings installed in stone filled pits, as shown on drawing nos. BAE-HYD-XX-XX-DR-D-2015 and 2016. These soakaways have been design using the same criteria as for the infiltration trenches discussed above however there is no flooding for the T1 units in the Q100 +30% event and nor for the East extension. These volumes can be readily accommodated in the adjacent grassed areas with no adverse impacts on the airfield infrastructure.

## 3.10 Walkway to East Pier

### *3.10.1 Description*

The proposal is to provide a new elevated walkway as access to the proposed East Pier.

### 3.10.2 Existing Site and Drainage

The area of the site is currently 100% paved being occupied by access roads, parking areas, buildings and pedestrian areas. Runoff from these areas currently drain to existing positive drainage systems and discharge to the east of the Terminal building, ultimately draining to soakaways located in the immediate area and the northern surface car parks.

### 3.10.3 Development Proposals

The proposals will be to provide a covered, elevated walkway form the eastern side of the Terminal Building.

### 3.10.4 Drainage Proposals

As noted above, the area of the proposed extension works is already occupied by impermeable, drained areas. There will therefore be no increase in runoff resulting from the proposed works. It is proposed that the outfall drainage is retained and that connections to the system are amended to suit.

# 4. DRAINAGE STRATEGY -FOUL WATER

## 4.1 Description

The majority of the application elements do not have foul drainage implications. The exception to this are the Terminal Building extension proposals and therefore the following sections relate to this part of the development.

## 4.2 Existing Site and Drainage

The existing foul water drainage network for the airport is split between two catchments, one to the south of the runway and the other to the north.

The southern catchment is pumped north, and discharges into the northern systems near the north-east corner of the airport site at which point the flows are discharged, via a pump, to an existing public foul sewer in Downside Road at Wessex Water manhole reference ST 51650604. The public sewer is then routed out to the A38 and then flows via the villages of Felton, Winford ultimately discharging to the Wessex Water sewage treatment works (STW) at Chew Stoke, Wessex Water STW reference 13058.

The Environment Agency currently lists the treatment works as being due for an upgrade in 2019 however, Wessex Water have confirmed that the works have now been assessed for investment in their next business plan period (2020-2025) with a low probability of development occurring. No major works are planned at this time. It has also been noted that approximately 60% of the biological load received at the STW is generated by the airport site.

As far as can be established, the foul and surface water drainage systems are separate and therefore rainfall events should not have any effect on flows within the foul systems.

Wessex Water have a current restriction of a maximum discharge rate from the airport site of 12 l/s and, under the previous 10 mppa application, it was established that a storage tank was to be provided in order that peak flows exceeding this value could be retained for discharge at off-peak times.

The existing foul water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2013.

## 4.3 Development Proposals

The application proposals which will impact on the foul drainage system are as follows;

- Western extension to main Terminal Building
- Southern extension to Terminal Building
- Removal of existing Administration Block to southern catchment
- Removal of 'Gourmet Gateway' building (anticipated early 2019)

The remainder of the application proposals will not have any foul drainage implications.

## 4.4 Drainage Proposals

As noted above, increased flows will be generated by the extension of the Terminal Building but will be partially offset by the removal of the Administration Block and the 'Gourmet Gateway' building.

The Administration Building and Fire Station are being relocated to the southern catchment which is served by an existing pumping station. The pumping rate will be maintained at the current value and therefore there will be no material change to flow rates arising from these changes.

The revised flow discharge rates for the proposed development will therefore be as follows;

*Main Terminal Building*

The planning application is for a passenger capacity of 12 million per annum.

The peak month for passenger numbers is August and previous analysis carried out for the 10 mppa application has established that this is approximately 11% of the yearly capacity. On this basis, the peak number of passengers per day, for the peak month will be,

$$\frac{12{,}000{,}000 \times 11\%}{31} = 42{,}581$$

Foul flows have been calculated using the British Water Code of Practice 'Flows and Loads – 4: Sizing Criteria, Treatment Capacity for Sewage Treatment Systems'. As there is no specific information available for airport passengers, the following activities have been used in the flow calculations and assumptions have been made with regard to the number of passengers who will take part in each activity.

| Per Capita Loadings Average | % of Passengers | Passengers/day | Flow litres/person/day | Flow ($m^3$/day) |
|---|---|---|---|---|
| Toilet Blocks (per use) | 75 | 31,936 | 10 | 319 |
| Toilet (urinal) per use | 25 | 10,465 | 5 | 53 |
| Full meal | 5 | 2,129 | 25 | 53 |
| Snack Bar | 15 | 6,387 | 15 | 96 |
| Fast Food | 10 | 4,258 | 12 | 51 |
| Bar Drinker | 10 | 4,258 | 12 | 51 |

Assuming a peaking factor of 3, the peak flow rate will be,

$$\frac{623 \times 10^3 \times 3}{24 \times 60 \times 60} = \mathbf{21.6\ l/s}$$

*Existing Hotel*

The existing hotel in the north-west part of the site is a 201 room 3*/4* facility with anticipated future expansion up to 251 rooms.

Using the British Water Code of Practice 'Flows and Loads – 4: Sizing Criteria, Treatment Capacity for Sewage Treatment Systems', the allowance is 250 litres/head day and assuming a maximum occupancy rate of 2 persons/room and a peaking factor of 3, the flow generated will be,

$$\frac{251 \times 2 \times 250 \times 3}{24 \times 60 \times 60} = 4.4 \text{ l/s}$$

*Flows from Southside Pumping Station*

Referring to an AECOM Technical Note dated December 2010, the rising main diameter is 100mm and, therefore, assuming that the velocity lies within the recommended range of 0.75 m/s to 1.8 m/s, the minimum and maximum delivery rates will be 5.9 l/s to 14.1 l/s.

An average value if 10 l/s has therefore been assumed.

NB: It should be noted that this will not be a constant rate throughout the whole day but will be a series of peaks, as determined by the fill time of the sump. The AECOM Technical Note dated March 2011 noted an estimated fill time of 43 mins and a pump run time of 2.6 minutes.

*Aircraft Foul Systems*

Reference has been made to an AECOM Technical Note dated December 2010, which notes that the maximum capacity of the system is 2,000 litres which can be emptied in approximately 10 minutes. This equates to an average flow rate of 3.3l/s.

The AECOM Technical Note also states that this operation happens on average 3.5 times a day therefore this figure is discarded from the following calculations due to the relatively infrequent occurrence.

The total peak discharge rate from the airport will therefore be;

21.6 + 4.4 + 10.0 = 36.0 l/s.

Assume a 3 hour storage period in order to allow discharge outside of peak periods, in accordance with the current operation of the foul system. On this basis, the storage requirement will be the difference between the total inflow and outflow during this period.

Total inflow = $\frac{36.0 \times 3 \times 60 \times 60}{1000} = 389 m^3$

Total outflow = $\frac{12.0 \times 3 \times 60 \times 60}{1000} = 129.6 m^3$

Therefore storage required = 389 – 129.6 = 259.4m$^3$

Storage already provided under previous scheme = 98m$^3$

Additional storage therefore required under this application, = 259.4 – 98 = 161.4m$^3$.

Due to the volume of storage required, it is likely that some form of chemical dosing will be required in order to prevent issues with septicity and this should be discussed with a suitable specialist contractor.

*General*

The provision of the new Western and Southern Extensions and the Transport Interchange/MSCP2 will require the diversion of existing foul drainage runs and the provision of new sewers.

The proposed foul water drainage systems are shown on Hydrock drawing no. BAE-HYD-XX-XX-DR-D-2014.

# 5. CONCLUSIONS

## 5.1 SURFACE WATER

All existing surface water from the airport site currently discharges to ground via numerous infiltration systems. There is no discharge to public sewers or watercourses.

The proposed redevelopment of various elements of the airport infrastructure will alter existing systems and introduce additional areas of surface water runoff.

The proposed drainage strategy described in this report continues and extends the use of infiltration systems to serve the proposed works. As for the baseline condition, no surface water will be discharged off site.

All infiltration systems have been designed for the 1 in 30 year return period event and tested for the 100 year event plus an allowance for climate change. Under no circumstances will flooding be permitted to occur for the 1 in 30 year event and, where the drainage system has been shown to flood, the volume of water has been determined and the location and depth identified.

The off-site risk from surface water flooding following the implementation of the proposed development will therefore not be increased.

## 5.2 Foul Water

All foul drainage from the site drains via both gravity and pumped systems to the north-east corner of the airport site at which point flows are discharged to a public foul sewer in Downside Road.

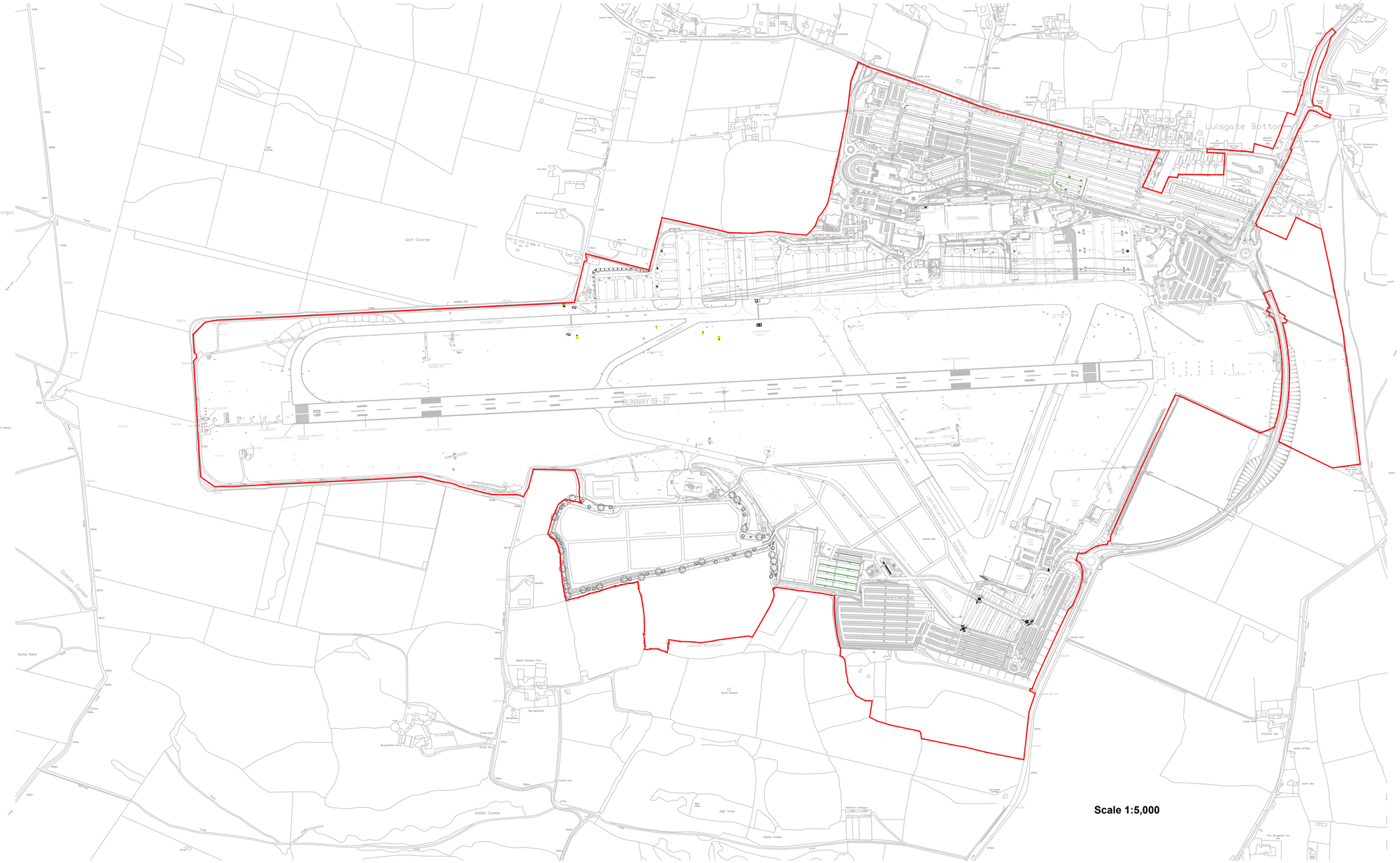
Wessex Water currently restrict the maximum flow rate from the airport site to 12 l/s. This rate is restricted by the capacity of the Chew Magna sewage treatment works. Wessex Water have confirmed that there is no short-term intention to upgrade these works at present.

The increase of the airport capacity to 12 million passengers per annum will give rise to an increase in foul flows. Given that Wessex Water have no intention to carry out works to the sewage treatment works to increase capacity, then the current 12 l/s restriction will remain in place. In order to cater for the increased flows, it will be necessary to extend the existing on-site storage tanks.

The provision of additional storage and maintaining the current discharge ate from the site will ensure that there is no detrimental impact on the off-site public sewer network.

# Appendix A

| Reference | Title |
|---|---|
| BAE-HYD-XX-XX-DR-D-2000-P02 | Site Location Plan |


NOTES

REVISIONS

| Rev | Date | Description | By | Ckd | App |
|---|---|---|---|---|---|
| P02 | 05\12/18 | Site boundary updated. | RJH | | |
| P01 | 24/09/18 | First Issue. | RJH | | |

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PROJECT
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12mppa EXPANSION SCHEME

TITLE
SITE LOCATION PLAN

| HYDROCK PROJECT NO. | SCALE @ A1 |
|---|---|
| C-09194-C | As Shown |

| STATUS DESCRIPTION | STATUS |
|---|---|
| INFORMATION | S2 |

| DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) | REVISION |
|---|---|
| BAE-HYD-XX-XX-DR-D-2000 | P02 |

# Appendix B – Proposed Masterplan

| Reference | Title |
|---|---|
| T17090-00-100-407-00 | Proposed Site Plan |

MULTI-STOREY CAR PARK (Phase 3)

WEST TERMINAL EXTENSION (Phase 2)

SERVICE YARD

OPERATIONAL CHANGES TO STANDS 38-39

CANOPIES TO FRONT OF EXISTING TERMINAL

SOUTH TERMINAL EXTENSION

GYRATORY ROAD WITH INTERNAL SURFACE CAR PARKING

HIGHWAY IMPROVEMENTS

EAST PIER with VERTICAL CIRCULATION CORES & 5no PRE-BOARDING ZONES

WALKWAY TO EAST PIER with VERTICAL CIRCULATION CORE to 1no PRE-BOARDING ZONE

EAST TAXIWAY LINK

TAXIWAY WIDENING AND FILLETS

TAXIWAY WIDENING AND FILLETS

OPERATIONAL CHANGE TO SILVER ZONE CAR PARK EXTENSION (Phase 1)

SILVER ZONE CAR PARK EXTENSION (Phase 2)

NORTHERN AREA

CENTRAL AREA

SOUTHERN AREA

Taxiway GOLF

Taxiway FOXTROT

Taxiway DELTA

Taxiway HOTEL

Taxiway JULIET

Taxiway BRAVO

Taxiway ALPHA

- EXISTING BUILDINGS
- PROPOSED BUILDINGS - (12mppa APPLICATION)
- EXISTING APRON / HARD STANDING
- PROPOSED and RECONFIGURED CAR PARKING
- PROPOSED INTERNAL ROAD ADJUSTMENT
- PROPOSED HIGHWAY IMPROVEMENTS
- PROPOSED IMPROVEMENTS TO RUNWAYS / TAXIWAYS
- LANDSCAPING - REFER TO THE INTEGRATED / EMBEDDED LANDSCAPE, VISUAL & ECOLOGY MASTERPLAN
- PROPOSED HARDSTANDING
- PLANNING APPLICATION BOUNDARY
- NORTH, CENTRAL & SOUTH AREA BOUNDARIES
- PROPOSED 5m HIGH ACOUSTIC TIMBER FENCE
- PROPOSED 3m HIGH SECURITY TIMBER FENCE

0 50m 100m 200m



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Status: PLANNING
Client: BRISTOL AIRPORT
Date: 05/12/2018
Project name: 12 MPPA PLANNING APPLICATION
Drawn by: EH
Chkd by: SF
Drawing Title: PROPOSED SITE PLAN
Scale: 1:2500
Page: A0
Drawing No: 17090-00-100-407
Revision: 00

| Rev no | Date | Amendment | Drwn by | Chkd by |
|---|---|---|---|---|

# Appendix C – Existing Drainage Plan

| Reference | Title |
|---|---|
| BAE-HYD-XX-XX-DR-D-2001-P02 | Existing Drainage Plan |

KEY

- Existing storm drainage
- Existing tank soakaway
- Existing manhole soakaway
- Existing petrol interceptor

NOTES

NOTES *(CONTINUED)*

NOTES *(CONTINUED)*

NOTES *(CONTINUED)*

NOTES *(CONTINUED)*

REVISIONS *(CONTINUED)*

REVISIONS

| Rev | Date | Description | By | Ckd | App |
|---|---|---|---|---|---|
| P02 | 16/11/18 | Additional drainage information. | RJH | | |
| P01 | 07/08/18 | First Issue. | RJH | | |


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PROJECT

BRISTOL AIRPORT
12mppa EXPANSION SCHEME

TITLE

EXISTING FOUL AND SURFACE WATER DRAINAGE LAYOUT

| HYDROCK PROJECT NO. | SCALE @ A0 |
|---|---|
| C-09194-C | 1 : 2,500 |

| STATUS DESCRIPTION | STATUS |
|---|---|
| FOR APPROVAL | S2 |

| DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) | REVISION |
|---|---|
| BAE-HYD-XX-XX-DR-D-2001 | P02 |

# Appendix D – West Terminal Extension, Terminal Canopy and New Service yard

| Reference | Title |
|---|---|
| BAE-HYD-XX-XX-DR-D-2003-P02 | Existing Surface Water Drainage |
| BAE-HYD-XX-XX-DR-D-2004-P03 | Proposed Surface Water Plan |
| Ex West Apron Replan.SRCX | Existing West Apron Replan Soakaway 1 - Q30 |
| Ex West Apron Replan.SRCX | Existing West Apron Replan Soakaway 1 – Q100 +30% |
| Soak1 Overflow.SRCX | Soakaways 1A & 1B – Q30 |
| Soak1 Overflow.SRCX | Soakaways 1A & 1B – Q100 +30% |
| Ex Terminal Replan.SRCX | Existing Terminal Replan Soakaway 2 - Q30 |
| Ex Terminal Replan.SRCX | Existing Terminal Replan Soakaway 2 – Q100 +30% |
| Point C + Ex Hways.SRCX | Soakaway 3 - Q30 |
| Point C + Ex Hways.SRCX | Soakaway 3 – Q100 +30% |
| Terminal Canopy.SRCX | Terminal Canopy Soakaway 10 - Q30 |
| Terminal Canopy.SRCX | Terminal Canopy Soakaway 10 – Q100 +30% |

OS NORTH

MSCP UNDER CONSTRUCTION

HOTEL

CHILLER COMPOUND

OPERATIONAL ADMINISTRATION

NORTH SIDE ROAD

DROP OFF ONLY

BAY 1 | BAY 2 | BAY 3

TERMINAL

CONTROL TOWER

GATE GOURMET

FUEL FARM

PBZ 1

PBZ 2 Dis / PRM Holding

PBZ 3

PBZ 4

PBZ 5

PBZ 6

PBZ 7

Z50 Z11A Z51 Z52 Z53 Z54

KEY

- Existing surface water drain
- Existing tank soakaway
- Existing manhole soakaway
- Existing petrol interceptor

REVISIONS

| Rev | Date | Description | By | Ckd | App |
|---|---|---|---|---|---|
| P02 | 16/11/18 | Additional existing drainage. | RJH | | |
| P01 | 11/09/18 | First Issue. | RJH | | |


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PROJECT
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12mppa EXPANSION SCHEME

TITLE
WEST TERMINAL EXTENSION, SERVICE YARD and TERMINAL CANOPY
EXISTING SURFACE WATER DRAINAGE

| HYDROCK PROJECT NO. | SCALE @ A0 |
|---|---|
| C-09194-C | 1:500 |
| STATUS DESCRIPTION: FOR APPROVAL | STATUS: S2 |
| DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER): BAE-HYD-XX-XX-DR-D-2003 | REVISION: P02 |

OS NORTH

**SOAKAWAY 1B**
Cellular soakaway tank.
4m x 95m x 1.8m deep

Existing highway drainage to be reconfigured

225ø link pipe between soakaways

**SOAKAWAY 1A**
Cellular soakaway tank.
4m x 15m x 1.8m deep

Intercept existing drainage upstream of 'B' into new downstream sewer to Soakaway 3

Overflow connection for storms > 1 in 30 years

**SOAKAWAY 1**
Cellular soakaway tank.
25m x 21m x 2.5m deep

Existing petrol interceptors to be retained

Diversion of existing drainage system

**SOAKAWAY 3**
Cellular soakaway tank.
4m x 50m x 1.8m deep

New manhole at head of shortened drainage run

New manhole at head of shortened drainage run

Intercept existing drainage from south and east and connect into new system

**SOAKAWAY 2**
Cellular soakaway tank.
20m x 20m x 1.8m deep

**SOAKAWAY 4A**
Cellular soakaway tank.
4m x 18m x 1.5m deep

MSCP UNDER CONSTRUCTION

HOTEL

CHILLER COMPOUND

CAR RENTAL ADMINISTRATION

LONG S

PREMIER PARKING

COVER

BUS

BUS DR

COVERED W

NORTH SIDE ROAD

DROP OFF ONLY

BAY 1 BAY 2 BAY 3

TERMINAL

TERMINAL BUILDING

GATE GOURMET

FUEL FARM

CONTROL TOWER

M1 SECTION

PBZ 1

PBZ 2

Dis. / PRM Holding

PBZ 3

PBZ 4

PBZ 5

PBZ 6

PBZ 7

KEY

- Existing surface water drain
- Existing petrol interceptor
- Existing tank soakaway
- Existing manhole soakaway
- Proposed surface water drain
- Proposed petrol interceptor
- Proposed cellular soakaway unit
- Existing surface water drain to be abandoned
- Proposed Service Yard Area
- Proposed West Terminal Extension
- Proposed New Terminal Canopy

REVISIONS

| Rev | Date | Description | By | Ckd | App |
|---|---|---|---|---|---|
| P03 | 05/12/18 | Masterplan updated. | RJH | | |
| P02 | 16/11/18 | Drainage updated. | RJH | | |
| P01 | 24/09/18 | First Issue. | RJH | | |


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PROJECT
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12mppa EXPANSION SCHEME

TITLE
WEST TERMINAL EXTENSION, SERVICE YARD and TERMINAL CANOPY
PROPOSED SURFACE WATER DRAINAGE

| HYDROCK PROJECT NO. | SCALE @ A0 |
|---|---|
| C-09194-C | 1:500 |

| STATUS DESCRIPTION | STATUS |
|---|---|
| FOR APPROVAL | S2 |

| DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL/TYPE-ROLE-NUMBER) | REVISION |
|---|---|
| BAE-HYD-XX-XX-DR-D-2004 | P03 |

## Summary of Results for 30 year Return Period

Half Drain Time : 657 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Overflow (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 15 min Summer | 7.834 | 0.834 | 12.6 | 0.0 | 12.6 | 415.9 | O K |
| 30 min Summer | 8.103 | 1.103 | 13.1 | 0.0 | 13.1 | 550.3 | O K |
| 60 min Summer | 8.376 | 1.376 | 13.7 | 0.0 | 13.7 | 686.1 | O K |
| 120 min Summer | 8.629 | 1.629 | 14.2 | 0.0 | 14.2 | 812.6 | O K |
| 180 min Summer | 8.752 | 1.752 | 14.4 | 0.0 | 14.4 | 873.6 | O K |
| 240 min Summer | 8.816 | 1.816 | 14.5 | 0.0 | 14.5 | 905.7 | O K |
| 360 min Summer | 8.873 | 1.873 | 14.6 | 0.0 | 14.6 | 934.3 | O K |
| 480 min Summer | 8.876 | 1.876 | 14.6 | 0.0 | 14.6 | 935.6 | O K |
| 600 min Summer | 8.854 | 1.854 | 14.6 | 0.0 | 14.6 | 924.5 | O K |
| 720 min Summer | 8.827 | 1.827 | 14.5 | 0.0 | 14.5 | 911.2 | O K |
| 960 min Summer | 8.770 | 1.770 | 14.4 | 0.0 | 14.4 | 882.7 | O K |
| 1440 min Summer | 8.666 | 1.666 | 14.2 | 0.0 | 14.2 | 831.1 | O K |
| 2160 min Summer | 8.520 | 1.520 | 13.9 | 0.0 | 13.9 | 758.1 | O K |
| 2880 min Summer | 8.378 | 1.378 | 13.7 | 0.0 | 13.7 | 687.3 | O K |
| 4320 min Summer | 8.114 | 1.114 | 13.2 | 0.0 | 13.2 | 555.4 | O K |
| 5760 min Summer | 7.881 | 0.881 | 12.7 | 0.0 | 12.7 | 439.4 | O K |
| 7200 min Summer | 7.682 | 0.682 | 12.3 | 0.0 | 12.3 | 340.0 | O K |
| 8640 min Summer | 7.515 | 0.515 | 12.0 | 0.0 | 12.0 | 256.9 | O K |
| 10080 min Summer | 7.378 | 0.378 | 11.7 | 0.0 | 11.7 | 188.6 | O K |
| 15 min Winter | 7.941 | 0.941 | 12.8 | 0.0 | 12.8 | 469.2 | O K |
| 30 min Winter | 8.244 | 1.244 | 13.4 | 0.0 | 13.4 | 620.6 | O K |
| 60 min Winter | 8.554 | 1.554 | 14.0 | 0.0 | 14.0 | 775.0 | O K |
| 120 min Winter | 8.848 | 1.848 | 14.6 | 0.0 | 14.6 | 921.9 | O K |
| 180 min Winter | 8.996 | 1.996 | 14.9 | 0.0 | 14.9 | 995.7 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Overflow Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 74.059 | 0.0 | 0.0 | 52 |
| 30 min Summer | 48.833 | 0.0 | 0.0 | 66 |
| 60 min Summer | 30.811 | 0.0 | 0.0 | 92 |
| 120 min Summer | 18.860 | 0.0 | 0.0 | 148 |
| 180 min Summer | 13.992 | 0.0 | 0.0 | 202 |
| 240 min Summer | 11.265 | 0.0 | 0.0 | 258 |
| 360 min Summer | 8.299 | 0.0 | 0.0 | 370 |
| 480 min Summer | 6.674 | 0.0 | 0.0 | 482 |
| 600 min Summer | 5.632 | 0.0 | 0.0 | 546 |
| 720 min Summer | 4.901 | 0.0 | 0.0 | 608 |
| 960 min Summer | 3.933 | 0.0 | 0.0 | 734 |
| 1440 min Summer | 2.881 | 0.0 | 0.0 | 1004 |
| 2160 min Summer | 2.107 | 0.0 | 0.0 | 1416 |
| 2880 min Summer | 1.687 | 0.0 | 0.0 | 1824 |
| 4320 min Summer | 1.231 | 0.0 | 0.0 | 2616 |
| 5760 min Summer | 0.984 | 0.0 | 0.0 | 3376 |
| 7200 min Summer | 0.827 | 0.0 | 0.0 | 4120 |
| 8640 min Summer | 0.717 | 0.0 | 0.0 | 4840 |
| 10080 min Summer | 0.636 | 0.0 | 0.0 | 5544 |
| 15 min Winter | 74.059 | 0.0 | 0.0 | 52 |
| 30 min Winter | 48.833 | 0.0 | 0.0 | 66 |
| 60 min Winter | 30.811 | 0.0 | 0.0 | 92 |
| 120 min Winter | 18.860 | 0.0 | 0.0 | 146 |
| 180 min Winter | 13.992 | 0.0 | 0.0 | 202 |

## Summary of Results for 30 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Overflow (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 240 min Winter | 9.079 | 2.079 | 15.0 | 0.0 | 15.0 | 1037.1 | O K |
| 360 min Winter | 9.166 | 2.166 | 15.2 | 0.0 | 15.2 | 1080.2 | O K |
| 480 min Winter | 9.190 | 2.190 | 15.2 | 0.0 | 15.2 | 1092.1 | O K |
| 600 min Winter | 9.179 | 2.179 | 15.2 | 0.0 | 15.2 | 1086.8 | O K |
| 720 min Winter | 9.148 | 2.148 | 15.2 | 0.0 | 15.2 | 1071.5 | O K |
| 960 min Winter | 9.075 | 2.075 | 15.0 | 0.0 | 15.0 | 1035.1 | O K |
| 1440 min Winter | 8.927 | 1.927 | 14.7 | 0.0 | 14.7 | 961.2 | O K |
| 2160 min Winter | 8.707 | 1.707 | 14.3 | 0.0 | 14.3 | 851.6 | O K |
| 2880 min Winter | 8.490 | 1.490 | 13.9 | 0.0 | 13.9 | 743.0 | O K |
| 4320 min Winter | 8.092 | 1.092 | 13.1 | 0.0 | 13.1 | 544.7 | O K |
| 5760 min Winter | 7.756 | 0.756 | 12.5 | 0.0 | 12.5 | 377.2 | O K |
| 7200 min Winter | 7.482 | 0.482 | 11.9 | 0.0 | 11.9 | 240.2 | O K |
| 8640 min Winter | 7.266 | 0.266 | 11.5 | 0.0 | 11.5 | 132.8 | O K |
| 10080 min Winter | 7.114 | 0.114 | 11.2 | 0.0 | 11.2 | 56.7 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Overflow Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 240 min Winter | 11.265 | 0.0 | 0.0 | 256 |
| 360 min Winter | 8.299 | 0.0 | 0.0 | 366 |
| 480 min Winter | 6.674 | 0.0 | 0.0 | 478 |
| 600 min Winter | 5.632 | 0.0 | 0.0 | 584 |
| 720 min Winter | 4.901 | 0.0 | 0.0 | 684 |
| 960 min Winter | 3.933 | 0.0 | 0.0 | 776 |
| 1440 min Winter | 2.881 | 0.0 | 0.0 | 1084 |
| 2160 min Winter | 2.107 | 0.0 | 0.0 | 1536 |
| 2880 min Winter | 1.687 | 0.0 | 0.0 | 1972 |
| 4320 min Winter | 1.231 | 0.0 | 0.0 | 2792 |
| 5760 min Winter | 0.984 | 0.0 | 0.0 | 3568 |
| 7200 min Winter | 0.827 | 0.0 | 0.0 | 4272 |
| 8640 min Winter | 0.717 | 0.0 | 0.0 | 4936 |
| 10080 min Winter | 0.636 | 0.0 | 0.0 | 5472 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 3.234

| Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.323 | 8 | 12 | 0.323 | 16 | 20 | 0.323 | 24 | 28 | 0.324 | 32 | 36 | 0.324 |
| 4 | 8 | 0.323 | 12 | 16 | 0.323 | 20 | 24 | 0.323 | 28 | 32 | 0.324 | 36 | 40 | 0.324 |

## Time Area Diagram

Total Area (ha) 0.000

| Time (mins) From: | To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15100

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 525.0 | 525.0 | 2.500 | 525.0 | 755.0 | 2.600 | 0.0 | 755.0 |

## Pipe Overflow Control

Diameter (m) 0.300 Roughness k (mm) 0.600 Upstream Invert Level (m) 9.200
Slope (1:X) 100.0 Entry Loss Coefficient 0.500
Length (m) 50.000 Coefficient of Contraction 0.600

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

Half Drain Time : 803 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Overflow (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 15 min Summer | 8.445 | 1.445 | 13.8 | 0.0 | 13.8 | 720.8 | O K |
| 30 min Summer | 8.925 | 1.925 | 14.7 | 0.0 | 14.7 | 960.2 | O K |
| 60 min Summer | 9.376 | 2.376 | 15.6 | 25.7 | 41.3 | 1184.9 | O K |
| 120 min Summer | 10.269 | 3.269 | 15.8 | 151.0 | 166.9 | 1264.2 | O K |
| 180 min Summer | 11.003 | 4.003 | 15.8 | 190.0 | 205.8 | 1268.4 | FLOOD |
| 240 min Summer | 11.003 | 4.003 | 15.8 | 190.0 | 205.8 | 1267.9 | FLOOD |
| 360 min Summer | 11.003 | 4.003 | 15.8 | 190.0 | 205.8 | 1268.0 | FLOOD |
| 480 min Summer | 10.736 | 3.736 | 15.8 | 176.8 | 192.6 | 1264.6 | Flood Risk |
| 600 min Summer | 10.418 | 3.418 | 15.8 | 159.7 | 175.5 | 1264.3 | O K |
| 720 min Summer | 9.884 | 2.884 | 15.8 | 126.0 | 141.8 | 1263.8 | O K |
| 960 min Summer | 9.611 | 2.611 | 15.8 | 93.7 | 109.5 | 1263.5 | O K |
| 1440 min Summer | 9.490 | 2.490 | 15.8 | 55.3 | 71.2 | 1242.1 | O K |
| 2160 min Summer | 9.424 | 2.424 | 15.7 | 36.4 | 52.1 | 1208.8 | O K |
| 2880 min Summer | 9.377 | 2.377 | 15.6 | 26.1 | 41.7 | 1185.5 | O K |
| 4320 min Summer | 9.316 | 2.316 | 15.5 | 10.9 | 26.4 | 1155.0 | O K |
| 5760 min Summer | 9.213 | 2.213 | 15.3 | 0.2 | 15.4 | 1103.5 | O K |
| 7200 min Summer | 8.927 | 1.927 | 14.7 | 0.0 | 14.7 | 961.0 | O K |
| 8640 min Summer | 8.670 | 1.670 | 14.2 | 0.0 | 14.2 | 833.0 | O K |
| 10080 min Summer | 8.443 | 1.443 | 13.8 | 0.0 | 13.8 | 719.6 | O K |
| 15 min Winter | 8.626 | 1.626 | 14.1 | 0.0 | 14.1 | 811.0 | O K |
| 30 min Winter | 9.166 | 2.166 | 15.2 | 0.0 | 15.2 | 1080.3 | O K |
| 60 min Winter | 10.962 | 3.962 | 15.8 | 188.0 | 203.8 | 1264.9 | Flood Risk |
| 120 min Winter | 11.051 | 4.051 | 15.8 | 192.2 | 208.1 | 1316.0 | FLOOD |
| 180 min Winter | 11.051 | 4.051 | 15.8 | 192.2 | 208.0 | 1315.4 | FLOOD |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Overflow Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 124.836 | 0.0 | 0.0 | 53 |
| 30 min Summer | 83.061 | 0.0 | 0.0 | 67 |
| 60 min Summer | 52.662 | 0.0 | 51.2 | 88 |
| 120 min Summer | 32.210 | 0.0 | 278.9 | 110 |
| 180 min Summer | 23.799 | 4.9 | 406.0 | 136 |
| 240 min Summer | 19.065 | 4.4 | 482.3 | 166 |
| 360 min Summer | 13.962 | 4.5 | 579.6 | 228 |
| 480 min Summer | 11.178 | 0.0 | 629.0 | 292 |
| 600 min Summer | 9.399 | 0.0 | 651.9 | 356 |
| 720 min Summer | 8.153 | 0.0 | 657.7 | 420 |
| 960 min Summer | 6.510 | 0.0 | 638.1 | 558 |
| 1440 min Summer | 4.731 | 0.0 | 552.1 | 838 |
| 2160 min Summer | 3.432 | 0.0 | 433.3 | 1244 |
| 2880 min Summer | 2.730 | 0.0 | 332.4 | 1648 |
| 4320 min Summer | 1.973 | 0.0 | 150.0 | 2524 |
| 5760 min Summer | 1.566 | 0.0 | 0.8 | 3528 |
| 7200 min Summer | 1.308 | 0.0 | 0.0 | 4328 |
| 8640 min Summer | 1.129 | 0.0 | 0.0 | 5096 |
| 10080 min Summer | 0.998 | 0.0 | 0.0 | 5856 |
| 15 min Winter | 124.836 | 0.0 | 0.0 | 53 |
| 30 min Winter | 83.061 | 0.0 | 0.0 | 67 |
| 60 min Winter | 52.662 | 0.0 | 186.6 | 76 |
| 120 min Winter | 32.210 | 52.5 | 465.3 | 110 |
| 180 min Winter | 23.799 | 51.9 | 612.8 | 142 |

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

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Overflow (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 240 min Winter | 11.043 | 4.043 | 15.8 | 191.9 | 207.7 | 1308.3 | FLOOD |
| 360 min Winter | 11.013 | 4.013 | 15.8 | 190.4 | 206.3 | 1277.5 | FLOOD |
| 480 min Winter | 11.003 | 4.003 | 15.8 | 190.0 | 205.8 | 1268.0 | FLOOD |
| 600 min Winter | 10.254 | 3.254 | 15.8 | 150.2 | 166.0 | 1264.2 | O K |
| 720 min Winter | 9.995 | 2.995 | 15.8 | 133.7 | 149.5 | 1263.9 | O K |
| 960 min Winter | 9.661 | 2.661 | 15.8 | 104.8 | 120.6 | 1263.6 | O K |
| 1440 min Winter | 9.508 | 2.508 | 15.8 | 60.8 | 76.7 | 1250.3 | O K |
| 2160 min Winter | 9.437 | 2.437 | 15.7 | 39.4 | 55.1 | 1215.5 | O K |
| 2880 min Winter | 9.386 | 2.386 | 15.6 | 28.1 | 43.7 | 1190.1 | O K |
| 4320 min Winter | 9.329 | 2.329 | 15.5 | 13.2 | 28.7 | 1161.7 | O K |
| 5760 min Winter | 9.252 | 2.252 | 15.4 | 2.3 | 17.6 | 1123.0 | O K |
| 7200 min Winter | 8.882 | 1.882 | 14.6 | 0.0 | 14.6 | 938.7 | O K |
| 8640 min Winter | 8.525 | 1.525 | 14.0 | 0.0 | 14.0 | 760.4 | O K |
| 10080 min Winter | 8.213 | 1.213 | 13.4 | 0.0 | 13.4 | 604.9 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Overflow Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 240 min Winter | 19.065 | 44.8 | 703.0 | 174 |
| 360 min Winter | 13.962 | 14.0 | 822.9 | 230 |
| 480 min Winter | 11.178 | 4.5 | 890.7 | 284 |
| 600 min Winter | 9.399 | 0.0 | 927.2 | 346 |
| 720 min Winter | 8.153 | 0.0 | 944.4 | 410 |
| 960 min Winter | 6.510 | 0.0 | 942.2 | 544 |
| 1440 min Winter | 4.731 | 0.0 | 860.9 | 836 |
| 2160 min Winter | 3.432 | 0.0 | 695.4 | 1248 |
| 2880 min Winter | 2.730 | 0.0 | 551.2 | 1660 |
| 4320 min Winter | 1.973 | 0.0 | 277.4 | 2568 |
| 5760 min Winter | 1.566 | 0.0 | 32.5 | 3664 |
| 7200 min Winter | 1.308 | 0.0 | 0.0 | 4576 |
| 8640 min Winter | 1.129 | 0.0 | 0.0 | 5376 |
| 10080 min Winter | 0.998 | 0.0 | 0.0 | 6152 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +30 |

## Time Area Diagram

Total Area (ha) 3.234

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.323 | 8 | 12 | 0.323 | 16 | 20 | 0.323 | 24 | 28 | 0.324 | 32 | 36 | 0.324 |
| 4 | 8 | 0.323 | 12 | 16 | 0.323 | 20 | 24 | 0.323 | 28 | 32 | 0.324 | 36 | 40 | 0.324 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15100

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 525.0 | 525.0 | 2.500 | 525.0 | 755.0 | 2.600 | 0.0 | 755.0 |

## Pipe Overflow Control

Diameter (m) 0.300 Roughness k (mm) 0.600 Upstream Invert Level (m) 9.200
Slope (1:X) 100.0 Entry Loss Coefficient 0.500
Length (m) 50.000 Coefficient of Contraction 0.600

## Summary of Results for 30 year Return Period

Half Drain Time : 418 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 30 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 60 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 120 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 180 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 240 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 360 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 480 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 600 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 720 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 960 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 1440 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 2160 min Summer | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 2880 min Summer | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 4320 min Summer | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 5760 min Summer | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 7200 min Summer | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 8640 min Summer | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 10080 min Summer | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 15 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 30 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 60 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 120 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 180 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 74.059 | 0.0 | 226 |
| 30 min Summer | 48.833 | 0.0 | 226 |
| 60 min Summer | 30.811 | 0.0 | 226 |
| 120 min Summer | 18.860 | 0.0 | 226 |
| 180 min Summer | 13.992 | 0.0 | 226 |
| 240 min Summer | 11.265 | 0.0 | 226 |
| 360 min Summer | 8.299 | 0.0 | 226 |
| 480 min Summer | 6.674 | 0.0 | 226 |
| 600 min Summer | 5.632 | 0.0 | 226 |
| 720 min Summer | 4.901 | 0.0 | 226 |
| 960 min Summer | 3.933 | 0.0 | 226 |
| 1440 min Summer | 2.881 | 0.0 | 226 |
| 2160 min Summer | 2.107 | 0.0 | 228 |
| 2880 min Summer | 1.687 | 0.0 | 228 |
| 4320 min Summer | 1.231 | 0.0 | 228 |
| 5760 min Summer | 0.984 | 0.0 | 224 |
| 7200 min Summer | 0.827 | 0.0 | 224 |
| 8640 min Summer | 0.717 | 0.0 | 224 |
| 10080 min Summer | 0.636 | 0.0 | 224 |
| 15 min Winter | 74.059 | 0.0 | 226 |
| 30 min Winter | 48.833 | 0.0 | 226 |
| 60 min Winter | 30.811 | 0.0 | 226 |
| 120 min Winter | 18.860 | 0.0 | 226 |
| 180 min Winter | 13.992 | 0.0 | 226 |

## Summary of Results for 30 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 360 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 480 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 600 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 720 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 960 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 1440 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 2160 min Winter | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 2880 min Winter | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 4320 min Winter | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 5760 min Winter | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 7200 min Winter | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 8640 min Winter | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 10080 min Winter | 8.532 | 1.532 | 16.6 | 640.2 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 11.265 | 0.0 | 226 |
| 360 min Winter | 8.299 | 0.0 | 226 |
| 480 min Winter | 6.674 | 0.0 | 226 |
| 600 min Winter | 5.632 | 0.0 | 226 |
| 720 min Winter | 4.901 | 0.0 | 226 |
| 960 min Winter | 3.933 | 0.0 | 226 |
| 1440 min Winter | 2.881 | 0.0 | 226 |
| 2160 min Winter | 2.107 | 0.0 | 228 |
| 2880 min Winter | 1.687 | 0.0 | 228 |
| 4320 min Winter | 1.231 | 0.0 | 228 |
| 5760 min Winter | 0.984 | 0.0 | 224 |
| 7200 min Winter | 0.827 | 0.0 | 224 |
| 8640 min Winter | 0.717 | 0.0 | 224 |
| 10080 min Winter | 0.636 | 0.0 | 224 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 0.000

| Time (mins) From: | To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Time Area Diagram

Total Area (ha) 0.000

| Time (mins) From: | To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15100

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 440.0 | 440.0 | 1.800 | 440.0 | 850.4 | 1.900 | 0.0 | 850.4 |

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

Half Drain Time : 418 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 30 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 60 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 120 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 180 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 240 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 360 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 480 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 600 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 720 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 960 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 1440 min Summer | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 2160 min Summer | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 2880 min Summer | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 4320 min Summer | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 5760 min Summer | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 7200 min Summer | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 8640 min Summer | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 10080 min Summer | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 15 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 30 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 60 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 120 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 180 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 124.836 | 0.0 | 226 |
| 30 min Summer | 83.061 | 0.0 | 226 |
| 60 min Summer | 52.662 | 0.0 | 226 |
| 120 min Summer | 32.210 | 0.0 | 226 |
| 180 min Summer | 23.799 | 0.0 | 226 |
| 240 min Summer | 19.065 | 0.0 | 226 |
| 360 min Summer | 13.962 | 0.0 | 226 |
| 480 min Summer | 11.178 | 0.0 | 226 |
| 600 min Summer | 9.399 | 0.0 | 226 |
| 720 min Summer | 8.153 | 0.0 | 226 |
| 960 min Summer | 6.510 | 0.0 | 226 |
| 1440 min Summer | 4.731 | 0.0 | 226 |
| 2160 min Summer | 3.432 | 0.0 | 228 |
| 2880 min Summer | 2.730 | 0.0 | 228 |
| 4320 min Summer | 1.973 | 0.0 | 228 |
| 5760 min Summer | 1.566 | 0.0 | 224 |
| 7200 min Summer | 1.308 | 0.0 | 224 |
| 8640 min Summer | 1.129 | 0.0 | 224 |
| 10080 min Summer | 0.998 | 0.0 | 224 |
| 15 min Winter | 124.836 | 0.0 | 226 |
| 30 min Winter | 83.061 | 0.0 | 226 |
| 60 min Winter | 52.662 | 0.0 | 226 |
| 120 min Winter | 32.210 | 0.0 | 226 |
| 180 min Winter | 23.799 | 0.0 | 226 |

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

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 360 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 480 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 600 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 720 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 960 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 1440 min Winter | 8.562 | 1.562 | 16.7 | 652.9 | O K |
| 2160 min Winter | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 2880 min Winter | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 4320 min Winter | 8.587 | 1.587 | 16.8 | 663.6 | O K |
| 5760 min Winter | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 7200 min Winter | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 8640 min Winter | 8.532 | 1.532 | 16.6 | 640.2 | O K |
| 10080 min Winter | 8.532 | 1.532 | 16.6 | 640.2 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 19.065 | 0.0 | 226 |
| 360 min Winter | 13.962 | 0.0 | 226 |
| 480 min Winter | 11.178 | 0.0 | 226 |
| 600 min Winter | 9.399 | 0.0 | 226 |
| 720 min Winter | 8.153 | 0.0 | 226 |
| 960 min Winter | 6.510 | 0.0 | 226 |
| 1440 min Winter | 4.731 | 0.0 | 226 |
| 2160 min Winter | 3.432 | 0.0 | 228 |
| 2880 min Winter | 2.730 | 0.0 | 228 |
| 4320 min Winter | 1.973 | 0.0 | 228 |
| 5760 min Winter | 1.566 | 0.0 | 224 |
| 7200 min Winter | 1.308 | 0.0 | 224 |
| 8640 min Winter | 1.129 | 0.0 | 224 |
| 10080 min Winter | 0.998 | 0.0 | 224 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +30 |

## Time Area Diagram

Total Area (ha) 0.000

| Time (mins) From: | To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Time Area Diagram

Total Area (ha) 0.000

| Time (mins) From: | To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15100

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 440.0 | 440.0 | 1.800 | 440.0 | 850.4 | 1.900 | 0.0 | 850.4 |

## Summary of Results for 30 year Return Period

Half Drain Time : 398 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.541 | 0.541 | 9.5 | 205.6 | O K |
| 30 min Summer | 7.718 | 0.718 | 9.9 | 272.9 | O K |
| 60 min Summer | 7.892 | 0.892 | 10.3 | 338.9 | O K |
| 120 min Summer | 8.041 | 1.041 | 10.6 | 395.5 | O K |
| 180 min Summer | 8.100 | 1.100 | 10.7 | 418.1 | O K |
| 240 min Summer | 8.121 | 1.121 | 10.7 | 425.8 | O K |
| 360 min Summer | 8.116 | 1.116 | 10.7 | 424.3 | O K |
| 480 min Summer | 8.095 | 1.095 | 10.7 | 416.0 | O K |
| 600 min Summer | 8.070 | 1.070 | 10.6 | 406.5 | O K |
| 720 min Summer | 8.045 | 1.045 | 10.6 | 397.2 | O K |
| 960 min Summer | 7.997 | 0.997 | 10.5 | 379.0 | O K |
| 1440 min Summer | 7.903 | 0.903 | 10.3 | 343.3 | O K |
| 2160 min Summer | 7.768 | 0.768 | 10.0 | 291.8 | O K |
| 2880 min Summer | 7.643 | 0.643 | 9.7 | 244.3 | O K |
| 4320 min Summer | 7.432 | 0.432 | 9.3 | 164.2 | O K |
| 5760 min Summer | 7.274 | 0.274 | 9.0 | 104.0 | O K |
| 7200 min Summer | 7.161 | 0.161 | 8.7 | 61.0 | O K |
| 8640 min Summer | 7.088 | 0.088 | 8.6 | 33.5 | O K |
| 10080 min Summer | 7.052 | 0.052 | 8.5 | 19.7 | O K |
| 15 min Winter | 7.612 | 0.612 | 9.7 | 232.7 | O K |
| 30 min Winter | 7.812 | 0.812 | 10.1 | 308.6 | O K |
| 60 min Winter | 8.010 | 1.010 | 10.5 | 383.9 | O K |
| 120 min Winter | 8.186 | 1.186 | 10.9 | 450.8 | O K |
| 180 min Winter | 8.263 | 1.263 | 11.0 | 479.8 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 74.059 | 0.0 | 51 |
| 30 min Summer | 48.833 | 0.0 | 64 |
| 60 min Summer | 30.811 | 0.0 | 90 |
| 120 min Summer | 18.860 | 0.0 | 142 |
| 180 min Summer | 13.992 | 0.0 | 194 |
| 240 min Summer | 11.265 | 0.0 | 248 |
| 360 min Summer | 8.299 | 0.0 | 342 |
| 480 min Summer | 6.674 | 0.0 | 402 |
| 600 min Summer | 5.632 | 0.0 | 466 |
| 720 min Summer | 4.901 | 0.0 | 532 |
| 960 min Summer | 3.933 | 0.0 | 670 |
| 1440 min Summer | 2.881 | 0.0 | 944 |
| 2160 min Summer | 2.107 | 0.0 | 1348 |
| 2880 min Summer | 1.687 | 0.0 | 1736 |
| 4320 min Summer | 1.231 | 0.0 | 2480 |
| 5760 min Summer | 0.984 | 0.0 | 3184 |
| 7200 min Summer | 0.827 | 0.0 | 3848 |
| 8640 min Summer | 0.717 | 0.0 | 4504 |
| 10080 min Summer | 0.636 | 0.0 | 5144 |
| 15 min Winter | 74.059 | 0.0 | 52 |
| 30 min Winter | 48.833 | 0.0 | 64 |
| 60 min Winter | 30.811 | 0.0 | 90 |
| 120 min Winter | 18.860 | 0.0 | 142 |
| 180 min Winter | 13.992 | 0.0 | 196 |

## Summary of Results for 30 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 8.295 | 1.295 | 11.1 | 492.2 | O K |
| 360 min Winter | 8.308 | 1.308 | 11.1 | 496.9 | O K |
| 480 min Winter | 8.282 | 1.282 | 11.1 | 487.0 | O K |
| 600 min Winter | 8.250 | 1.250 | 11.0 | 475.0 | O K |
| 720 min Winter | 8.217 | 1.217 | 10.9 | 462.3 | O K |
| 960 min Winter | 8.148 | 1.148 | 10.8 | 436.1 | O K |
| 1440 min Winter | 8.004 | 1.004 | 10.5 | 381.7 | O K |
| 2160 min Winter | 7.796 | 0.796 | 10.1 | 302.6 | O K |
| 2880 min Winter | 7.610 | 0.610 | 9.7 | 231.8 | O K |
| 4320 min Winter | 7.311 | 0.311 | 9.0 | 118.3 | O K |
| 5760 min Winter | 7.113 | 0.113 | 8.6 | 42.9 | O K |
| 7200 min Winter | 7.048 | 0.048 | 8.1 | 18.1 | O K |
| 8640 min Winter | 7.041 | 0.041 | 7.0 | 15.6 | O K |
| 10080 min Winter | 7.037 | 0.037 | 6.2 | 13.9 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 11.265 | 0.0 | 250 |
| 360 min Winter | 8.299 | 0.0 | 356 |
| 480 min Winter | 6.674 | 0.0 | 452 |
| 600 min Winter | 5.632 | 0.0 | 494 |
| 720 min Winter | 4.901 | 0.0 | 570 |
| 960 min Winter | 3.933 | 0.0 | 724 |
| 1440 min Winter | 2.881 | 0.0 | 1024 |
| 2160 min Winter | 2.107 | 0.0 | 1448 |
| 2880 min Winter | 1.687 | 0.0 | 1848 |
| 4320 min Winter | 1.231 | 0.0 | 2580 |
| 5760 min Winter | 0.984 | 0.0 | 3192 |
| 7200 min Winter | 0.827 | 0.0 | 3648 |
| 8640 min Winter | 0.717 | 0.0 | 4400 |
| 10080 min Winter | 0.636 | 0.0 | 5136 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 1.656

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.166 | 8 | 12 | 0.166 | 16 | 20 | 0.166 | 24 | 28 | 0.165 | 32 | 36 | 0.165 |
| 4 | 8 | 0.166 | 12 | 16 | 0.166 | 20 | 24 | 0.166 | 28 | 32 | 0.165 | 36 | 40 | 0.165 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 10.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15100

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 400.0 | 400.0 | 2.000 | 400.0 | 600.0 | 2.100 | 0.0 | 600.0 |

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

Half Drain Time : 682 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.950 | 0.950 | 10.4 | 360.9 | O K |
| 30 min Summer | 8.267 | 1.267 | 11.0 | 481.5 | O K |
| 60 min Summer | 8.587 | 1.587 | 11.7 | 603.2 | O K |
| 120 min Summer | 8.880 | 1.880 | 12.3 | 714.5 | O K |
| 180 min Summer | 9.018 | 2.018 | 12.6 | 765.6 | O K |
| 240 min Summer | 10.017 | 3.017 | 12.6 | 790.5 | FLOOD |
| 360 min Summer | 10.039 | 3.039 | 12.6 | 812.4 | FLOOD |
| 480 min Summer | 10.038 | 3.038 | 12.6 | 811.2 | FLOOD |
| 600 min Summer | 10.026 | 3.026 | 12.6 | 799.7 | FLOOD |
| 720 min Summer | 10.013 | 3.013 | 12.6 | 786.7 | FLOOD |
| 960 min Summer | 8.996 | 1.996 | 12.6 | 758.4 | O K |
| 1440 min Summer | 8.863 | 1.863 | 12.3 | 707.9 | O K |
| 2160 min Summer | 8.687 | 1.687 | 11.9 | 640.9 | O K |
| 2880 min Summer | 8.523 | 1.523 | 11.6 | 578.8 | O K |
| 4320 min Summer | 8.229 | 1.229 | 11.0 | 467.0 | O K |
| 5760 min Summer | 7.977 | 0.977 | 10.4 | 371.1 | O K |
| 7200 min Summer | 7.763 | 0.763 | 10.0 | 290.0 | O K |
| 8640 min Summer | 7.585 | 0.585 | 9.6 | 222.4 | O K |
| 10080 min Summer | 7.439 | 0.439 | 9.3 | 166.9 | O K |
| 15 min Winter | 8.071 | 1.071 | 10.6 | 406.9 | O K |
| 30 min Winter | 8.428 | 1.428 | 11.4 | 542.6 | O K |
| 60 min Winter | 8.791 | 1.791 | 12.1 | 680.8 | O K |
| 120 min Winter | 10.036 | 3.036 | 12.6 | 809.9 | FLOOD |
| 180 min Winter | 10.099 | 3.099 | 12.6 | 872.5 | FLOOD |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 124.836 | 0.0 | 52 |
| 30 min Summer | 83.061 | 0.0 | 66 |
| 60 min Summer | 52.662 | 0.0 | 92 |
| 120 min Summer | 32.210 | 0.0 | 148 |
| 180 min Summer | 23.799 | 0.0 | 202 |
| 240 min Summer | 19.065 | 17.8 | 258 |
| 360 min Summer | 13.962 | 39.7 | 370 |
| 480 min Summer | 11.178 | 38.5 | 482 |
| 600 min Summer | 9.399 | 27.1 | 542 |
| 720 min Summer | 8.153 | 14.0 | 602 |
| 960 min Summer | 6.510 | 0.0 | 726 |
| 1440 min Summer | 4.731 | 0.0 | 1000 |
| 2160 min Summer | 3.432 | 0.0 | 1412 |
| 2880 min Summer | 2.730 | 0.0 | 1820 |
| 4320 min Summer | 1.973 | 0.0 | 2612 |
| 5760 min Summer | 1.566 | 0.0 | 3368 |
| 7200 min Summer | 1.308 | 0.0 | 4120 |
| 8640 min Summer | 1.129 | 0.0 | 4848 |
| 10080 min Summer | 0.998 | 0.0 | 5552 |
| 15 min Winter | 124.836 | 0.0 | 53 |
| 30 min Winter | 83.061 | 0.0 | 66 |
| 60 min Winter | 52.662 | 0.0 | 92 |
| 120 min Winter | 32.210 | 37.2 | 146 |
| 180 min Winter | 23.799 | 99.8 | 202 |

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

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 10.132 | 3.132 | 12.6 | 905.4 | FLOOD |
| 360 min Winter | 10.166 | 3.166 | 12.6 | 940.0 | FLOOD |
| 480 min Winter | 10.175 | 3.175 | 12.6 | 948.5 | FLOOD |
| 600 min Winter | 10.169 | 3.169 | 12.6 | 942.3 | FLOOD |
| 720 min Winter | 10.154 | 3.154 | 12.6 | 927.3 | FLOOD |
| 960 min Winter | 10.118 | 3.118 | 12.6 | 891.4 | FLOOD |
| 1440 min Winter | 10.044 | 3.044 | 12.6 | 817.2 | FLOOD |
| 2160 min Winter | 8.889 | 1.889 | 12.4 | 717.8 | O K |
| 2880 min Winter | 8.646 | 1.646 | 11.8 | 625.3 | O K |
| 4320 min Winter | 8.215 | 1.215 | 10.9 | 461.9 | O K |
| 5760 min Winter | 7.861 | 0.861 | 10.2 | 327.1 | O K |
| 7200 min Winter | 7.573 | 0.573 | 9.6 | 217.6 | O K |
| 8640 min Winter | 7.344 | 0.344 | 9.1 | 130.8 | O K |
| 10080 min Winter | 7.172 | 0.172 | 8.8 | 65.5 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 19.065 | 132.8 | 256 |
| 360 min Winter | 13.962 | 167.4 | 368 |
| 480 min Winter | 11.178 | 175.8 | 478 |
| 600 min Winter | 9.399 | 169.6 | 586 |
| 720 min Winter | 8.153 | 154.6 | 688 |
| 960 min Winter | 6.510 | 118.7 | 780 |
| 1440 min Winter | 4.731 | 44.5 | 1082 |
| 2160 min Winter | 3.432 | 0.0 | 1528 |
| 2880 min Winter | 2.730 | 0.0 | 1964 |
| 4320 min Winter | 1.973 | 0.0 | 2784 |
| 5760 min Winter | 1.566 | 0.0 | 3552 |
| 7200 min Winter | 1.308 | 0.0 | 4280 |
| 8640 min Winter | 1.129 | 0.0 | 4960 |
| 10080 min Winter | 0.998 | 0.0 | 5568 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +30 |

## Time Area Diagram

Total Area (ha) 1.656

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.166 | 8 | 12 | 0.166 | 16 | 20 | 0.166 | 24 | 28 | 0.165 | 32 | 36 | 0.165 |
| 4 | 8 | 0.166 | 12 | 16 | 0.166 | 20 | 24 | 0.166 | 28 | 32 | 0.165 | 36 | 40 | 0.165 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 10.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15100

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 400.0 | 400.0 | 2.000 | 400.0 | 600.0 | 2.100 | 0.0 | 600.0 |

## Summary of Results for 30 year Return Period

Half Drain Time : 259 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.412 | 0.412 | 5.1 | 78.3 | O K |
| 30 min Summer | 7.538 | 0.538 | 5.4 | 102.2 | O K |
| 60 min Summer | 7.653 | 0.653 | 5.7 | 124.1 | O K |
| 120 min Summer | 7.737 | 0.737 | 5.9 | 140.0 | O K |
| 180 min Summer | 7.755 | 0.755 | 5.9 | 143.4 | O K |
| 240 min Summer | 7.750 | 0.750 | 5.9 | 142.5 | O K |
| 360 min Summer | 7.732 | 0.732 | 5.9 | 139.0 | O K |
| 480 min Summer | 7.709 | 0.709 | 5.8 | 134.6 | O K |
| 600 min Summer | 7.685 | 0.685 | 5.7 | 130.1 | O K |
| 720 min Summer | 7.661 | 0.661 | 5.7 | 125.5 | O K |
| 960 min Summer | 7.613 | 0.613 | 5.6 | 116.5 | O K |
| 1440 min Summer | 7.522 | 0.522 | 5.4 | 99.2 | O K |
| 2160 min Summer | 7.402 | 0.402 | 5.1 | 76.4 | O K |
| 2880 min Summer | 7.303 | 0.303 | 4.9 | 57.5 | O K |
| 4320 min Summer | 7.160 | 0.160 | 4.6 | 30.4 | O K |
| 5760 min Summer | 7.078 | 0.078 | 4.4 | 14.7 | O K |
| 7200 min Summer | 7.048 | 0.048 | 4.2 | 9.2 | O K |
| 8640 min Summer | 7.042 | 0.042 | 3.6 | 8.0 | O K |
| 10080 min Summer | 7.037 | 0.037 | 3.2 | 7.0 | O K |
| 15 min Winter | 7.465 | 0.465 | 5.2 | 88.4 | O K |
| 30 min Winter | 7.608 | 0.608 | 5.6 | 115.5 | O K |
| 60 min Winter | 7.742 | 0.742 | 5.9 | 140.9 | O K |
| 120 min Winter | 7.845 | 0.845 | 6.1 | 160.5 | O K |
| 180 min Winter | 7.875 | 0.875 | 6.2 | 166.2 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 74.059 | 0.0 | 32 |
| 30 min Summer | 48.833 | 0.0 | 45 |
| 60 min Summer | 30.811 | 0.0 | 72 |
| 120 min Summer | 18.860 | 0.0 | 126 |
| 180 min Summer | 13.992 | 0.0 | 182 |
| 240 min Summer | 11.265 | 0.0 | 214 |
| 360 min Summer | 8.299 | 0.0 | 278 |
| 480 min Summer | 6.674 | 0.0 | 344 |
| 600 min Summer | 5.632 | 0.0 | 414 |
| 720 min Summer | 4.901 | 0.0 | 482 |
| 960 min Summer | 3.933 | 0.0 | 620 |
| 1440 min Summer | 2.881 | 0.0 | 888 |
| 2160 min Summer | 2.107 | 0.0 | 1272 |
| 2880 min Summer | 1.687 | 0.0 | 1644 |
| 4320 min Summer | 1.231 | 0.0 | 2344 |
| 5760 min Summer | 0.984 | 0.0 | 3000 |
| 7200 min Summer | 0.827 | 0.0 | 3672 |
| 8640 min Summer | 0.717 | 0.0 | 4408 |
| 10080 min Summer | 0.636 | 0.0 | 5144 |
| 15 min Winter | 74.059 | 0.0 | 32 |
| 30 min Winter | 48.833 | 0.0 | 45 |
| 60 min Winter | 30.811 | 0.0 | 72 |
| 120 min Winter | 18.860 | 0.0 | 126 |
| 180 min Winter | 13.992 | 0.0 | 180 |

## Summary of Results for 30 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 7.873 | 0.873 | 6.2 | 165.9 | O K |
| 360 min Winter | 7.849 | 0.849 | 6.1 | 161.2 | O K |
| 480 min Winter | 7.818 | 0.818 | 6.0 | 155.4 | O K |
| 600 min Winter | 7.783 | 0.783 | 6.0 | 148.8 | O K |
| 720 min Winter | 7.747 | 0.747 | 5.9 | 141.9 | O K |
| 960 min Winter | 7.673 | 0.673 | 5.7 | 128.0 | O K |
| 1440 min Winter | 7.536 | 0.536 | 5.4 | 101.8 | O K |
| 2160 min Winter | 7.360 | 0.360 | 5.0 | 68.5 | O K |
| 2880 min Winter | 7.223 | 0.223 | 4.7 | 42.4 | O K |
| 4320 min Winter | 7.058 | 0.058 | 4.3 | 11.0 | O K |
| 5760 min Winter | 7.042 | 0.042 | 3.6 | 7.9 | O K |
| 7200 min Winter | 7.035 | 0.035 | 3.0 | 6.7 | O K |
| 8640 min Winter | 7.030 | 0.030 | 2.6 | 5.8 | O K |
| 10080 min Winter | 7.027 | 0.027 | 2.3 | 5.1 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 11.265 | 0.0 | 234 |
| 360 min Winter | 8.299 | 0.0 | 294 |
| 480 min Winter | 6.674 | 0.0 | 370 |
| 600 min Winter | 5.632 | 0.0 | 448 |
| 720 min Winter | 4.901 | 0.0 | 522 |
| 960 min Winter | 3.933 | 0.0 | 670 |
| 1440 min Winter | 2.881 | 0.0 | 952 |
| 2160 min Winter | 2.107 | 0.0 | 1344 |
| 2880 min Winter | 1.687 | 0.0 | 1708 |
| 4320 min Winter | 1.231 | 0.0 | 2292 |
| 5760 min Winter | 0.984 | 0.0 | 2920 |
| 7200 min Winter | 0.827 | 0.0 | 3672 |
| 8640 min Winter | 0.717 | 0.0 | 4408 |
| 10080 min Winter | 0.636 | 0.0 | 5056 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 0.618

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.124 | 4 | 8 | 0.124 | 8 | 12 | 0.124 | 12 | 16 | 0.123 | 16 | 20 | 0.123 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15100

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 200.0 | 200.0 | 1.800 | 200.0 | 394.4 | 1.900 | 0.0 | 394.4 |

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

Half Drain Time : 382 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.716 | 0.716 | 5.8 | 136.0 | O K |
| 30 min Summer | 7.944 | 0.944 | 6.3 | 179.5 | O K |
| 60 min Summer | 8.166 | 1.166 | 6.8 | 221.6 | O K |
| 120 min Summer | 8.349 | 1.349 | 7.2 | 256.3 | O K |
| 180 min Summer | 8.413 | 1.413 | 7.4 | 268.5 | O K |
| 240 min Summer | 8.427 | 1.427 | 7.4 | 271.1 | O K |
| 360 min Summer | 8.413 | 1.413 | 7.4 | 268.4 | O K |
| 480 min Summer | 8.385 | 1.385 | 7.3 | 263.2 | O K |
| 600 min Summer | 8.353 | 1.353 | 7.3 | 257.0 | O K |
| 720 min Summer | 8.319 | 1.319 | 7.2 | 250.5 | O K |
| 960 min Summer | 8.252 | 1.252 | 7.0 | 238.0 | O K |
| 1440 min Summer | 8.132 | 1.132 | 6.8 | 215.1 | O K |
| 2160 min Summer | 7.969 | 0.969 | 6.4 | 184.1 | O K |
| 2880 min Summer | 7.826 | 0.826 | 6.1 | 156.9 | O K |
| 4320 min Summer | 7.590 | 0.590 | 5.5 | 112.2 | O K |
| 5760 min Summer | 7.411 | 0.411 | 5.1 | 78.0 | O K |
| 7200 min Summer | 7.275 | 0.275 | 4.8 | 52.3 | O K |
| 8640 min Summer | 7.175 | 0.175 | 4.6 | 33.2 | O K |
| 10080 min Summer | 7.105 | 0.105 | 4.4 | 20.0 | O K |
| 15 min Winter | 7.806 | 0.806 | 6.0 | 153.1 | O K |
| 30 min Winter | 8.064 | 1.064 | 6.6 | 202.2 | O K |
| 60 min Winter | 8.318 | 1.318 | 7.2 | 250.4 | O K |
| 120 min Winter | 8.534 | 1.534 | 7.7 | 291.5 | O K |
| 180 min Winter | 8.618 | 1.618 | 7.9 | 307.3 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 124.836 | 0.0 | 33 |
| 30 min Summer | 83.061 | 0.0 | 47 |
| 60 min Summer | 52.662 | 0.0 | 74 |
| 120 min Summer | 32.210 | 0.0 | 130 |
| 180 min Summer | 23.799 | 0.0 | 186 |
| 240 min Summer | 19.065 | 0.0 | 242 |
| 360 min Summer | 13.962 | 0.0 | 314 |
| 480 min Summer | 11.178 | 0.0 | 376 |
| 600 min Summer | 9.399 | 0.0 | 442 |
| 720 min Summer | 8.153 | 0.0 | 510 |
| 960 min Summer | 6.510 | 0.0 | 648 |
| 1440 min Summer | 4.731 | 0.0 | 924 |
| 2160 min Summer | 3.432 | 0.0 | 1328 |
| 2880 min Summer | 2.730 | 0.0 | 1716 |
| 4320 min Summer | 1.973 | 0.0 | 2472 |
| 5760 min Summer | 1.566 | 0.0 | 3184 |
| 7200 min Summer | 1.308 | 0.0 | 3896 |
| 8640 min Summer | 1.129 | 0.0 | 4584 |
| 10080 min Summer | 0.998 | 0.0 | 5248 |
| 15 min Winter | 124.836 | 0.0 | 33 |
| 30 min Winter | 83.061 | 0.0 | 47 |
| 60 min Winter | 52.662 | 0.0 | 74 |
| 120 min Winter | 32.210 | 0.0 | 128 |
| 180 min Winter | 23.799 | 0.0 | 184 |

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

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 8.644 | 1.644 | 7.9 | 312.3 | O K |
| 360 min Winter | 8.639 | 1.639 | 7.9 | 311.4 | O K |
| 480 min Winter | 8.604 | 1.604 | 7.8 | 304.8 | O K |
| 600 min Winter | 8.567 | 1.567 | 7.7 | 297.7 | O K |
| 720 min Winter | 8.522 | 1.522 | 7.6 | 289.2 | O K |
| 960 min Winter | 8.426 | 1.426 | 7.4 | 270.9 | O K |
| 1440 min Winter | 8.248 | 1.248 | 7.0 | 237.2 | O K |
| 2160 min Winter | 8.009 | 1.009 | 6.5 | 191.7 | O K |
| 2880 min Winter | 7.804 | 0.804 | 6.0 | 152.8 | O K |
| 4320 min Winter | 7.484 | 0.484 | 5.3 | 91.9 | O K |
| 5760 min Winter | 7.255 | 0.255 | 4.8 | 48.4 | O K |
| 7200 min Winter | 7.101 | 0.101 | 4.4 | 19.2 | O K |
| 8640 min Winter | 7.048 | 0.048 | 4.1 | 9.1 | O K |
| 10080 min Winter | 7.042 | 0.042 | 3.6 | 8.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 19.065 | 0.0 | 240 |
| 360 min Winter | 13.962 | 0.0 | 344 |
| 480 min Winter | 11.178 | 0.0 | 394 |
| 600 min Winter | 9.399 | 0.0 | 468 |
| 720 min Winter | 8.153 | 0.0 | 546 |
| 960 min Winter | 6.510 | 0.0 | 700 |
| 1440 min Winter | 4.731 | 0.0 | 996 |
| 2160 min Winter | 3.432 | 0.0 | 1420 |
| 2880 min Winter | 2.730 | 0.0 | 1824 |
| 4320 min Winter | 1.973 | 0.0 | 2596 |
| 5760 min Winter | 1.566 | 0.0 | 3296 |
| 7200 min Winter | 1.308 | 0.0 | 3904 |
| 8640 min Winter | 1.129 | 0.0 | 4408 |
| 10080 min Winter | 0.998 | 0.0 | 5000 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +30 |

## Time Area Diagram

Total Area (ha) 0.618

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.124 | 4 | 8 | 0.124 | 8 | 12 | 0.124 | 12 | 16 | 0.123 | 16 | 20 | 0.123 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15100

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 200.0 | 200.0 | 1.800 | 200.0 | 394.4 | 1.900 | 0.0 | 394.4 |

## Summary of Results for 30 year Return Period

Half Drain Time : 218 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.307 | 0.307 | 3.3 | 41.9 | O K |
| 30 min Summer | 7.398 | 0.398 | 3.4 | 54.5 | O K |
| 60 min Summer | 7.480 | 0.480 | 3.5 | 65.6 | O K |
| 120 min Summer | 7.532 | 0.532 | 3.6 | 72.8 | O K |
| 180 min Summer | 7.537 | 0.537 | 3.6 | 73.4 | O K |
| 240 min Summer | 7.530 | 0.530 | 3.6 | 72.4 | O K |
| 360 min Summer | 7.511 | 0.511 | 3.5 | 69.9 | O K |
| 480 min Summer | 7.489 | 0.489 | 3.5 | 66.9 | O K |
| 600 min Summer | 7.467 | 0.467 | 3.5 | 63.9 | O K |
| 720 min Summer | 7.445 | 0.445 | 3.5 | 60.9 | O K |
| 960 min Summer | 7.401 | 0.401 | 3.4 | 54.9 | O K |
| 1440 min Summer | 7.320 | 0.320 | 3.3 | 43.7 | O K |
| 2160 min Summer | 7.217 | 0.217 | 3.2 | 29.7 | O K |
| 2880 min Summer | 7.141 | 0.141 | 3.2 | 19.4 | O K |
| 4320 min Summer | 7.059 | 0.059 | 3.1 | 8.0 | O K |
| 5760 min Summer | 7.043 | 0.043 | 2.7 | 5.9 | O K |
| 7200 min Summer | 7.037 | 0.037 | 2.3 | 5.0 | O K |
| 8640 min Summer | 7.032 | 0.032 | 1.9 | 4.3 | O K |
| 10080 min Summer | 7.028 | 0.028 | 1.7 | 3.8 | O K |
| 15 min Winter | 7.346 | 0.346 | 3.4 | 47.4 | O K |
| 30 min Winter | 7.451 | 0.451 | 3.5 | 61.7 | O K |
| 60 min Winter | 7.546 | 0.546 | 3.6 | 74.7 | O K |
| 120 min Winter | 7.614 | 0.614 | 3.6 | 83.9 | O K |
| 180 min Winter | 7.626 | 0.626 | 3.7 | 85.7 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 74.059 | 0.0 | 28 |
| 30 min Summer | 48.833 | 0.0 | 42 |
| 60 min Summer | 30.811 | 0.0 | 68 |
| 120 min Summer | 18.860 | 0.0 | 124 |
| 180 min Summer | 13.992 | 0.0 | 172 |
| 240 min Summer | 11.265 | 0.0 | 200 |
| 360 min Summer | 8.299 | 0.0 | 266 |
| 480 min Summer | 6.674 | 0.0 | 334 |
| 600 min Summer | 5.632 | 0.0 | 402 |
| 720 min Summer | 4.901 | 0.0 | 470 |
| 960 min Summer | 3.933 | 0.0 | 606 |
| 1440 min Summer | 2.881 | 0.0 | 866 |
| 2160 min Summer | 2.107 | 0.0 | 1236 |
| 2880 min Summer | 1.687 | 0.0 | 1588 |
| 4320 min Summer | 1.231 | 0.0 | 2220 |
| 5760 min Summer | 0.984 | 0.0 | 2936 |
| 7200 min Summer | 0.827 | 0.0 | 3672 |
| 8640 min Summer | 0.717 | 0.0 | 4408 |
| 10080 min Summer | 0.636 | 0.0 | 5056 |
| 15 min Winter | 74.059 | 0.0 | 28 |
| 30 min Winter | 48.833 | 0.0 | 42 |
| 60 min Winter | 30.811 | 0.0 | 68 |
| 120 min Winter | 18.860 | 0.0 | 124 |
| 180 min Winter | 13.992 | 0.0 | 178 |

## Summary of Results for 30 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 7.617 | 0.617 | 3.6 | 84.5 | O K |
| 360 min Winter | 7.592 | 0.592 | 3.6 | 81.0 | O K |
| 480 min Winter | 7.561 | 0.561 | 3.6 | 76.8 | O K |
| 600 min Winter | 7.527 | 0.527 | 3.6 | 72.2 | O K |
| 720 min Winter | 7.493 | 0.493 | 3.5 | 67.5 | O K |
| 960 min Winter | 7.425 | 0.425 | 3.4 | 58.1 | O K |
| 1440 min Winter | 7.301 | 0.301 | 3.3 | 41.2 | O K |
| 2160 min Winter | 7.155 | 0.155 | 3.2 | 21.2 | O K |
| 2880 min Winter | 7.064 | 0.064 | 3.1 | 8.8 | O K |
| 4320 min Winter | 7.039 | 0.039 | 2.4 | 5.4 | O K |
| 5760 min Winter | 7.032 | 0.032 | 1.9 | 4.3 | O K |
| 7200 min Winter | 7.027 | 0.027 | 1.6 | 3.6 | O K |
| 8640 min Winter | 7.023 | 0.023 | 1.4 | 3.1 | O K |
| 10080 min Winter | 7.021 | 0.021 | 1.3 | 2.8 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 11.265 | 0.0 | 228 |
| 360 min Winter | 8.299 | 0.0 | 284 |
| 480 min Winter | 6.674 | 0.0 | 362 |
| 600 min Winter | 5.632 | 0.0 | 438 |
| 720 min Winter | 4.901 | 0.0 | 512 |
| 960 min Winter | 3.933 | 0.0 | 654 |
| 1440 min Winter | 2.881 | 0.0 | 922 |
| 2160 min Winter | 2.107 | 0.0 | 1280 |
| 2880 min Winter | 1.687 | 0.0 | 1564 |
| 4320 min Winter | 1.231 | 0.0 | 2208 |
| 5760 min Winter | 0.984 | 0.0 | 2944 |
| 7200 min Winter | 0.827 | 0.0 | 3680 |
| 8640 min Winter | 0.717 | 0.0 | 4336 |
| 10080 min Winter | 0.636 | 0.0 | 5128 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 0.333

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.083 | 4 | 8 | 0.083 | 8 | 12 | 0.083 | 12 | 16 | 0.084 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15100

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 144.0 | 144.0 | 1.500 | 144.0 | 216.0 | 1.600 | 0.0 | 216.0 |

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

Half Drain Time : 366 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.535 | 0.535 | 3.6 | 73.1 | O K |
| 30 min Summer | 7.704 | 0.704 | 3.7 | 96.3 | O K |
| 60 min Summer | 7.866 | 0.866 | 3.9 | 118.4 | O K |
| 120 min Summer | 7.994 | 0.994 | 4.0 | 136.0 | O K |
| 180 min Summer | 8.035 | 1.035 | 4.1 | 141.6 | O K |
| 240 min Summer | 8.038 | 1.038 | 4.1 | 142.0 | O K |
| 360 min Summer | 8.016 | 1.016 | 4.0 | 139.0 | O K |
| 480 min Summer | 7.987 | 0.987 | 4.0 | 135.1 | O K |
| 600 min Summer | 7.958 | 0.958 | 4.0 | 131.1 | O K |
| 720 min Summer | 7.930 | 0.930 | 4.0 | 127.2 | O K |
| 960 min Summer | 7.875 | 0.875 | 3.9 | 119.8 | O K |
| 1440 min Summer | 7.772 | 0.772 | 3.8 | 105.6 | O K |
| 2160 min Summer | 7.629 | 0.629 | 3.7 | 86.1 | O K |
| 2880 min Summer | 7.504 | 0.504 | 3.5 | 69.0 | O K |
| 4320 min Summer | 7.307 | 0.307 | 3.3 | 42.0 | O K |
| 5760 min Summer | 7.171 | 0.171 | 3.2 | 23.4 | O K |
| 7200 min Summer | 7.088 | 0.088 | 3.1 | 12.0 | O K |
| 8640 min Summer | 7.050 | 0.050 | 3.1 | 6.8 | O K |
| 10080 min Summer | 7.044 | 0.044 | 2.7 | 6.0 | O K |
| 15 min Winter | 7.602 | 0.602 | 3.6 | 82.4 | O K |
| 30 min Winter | 7.794 | 0.794 | 3.8 | 108.7 | O K |
| 60 min Winter | 7.981 | 0.981 | 4.0 | 134.2 | O K |
| 120 min Winter | 8.135 | 1.135 | 4.2 | 155.3 | O K |
| 180 min Winter | 8.191 | 1.191 | 4.2 | 163.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 124.836 | 0.0 | 29 |
| 30 min Summer | 83.061 | 0.0 | 43 |
| 60 min Summer | 52.662 | 0.0 | 72 |
| 120 min Summer | 32.210 | 0.0 | 128 |
| 180 min Summer | 23.799 | 0.0 | 184 |
| 240 min Summer | 19.065 | 0.0 | 242 |
| 360 min Summer | 13.962 | 0.0 | 310 |
| 480 min Summer | 11.178 | 0.0 | 372 |
| 600 min Summer | 9.399 | 0.0 | 436 |
| 720 min Summer | 8.153 | 0.0 | 506 |
| 960 min Summer | 6.510 | 0.0 | 644 |
| 1440 min Summer | 4.731 | 0.0 | 916 |
| 2160 min Summer | 3.432 | 0.0 | 1312 |
| 2880 min Summer | 2.730 | 0.0 | 1700 |
| 4320 min Summer | 1.973 | 0.0 | 2424 |
| 5760 min Summer | 1.566 | 0.0 | 3112 |
| 7200 min Summer | 1.308 | 0.0 | 3752 |
| 8640 min Summer | 1.129 | 0.0 | 4400 |
| 10080 min Summer | 0.998 | 0.0 | 5080 |
| 15 min Winter | 124.836 | 0.0 | 29 |
| 30 min Winter | 83.061 | 0.0 | 43 |
| 60 min Winter | 52.662 | 0.0 | 70 |
| 120 min Winter | 32.210 | 0.0 | 126 |
| 180 min Winter | 23.799 | 0.0 | 182 |

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

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 8.205 | 1.205 | 4.2 | 164.8 | O K |
| 360 min Winter | 8.189 | 1.189 | 4.2 | 162.7 | O K |
| 480 min Winter | 8.151 | 1.151 | 4.2 | 157.5 | O K |
| 600 min Winter | 8.114 | 1.114 | 4.1 | 152.4 | O K |
| 720 min Winter | 8.075 | 1.075 | 4.1 | 147.1 | O K |
| 960 min Winter | 7.996 | 0.996 | 4.0 | 136.3 | O K |
| 1440 min Winter | 7.840 | 0.840 | 3.9 | 114.9 | O K |
| 2160 min Winter | 7.627 | 0.627 | 3.7 | 85.8 | O K |
| 2880 min Winter | 7.447 | 0.447 | 3.5 | 61.2 | O K |
| 4320 min Winter | 7.181 | 0.181 | 3.2 | 24.8 | O K |
| 5760 min Winter | 7.050 | 0.050 | 3.1 | 6.9 | O K |
| 7200 min Winter | 7.042 | 0.042 | 2.6 | 5.7 | O K |
| 8640 min Winter | 7.036 | 0.036 | 2.2 | 4.9 | O K |
| 10080 min Winter | 7.032 | 0.032 | 2.0 | 4.4 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 19.065 | 0.0 | 238 |
| 360 min Winter | 13.962 | 0.0 | 344 |
| 480 min Winter | 11.178 | 0.0 | 392 |
| 600 min Winter | 9.399 | 0.0 | 468 |
| 720 min Winter | 8.153 | 0.0 | 544 |
| 960 min Winter | 6.510 | 0.0 | 698 |
| 1440 min Winter | 4.731 | 0.0 | 992 |
| 2160 min Winter | 3.432 | 0.0 | 1408 |
| 2880 min Winter | 2.730 | 0.0 | 1792 |
| 4320 min Winter | 1.973 | 0.0 | 2476 |
| 5760 min Winter | 1.566 | 0.0 | 2936 |
| 7200 min Winter | 1.308 | 0.0 | 3672 |
| 8640 min Winter | 1.129 | 0.0 | 4312 |
| 10080 min Winter | 0.998 | 0.0 | 5080 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +30 |

## Time Area Diagram

Total Area (ha) 0.333

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.083 | 4 | 8 | 0.083 | 8 | 12 | 0.083 | 12 | 16 | 0.084 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15100

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 144.0 | 144.0 | 1.500 | 144.0 | 216.0 | 1.600 | 0.0 | 216.0 |

# Appendix E – Transport Interchange / MSCP2

| Reference | Title |
|---|---|
| BAE-HYD-XX-XX-DR-D-2007-P03 | Existing Surface Water Drainage |
| BAE-HYD-XX-XX-DR-D-2008-P04 | Proposed Surface Water Drainage |
| MSCP2.SRCX | MSCP2 Soakaway 6 – Q30 |
| MSCP2.SRCX | MSCP2 Soakaway 6 – Q100 +30% |
| MSCP2 Access South.SRCX | MSCP2 Access South Soakaway 8 - Q30 |
| MSCP2 Access South.SRCX | MSCP2 Access South Soakaway 8 – Q100 +30% |

DOWNSIDE ROAD

166.4m

BM 168.92m

Lulsgate Farm

168.1m

169.5m

MSCP UNDER CONSTRUCTION

LONG STAY

PREMIER PARKING

PREMIER PARKING

PREMIER PARKING

PREMIER PARKING

MSCP2

LONG STAY PARKING

SHORT STAY PARKING

PREMIER PARKING

PREMIER PARKING

CAR RENTAL ADMINISTRATION

NORTH SIDE ROAD

BAY 1 BAY 2 BAY 3

DROP OFF

TERMINAL

RFFS Garag

WAY OUT

BUS STOP

MH S

FLYER KIOSK

EXISTING TAXI OFFICE

SUBSTATION

KEY

- Existing surface water drain
- Existing tank soakaway
- Existing manhole soakaway
- Existing petrol interceptor
- Extent of proposed MSCP2

REVISIONS

| Rev | Date | Description | By | Ckd | App |
|---|---|---|---|---|---|
| P03 | 16/11/18 | Existing drainage updated | RJH | | |
| P02 | 05/10/18 | Project title amended. | RJH | | |
| P01 | 24/09/18 | First Issue. | RJH | | |

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CLIENT
BRISTOL AIRPORT

PROJECT
BRISTOL AIRPORT
10mppa EXPANSION SCHEME

TITLE
MULTI-STOREY CAR PARK 2
EXISTING SURFACE WATER DRAINAGE

| HYDROCK PROJECT NO. | SCALE @ A1 |
|---|---|
| C-09194-C | 1 : 500 |

| STATUS DESCRIPTION | STATUS |
|---|---|
| FOR APPROVAL | S2 |

| DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) | REVISION |
|---|---|
| BAE-HYD-XX-XX-DR-D-2007 | P03 |

DOWNSIDE ROAD

BM 168.92m

Lulsgate Farm

166.4m

168.1m

169.5m

LONG STAY

SHORT STAY PARKING

LONG STAY PARKING

PREMIER PARKING

PUBLIC DROP OFF

TAXI PICK UP

COVERED WALKWAY

BUS DROP OFF / PICK UP

MSCP2

DROP OFF

BAY 1 BAY 2 BAY 3

CAR RENTAL ADMINISTRATION

RFFS Garage

FIRE STATION

TERMINAL

NSTRUCTION

**SOAKAWAY 7**
To be retained as built

Proposed drainage system to connect to existing manhole to soakaway

**SOAKAWAY 5**
Cellular soakaway tank.
1.5m x 40m x 1.5m deep

**SOAKAWAY 2**
Cellular soakaway tank.
20m x 20m x 2.0m deep

Proposed drainage to serve new highway access

**SOAKAWAY 2**
Cellular soakaway tank.
20m x 20m x 2.0m deep

**SOAKAWAY 8**
Cellular soakaway tank.
1.5m x 40m x 1.5m deep

**SOAKAWAY 3**
Cellular soakaway tank.
17m x 17m x 1.5m deep

**SOAKAWAY 9E**
Precast concrete perforated ring
3.0m dia x 2.5m deep in 5.4m pit

**SOAKAWAY 9D**
Precast concrete perforated ring
3.0m dia x 2.5m deep in 5.4m pit

**SOAKAWAY 9C**
Precast concrete perforated ring
3.0m dia x 2.5m deep in 5.4m pit

Existing soakaway to be relocated as 'like for like' size and type from 'A' to 'B'

**SOAKAWAY 9A**
Precast concrete perforated ring
3.0m dia x 2.5m deep in 5.4m pit

**SOAKAWAY 9B**
Precast concrete perforated ring
3.0m dia x 2.5m deep in 5.4m pit

KEY

- Existing surface water drain
- Existing petrol interceptor
- Existing tank soakaway
- Existing manhole soakaway
- Proposed surface water drain
- Proposed petrol interceptor
- Proposed cellular soakaway unit
- Existing surface water drain to be abandoned
- Extent of proposed MSCP2

REVISIONS

| Rev | Date | Description | By | Ckd | App |
|---|---|---|---|---|---|
| P04 | 105/12/18 | Master plan updated. | RJH | | |
| P03 | 16/11/18 | Drainage updated. | RJH | | |
| P02 | 05/10/18 | Project title amended. | RJH | | |
| P01 | 24/09/18 | First Issue. | RJH | | |


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CLIENT
BRISTOL AIRPORT

PROJECT
BRISTOL AIRPORT
10mppa EXPANSION SCHEME

TITLE
MULTI-STOREY CAR PARK 2
and APPROACH ROADS
PROPOSED SURFACE WATER DRAINAGE

| HYDROCK PROJECT NO. | SCALE @ A1 |
|---|---|
| C-09194-C | 1 : 500 |

| STATUS DESCRIPTION | STATUS |
|---|---|
| FOR APPROVAL | S2 |

| DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) | REVISION |
|---|---|
| BAE-HYD-XX-XX-DR-D-2008 | P04 |

## Summary of Results for 30 year Return Period

Half Drain Time : 216 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.384 | 0.384 | 8.1 | 105.5 | O K |
| 30 min Summer | 7.499 | 0.499 | 8.3 | 137.1 | O K |
| 60 min Summer | 7.602 | 0.602 | 8.5 | 165.1 | O K |
| 120 min Summer | 7.668 | 0.668 | 8.6 | 183.4 | O K |
| 180 min Summer | 7.675 | 0.675 | 8.6 | 185.2 | O K |
| 240 min Summer | 7.665 | 0.665 | 8.6 | 182.5 | O K |
| 360 min Summer | 7.640 | 0.640 | 8.5 | 175.8 | O K |
| 480 min Summer | 7.614 | 0.614 | 8.5 | 168.5 | O K |
| 600 min Summer | 7.587 | 0.587 | 8.5 | 161.1 | O K |
| 720 min Summer | 7.560 | 0.560 | 8.4 | 153.7 | O K |
| 960 min Summer | 7.506 | 0.506 | 8.3 | 138.9 | O K |
| 1440 min Summer | 7.405 | 0.405 | 8.1 | 111.1 | O K |
| 2160 min Summer | 7.276 | 0.276 | 7.9 | 75.8 | O K |
| 2880 min Summer | 7.179 | 0.179 | 7.7 | 49.1 | O K |
| 4320 min Summer | 7.068 | 0.068 | 7.5 | 18.6 | O K |
| 5760 min Summer | 7.045 | 0.045 | 6.7 | 12.2 | O K |
| 7200 min Summer | 7.038 | 0.038 | 5.7 | 10.3 | O K |
| 8640 min Summer | 7.033 | 0.033 | 4.9 | 8.9 | O K |
| 10080 min Summer | 7.029 | 0.029 | 4.4 | 8.0 | O K |
| 15 min Winter | 7.434 | 0.434 | 8.2 | 119.2 | O K |
| 30 min Winter | 7.565 | 0.565 | 8.4 | 155.2 | O K |
| 60 min Winter | 7.685 | 0.685 | 8.6 | 188.2 | O K |
| 120 min Winter | 7.771 | 0.771 | 8.8 | 211.7 | O K |
| 180 min Winter | 7.789 | 0.789 | 8.8 | 216.6 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 74.059 | 0.0 | 28 |
| 30 min Summer | 48.833 | 0.0 | 42 |
| 60 min Summer | 30.811 | 0.0 | 68 |
| 120 min Summer | 18.860 | 0.0 | 124 |
| 180 min Summer | 13.992 | 0.0 | 176 |
| 240 min Summer | 11.265 | 0.0 | 204 |
| 360 min Summer | 8.299 | 0.0 | 268 |
| 480 min Summer | 6.674 | 0.0 | 336 |
| 600 min Summer | 5.632 | 0.0 | 406 |
| 720 min Summer | 4.901 | 0.0 | 474 |
| 960 min Summer | 3.933 | 0.0 | 610 |
| 1440 min Summer | 2.881 | 0.0 | 872 |
| 2160 min Summer | 2.107 | 0.0 | 1240 |
| 2880 min Summer | 1.687 | 0.0 | 1592 |
| 4320 min Summer | 1.231 | 0.0 | 2248 |
| 5760 min Summer | 0.984 | 0.0 | 2936 |
| 7200 min Summer | 0.827 | 0.0 | 3664 |
| 8640 min Summer | 0.717 | 0.0 | 4336 |
| 10080 min Summer | 0.636 | 0.0 | 5104 |
| 15 min Winter | 74.059 | 0.0 | 28 |
| 30 min Winter | 48.833 | 0.0 | 42 |
| 60 min Winter | 30.811 | 0.0 | 68 |
| 120 min Winter | 18.860 | 0.0 | 124 |
| 180 min Winter | 13.992 | 0.0 | 178 |

## Summary of Results for 30 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 7.778 | 0.778 | 8.8 | 213.7 | O K |
| 360 min Winter | 7.745 | 0.745 | 8.7 | 204.6 | O K |
| 480 min Winter | 7.708 | 0.708 | 8.7 | 194.3 | O K |
| 600 min Winter | 7.667 | 0.667 | 8.6 | 183.1 | O K |
| 720 min Winter | 7.625 | 0.625 | 8.5 | 171.5 | O K |
| 960 min Winter | 7.541 | 0.541 | 8.4 | 148.6 | O K |
| 1440 min Winter | 7.386 | 0.386 | 8.1 | 106.0 | O K |
| 2160 min Winter | 7.200 | 0.200 | 7.8 | 55.0 | O K |
| 2880 min Winter | 7.079 | 0.079 | 7.6 | 21.8 | O K |
| 4320 min Winter | 7.040 | 0.040 | 6.0 | 11.1 | O K |
| 5760 min Winter | 7.032 | 0.032 | 4.8 | 8.9 | O K |
| 7200 min Winter | 7.027 | 0.027 | 4.1 | 7.4 | O K |
| 8640 min Winter | 7.024 | 0.024 | 3.6 | 6.5 | O K |
| 10080 min Winter | 7.021 | 0.021 | 3.2 | 5.8 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 11.265 | 0.0 | 230 |
| 360 min Winter | 8.299 | 0.0 | 288 |
| 480 min Winter | 6.674 | 0.0 | 364 |
| 600 min Winter | 5.632 | 0.0 | 440 |
| 720 min Winter | 4.901 | 0.0 | 514 |
| 960 min Winter | 3.933 | 0.0 | 658 |
| 1440 min Winter | 2.881 | 0.0 | 928 |
| 2160 min Winter | 2.107 | 0.0 | 1288 |
| 2880 min Winter | 1.687 | 0.0 | 1588 |
| 4320 min Winter | 1.231 | 0.0 | 2208 |
| 5760 min Winter | 0.984 | 0.0 | 2944 |
| 7200 min Winter | 0.827 | 0.0 | 3640 |
| 8640 min Winter | 0.717 | 0.0 | 4384 |
| 10080 min Winter | 0.636 | 0.0 | 5136 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 0.837

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.209 | 4 | 8 | 0.209 | 8 | 12 | 0.209 | 12 | 16 | 0.210 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.18500 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.18500

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 289.0 | 289.0 | 1.500 | 289.0 | 391.0 | 1.600 | 0.0 | 391.0 |

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

Half Drain Time : 371 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.670 | 0.670 | 8.6 | 184.0 | O K |
| 30 min Summer | 7.883 | 0.883 | 9.0 | 242.4 | O K |
| 60 min Summer | 8.087 | 1.087 | 9.3 | 298.4 | O K |
| 120 min Summer | 8.251 | 1.251 | 9.6 | 343.5 | O K |
| 180 min Summer | 8.305 | 1.305 | 9.7 | 358.3 | O K |
| 240 min Summer | 8.311 | 1.311 | 9.7 | 360.0 | O K |
| 360 min Summer | 8.285 | 1.285 | 9.7 | 352.7 | O K |
| 480 min Summer | 8.248 | 1.248 | 9.6 | 342.6 | O K |
| 600 min Summer | 8.211 | 1.211 | 9.5 | 332.5 | O K |
| 720 min Summer | 8.176 | 1.176 | 9.5 | 322.9 | O K |
| 960 min Summer | 8.110 | 1.110 | 9.4 | 304.7 | O K |
| 1440 min Summer | 7.983 | 0.983 | 9.1 | 269.8 | O K |
| 2160 min Summer | 7.807 | 0.807 | 8.8 | 221.5 | O K |
| 2880 min Summer | 7.650 | 0.650 | 8.6 | 178.6 | O K |
| 4320 min Summer | 7.399 | 0.399 | 8.1 | 109.6 | O K |
| 5760 min Summer | 7.224 | 0.224 | 7.8 | 61.4 | O K |
| 7200 min Summer | 7.111 | 0.111 | 7.6 | 30.5 | O K |
| 8640 min Summer | 7.056 | 0.056 | 7.5 | 15.3 | O K |
| 10080 min Summer | 7.046 | 0.046 | 6.9 | 12.5 | O K |
| 15 min Winter | 7.755 | 0.755 | 8.7 | 207.3 | O K |
| 30 min Winter | 7.996 | 0.996 | 9.2 | 273.5 | O K |
| 60 min Winter | 8.231 | 1.231 | 9.6 | 338.0 | O K |
| 120 min Winter | 8.429 | 1.429 | 9.9 | 392.2 | O K |
| 180 min Winter | 8.502 | 1.502 | 10.0 | 412.5 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 124.836 | 0.0 | 29 |
| 30 min Summer | 83.061 | 0.0 | 43 |
| 60 min Summer | 52.662 | 0.0 | 72 |
| 120 min Summer | 32.210 | 0.0 | 128 |
| 180 min Summer | 23.799 | 0.0 | 184 |
| 240 min Summer | 19.065 | 0.0 | 242 |
| 360 min Summer | 13.962 | 0.0 | 316 |
| 480 min Summer | 11.178 | 0.0 | 380 |
| 600 min Summer | 9.399 | 0.0 | 444 |
| 720 min Summer | 8.153 | 0.0 | 510 |
| 960 min Summer | 6.510 | 0.0 | 648 |
| 1440 min Summer | 4.731 | 0.0 | 922 |
| 2160 min Summer | 3.432 | 0.0 | 1320 |
| 2880 min Summer | 2.730 | 0.0 | 1708 |
| 4320 min Summer | 1.973 | 0.0 | 2428 |
| 5760 min Summer | 1.566 | 0.0 | 3120 |
| 7200 min Summer | 1.308 | 0.0 | 3760 |
| 8640 min Summer | 1.129 | 0.0 | 4408 |
| 10080 min Summer | 0.998 | 0.0 | 5120 |
| 15 min Winter | 124.836 | 0.0 | 29 |
| 30 min Winter | 83.061 | 0.0 | 43 |
| 60 min Winter | 52.662 | 0.0 | 70 |
| 120 min Winter | 32.210 | 0.0 | 126 |
| 180 min Winter | 23.799 | 0.0 | 182 |

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

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 8.531 | 1.531 | 10.0 | 418.0 | O K |
| 360 min Winter | 8.510 | 1.510 | 10.0 | 414.3 | O K |
| 480 min Winter | 8.460 | 1.460 | 10.0 | 400.9 | O K |
| 600 min Winter | 8.414 | 1.414 | 9.9 | 388.2 | O K |
| 720 min Winter | 8.366 | 1.366 | 9.8 | 375.0 | O K |
| 960 min Winter | 8.270 | 1.270 | 9.6 | 348.7 | O K |
| 1440 min Winter | 8.079 | 1.079 | 9.3 | 296.4 | O K |
| 2160 min Winter | 7.815 | 0.815 | 8.9 | 223.8 | O K |
| 2880 min Winter | 7.588 | 0.588 | 8.5 | 161.4 | O K |
| 4320 min Winter | 7.245 | 0.245 | 7.9 | 67.2 | O K |
| 5760 min Winter | 7.058 | 0.058 | 7.5 | 15.9 | O K |
| 7200 min Winter | 7.043 | 0.043 | 6.5 | 11.8 | O K |
| 8640 min Winter | 7.037 | 0.037 | 5.6 | 10.2 | O K |
| 10080 min Winter | 7.033 | 0.033 | 4.9 | 9.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 19.065 | 0.0 | 238 |
| 360 min Winter | 13.962 | 0.0 | 346 |
| 480 min Winter | 11.178 | 0.0 | 402 |
| 600 min Winter | 9.399 | 0.0 | 472 |
| 720 min Winter | 8.153 | 0.0 | 550 |
| 960 min Winter | 6.510 | 0.0 | 704 |
| 1440 min Winter | 4.731 | 0.0 | 998 |
| 2160 min Winter | 3.432 | 0.0 | 1416 |
| 2880 min Winter | 2.730 | 0.0 | 1804 |
| 4320 min Winter | 1.973 | 0.0 | 2512 |
| 5760 min Winter | 1.566 | 0.0 | 3008 |
| 7200 min Winter | 1.308 | 0.0 | 3680 |
| 8640 min Winter | 1.129 | 0.0 | 4288 |
| 10080 min Winter | 0.998 | 0.0 | 5144 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +30 |

## Time Area Diagram

Total Area (ha) 0.837

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.209 | 4 | 8 | 0.209 | 8 | 12 | 0.209 | 12 | 16 | 0.210 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.18500 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.18500

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 289.0 | 289.0 | 1.500 | 289.0 | 391.0 | 1.600 | 0.0 | 391.0 |

## Summary of Results for 30 year Return Period

Half Drain Time : 123 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.327 | 0.327 | 2.2 | 18.6 | O K |
| 30 min Summer | 7.420 | 0.420 | 2.4 | 24.0 | O K |
| 60 min Summer | 7.493 | 0.493 | 2.6 | 28.1 | O K |
| 120 min Summer | 7.521 | 0.521 | 2.7 | 29.7 | O K |
| 180 min Summer | 7.517 | 0.517 | 2.6 | 29.5 | O K |
| 240 min Summer | 7.504 | 0.504 | 2.6 | 28.7 | O K |
| 360 min Summer | 7.474 | 0.474 | 2.6 | 27.0 | O K |
| 480 min Summer | 7.443 | 0.443 | 2.5 | 25.2 | O K |
| 600 min Summer | 7.413 | 0.413 | 2.4 | 23.5 | O K |
| 720 min Summer | 7.384 | 0.384 | 2.4 | 21.9 | O K |
| 960 min Summer | 7.332 | 0.332 | 2.2 | 18.9 | O K |
| 1440 min Summer | 7.245 | 0.245 | 2.1 | 14.0 | O K |
| 2160 min Summer | 7.151 | 0.151 | 1.9 | 8.6 | O K |
| 2880 min Summer | 7.091 | 0.091 | 1.7 | 5.2 | O K |
| 4320 min Summer | 7.046 | 0.046 | 1.5 | 2.6 | O K |
| 5760 min Summer | 7.037 | 0.037 | 1.2 | 2.1 | O K |
| 7200 min Summer | 7.031 | 0.031 | 1.0 | 1.8 | O K |
| 8640 min Summer | 7.027 | 0.027 | 0.9 | 1.5 | O K |
| 10080 min Summer | 7.024 | 0.024 | 0.8 | 1.4 | O K |
| 15 min Winter | 7.370 | 0.370 | 2.3 | 21.1 | O K |
| 30 min Winter | 7.476 | 0.476 | 2.6 | 27.1 | O K |
| 60 min Winter | 7.563 | 0.563 | 2.7 | 32.1 | O K |
| 120 min Winter | 7.600 | 0.600 | 2.8 | 34.2 | O K |
| 180 min Winter | 7.593 | 0.593 | 2.8 | 33.8 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 74.059 | 0.0 | 27 |
| 30 min Summer | 48.833 | 0.0 | 40 |
| 60 min Summer | 30.811 | 0.0 | 64 |
| 120 min Summer | 18.860 | 0.0 | 106 |
| 180 min Summer | 13.992 | 0.0 | 138 |
| 240 min Summer | 11.265 | 0.0 | 172 |
| 360 min Summer | 8.299 | 0.0 | 242 |
| 480 min Summer | 6.674 | 0.0 | 310 |
| 600 min Summer | 5.632 | 0.0 | 378 |
| 720 min Summer | 4.901 | 0.0 | 444 |
| 960 min Summer | 3.933 | 0.0 | 574 |
| 1440 min Summer | 2.881 | 0.0 | 824 |
| 2160 min Summer | 2.107 | 0.0 | 1180 |
| 2880 min Summer | 1.687 | 0.0 | 1528 |
| 4320 min Summer | 1.231 | 0.0 | 2204 |
| 5760 min Summer | 0.984 | 0.0 | 2936 |
| 7200 min Summer | 0.827 | 0.0 | 3672 |
| 8640 min Summer | 0.717 | 0.0 | 4352 |
| 10080 min Summer | 0.636 | 0.0 | 5136 |
| 15 min Winter | 74.059 | 0.0 | 28 |
| 30 min Winter | 48.833 | 0.0 | 40 |
| 60 min Winter | 30.811 | 0.0 | 66 |
| 120 min Winter | 18.860 | 0.0 | 116 |
| 180 min Winter | 13.992 | 0.0 | 148 |

## Summary of Results for 30 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 7.575 | 0.575 | 2.8 | 32.7 | O K |
| 360 min Winter | 7.529 | 0.529 | 2.7 | 30.2 | O K |
| 480 min Winter | 7.482 | 0.482 | 2.6 | 27.5 | O K |
| 600 min Winter | 7.436 | 0.436 | 2.5 | 24.9 | O K |
| 720 min Winter | 7.394 | 0.394 | 2.4 | 22.5 | O K |
| 960 min Winter | 7.318 | 0.318 | 2.2 | 18.1 | O K |
| 1440 min Winter | 7.199 | 0.199 | 2.0 | 11.3 | O K |
| 2160 min Winter | 7.083 | 0.083 | 1.7 | 4.7 | O K |
| 2880 min Winter | 7.046 | 0.046 | 1.5 | 2.6 | O K |
| 4320 min Winter | 7.034 | 0.034 | 1.1 | 1.9 | O K |
| 5760 min Winter | 7.027 | 0.027 | 0.9 | 1.5 | O K |
| 7200 min Winter | 7.023 | 0.023 | 0.7 | 1.3 | O K |
| 8640 min Winter | 7.020 | 0.020 | 0.7 | 1.1 | O K |
| 10080 min Winter | 7.018 | 0.018 | 0.6 | 1.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 11.265 | 0.0 | 186 |
| 360 min Winter | 8.299 | 0.0 | 262 |
| 480 min Winter | 6.674 | 0.0 | 334 |
| 600 min Winter | 5.632 | 0.0 | 406 |
| 720 min Winter | 4.901 | 0.0 | 474 |
| 960 min Winter | 3.933 | 0.0 | 608 |
| 1440 min Winter | 2.881 | 0.0 | 860 |
| 2160 min Winter | 2.107 | 0.0 | 1196 |
| 2880 min Winter | 1.687 | 0.0 | 1468 |
| 4320 min Winter | 1.231 | 0.0 | 2208 |
| 5760 min Winter | 0.984 | 0.0 | 2912 |
| 7200 min Winter | 0.827 | 0.0 | 3592 |
| 8640 min Winter | 0.717 | 0.0 | 4392 |
| 10080 min Winter | 0.636 | 0.0 | 5152 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 0.153

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.038 | 4 | 8 | 0.038 | 8 | 12 | 0.038 | 12 | 16 | 0.039 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.18500 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.18500

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 60.0 | 60.0 | 1.500 | 60.0 | 184.5 | 1.600 | 0.0 | 184.5 |

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

Half Drain Time : 371 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.670 | 0.670 | 8.6 | 184.0 | O K |
| 30 min Summer | 7.883 | 0.883 | 9.0 | 242.4 | O K |
| 60 min Summer | 8.087 | 1.087 | 9.3 | 298.4 | O K |
| 120 min Summer | 8.251 | 1.251 | 9.6 | 343.5 | O K |
| 180 min Summer | 8.305 | 1.305 | 9.7 | 358.3 | O K |
| 240 min Summer | 8.311 | 1.311 | 9.7 | 360.0 | O K |
| 360 min Summer | 8.285 | 1.285 | 9.7 | 352.7 | O K |
| 480 min Summer | 8.248 | 1.248 | 9.6 | 342.6 | O K |
| 600 min Summer | 8.211 | 1.211 | 9.5 | 332.5 | O K |
| 720 min Summer | 8.176 | 1.176 | 9.5 | 322.9 | O K |
| 960 min Summer | 8.110 | 1.110 | 9.4 | 304.7 | O K |
| 1440 min Summer | 7.983 | 0.983 | 9.1 | 269.8 | O K |
| 2160 min Summer | 7.807 | 0.807 | 8.8 | 221.5 | O K |
| 2880 min Summer | 7.650 | 0.650 | 8.6 | 178.6 | O K |
| 4320 min Summer | 7.399 | 0.399 | 8.1 | 109.6 | O K |
| 5760 min Summer | 7.224 | 0.224 | 7.8 | 61.4 | O K |
| 7200 min Summer | 7.111 | 0.111 | 7.6 | 30.5 | O K |
| 8640 min Summer | 7.056 | 0.056 | 7.5 | 15.3 | O K |
| 10080 min Summer | 7.046 | 0.046 | 6.9 | 12.5 | O K |
| 15 min Winter | 7.755 | 0.755 | 8.7 | 207.3 | O K |
| 30 min Winter | 7.996 | 0.996 | 9.2 | 273.5 | O K |
| 60 min Winter | 8.231 | 1.231 | 9.6 | 338.0 | O K |
| 120 min Winter | 8.429 | 1.429 | 9.9 | 392.2 | O K |
| 180 min Winter | 8.502 | 1.502 | 10.0 | 412.5 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 124.836 | 0.0 | 29 |
| 30 min Summer | 83.061 | 0.0 | 43 |
| 60 min Summer | 52.662 | 0.0 | 72 |
| 120 min Summer | 32.210 | 0.0 | 128 |
| 180 min Summer | 23.799 | 0.0 | 184 |
| 240 min Summer | 19.065 | 0.0 | 242 |
| 360 min Summer | 13.962 | 0.0 | 316 |
| 480 min Summer | 11.178 | 0.0 | 380 |
| 600 min Summer | 9.399 | 0.0 | 444 |
| 720 min Summer | 8.153 | 0.0 | 510 |
| 960 min Summer | 6.510 | 0.0 | 648 |
| 1440 min Summer | 4.731 | 0.0 | 922 |
| 2160 min Summer | 3.432 | 0.0 | 1320 |
| 2880 min Summer | 2.730 | 0.0 | 1708 |
| 4320 min Summer | 1.973 | 0.0 | 2428 |
| 5760 min Summer | 1.566 | 0.0 | 3120 |
| 7200 min Summer | 1.308 | 0.0 | 3760 |
| 8640 min Summer | 1.129 | 0.0 | 4408 |
| 10080 min Summer | 0.998 | 0.0 | 5120 |
| 15 min Winter | 124.836 | 0.0 | 29 |
| 30 min Winter | 83.061 | 0.0 | 43 |
| 60 min Winter | 52.662 | 0.0 | 70 |
| 120 min Winter | 32.210 | 0.0 | 126 |
| 180 min Winter | 23.799 | 0.0 | 182 |

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

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 8.531 | 1.531 | 10.0 | 418.0 | O K |
| 360 min Winter | 8.510 | 1.510 | 10.0 | 414.3 | O K |
| 480 min Winter | 8.460 | 1.460 | 10.0 | 400.9 | O K |
| 600 min Winter | 8.414 | 1.414 | 9.9 | 388.2 | O K |
| 720 min Winter | 8.366 | 1.366 | 9.8 | 375.0 | O K |
| 960 min Winter | 8.270 | 1.270 | 9.6 | 348.7 | O K |
| 1440 min Winter | 8.079 | 1.079 | 9.3 | 296.4 | O K |
| 2160 min Winter | 7.815 | 0.815 | 8.9 | 223.8 | O K |
| 2880 min Winter | 7.588 | 0.588 | 8.5 | 161.4 | O K |
| 4320 min Winter | 7.245 | 0.245 | 7.9 | 67.2 | O K |
| 5760 min Winter | 7.058 | 0.058 | 7.5 | 15.9 | O K |
| 7200 min Winter | 7.043 | 0.043 | 6.5 | 11.8 | O K |
| 8640 min Winter | 7.037 | 0.037 | 5.6 | 10.2 | O K |
| 10080 min Winter | 7.033 | 0.033 | 4.9 | 9.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 19.065 | 0.0 | 238 |
| 360 min Winter | 13.962 | 0.0 | 346 |
| 480 min Winter | 11.178 | 0.0 | 402 |
| 600 min Winter | 9.399 | 0.0 | 472 |
| 720 min Winter | 8.153 | 0.0 | 550 |
| 960 min Winter | 6.510 | 0.0 | 704 |
| 1440 min Winter | 4.731 | 0.0 | 998 |
| 2160 min Winter | 3.432 | 0.0 | 1416 |
| 2880 min Winter | 2.730 | 0.0 | 1804 |
| 4320 min Winter | 1.973 | 0.0 | 2512 |
| 5760 min Winter | 1.566 | 0.0 | 3008 |
| 7200 min Winter | 1.308 | 0.0 | 3680 |
| 8640 min Winter | 1.129 | 0.0 | 4288 |
| 10080 min Winter | 0.998 | 0.0 | 5144 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +30 |

## Time Area Diagram

Total Area (ha) 0.837

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.209 | 4 | 8 | 0.209 | 8 | 12 | 0.209 | 12 | 16 | 0.210 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

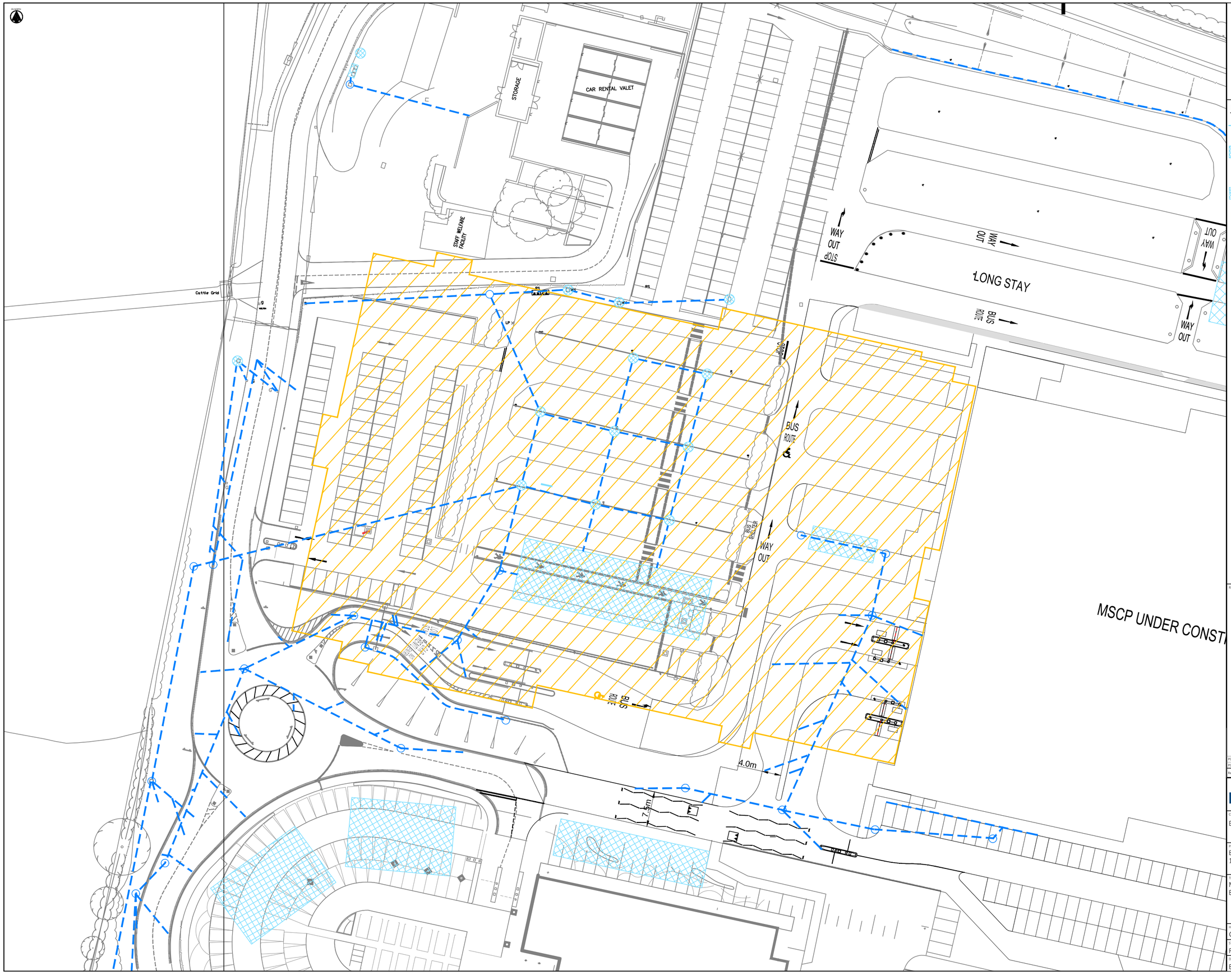
## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.18500 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.18500

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 289.0 | 289.0 | 1.500 | 289.0 | 391.0 | 1.600 | 0.0 | 391.0 |

# Appendix F – MSCP3

| Reference | Title |
|---|---|
| BAE-HYD-XX-XX-DR-D-2005-P02 | Existing Surface Water Drainage |
| BAE-HYD-XX-XX-DR-D-2006-P03 | Proposed Surface Water Drainage |
| MSCP3.SRCX | MSCP3 Soakaway 4 – Q30 |
| MSCP3.SRCX | MSCP3 Soakaway 4 – Q100 +30% |
| MSCP3 Access South.SRCX | MSCP3 Access South Soakaway 5 - Q30 |
| MSC32 Access South.SRCX | MSCP3 Access South Soakaway 5 – Q100 +30% |




KEY

- Existing surface water drain
- Existing tank soakaway
- Existing manhole soakaway
- Existing petrol interceptor
- Extent of proposed MSCP3

REVISIONS

| Rev | Date | Description | By | Ckd | App |
|---|---|---|---|---|---|
| P02 | 16/11/18 | Existing drainage updated. | RJH | | |
| P01 | 24/09/18 | First issue. | RJH | | |

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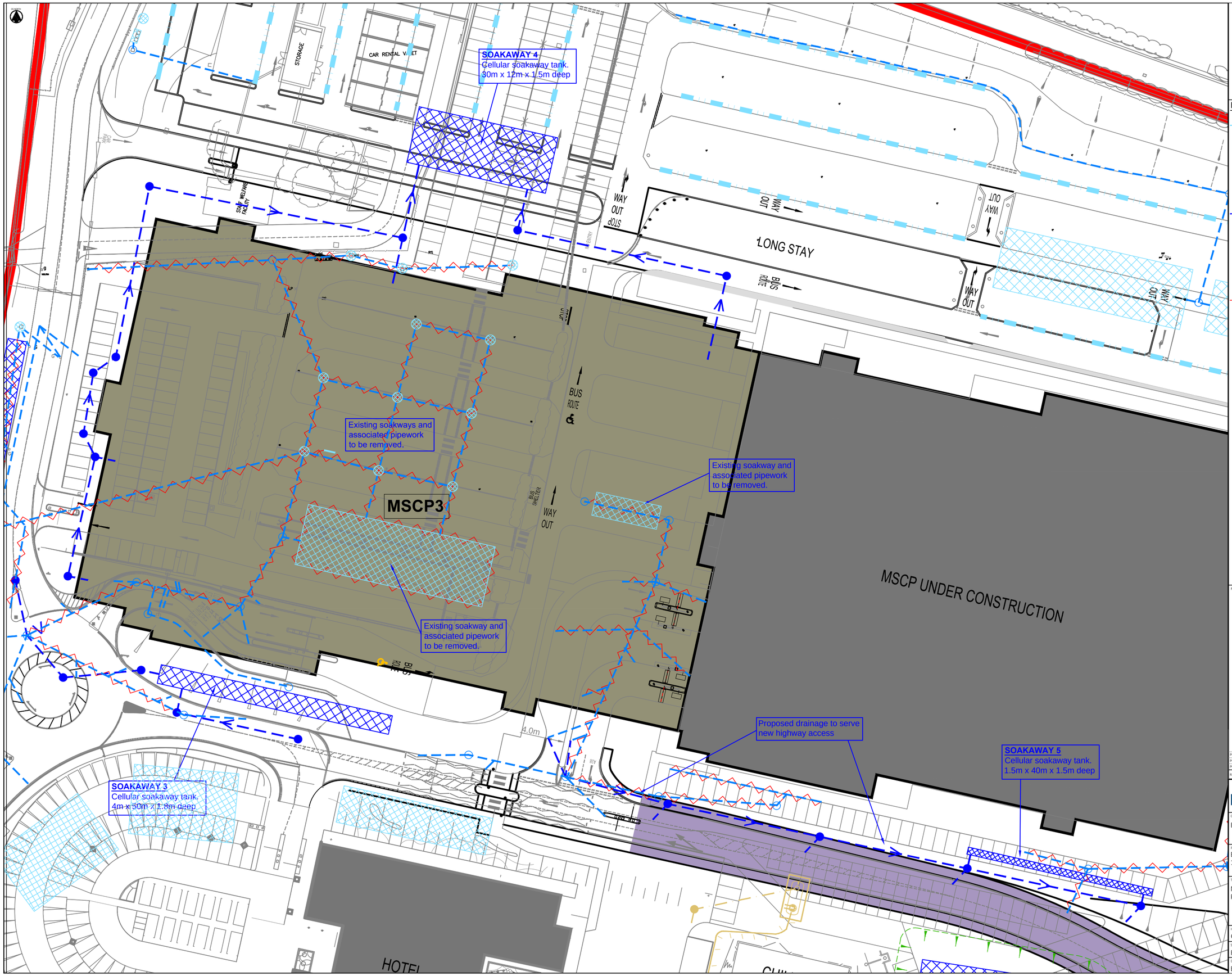
PROJECT
BRISTOL AIRPORT
12mppa EXPANSION SCHEME

TITLE
MULTI STOREY CAR PARK 3
EXISTING SURFACE WATER DRAINAGE

| HYDROCK PROJECT NO. | SCALE @ A2 |
|---|---|
| C-09194-C | 1:500 |

| STATUS DESCRIPTION | STATUS |
|---|---|
| FOR APPROVAL | S2 |

| DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) | REVISION |
|---|---|
| BAE-HYD-XX-XX-DR-D-2005 | P02 |




REVISIONS

| Rev | Date | Description | By | Ckd | App |
|---|---|---|---|---|---|
| P03 | 05/12/18 | Master plan updated. | RJH | | |
| P02 | 16/11/18 | Drainage updated. | RJH | | |
| P01 | 24/09/18 | First Issue. | RJH | | |

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PROJECT
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12mppa EXPANSION SCHEME

TITLE
MULTI STOREY CAR PARK 3
PROPOSED SURFACE WATER DRAINAGE

| HYDROCK PROJECT NO. | SCALE @ A2 |
|---|---|
| C-09194-C | 1:500 |
| STATUS DESCRIPTION: FOR APPROVAL | STATUS: S2 |
| DRAWING NO. (PROJECT CODE ORIGINATOR ZONE LEVEL TYPE ROLE NUMBER): BAE-HYD-XX-XX-DR-D-2006 | REVISION: P03 |

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

Half Drain Time : 402 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.713 | 0.713 | 10.8 | 243.8 | O K |
| 30 min Summer | 7.942 | 0.942 | 11.3 | 322.1 | O K |
| 60 min Summer | 8.163 | 1.163 | 11.8 | 397.9 | O K |
| 120 min Summer | 8.346 | 1.346 | 12.2 | 460.2 | O K |
| 180 min Summer | 8.409 | 1.409 | 12.3 | 482.0 | O K |
| 240 min Summer | 8.423 | 1.423 | 12.3 | 486.5 | O K |
| 360 min Summer | 8.401 | 1.401 | 12.3 | 479.0 | O K |
| 480 min Summer | 8.364 | 1.364 | 12.2 | 466.5 | O K |
| 600 min Summer | 8.326 | 1.326 | 12.1 | 453.4 | O K |
| 720 min Summer | 8.289 | 1.289 | 12.0 | 441.0 | O K |
| 960 min Summer | 8.221 | 1.221 | 11.9 | 417.6 | O K |
| 1440 min Summer | 8.092 | 1.092 | 11.6 | 373.4 | O K |
| 2160 min Summer | 7.911 | 0.911 | 11.2 | 311.7 | O K |
| 2880 min Summer | 7.749 | 0.749 | 10.9 | 256.2 | O K |
| 4320 min Summer | 7.483 | 0.483 | 10.3 | 165.2 | O K |
| 5760 min Summer | 7.289 | 0.289 | 9.9 | 98.8 | O K |
| 7200 min Summer | 7.157 | 0.157 | 9.6 | 53.6 | O K |
| 8640 min Summer | 7.077 | 0.077 | 9.4 | 26.2 | O K |
| 10080 min Summer | 7.049 | 0.049 | 9.1 | 16.6 | O K |
| 15 min Winter | 7.803 | 0.803 | 11.0 | 274.7 | O K |
| 30 min Winter | 8.062 | 1.062 | 11.5 | 363.4 | O K |
| 60 min Winter | 8.317 | 1.317 | 12.1 | 450.4 | O K |
| 120 min Winter | 9.119 | 2.119 | 12.5 | 524.9 | O K |
| 180 min Winter | 11.028 | 4.028 | 12.5 | 554.4 | FLOOD |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 124.836 | 0.0 | 33 |
| 30 min Summer | 83.061 | 0.0 | 47 |
| 60 min Summer | 52.662 | 0.0 | 74 |
| 120 min Summer | 32.210 | 0.0 | 130 |
| 180 min Summer | 23.799 | 0.0 | 186 |
| 240 min Summer | 19.065 | 0.0 | 244 |
| 360 min Summer | 13.962 | 0.0 | 328 |
| 480 min Summer | 11.178 | 0.0 | 390 |
| 600 min Summer | 9.399 | 0.0 | 452 |
| 720 min Summer | 8.153 | 0.0 | 520 |
| 960 min Summer | 6.510 | 0.0 | 656 |
| 1440 min Summer | 4.731 | 0.0 | 930 |
| 2160 min Summer | 3.432 | 0.0 | 1332 |
| 2880 min Summer | 2.730 | 0.0 | 1716 |
| 4320 min Summer | 1.973 | 0.0 | 2464 |
| 5760 min Summer | 1.566 | 0.0 | 3168 |
| 7200 min Summer | 1.308 | 0.0 | 3824 |
| 8640 min Summer | 1.129 | 0.0 | 4432 |
| 10080 min Summer | 0.998 | 0.0 | 5080 |
| 15 min Winter | 124.836 | 0.0 | 33 |
| 30 min Winter | 83.061 | 0.0 | 47 |
| 60 min Winter | 52.662 | 0.0 | 74 |
| 120 min Winter | 32.210 | 0.0 | 130 |
| 180 min Winter | 23.799 | 30.0 | 186 |

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

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 11.037 | 4.037 | 12.5 | 564.2 | FLOOD |
| 360 min Winter | 11.037 | 4.037 | 12.5 | 563.5 | FLOOD |
| 480 min Winter | 11.021 | 4.021 | 12.5 | 547.5 | FLOOD |
| 600 min Winter | 11.004 | 4.004 | 12.5 | 530.5 | FLOOD |
| 720 min Winter | 8.501 | 1.501 | 12.5 | 513.2 | O K |
| 960 min Winter | 8.404 | 1.404 | 12.3 | 480.1 | O K |
| 1440 min Winter | 8.211 | 1.211 | 11.9 | 414.1 | O K |
| 2160 min Winter | 7.939 | 0.939 | 11.3 | 321.3 | O K |
| 2880 min Winter | 7.703 | 0.703 | 10.8 | 240.3 | O K |
| 4320 min Winter | 7.333 | 0.333 | 10.0 | 113.9 | O K |
| 5760 min Winter | 7.100 | 0.100 | 9.5 | 34.2 | O K |
| 7200 min Winter | 7.046 | 0.046 | 8.7 | 15.7 | O K |
| 8640 min Winter | 7.040 | 0.040 | 7.4 | 13.5 | O K |
| 10080 min Winter | 7.035 | 0.035 | 6.6 | 12.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 19.065 | 39.8 | 242 |
| 360 min Winter | 13.962 | 39.1 | 350 |
| 480 min Winter | 11.178 | 23.1 | 448 |
| 600 min Winter | 9.399 | 6.1 | 482 |
| 720 min Winter | 8.153 | 0.0 | 556 |
| 960 min Winter | 6.510 | 0.0 | 710 |
| 1440 min Winter | 4.731 | 0.0 | 1010 |
| 2160 min Winter | 3.432 | 0.0 | 1432 |
| 2880 min Winter | 2.730 | 0.0 | 1828 |
| 4320 min Winter | 1.973 | 0.0 | 2556 |
| 5760 min Winter | 1.566 | 0.0 | 3128 |
| 7200 min Winter | 1.308 | 0.0 | 3664 |
| 8640 min Winter | 1.129 | 0.0 | 4328 |
| 10080 min Winter | 0.998 | 0.0 | 5120 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +30 |

## Time Area Diagram

Total Area (ha) 1.114

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.222 | 4 | 8 | 0.223 | 8 | 12 | 0.223 | 12 | 16 | 0.223 | 16 | 20 | 0.223 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.18500 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.18500

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 360.0 | 360.0 | 1.500 | 360.0 | 486.0 | 1.600 | 0.0 | 486.0 |

## Summary of Results for 30 year Return Period

Half Drain Time : 136 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.378 | 0.378 | 2.3 | 21.6 | O K |
| 30 min Summer | 7.487 | 0.487 | 2.6 | 27.7 | O K |
| 60 min Summer | 7.574 | 0.574 | 2.8 | 32.7 | O K |
| 120 min Summer | 7.611 | 0.611 | 2.8 | 34.8 | O K |
| 180 min Summer | 7.609 | 0.609 | 2.8 | 34.7 | O K |
| 240 min Summer | 7.597 | 0.597 | 2.8 | 34.0 | O K |
| 360 min Summer | 7.566 | 0.566 | 2.7 | 32.2 | O K |
| 480 min Summer | 7.533 | 0.533 | 2.7 | 30.4 | O K |
| 600 min Summer | 7.502 | 0.502 | 2.6 | 28.6 | O K |
| 720 min Summer | 7.471 | 0.471 | 2.5 | 26.9 | O K |
| 960 min Summer | 7.415 | 0.415 | 2.4 | 23.7 | O K |
| 1440 min Summer | 7.320 | 0.320 | 2.2 | 18.2 | O K |
| 2160 min Summer | 7.213 | 0.213 | 2.0 | 12.1 | O K |
| 2880 min Summer | 7.138 | 0.138 | 1.8 | 7.9 | O K |
| 4320 min Summer | 7.057 | 0.057 | 1.7 | 3.3 | O K |
| 5760 min Summer | 7.043 | 0.043 | 1.4 | 2.4 | O K |
| 7200 min Summer | 7.036 | 0.036 | 1.2 | 2.0 | O K |
| 8640 min Summer | 7.031 | 0.031 | 1.0 | 1.8 | O K |
| 10080 min Summer | 7.028 | 0.028 | 0.9 | 1.6 | O K |
| 15 min Winter | 7.427 | 0.427 | 2.5 | 24.4 | O K |
| 30 min Winter | 7.551 | 0.551 | 2.7 | 31.4 | O K |
| 60 min Winter | 7.654 | 0.654 | 2.9 | 37.3 | O K |
| 120 min Winter | 7.704 | 0.704 | 3.0 | 40.1 | O K |
| 180 min Winter | 7.699 | 0.699 | 3.0 | 39.9 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 74.059 | 0.0 | 27 |
| 30 min Summer | 48.833 | 0.0 | 40 |
| 60 min Summer | 30.811 | 0.0 | 66 |
| 120 min Summer | 18.860 | 0.0 | 110 |
| 180 min Summer | 13.992 | 0.0 | 142 |
| 240 min Summer | 11.265 | 0.0 | 176 |
| 360 min Summer | 8.299 | 0.0 | 244 |
| 480 min Summer | 6.674 | 0.0 | 314 |
| 600 min Summer | 5.632 | 0.0 | 380 |
| 720 min Summer | 4.901 | 0.0 | 448 |
| 960 min Summer | 3.933 | 0.0 | 580 |
| 1440 min Summer | 2.881 | 0.0 | 834 |
| 2160 min Summer | 2.107 | 0.0 | 1196 |
| 2880 min Summer | 1.687 | 0.0 | 1556 |
| 4320 min Summer | 1.231 | 0.0 | 2212 |
| 5760 min Summer | 0.984 | 0.0 | 2936 |
| 7200 min Summer | 0.827 | 0.0 | 3672 |
| 8640 min Summer | 0.717 | 0.0 | 4400 |
| 10080 min Summer | 0.636 | 0.0 | 5048 |
| 15 min Winter | 74.059 | 0.0 | 28 |
| 30 min Winter | 48.833 | 0.0 | 40 |
| 60 min Winter | 30.811 | 0.0 | 66 |
| 120 min Winter | 18.860 | 0.0 | 118 |
| 180 min Winter | 13.992 | 0.0 | 150 |

## Summary of Results for 30 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 7.682 | 0.682 | 3.0 | 38.9 | O K |
| 360 min Winter | 7.636 | 0.636 | 2.9 | 36.3 | O K |
| 480 min Winter | 7.587 | 0.587 | 2.8 | 33.4 | O K |
| 600 min Winter | 7.538 | 0.538 | 2.7 | 30.7 | O K |
| 720 min Winter | 7.493 | 0.493 | 2.6 | 28.1 | O K |
| 960 min Winter | 7.411 | 0.411 | 2.4 | 23.4 | O K |
| 1440 min Winter | 7.278 | 0.278 | 2.1 | 15.9 | O K |
| 2160 min Winter | 7.141 | 0.141 | 1.8 | 8.0 | O K |
| 2880 min Winter | 7.059 | 0.059 | 1.7 | 3.4 | O K |
| 4320 min Winter | 7.039 | 0.039 | 1.3 | 2.2 | O K |
| 5760 min Winter | 7.031 | 0.031 | 1.0 | 1.8 | O K |
| 7200 min Winter | 7.026 | 0.026 | 0.9 | 1.5 | O K |
| 8640 min Winter | 7.023 | 0.023 | 0.7 | 1.3 | O K |
| 10080 min Winter | 7.020 | 0.020 | 0.7 | 1.1 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 11.265 | 0.0 | 188 |
| 360 min Winter | 8.299 | 0.0 | 264 |
| 480 min Winter | 6.674 | 0.0 | 338 |
| 600 min Winter | 5.632 | 0.0 | 410 |
| 720 min Winter | 4.901 | 0.0 | 480 |
| 960 min Winter | 3.933 | 0.0 | 616 |
| 1440 min Winter | 2.881 | 0.0 | 874 |
| 2160 min Winter | 2.107 | 0.0 | 1236 |
| 2880 min Winter | 1.687 | 0.0 | 1532 |
| 4320 min Winter | 1.231 | 0.0 | 2204 |
| 5760 min Winter | 0.984 | 0.0 | 2936 |
| 7200 min Winter | 0.827 | 0.0 | 3624 |
| 8640 min Winter | 0.717 | 0.0 | 4344 |
| 10080 min Winter | 0.636 | 0.0 | 5096 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 0.175

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.044 | 4 | 8 | 0.044 | 8 | 12 | 0.044 | 12 | 16 | 0.043 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.18500 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.18500

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 60.0 | 60.0 | 1.500 | 60.0 | 184.5 | 1.600 | 0.0 | 184.5 |

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

Half Drain Time : 181 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 7.659 | 0.659 | 2.9 | 37.6 | O K |
| 30 min Summer | 7.858 | 0.858 | 3.4 | 48.9 | O K |
| 60 min Summer | 8.033 | 1.033 | 3.7 | 58.9 | O K |
| 120 min Summer | 8.135 | 1.135 | 4.0 | 64.7 | O K |
| 180 min Summer | 8.143 | 1.143 | 4.0 | 65.2 | O K |
| 240 min Summer | 8.131 | 1.131 | 4.0 | 64.4 | O K |
| 360 min Summer | 8.093 | 1.093 | 3.9 | 62.3 | O K |
| 480 min Summer | 8.046 | 1.046 | 3.8 | 59.6 | O K |
| 600 min Summer | 7.999 | 0.999 | 3.7 | 57.0 | O K |
| 720 min Summer | 7.955 | 0.955 | 3.6 | 54.5 | O K |
| 960 min Summer | 7.874 | 0.874 | 3.4 | 49.8 | O K |
| 1440 min Summer | 7.735 | 0.735 | 3.1 | 41.9 | O K |
| 2160 min Summer | 7.571 | 0.571 | 2.8 | 32.5 | O K |
| 2880 min Summer | 7.444 | 0.444 | 2.5 | 25.3 | O K |
| 4320 min Summer | 7.267 | 0.267 | 2.1 | 15.2 | O K |
| 5760 min Summer | 7.152 | 0.152 | 1.9 | 8.7 | O K |
| 7200 min Summer | 7.080 | 0.080 | 1.7 | 4.6 | O K |
| 8640 min Summer | 7.049 | 0.049 | 1.6 | 2.8 | O K |
| 10080 min Summer | 7.043 | 0.043 | 1.4 | 2.5 | O K |
| 15 min Winter | 7.742 | 0.742 | 3.1 | 42.3 | O K |
| 30 min Winter | 7.968 | 0.968 | 3.6 | 55.2 | O K |
| 60 min Winter | 8.171 | 1.171 | 4.0 | 66.7 | O K |
| 120 min Winter | 8.299 | 1.299 | 4.3 | 74.0 | O K |
| 180 min Winter | 8.308 | 1.308 | 4.3 | 74.5 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 124.836 | 0.0 | 28 |
| 30 min Summer | 83.061 | 0.0 | 41 |
| 60 min Summer | 52.662 | 0.0 | 68 |
| 120 min Summer | 32.210 | 0.0 | 120 |
| 180 min Summer | 23.799 | 0.0 | 152 |
| 240 min Summer | 19.065 | 0.0 | 184 |
| 360 min Summer | 13.962 | 0.0 | 252 |
| 480 min Summer | 11.178 | 0.0 | 322 |
| 600 min Summer | 9.399 | 0.0 | 390 |
| 720 min Summer | 8.153 | 0.0 | 460 |
| 960 min Summer | 6.510 | 0.0 | 594 |
| 1440 min Summer | 4.731 | 0.0 | 856 |
| 2160 min Summer | 3.432 | 0.0 | 1236 |
| 2880 min Summer | 2.730 | 0.0 | 1600 |
| 4320 min Summer | 1.973 | 0.0 | 2336 |
| 5760 min Summer | 1.566 | 0.0 | 3048 |
| 7200 min Summer | 1.308 | 0.0 | 3688 |
| 8640 min Summer | 1.129 | 0.0 | 4368 |
| 10080 min Summer | 0.998 | 0.0 | 5136 |
| 15 min Winter | 124.836 | 0.0 | 28 |
| 30 min Winter | 83.061 | 0.0 | 41 |
| 60 min Winter | 52.662 | 0.0 | 68 |
| 120 min Winter | 32.210 | 0.0 | 120 |
| 180 min Winter | 23.799 | 0.0 | 164 |

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

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 240 min Winter | 8.292 | 1.292 | 4.3 | 73.7 | O K |
| 360 min Winter | 8.241 | 1.241 | 4.2 | 70.7 | O K |
| 480 min Winter | 8.174 | 1.174 | 4.0 | 66.9 | O K |
| 600 min Winter | 8.104 | 1.104 | 3.9 | 63.0 | O K |
| 720 min Winter | 8.039 | 1.039 | 3.8 | 59.2 | O K |
| 960 min Winter | 7.921 | 0.921 | 3.5 | 52.5 | O K |
| 1440 min Winter | 7.726 | 0.726 | 3.1 | 41.4 | O K |
| 2160 min Winter | 7.508 | 0.508 | 2.6 | 28.9 | O K |
| 2880 min Winter | 7.351 | 0.351 | 2.3 | 20.0 | O K |
| 4320 min Winter | 7.145 | 0.145 | 1.9 | 8.2 | O K |
| 5760 min Winter | 7.049 | 0.049 | 1.6 | 2.8 | O K |
| 7200 min Winter | 7.041 | 0.041 | 1.4 | 2.3 | O K |
| 8640 min Winter | 7.036 | 0.036 | 1.2 | 2.0 | O K |
| 10080 min Winter | 7.031 | 0.031 | 1.0 | 1.8 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 240 min Winter | 19.065 | 0.0 | 194 |
| 360 min Winter | 13.962 | 0.0 | 270 |
| 480 min Winter | 11.178 | 0.0 | 346 |
| 600 min Winter | 9.399 | 0.0 | 420 |
| 720 min Winter | 8.153 | 0.0 | 492 |
| 960 min Winter | 6.510 | 0.0 | 634 |
| 1440 min Winter | 4.731 | 0.0 | 906 |
| 2160 min Winter | 3.432 | 0.0 | 1296 |
| 2880 min Winter | 2.730 | 0.0 | 1672 |
| 4320 min Winter | 1.973 | 0.0 | 2380 |
| 5760 min Winter | 1.566 | 0.0 | 2928 |
| 7200 min Winter | 1.308 | 0.0 | 3624 |
| 8640 min Winter | 1.129 | 0.0 | 4384 |
| 10080 min Winter | 0.998 | 0.0 | 5136 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.370 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +30 |

## Time Area Diagram

Total Area (ha) 0.175

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.044 | 4 | 8 | 0.044 | 8 | 12 | 0.044 | 12 | 16 | 0.043 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 11.000

## Cellular Storage Structure

Invert Level (m) 7.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.18500 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.18500

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 60.0 | 60.0 | 1.500 | 60.0 | 184.5 | 1.600 | 0.0 | 184.5 |

# Appendix G – New Gyratory Road

| Reference | Title |
|---|---|
| BAE-HYD-XX-XX-DR-D-2009-P02 | Existing Surface Water Drainage |
| BAE-HYD-XX-XX-DR-D-2010-P03 | Proposed Surface Water Drainage |
| GYRATORY.SRCX | Gyratory  Soakaway 9x – Q30 |
| GYRATORY.SRCX | Gyratory Soakaway 49x– Q100 +30% |

OS NORTH

169.5m

Homelea

The Gables

The Cottage

Yew Tree Cottage

Lundy

Martindale

1

Carrigan House

Wilburn

Sandeedine

COOMBE DALE

6

Benvenuto

Top 8

Greylands

Wood View

7

Jondon

6

171.5m

BM 172.78m

172.2m

Lulsgate B

St Katherine's Farm

169.5m

Yew Tree House

169.7m

DOWNSIDE ROAD

Rivendell

Uplands

Marlyn

Trevellas

Melle

Ponsmere

Ellandee

Greenacre

High Lands

LONG STAY

SHORT STAY PARKING

LONG STAY

RFFS Garage

FIRE STATION

NO ENTRY

NORTH SIDE ROAD

BOUNDARY BETWEEN CONCRETE AND FLEXIBLE APRON

GARAGES

NORTHSIDE HOUSE

OLD TERMINAL

EXIT

KEEP CLEAR

MAIN SUB STATION

KEY

- Existing surface water drain
- Existing tank soakaway
- Existing manhole soakaway
- Existing petrol interceptor
- Extent of Gyratory Roads and Internal Surface Parking

REVISIONS

| Rev | Date | Description | By | Ckd | App |
|---|---|---|---|---|---|
| P02 | 16/11/18 | Existing drainage updated. | RJH | | |
| P01 | 24/09/18 | First Issue. | RJH | | |


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OVER COURT BARNS
OVER LANE
ALMONDSBURY
BRISTOL
BS32 4DF
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e: bristol@hydrock.com


CLIENT
BRISTOL AIRPORT

PROJECT
BRISTOL AIRPORT 12mppa
EXPANSION SCHEME

TITLE
GYRATORY ROADS
EXISTING SURFACE WATER DRAINAGE

| HYDROCK PROJECT NO. | SCALE @ A0 |
|---|---|
| C-09194-C | 1:500 |

| STATUS DESCRIPTION | STATUS |
|---|---|
| FOR APPROVAL | S2 |

| DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) | REVISION |
|---|---|
| BAE-HYD-XX-XX-DR-D-2009 | P02 |